Assessment of Mental Illness in Patient's Seeking Rhinoplasty: A Crowdsourcing-Based Study

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Introduction: Physical appearance of the face plays a critical role in the social life of a person. Several studies have concluded that there is a direct correlation between a patient and their self-image, which can be drastically altered by the perceptions of others. This can have a negative effect on the self-esteem of a patient, resulting in anxiety, depression, and other psychological disorders, and subsequently social avoidance which may further exacerbate these conditions. Recently, it has been proposed that psychosocial concerns may motivate the demand for aesthetic rhinoplasty. Although successful operations often improve the quality of life and self-esteem symptoms in patients with sound mental health, they may actually result in unsatisfactory outcomes in those patients with significant depression, anxiety, or other severe psychological disorders. As such, the purpose of this study was to assess the incidence of mental illness in patients seeking rhinoplasty.

Methods: A prospective cross-sectional study of 298 random volunteers was conducted, with each participant completing a survey instrument that was administered through an internet crowd-sourcing service (Amazon Mechanical Turk©). Participants were asked to complete a 10-item standardized SHNOS scale, and a 26-question PRIME-MD questionnaire in order to assess functional and aesthetic need for rhinoplasty, as well as the incidence of psychological disorders, respectively. Participants were also asked to assess their satisfaction with the overall appearance of their nose both before and after administration of the survey in order to evaluate response bias.

Results: A total of 298 volunteers successfully completed the survey, with only 5.03% of survey participants demonstrating a response bias after completing the PRIME-MD questionnaire. With respect to gender, 38.95% of female participants reported a willingness to undergo aesthetic rhinoplasty, with a significantly lower number of men reporting the same (27.78%, $p = 0.042$). There was also a significantly higher percentage of young adults between the ages of 18-24 (52.92%) willing to undergo aesthetic rhinoplasty, as compared to any other age group ($p < 0.01$). Income further demonstrated a significant role in the decision to seek aesthetic rhinoplasty, with 47.37% of individuals with annual household income of $50,000-$75,000 interested in surgery, while only 32.41% of individuals with income less than $50,000 interested in rhinoplasty ($p = 0.033$). Of those participants that were satisfied with the

overall appearance of their nose, 15.32% still reported a willingness to undergo aesthetic otoplasty. Furthermore, 57.84% of patients interested in surgery reported a psychological or mental health disorder as determined by the PRIME-MD questionnaire.

Conclusions: The results of this study, as a reflection of the general US population, demonstrate that a majority of individuals interested in aesthetic rhinoplasty may be suffering from a mental health disorder. Those suffering from major depressive disorder, generalized anxiety disorder, or body dysmorphic disorder may seek aesthetic rhinoplasty as a solution to their perceived psychosocial problems. As such, it is important that surgeons assess patient mental health prior to treatment in order to avoid unsuccessful outcomes secondary to mental illness.

Safety of Enoxaparin As VTE Prophylaxis after Rhytidectomy

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Purpose: Venous thromboembolism (VTE) is a recognized and highly morbid complication of plastic surgical procedures. Though rare after cervicofacial rhytidectomy, it is a potential complication of this procedure and significantly more likely in instances of combined procedures. We are concerned that some surgeons may elect not to give DVT prophylaxis postoperatively, in rhytidectomy or combined procedures patients, out of concern about the potential for hematoma at the facelift site. We aim to examine if postoperative VTE prophylaxis with enoxaparin increases the risk of postoperative bleeding complications after these procedures.

Methods: All research was performed with approval of the University of Michigan IRB (HUM00153351). Patients undergoing cervicofacial rhytidectomy procedures (facelift and necklift via periauricular incisions) between 2006 and 2018 were recorded. Demographic factors were recorded, as well as the Caprini score as documented at the time of surgery. Patients who received postoperative DVT chemoprophylaxis received enoxaparin 40mg starting at least 6 hours postoperatively, per our institution's usual guidelines. The choice between receipt of postoperative VTE chemoprophylaxis or not was at the discretion of the treating surgeons. All hematomas and other complications were managed appropriately and documented.

Results: Eighty-six patients underwent facelift and necklift at the University of Michigan between 2006 and 2018. Thirteen of these patients (15%) received postoperative DVT prophylaxis with enoxaparin 40mg within the 24 hours after surgery (range 6.5 to 19.8 hours). The rate of hematoma was 7.7% in the group that received enoxaparin and 6.8% in the group that did not; the difference was not significantly different (p=1.0). The groups were otherwise similar, except that the group receiving enoxaparin had a higher mean BMI than the group that did not (28.2 vs 25.0, p=0.01). No VTE was observed in either group, and the mean Caprini score was similar between groups (4.5 vs 4.6, p=0.66). In multivariate logistic regression controlling for age, gender, and BMI, enoxaparin administration was not associated with hematoma development (OR=1.30, p=0.84, 95% CI=[-2.24, 2.76]).

Conclusions: In patients undergoing cervicofacial rhytidectomy, administration of enoxaparin 40mg beginning at least 6 hours after surgery does not appear to significantly increase the rate of hematoma requiring intervention.

The Earfold Implant System for the Correction of Prominent Ears: Early Experience from Two UK Aesthetic Surgeons

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Introduction & aims: The earfold™ implant system, made from a nickel-titanium alloy, is deployed and bends auricular cartilage to address an underdeveloped antihelical fold. In 2018, Kang *et al* (the device inventor) published a series of 403 patients treated with the earfold™ device, showing acceptable safety outcomes. [1] The aim of this study is to report the early results and technical tips from two UK plastic surgeons implementing the earfold™ system into their aesthetic practice.

Material & Methods: A retrospective review of all patients who received earfold™ implants between February 2017 and August 2018 was undertaken. This was a consecutive series carried out in two separate UK clinics. Demographics, clinical outcomes, complications and follow-up data was collected from electronic records.

Key results: A total of 79 implants were used in 36 patients, with 82 % (n=31) placed bilaterally. Mean age was 35 years (56% female). Overall complication rate leading to implant removal was 22% (n =8), compared to 10% reported by Kang *et al*. Indication for implant removal included: implant visibility (n=2); chronic pain (n=2);

undercorrection (n=1) and erosion (n=3). Three patients who had implants removed had previously had an otoplasty procedure and one was a recent ex-smoker. Eighty-eight percent (7/8) of complications occurred in the first 50% of earfold™ cases performed. Average follow up time from surgery was 19 weeks.

Conclusions: The earfold™ system gives reproducible results that can be visualised by patients prior to surgery, and is becoming increasingly popular. Our results indicate higher revision rates than those reported by Kang *et al* (2018), but similar to their initial published results in 2016. [2] The trend appears to support a learning curve associated with earfold™ and we advise careful patient selection, in particular a history of previous otoplasty, when starting to use the device.

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Treatment of Post-Facelift Facial Paralysis with Botulinum Toxin Type a

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Background: Nerve injuries post-facelifts are rare but cause serious functional and psychological impairment of self-esteem and quality of life. [1,2] Despite being temporary in most cases, facial asymmetry typically lasts for 3 months. We present a treatment protocol for post-facelift facial nerve injuries using botulinum toxin type A (BTXA).

Materials and Methods: The study was conducted from January 2002 to June 2018. Nine patients (all female, mean age 58 ± 8.4 years) with asymmetries due to post-rhytidectomy facial palsies were treated in the non-paralyzed side with abobotulinum toxin type A, with six months to five years follow-up. The 500-U vial was diluted in 4ml of 0.9% saline. We considered 0.02 ml of the solution (2.5 abobotulinum toxin

units) as 1 volume-Unit (Uv). Patients were examined after 15 days for outcomes evaluation. The dose applied to each muscle group[1] varied from 1 to 2 Uv/point. Patients were re-treated after 5-6 months in case of asymmetry recurrence.

Results: Four patients sought early care (mean 14.2 ± 6.4 days post-operative, ranging from 5 to 21 days). The others arrived later (mean 225 ± 80.7 days post-op, ranging from 150 to 360 days). Two patients had lesions affecting the upper third of the face and symmetry was achieved after unilateral treatment of the frontalis muscle. Three patients had injury in the middle third; their treatment depended of analysis of the deviation vectors when smiling and frowning, as to decide which muscle groups should be treated (vertical – upper lip lifter muscles; upper oblique – lifters of the angle of the mouth muscles and horizontal – rizorius muscle). Four patients were affected in the lower third (inferior deviation vectors) and were treated with two points in order to paralyze the lower lip depressor muscles.

Correction of asymmetry was achieved in all cases. Recovery from the nerve injury and BTXA application occurred symmetrically in both sides of the face in the following months. All patients with early onset of BTXA therapy (<30 days) had complete recovery of facial symmetry with a single application, evidence of neuropraxis. Patients with lesions of the upper third, those with late onset of BTXA treatment (>30 days) and those with more than one affected nervous branch presented definitive lesion, with partial recovery or improvement, and needed BTXA treatment every 6 months.

Conclusion: Most facial nerve injuries post-facelifts presented favorable evolution for spontaneous resolution, except in the upper third of the face and in case of late lesions. Symmetry was achieved in all cases with low doses of BTXA in the suggested protocol points, avoiding an unhappy asymmetric patient in the following months.

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Otoplasty: The Belfast Experience - a Ten Year Review

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Purpose: Prominent ear is a common congenital anomaly with an estimated incidence of 5%. Otoplasty aims to address the abnormal shape of the auricular cartilage framework. The vast range of operative techniques and refinements belies a lack of consensus as to the proper surgical approach to this common condition. Recent publications favour cartilage suturing techniques over cartilage scoring methods. The Belfast experience of different otoplasty techniques of one thousand one hundred and ninety nine patients over a ten year period is reviewed

Methods and Materials: All paediatric cases undergoing correction of prominent ear/ears from 2005 – 2015 were included in this retrospective case note analysis and follow up study. Data collected included age, sex, age at referral, age at outpatient clinic, indication for referral, laterality, family history and cause of prominence. Also collected was age at surgery, time on waiting list, method of anaesthesia, surgeon grade / supervision, surgical technique utilized, hospital stay, duration and compliance with head bandage and complication rate associated with each technique

Experience including number of cases and follow-up

Over a ten year period 1199 otoplasties were performed, 1134 bilateral and 65 unilateral (a total of 2333 ears corrected). Of these 707 (59%) cases were male and 494 (41%) female. Patient review was at one week and three months post op

Summary of Results: Mean age at surgery; 9 years, median; 9 years, range 2-14 years. Surgery under combined general (GA) and local anaesthetic (LA) in 94% cases, GA only 4% and LA only 2%. Surgery performed by a consultant in 29%, registrar 68% and a core trainee in 3% of cases. Surgical technique; conventional anterior cartilage scoring in 1575 (68%) cases, suture only technique in 215 cases (9%), conchal / cartilage reduction 82 cases (3%), combined conventional cartilage scoring and suturing 444 cases (19%) and combined suturing and conchal reduction in 17 cases (1%)

Complication rates for:

Anterior scoring (1575 ears)

16 ears (1.01%) bleeding requiring early redressing

25 ears (1.58%) developed haematoma requiring theatre for evacuation

8 ears (0.32%) Infection requiring antibiotics

5 ears (0.32%) wound dehiscence

27 ears (1.715%) developed pressure necrosis

3 ears (0.63%) developed keloid scars

11 ears (0.69%) deemed to have a residual asymmetry deformity

Suture only otoplasty 215 ears

0 ears (0%) bleeding requiring redressing

0 ears (0%) haematoma requiring evacuation

4 ears (1.39%) infection requiring antibiotics

1 ear (0.47%) wound dehiscence

0 ears (0%) developed pressure necrosis

0 ears (0%) developed keloid scarring

0 ears (0%) were deemed to have a residual asymmetry deformity

The remaining ears underwent combination procedures, again with low associated complication rates. For all patients satisfaction based on an objective questionnaire was found to be 96% post operatively

Conclusions: Otoplasty with anterior scoring is a safe procedure and overall our results highlight it to be a reliable, reproducible technique with high patient satisfaction. We feel our institution presents results that are comparable to other

studies that rely only on suture correction otoplasty, with a complication rate that is similar if not superior to this technique

Contemporary Analysis of Rhytidectomy Using TOPS Outcomes Registry with 13,346 Patients

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Background: Rhytidectomy is a popular procedure for facial rejuvenation, but a comprehensive and up-to-date appraisal is lacking. This study reports current practices, safety profile and complications following rhytidectomy in a large, prospective, multi-center database.

Methods: A prospective cohort of patients undergoing rhytidectomy between 2008 and 2016 was identified from the TOPS database. Perioperative data and patient characteristics were extracted and analyzed with respect to adverse events. Multivariate logistic regression evaluated for risk factors including age, gender, BMI, smoking, diabetes, duration, multiple procedures, type of surgical facility, anesthesia type and provider.

Results: 13,346 patients with a mean age of 60 years underwent rhytidectomies and a total of 31,206 CPT procedures. Most were healthy females with an ASA class < 3 (98%). On average 2.3 CPT procedures were performed in 3.8 hours per patient, and blepharoplasty was the most common adjunctive procedure. 50% of operations were performed in office-based settings, with an anesthesiologist and general anesthesia utilized in 50.5% and 63% of cases, respectively . The incidence of adverse events was 5.1%, and hematoma (1.9%), infection (0.8%) were the most frequent surgical complications. Male gender (OR 1.6), obesity (OR 1.7), smoking status (OR 1.6), duration (OR 1.1), combined procedures (OR 1.3), general anesthesia (OR 1.7) and office-based surgery (OR 1.3) were associated with an increased odd of adverse events.

Conclusion: This is the largest analysis of rhytidectomy in a representative population. Rhytidectomy is a very safe procedure when performed by board-certified plastic surgeons. The study provides a standard reference for professionals when counseling patients and in guiding clinical practices.

Evaluation and Timing of Improvement Following Direct Doxycycline Hyclate Injections for Malar Edema and Lower Eyelid Festoons

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Purpose: Tetracycline family antibiotics have demonstrated utility as sclerosing agents for lymphatic malformations and other lesions of impaired fluid drainage, including conjunctival chemosis, eyelid festoons, and malar edema. [1-5] However, the timing of improvement and patient reported subjective outcomes for aesthetic use of doxycycline hyclate injections in treating lower eyelid festoons and malar edema is not well reported. The purpose of this study was to evaluate subjective patient satisfaction and timing of improvement of cosmetically significant lower eyelid festoons and malar edema treated with direct, intralesional injections of doxycycline hyclate.

Methods: An IRB-approved, retrospective review was performed. Inclusion criteria were patients with lower eyelid festoons and/or malar edema treated with direct, intralesional injection of doxycycline hyclate at a concentration of 10mg/mL. Exclusion criteria were inadequate follow-up, alternate doxycycline concentration, or alternate intervention during the observation period. The primary outcome measure was patient self-reported improvement which was graded as percentage improvement at each visit. Additional data collected included injection volume, concentration, timing of repeat injections, and any subjective patient-reported complaints. Standard statistical calculations were performed.

Results: 27 treatment areas of 15 patients met inclusion criteria. Average length of final follow-up was 20 weeks (SD: 16 weeks, range: 4 to 56 weeks). Overall, 9 out of 15 patients subjectively reported complete resolution of their lower eyelid festoons or malar edema and 13 out of 15 patients reported improvement of greater than or equal to 50%. The average final patient reported subjective improvement was 80% (SD: 27%, range 33-100%). The average time to final subjective improvement in appearance was 16 weeks from initial injection (SD: 10 weeks, range 4 to 44). The average number of injections performed per side was 1.4 (SD: 0.64 injections, range 1 to 3 injections). When necessary, repeat injections were performed at an average of 16 weeks following prior injection (SD: 3 weeks, range 12-20 weeks). Average initial injection volume was 0.64mL (SD: 0.29mL, range: 0.2 to 1). Average repeat injection volume was 0.54 mL (SD: 0.35mL, range 0.2 to 1.5mL). Patient reported complaints included burning sensation and pain at the time of injection, and transient bruising,

edema, and erythema following the injection. No significant dermatological or visual complications were reported during the documented follow-up period.

Conclusions: Direct, intralesional injection of doxycycline hyclate at a concentration of 10 mg/mL subjectively improved the appearance of lower eyelid festoons and malar edema. On average, final improvement took approximately 16 weeks.

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Lipoabdominoplasty and Oblique Flankplasty: An Alternative to Fleur De Lys Abdominoplasty and Lower Body Lift

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Purpose: After weight loss, pregnancy and/or aging, excess skin of the lower torso maybe treated with abdominoplasty extended as lower body lift. Pittsburgh Grade 3b-d transverse skin excess is often additionally treated by midline vertical excision, Fleur-de-Lys (FDL) abdominoplasty. (1) While loose skin removed, and waist slightly narrowed, “aesthetic cost” is full-length midline abdominal scar and flatness.
(2) Recently innovated Oblique Flankplasty Lipoabdominoplasty (OFLA) smoothly deepens the waist and raises lateral buttocks and thighs, leaving lower abdominal and waist-long scars. (3, 4) An unforeseen benefit is the circumferential removal of mid and lower torso vertical skin excess, obviating FDL abdominoplasty.

Methods: Oblique Flankplasty is posterior rising extensions of lipoabdominoplasty. In 18 3b-d abdominal deformity cases, vertical midline excision was replaced by flankplasty. The Lipoabdominoplasty is planned with superior incision continuing across the lateral costal margin and the inferior incision across the iliac crests. The width of excision is confirmed through pinching. Drawings of the elliptical flank excisions are centered over the protruding flank bulges from the Posterior Iliac crests to the junction of the twelfth rib and spine. The superior incision line extension of the abdominoplasty lies inferior and parallel to the posterior costal margin. This is a stable anchor closure line. After superior push of the descended lateral buttocks, the width of resection is determined by tissue gathering. While prone, the inferior incision is made along the hip and obliquely through lower lumbar globular adipose to lumbodorsal fascia. The mobile lower flap of buttocks and lateral thigh is pulled towards the midback to adjust the planned superior incision. After that perimeter incision is completed, the intervening tissue is excised to Lumbodorsal fascia. The superficial SFS layers of the buttocks are approximated to all SFS layers of the lower back with #2 Barbed PDO, including underlying fascia. Intradermal running Monoderm completes closure. Buttocks may be lipoaugmented. Lipoabdominoplasty follows. Some months later, the breast and upper torsoplasty with a Wise pattern mastopexy, J-torsoplasty and Spiral Flap reshaping of the breasts can be performed.

Results: OFLA achieves ventral abdominal skin tightness without FDL in 18 consecutive 3b-d abdominoplasty cases. Natural contours with deep smooth transition from waist to defined hips. All patients preferred flank scars over abdominal midline. One patient had a 2-month 4-centimeter wound delay. No seromas or tissue necrosis. No scar revisions. Secondary liposuction, lipoaugmentation or BodyTite in 4 cases. Two saddlebags were improved. The lateral buttock was rounded rather than depressed.

Conclusion: In 18 Grade 3b-d (severe) abdominoplasty candidates, OFLA improved aesthetics with minimal complications, and uniform patient satisfaction.

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Patient Expectations Impact Satisfaction after Implant-Based Breast Reconstruction

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Purpose: The purpose of this study was to evaluate the relationship between patient expectations and satisfaction after implant-based breast reconstruction using patient-reported outcomes.

Methods: A prospective cohort study was conducted on patients who underwent two-stage implant-based breast reconstruction between December 2014 and May 2018 at Memorial Sloan Kettering Cancer Center. Patients completed the expectations module of the BREAST-Q preoperatively and the postmastectomy reconstruction module at 6 months postoperatively. The domains evaluated using the BREAST-Q were psychosocial well-being, physical well-being, sexual well-being, satisfaction with breasts, and satisfaction with the medical team. The relationship between expectations and satisfaction was evaluated via Pearson correlation.

Results: 296 patients were enrolled during the study period. The average patient expectation score was 86.8±19.2 for psychosocial well-being, 76.1±17.2 for physical well-being, 72.2±26.8 for sexual well-being, 87.9±19.0 for satisfaction with breasts, and 75.5±22.7 for satisfaction with the medical team. At 6 months following the first-stage reconstruction with tissue expanders, patient expectations were negatively associated with physical well-being ($r=-0.26$, $p=0.010$). At 6 months following second-stage reconstruction with silicone implants, patient expectations were positively associated with psychosocial ($r=0.34$, $p=0.011$) and sexual ($r=0.46$, $p=0.005$) well-being, but not with physical well-being ($r=0.08$, $p=0.566$) or satisfaction with breasts ($r=0.06$, $p=0.647$).

Conclusions: Preoperative patient expectations significantly impact postoperative satisfaction of patients undergoing implant-based breast reconstruction, and differently for different BREAST-Q domains. The results of this study may therefore be used to better inform expectations and improve the shared medical decision-making process between patients and surgeons.

The "Skinny" on Fat Grafting for Total Autologous Breast Reconstruction: A Retrospective Cohort Study

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Purpose: Fat grafting has emerged as an oncologically safe and irreplaceable technique in breast reconstruction. However, it is most commonly used in smaller volumes as an adjunctive procedure following either implant-based or flap reconstruction. Nonetheless, larger volume fat grafting alone has proven to be an indispensible option for breast reconstruction, particularly in the patient who desires an autologous reconstruction with low morbidity. Yet, there is a paucity of literature examining this process and analyzing the procedures and time involved. Here, we report a single surgeon's experience using fat grafting entirely for total autologous breast reconstruction (TABR).

Methods: A retrospective cohort review was performed of patients who underwent TABR with fat grafting by a single senior surgeon (CD) between 2013-2018. Perioperative patient characteristics were collected as well as surgical data pertaining to fat graft volume, donor site, and time between rounds of fat grafting. Statistical analyses were performed to determine the effects of patient factors on fat grafting procedures. The presence of nipple reconstruction, symmetrizing procedures, and complications were also reviewed.

Results: 12 female patients were identified. Mean age was 61.42+/-7.85 years. Mean BMI was 23+/-4.64. 25% of patients underwent bilateral breast reconstruction with fat grafting, while 41.67% had a left-unilateral reconstruction and 33.33% were right-unilateral. Only 1 patient, 8.33%, was previously irradiated. Number of fat grafting procedures ranged from 1-5 and averaged 3.08+/-1.50. BMI and number of procedures was inversely correlated with R = -0.24 and R2= 0.061. As expected, the initial round of fat grafting was on average the lowest volume (189.67+/-92.99 cc). The abdominal area seemed to be the donor site of choice for first round fat grafting (75% of patients), while the lower extremities were the donor sites in 33.33% of patients. For 2nd, 3rd, 4th, and 5th round fat grating procedures, the abdominal donor site became less common (66.67%, 12.5%, 20%, and 0%, respectively) and the lower body more common (33.33%, 100%, 100%, 100%, respectively). Donor site contour irregularities requiring surgical correction were present in 16.67% of patients. The numbers of days between subsequent fat grafting procedures were on average 115 days, 191 days, 221 days, and 177 days, respectively. Fat grafting volumes in subsequent procedures did not differ significantly (P>0.05). The only complication

(8.33%) was an oil cyst that was surgically excised. 41.67% of patients underwent nipple reconstruction.

Conclusion: Fat grafting for TABR is an oncologically safe, low morbidity alternative for breast reconstruction. Our study will allow plastic surgeons to better manage patient expectations and accurately inform them regarding the extent and timeline of this technique. We show that lower BMI was correlated with more fat grafting procedures, likely due to a more diminutive donor site and overall lower graft volumes. Graft volume stayed relatively consistent among subsequent procedures, with the abdomen being the most common donor site earlier on and the lower extremities being most common in later procedures. Future studies will aim to further elucidate graft 'take' through 3D image analysis.

Complications after Perforated Vs. Non-Perforated Acellular Dermal Matrix Use in Direct to Implant Breast Reconstruction: A Propensity Score Analysis

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Introduction: Direct-to-implant (DTI) breast reconstruction has become an integral surgical approach due to its decreased medical system costs, improved psychosocial morbidity, and optimized cosmetic outcomes. This approach has been furthered by the use of acellular dermal matrices (ADM), which were first used by the senior author in breast reconstruction in 2000, and have since become foundational to implant-based breast reconstruction. The composition of ADMs has evolved in recent years and now includes perforated or fenestrated types; though limited literature exists on how these changes have affected patient outcomes. Thus, the authors performed a retrospective review of patients undergoing DTI breast reconstruction with either perforated or non-perforated ADM in order to evaluate differences in rates of complications.

Methods: A retrospective review was conducted for patients who underwent DTI breast reconstruction by a single surgeon (CAS) from December 2001 to December 2018. Of note, aside from a change in ADM composition, during the study time period there was no change in operative procedure or postoperative protocol, including time to drain removal. Patient age, co-morbidities, chemotherapy status, radiation status, and mastectomy type (prophylactic vs. oncologic) were recorded alongside whether the patient received perforated or non-perforated ADM. Patients who received expander implants or whose comorbid and demographic information

was not available through chart review were excluded. Propensity score matching and univariate Chi-square analysis was conducted in SAS 9.4 (Cary, N.C.) to account for confounding variables and evaluate the association between ADM perforation and postoperative complications ($p<0.05$).

Results: A total of 409 patients (761 breasts) with DTI reconstruction were reviewed. 4 patients (8 breasts) were excluded due to missing demographic information, 8 patients (12 breasts) were excluded due to lack of ADM use in their reconstruction, and 33 patients (61 breasts) were excluded because they failed to follow-up for at least 4 weeks. Thus 364 patients (680 breasts) were included for analysis. 530 (77.94%) breasts were reconstructed using non-perforated ADM and 150 (22.06%) breasts were reconstructed using perforated ADM. Univariate analyses of 147 pairs of propensity score matched breasts receiving perforated ADM and non-perforated ADM revealed that perforated ADM was not significantly associated with a difference in overall complication rate (4.67% vs. 4.72%, p=0.9795). Analysis of individual complications revealed no significant increase in perforated ADM as compared to non-perforated ADM regarding the development of necrosis (2.00% vs. 1.32%, p=0.4661), infection (1.33% vs. 1.32%, p=1.0000), hematoma (0% vs. 0.38%, p=1.0000), seroma(0% vs. 1.51%, p =0.2105), implant loss (1.33% vs. 1.32%, p=1.0000), or capsular contracture (1.33% vs. 1.51%, p=1.0000). Of note, propensity matched pairs of patients receiving perforated ADM vs. non-perforated ADM had no significant difference in age (46.63(11.01) vs. 43.29(11.61), unpaired t-test, p=0.7968).

Conclusion: DTI breast reconstruction with perforated ADM has a comparable complication profile as compared to non-perforated ADM, including no change in rate of seroma development. Further investigation is needed to evaluate complications after perforated ADM use in tissue expander-based reconstruction as well as potential differences in cosmetic outcomes.

Do We Need Nasal Swabs? the Effects of Preoperative MRSA Colonization on Implant-Based Breast Reconstruction

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Background: Various studies have correlated preoperative Methicillin-Resistant *Staphylococcus aureus* (MRSA) nasal colonization with increased risk of postoperative complications. This data has driven many institutions to develop

policies regarding the usage of nasal swabs preoperatively in all implant related cases. The goal of this study is to evaluate the relationship between MRSA colonization and complication rates in implant-based breast reconstruction.

Methods: A retrospective review was performed on 218 patients (354 breasts) that underwent mastectomy with implant based breast reconstruction by a single surgeon from 2013 to 2016. 126 patients had preoperative nasal swabs with 102 of them having an additional postoperative swab. Patients were identified as being colonized with MRSA, not colonized or converted during their operative course. Each patient received a standard preoperative antibiotic (Ancef or Clindamycin) and a postoperative antibiotic (Keflex or Bactrim). However, specific intervention to treat MRSA status was not performed. Complications rates were then analyzed and compared to MRSA colonization status.

Results: 4.8% (n=6) of the patients in this study were colonized with MRSA preoperatively compared to 95.2% (n=120) that were not colonized with MRSA. 2.0% (n=3) patients remained MRSA positive in the post-operative period, while the other 3 patients converted to a MRSA negative status. There was no statistically significant difference in complication rates of preoperative MRSA carriers (n=3, 2.38%) and non-carriers (n=56, 46.7%). There was no statistical significance ($p = 1.0$) between MRSA carriers (n=2, 2.38%) and non-carriers (n=32, 25.4%) that required percutaneous seroma drainage. In addition, there was no statistical significance found in patients that developed wound dehiscence, implant exposure, or capsular contracture between the two cohorts.

Summary: MRSA colonization, in the preoperative and postoperative setting, does not increase the risk of complication following implant-based breast reconstruction. Though preoperative and postoperative antibiotics were given for prophylaxis there were no specific therapies initiated, based on patient's MRSA carrier status. We therefore question the necessity of nasal swab being performed preoperatively as it pertains to postoperative complications.

Prepectoral Breast Reconstruction in Nipple Sparing Mastectomy with Immediate Mastopexy: Is It Possible?

Presenter:	Joseph Banuelos, MD
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Background: Implant-based breast reconstruction (IBR) is the most common reconstructive approach after nipple sparing mastectomy (NSM). Prepectoral approach has gained more interest in recent years inasmuch as the traditional subpectoral approach has been associated with animation deformity and increased pain. However, for patients with ptotic and large breasts, technical difficulties and wound healing prevent the plastic surgeon from offering NSM with immediate mastopexy. Herein, we report our experience with patients who underwent nipple sparing mastectomy with prepectoral IBR and immediate mastopexy.

Methods: Retrospective chart review of patients who underwent two-stage implant-based breast reconstruction at our institution from February 2014 to February 2018. We included adults who underwent NSM in combination with immediate mastopexy and prepectoral tissue expander placement. We collected demographic data, smoking status, comorbidities, grade of ptosis, intent of surgery (therapeutic or prophylactic), axillary lymph node dissection, breast weight, TE filling, use of ADM, use of SPY angiography and additional oncologic treatment (radiation or chemotherapy). Post-operative outcomes and complications were reported. We also evaluated the patients reported outcomes using reconstruction module of the BREAST-Q questionnaire.

Results: A total of seventeen NSM (9 patients) with simultaneous mastopexy were performed and analyzed . The median age of the patients was 43 years (range 39-54), with a median BMI of 30.7 kg/m2 (range 20.5-39.7). All patients had a grade 2 or 3 ptosis with no history of breast radiotherapy. Wise pattern mastopexy was performed in 15 (88%) breasts, and periareolar mastopexy was performed in only in 2 (12%). All patients underwent immediate tissue expander placement in the pre-pectoral plane with complete coverage with ADM. Intraoperative angiography was used in 13 (76%) reconstructions to assess the nipple-areolar perfusion, while in the remaining 4 reconstructions only clinical examination during surgery was used and ICG was not considered necessary. The median follow-up time was 23.5 months (range 16.7-55.2). Only two (12%) breasts presented with seroma, which was percutaneously aspirated. No nipples were lost and all patients achieved final breast reconstruction. Only 1 patient had a subsequent revision with bilateral autologous fat grafting to improve contour. The mean Q-Score for patient satisfaction for the procedure was 88 points.

Conclusion: Based on these results, we believe that in patients with large and/or ptotic breasts, given no oncological contraindications, nipple-spearing mastectomy with prepectoral breast reconstruction and immediate mastopexy can be attempted if adequate mastectomy flaps and nipple perfusion are present.

Safety of Performing Nipple Sparing Mastectomy for Patients with History of Reduction Mammoplasty or Mastopexy: A Retrospective Cohort Study and Systematic Review

Presenter:	Joseph Banuelos, MD
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Objectives: Nipple sparing mastectomy (NSM) offers an aesthetically superior approach for either therapeutic or prophylactic treatment of breast cancer in appropriate patients. However, its use still poses a dilemma in patients with prior reduction mammoplasty or mastopexy, as these patients may be at higher risk of postoperative complications and flap necrosis due to existing surgical scars. The aim of this study is to determine rate of complications, nipple-areola complex (NAC) necrosis and completion rate of breast reconstruction in patients with history of reduction mammoplasty or mastopexy.

Methods: Retrospective electronic chart review was performed to identify all consecutive patients who underwent immediate breast reconstruction at our institution from May 2013 to September 2017, who had history of mastopexy or reduction mammaplasty. Patient's demographics, surgical characteristics and postoperative outcomes were evaluated. Additionally, a systematic review was performed using the guidelines outlined in the Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA). The electronic literature search included Medline/Pubmed, Scopus and Cochrane Databases to identify all articles published to date that reported outcomes of nipple sparing mastectomy and breast reconstruction in patients with prior reduction mammaplasty or mastopexy.

Results: A total of 23 immediate breast reconstruction and nipple sparing mastectomies were performed in 15 patients. The median age of the patients was 58 (45-62) years, with a median BMI of 28.7 (25.3-30.8). Thirteen (56.5%) had previous mastopexy, and 10 (44.5%) had previous reduction mammoplasty. The median interval time from mastopexy/reduction mammoplasty to NSM was 43 (34-38) months. Intraoperative indocyanine green (ICG) angiography was used in all patients to assess nipple-areolar perfusion, and all breasts demonstrated adequate perfusion. Postoperatively, one breast presented with nipple ischemia that improved with medical treatment, and another presented with TE infection that required explantation and eventually TE replacement. All patients achieved final breast reconstruction and no nipples presented with necrosis. The electronic literature search identified 175

articles, of which 6 met the inclusion criteria, for a total of 116 patients and 184 breasts. The majority (64%) had previous mastopexy. All the NSM were performed after 3 months of the mastopexy or reduction mammoplasty, with a mean of 35 months after the first procedure. The pooled complication rate was 14.6%, of which 5.4% required additional surgical treatment. Only 2 (1%) nipples presented partial necrosis that did not required surgical management and 4 (2%) breasts had implant removed secondary to a complication. All patients achieved final reconstruction.

Conclusion: Based on this analysis, nipple-sparing mastectomy with immediate implant-based reconstruction can be safely offered in patients with prior history of reduction mammoplasty or mastopexy. The low complication rate and low reconstructive failure is promising and can be discussed with the patient if no further oncologic contraindication exists. However, well perfused mastectomy flaps on physical exam and on angiography are necessary in order to reduce complications.

Breast Reconstruction Completion in the Obese Female: Does Reconstruction Technique Make a Difference in Its Achievement?

Presenter: Ivo A. Pestana, MD
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Breast reconstruction completion is the goal of the reconstructive process. Reconstruction completion may be defined as breast mound creation allowing the use of clothing without prosthetics or the stigmata of mastectomy. Creation of the nipple areolar complex (NAC) may also be considered reconstruction completion since many women do not feel like it is their breast again until the NAC in place. In normal BMI patients undergoing breast reconstruction, perioperative complication risk is similar between implant-based and autologous reconstruction. This is not the case in the obese female where breast reconstruction operations are associated with increased risk of perioperative complications. We hypothesize that perioperative complications may affect the eventual completion of reconstruction in the obese female. Our aim is to determine if reconstruction technique affects the achievement of reconstruction completion in the obese female.

An IRB-approved retrospective study of consecutive obese women (BMI $\geq$ 30) who underwent mastectomy and implant-based or autologous reconstruction over a 10-year period was performed. Patient demographics, comorbidities, oncologic treatments, reconstructive procedures and their complications were analyzed.

Two hundred twenty five women with 352 breast reconstructions were included with mean follow-up of 27 months. Seventy-four women underwent 111 autologous breast reconstructions and 151 underwent 241 implant reconstructions. Mean age of included women was 52 years. Mean BMI in the autologous group was 33 and 36 in the implant group. There were no differences between groups in terms of age and presence of medical comorbidities. Active tobacco use was noted in 5.4% of the autologous group and 14.5% of implant patients (p=0.47). Chemotherapy, radiation, and delayed reconstruction timing was more common in the autologous patients compared to the implant group (p=0.01, 0.09, and<0.0001, respectively). Minor and major complications occurred more frequently in the implant group compared to the autologous group (p=<0.0001). Breast mounds were completed in >98% of autologous cases compared to 76% of implant cases (p=<0.001). NAC creation was completed in 57% of autologous patients and 33% of implant patients (p=0.0009). The rate of successfully completing the breast mound and the NAC is higher in the autologous patient group (Mound OR 3.32, 95% CI 1.36-5.28 and NAC OR 2.7, 95% CI 1.50-4.69) compared to the implant group. Occurrence of a major complication in the implant group decreases the rate of reconstruction completion (OR 13.0, 95% CI 4.9 to 34.1).

Obese women undergoing implant-based breast reconstruction are more likely to have perioperative complications and 24% of these patients fail to achieve mound completion. Obese women who undergo autologous breast reconstruction are more likely to achieve breast reconstruction completion (both mound creation and completion NAC reconstruction) when compared to obese women who undergo implant-based breast reconstruction.

Breast Reconstruction Using a Three-Dimensional Absorbable Mesh Scaffold and Autologous Fat Grafting: A Composite Strategy Using Tissue Engineering Principles

Presenter:	Mark A Schusterman, II, MD
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Background: Breast reconstruction remains an important field in plastic surgery, with most procedures utilizing implants and/or autologous tissue. Few series report on experience with fat grafting as the primary form of breast reconstruction. This study

reports a novel method of breast reconstruction using a three-dimensional absorbable mesh scaffold and subsequent AFG.

Methods: A retrospective review was performed for all patients who underwent breast reconstruction using Lotus scaffold and AFG. Post-operative mammogram and MRI were analyzed and tissue specimens collected at subsequent procedures were harvested and stained with H&E for histological evaluation. Lastly, compression testing of the scaffold was performed using a tensiometer and digital tracking technology.

Results: 22 patients underwent reconstruction of 28 breasts using Lotus scaffold and AFG between February 2015 and February 2018. Average follow-up was 19 months. All patients were satisfied with final breast shape and size. Mean patient age was 60.5 years and average BMI was 28. Patients required on average 2 fat grafting sessions to achieve a successful result (range 1-4). Post-operative mammogram and MRI revealed robust adipose tissue in the breast with a slowly resorbing mesh and no oil cysts or calcifications. Histological evaluated revealed no capsule formation with ingrowth of fat tissue around the scaffold. Compression testing revealed that the Lotus scaffold is a compliant construct with a high resilience profile.

Conclusions: The Lotus scaffold with AFG is a viable method for breast reconstruction, giving the patient an autologous reconstruction with less morbidity than free tissue transfer.

Monocortical Vs. Bicortical Plating for Isolated Mandible Fractures: A Retrospective Chart Review

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Background: Currently, two dominant philosophies for open reduction internal fixation guide management of mandibular fractures. The Arbeitsgemeinschaft für Osteosynthesefragen (AO) considers the use of large plates with bicortical screws for rigid fixation to be most effective. [1] However, the Champy system advocates the use of smaller plates stabilized with monocortical screws around the “ideal lines of osteosynthesis” is equally effective. [2] This study compared outcomes between these two methods when applying these differing degress of rigidity in mandibular fracture treatment.

Methods: Data was collected in a retrospective fashion via review of electronic medical records from two academic institutions in New Orleans between the years of 2011 to 2016. Variables of interest were age at time of surgery, method of injury, fracture classification,[3] method of reduction, method of fixation (monocortical vs. bicortical screws), intraoperative complications, postoperative complications, and choice of antibiotic prophylaxis.

Results: 66 patients with similar demographics and mechanisms of injury comprising a sum total of 103 mandibular fractures were treated in accordance with either the AO or Champy system. The regional distribution of treated fractures was also consistent with recent literature. We plated 75 fractures using bicortical screws or bicortical screws with tension bands and 22 fractures with a monocortical locking system. The remaining 6 subcondylar fractures were not plated and were excluded from the data analysis. Bicortical fixation rendered a complication rate of 20% compared to 9% in monocortical fixation ($p = 0.24$). Bicortical plating was associated with greater rates of infection (17% vs 5%; $p = 0.09$), hardware removal (9% vs 0%; $p = 0.14$), non-union (3% vs 0%; p 0.44), and V3 nerve damage (1% vs 0%; $p = 0.59$); while monocortical fixation was associated with more frequent wound dehiscence (5% vs 0%; $p = 0.06$). Chi-squared analysis indicated differences in individual complication variables between the two methods, but they were not statistically significant.

Conclusion: Our retrospective analysis indicates that employing monocortical fixation rather than bicortical fixation results in no increased rate of complications. This finding aligned with the recent shift in clinical practice toward treating mandibular fractures with smaller, less bulky methods of fixation. Despite this shift, we believe that both monocortical and bicortical fixation of mandible fractures are safe, reliable, and should be tailored to patient situation and daily practice. Considering our limited sample size, we recommend further investigation for definitive use of one technique over another.

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Analysis of Narcotic Use in Isolated Facial Fractures: Potential Targets for for a Narcotic Reduction Protocol

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Purpose: Isolated facial fractures pose a challenge to the craniofacial surgeon. We hypothesize that isolated facial fractures have high narcotic requirements. In the midst of opioid misuse and rising rates of opioid overdose-related deaths, the surgeon must identify strategies to reduce opioid consumption. The purpose of this study was to characterize rates of narcotic usage following hospital admission for isolated traumatic facial fractures and to evaluate if previous substance use or the use of non-narcotic adjuncts may affect narcotic consumption.

Methods: A retrospective chart review was conducted to assess narcotic use in patients with isolated craniofacial fractures undergoing intervention between 2015 and 2018 at a level one trauma center. Data was collected on patient demographics, mechanism of injury, injury severity score, recent alcohol and recreational drug use, narcotic use, and non-narcotic analgesic use. Analysis of narcotic usage variance (controlled for sex and race) was conducted across these variables. A linear regression model was constructed to examine the impact of non-narcotic analgesic use on narcotic usage in various settings.

Results: Thirty-six patients met eligibility criteria (mean age 40.5 years). Study participants were predominantly male (83.3%), Caucasian (36.1%), and remained hospitalized for an average of 3.3 days. The average morphine milligram equivalent (MME) use during inpatient stay was 997.0. Total narcotic use across inpatient, intra-operative, and outpatient settings was 1266.9 MME. Race and gender were not predictive of amount of narcotic use. Significant variations in rates of narcotic use in the inpatient setting were found based on mechanism of injury ($p < 0.0001$), operative intervention ($p = 0.04$), injury severity score ($p = 0.013$), and during the 24-hour post-operative period ($p = 0.005$). Recent alcohol use, as defined by serum levels greater 11 mg/dL at admission, was also associated with increased narcotic use in the inpatient setting ($p = 0.002$). Recent use of other recreational substances and history of drug abuse did not appear to impact narcotic usage rates. For those patients who received Gabapentin ($N = 4$), mean narcotic usage was 578.1 MME less in the inpatient setting and 141.9 MME less in the outpatient setting compared to patients who did not receive Gabapentin ($N = 32$). Due to small sample size, evaluation of the

significance of this difference was not possible. Use of other non-narcotic analgesics, including acetaminophen and lidocaine, was not predictive of amount of narcotic use in the peri-operative setting.

Conclusions: Recent alcohol use appears to influence the rate of narcotic use following isolated traumatic facial fractures. Recent use of other recreational substances and history of drug abuse did not appear to impact narcotic usage rates. Non-narcotic adjuncts trended toward reduction in narcotic use, however the study lacked power for statistical significance. Further study with prospective implementation of a narcotic reduction protocol will follow at this institution.

Validation of a New Method in Endoscopic Medial Orbital Wall Reconstruction - a Comparison with the Conventional Transcaruncular Method

Presenter: Taewoon Kim, MD
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Conventionally, isolated medial orbital wall fractures, if indicated, were treated surgically through a transcaruncular incision. Nowadays the endonasal endoscopic approach is also a popular method. However comprehensive studies comparing the endoscopic and transcaruncular approaches are rare. Also, in this series, the mesh was trimmed to match the defect size after CT evaluation, and then inserted into the orbital space, which differs to the previously known method. We aimed to study the efficacy of this new approach by comparing the outcomes with patients who underwent medial orbital wall repair through the transcaruncular approach.

Retrospectively, 31 patients with isolated medial orbital blowout fracture who underwent medial orbital wall reconstruction were reviewed. 17 patients underwent endoscopic repair and 14 patients received the external repair. All patients were followed up for at least six months. All operations were done at a single institution by four plastic surgeons from June of 2013 to October of 2018. All patients had preoperative CT scans taken to determine the defect size. Pre- and postoperative ophthalmologic examinations were documented for assessment of enophthalmos or diplopia. In the endonasal endoscopic repair, the synpor mesh is tailored to be slightly larger than the defect size, and inserted into the orbit. The synpor mesh was used also for the transcaruncular repair. Pre- and postoperative exophthalmometry, existence of diplopia, and pain were evaluated and compared between the two methods.

27 of the patients were male and 4 were female, with an average age of 33. 17 were right-sided and 14 were left-sided. The average operation time for the endoscopic group and transcaruncular group were 51.5 minutes and 73.9 minutes, respectively, but the difference was not statistically significant. Two patients had preoperative enophthalmos, and both received the endoscopic repair, where the symptoms resolved for both. The enophthalmos correction rate for the endoscopic group was 0.8, and 0.5 for the transcaruncular group, but this was not statistically significant. One patient in the endoscopic group and two patients in the transcaruncular group had preoperative diplopia. The latter two had their diplopia resolved, and the former endoscopic group patient showed improvement but had remnant diplopia. However, this patient was known to have preexisting strabismus before the injury. The average pain score (NRS: numeric rating scale) was 2.62 for the endoscopic group and 2.83 for the transcaruncular group, which was not statistically significant.

This study manifests that the endoscopic medial orbital wall repair is not inferior when compared to the transcaruncular method. Though not statistically significant, the endoscopic approach seems to reduce the operative time, probably because the dissection process is shorter and no wound repair is needed. Compared to the previous endoscopic method, inserting the mesh into the orbit did not turn out to be complicated, and we suggest it might give better results because it is thought to be less prone to implant migration. A larger scale of studies should be performed for validation.

Predicting and Managing Pediatric Post-Operative Pain in the Age of Opioid Abuse

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Purpose: Opioid abuse and overdose has become an epidemic in the US and overprescribing by physicians has been shown to be a major contributor to this morbidity and mortality. The opioid epidemic is especially problematic in the pediatric population, as early exposure has been linked to potential future illicit drug use. Currently, it is common to prescribe pediatric patients opioids for post-operative pain control, though there is a lack of evidence for their necessity in pediatric ambulatory surgery. This study aims to investigate post-operative pain management in

the ambulatory pediatric plastic surgery setting and the role of prescribed narcotics to guide future pain management of this vulnerable population.

Methods and Materials: This is an observational, prospective study of patient pain management practices and their effectiveness. A questionnaire was developed to interrogate post-operative pain, narcotic use, and pain management practices. All assenting patients and parents of pediatric plastic surgery patients, ages 0-17, who underwent an ambulatory procedure by one attending surgeon from March 2018-February 2019, were asked to participate in the study. The questionnaire was given at the first post-operative clinic visit. Supplemental clinical data was obtained from patient charts. T-test and univariate analysis was performed to identify significant contributing factors of narcotic use.

Results: 53 patients participated in the study, 34%(18) males and 66%(35) females. Age ranged from 1-17, with an average of 8 years-old. All patients were offered a prescription for narcotic pain medication, most commonly oxycodone, with 85%(45) filling the prescription, 38%(20) taking at least one dose of narcotics, and only 11%(6) taking four or more doses. Univariate analysis found no significant difference in the amount of narcotic used based on gender or age (OR 1.03,p=0.575 and OR 0.904,p=0.086, respectively). However, patient use of narcotic pain medication could be predicted based on type of procedure, comparing simple soft tissue lesion excision to all other procedures, such as otoplasty and rhinoplasty (OR 0.207 CI 0.052-0.819 p=0.025). Patients on average found the efficacy of the narcotics to be comparable to that of over the counter analgesics (4.2/5 and 4.5/5, p=0.387). Of the patients that filled the narcotic prescription, not one patient properly disposed of it post operatively, with nearly 50%(18) keeping the extra in their home.

Conclusion: This study demonstrates that most ambulatory plastic surgery pediatric patients will have sufficient pain relief with only over the counter pain medications, without the need for narcotic prescriptions. This study also demonstrates that the type of surgery can be used as a guideline for who should receive a narcotic prescription post-operatively. Additionally, education on proper disposal of narcotic medications may be a simple and effective target to decrease opioid availability for abuse. In an era of opioid abuse and misuse, which has been propagated by clinician's opioid prescription practices, this research deepens the physicians' understanding of post-operative pain management in pediatric plastic surgery ambulatory patients and serves to guide future pain management and narcotic regimens.

The Prevalence of Blood-Borne Pathogens in Facial Trauma Reconstruction Patients at an Urban, Level 1 Trauma Center

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Background: Blood-borne pathogens, most notably human immunodeficiency, hepatitis B (HepB), and hepatitis C viruses (HepC), constitute significant occupational hazard to the reconstructive surgeon. This study is the first to examine the prevalence of blood-borne pathogen infections (BPI) in a facial trauma reconstruction practice.

Methods: We studied 10,592 consecutive trauma patients presenting to an urban, level 1 trauma center (January 2005 to December 2015) with facial fractures, based on ICD-9 coding. Data collected included HIV, hepatitis B and C test results prior to or at index admission, type of operation, age, sex, and history of intravenous drug use.

Results: At the trauma admission, 328 patients (3.1%) had a diagnosed BPI – HIV positive (n=85, 33.3%), chronic HepC (n=140, 54.9%), chronic HepB (n=28, 11.0%) or coinfection with HIV and HepC (n=29, 11.4%). The prevalence of BPI by age was normally distributed, with HIV prevalence reaching a peak in the fifth decade of life (2.6%), and chronic HepC or HepB prevalence reaching a peak in the sixth decade of life (4.0%, 0.8%, respectively). BPI was more likely in African Americans (OR=1.5, P=0.004), in those who sustain injury from assault (OR=2.2, P<0.001) and in comorbid substance use or psychiatric disorders (notably, intravenous drug abuse OR=10.7, P<0.001). The different facial fractures treated operatively had a similar prevalence of BPI (P=0.135), however operative mandible fractures were the fractures most associated with chronic HepC infections (3.9%).

Conclusions: The prevalence of BPI in the urban, facial fracture population may be higher than that of the general population (3.1% vs 2.0%). The increased risk to surgical staff and the benefit of early diagnosis could justify routine screening for BPI in high risk patients (i.e. assault injuries, history of smoking, intravenous drug abuse, psychiatric comorbidity).

Le Fort Fractures in the Pediatric Population: A Level One Trauma Center Review

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Background: Pediatric Le Fort fractures are a small subset of facial fractures requiring more intervention to manage the patient and stabilize the floating midface. Our purpose was to identify associated factors for patients with Le Fort fractures.

Methods: An IRB-approved retrospective chart analysis of all pediatric patients age ≤ 18 years diagnosed with facial fractures at our level one trauma center over a 10-year period (January 2006 to December 2015) was performed. Demographics, fracture location, mechanism of injury, and hospital course were abstracted. Statistical analysis was then performed comparing facial fracture patients with Le Fort fractures and facial fracture patients without Le Fort fractures.

Results: 1274 patients met inclusion criteria. Of these, 69 (5.4%) presented with Le Fort fractures. Factors associated with Le Fort fractures included motor vehicle accidents ($p<0.001$), increased age ($p<0.001$), and traumatic brain injury ($p<0.04$). Patients with Le Fort fractures were more likely to need intensive care unit admission ($p<0.001$), surgical management ($p<0.001$), transfusions ($p<0.001$), secondary fixation surgery ($p<0.001$), and have a longer length of stay ($p<0.001$). Multivariate showed increased odds for increased age (OR 1.1; 95%CI 1.04-1.17) and concomitant orbit fractures (OR 8.33; 95%CI 4.08-19.34). Decreased odds were associated for all mechanisms of injury other than motor vehicle collision (Other blunt trauma: OR 0.36; 95%CI 0.2-0.6. Penetrating trauma: OR 0.13; 95%CI 0.01-0.6).

Conclusion: Le Fort fractures represent a small portion of pediatric facial fractures, but require critical management. Careful evaluation of patients following motor vehicle accidents for midface stability will allow for proper planning and patient management.

Decision Making in Pediatric Plastic Surgery: Autonomy Versus Shared Approaches

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Background: Although shared decision-making is an essential component of patient-centered healthcare, its role in pediatric patient populations is not well-defined.

Particularly among children presenting to pediatric plastic surgery clinics, the extent of agreement between parents, children, and providers regarding the extent of autonomous decision-making remains unclear. The goal of the current study was to define the preferred level of autonomy in decision-making among the various stakeholders involved in cleft care.

Methods: We surveyed children presenting to plastic surgery clinics (n=100) and their caregivers regarding their preferences on autonomy during the process of surgical decision-making. Patients and their parents independently completed surveys on their preferred method of decision-making and autonomy. Fleiss' kappa was used to assess the extent of agreement between groups. Bivariate chi-square tests were used to assess the relationship between decision-making preferences and demographic factors such as age, gender, and socioeconomic status. Multinomial logistic regression was performed to assess the relationship between age and sex and child/parent preference.

Results: Of the 100 children surveyed, 64 were female; the average age was 12.5 years. Children and their caregivers disagreed upon their overall decision-making preferences (k=0.0385). Overall, 40% of children and 67% of parents preferred the option of completely shared decision-making between the patient, parent, and provider; the minority of children (16%) preferred the doctor to be the sole decision-maker. Approximately 20% of children desired complete autonomy. Child's preference was significantly associated with their age; the relative risk of children deferring to parents or surgeons over a shared approach was lower for adolescents compared to children under ten years old (RR=0.202; 95% CI: 0.054-0.751; p=0.017). Alternatively, caregiver's preferences did not change based on the child's age, but rather based on the child's sex. Parents were less likely to prefer a shared approach when the child was female (OR=0.365; 95% CI: 0.139-0.961; p=0.04).

Conclusions: While most parents preferred a completely shared approach to decision-making, children desired greater autonomy, particularly with increasing age. There was limited agreement between parents and children regarding their decision-making preferences. Providers must be cognizant of differing preferences among parents and children when discussing treatment plans and surgical algorithms; to optimize patient and parent satisfaction, differing methods of discussion may be required to respect the preferences of all stakeholders involved.

Cross-Shaped Tongue Reduction for Macroglossia with Beckwith-Wiedemann Syndrome: A Novel Technique

Presenter:	Makoto Hikosaka, MD
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Introduction: In the glossectomy for macroglossia, adequate volume of reduction and preservation of shape is essential. We have developed a novel technique, cross-shaped tongue reduction and performed the technique since 2007. This technique enables reduction in all three dimensions (length, width and thickness), while maintaining the naturally-looking shape. The purpose of the present study is to evaluate the feasibility and efficacy of the technique.

Method: Retrospective review was performed on the patients who underwent cross-shaped tongue reduction at National Center for Child Health and Development, Tokyo, Japan. Data concerning complications were collected for feasibility analysis, and information on tongue size, speech and occlusion were collected for efficacy outcomes.

Immediately before operation, intravenous catheters are inserted along medial margins of the arteries with US visualization for surgical guides. The resection in midline is performed first, along the inserted catheters to preserve the arteries. The arteries can be identified at the resection edges at this stage. The resection in transverse direction is performed next, at the position anterior to the papilla and posterior to where the arteries emerge superficial. Finally, the reduction in thickness is performed superficial to the arteries. The wound is closed with absorbable sutures.

Postoperatively, patients are kept sedated, intubated and cared in ICU. Patients are extubated after the swelling subsides and discharged from hospital when oral intake is adequate.

Results: Total of 32 cross-shaped tongue reduction procedures were performed on 29 patients. All patients were associated with Beckwith-Wiedemann syndrome. The average age at surgery was 31 months. Four patients had the previous history of glossectomy by different method, and 3 patients required the same procedure for further reduction. Average duration of operation was 113 minutes, and average estimated blood loss was 35g. Average of planned reduction in length was 21mm and width was 15mm. Patients were extubated on average of 3 days postoperatively. Average stay in hospital was 12 days. Two patients required vessel repair for damage of glossal artery. Partial necrosis and wound dehiscence were observed in 2 and 3 patients, respectively. These healed spontaneously without treatment within 1 month.

The information concerning the efficacy were collected from 26 patients with follow up period longer than 1 year (average: 5 years 1 month). All patients could put their tongue within their mouth. For speech evaluation, after exclusion of 7 patients due to young age or tracheostomy, 6 patients had normal articulation while 13 had slight distortion. The speech was clear enough for communication except for 1 patient. Anterior cross bite and open bite were observed in 2 and 10 patients, respectively.

Conclusions: Various methods of glossectomy have been reported in the past, but few methods enable the reduction in all three dimensions. Anterior wedge resection and its variants are widely-performed methods, but resection of large volume results in loss of tongue tip and a bowl-like shaped tongue. Cross-shaped tongue reduction enables reduction in three dimensions. This study elucidated that this technique is feasible with acceptable rate of complication, and provides adequate volume of reduction while preserving function.

Facial Fractures and Mixed Dentition: What Are the Implications of Dentition Status in Pediatric Facial Fracture Management?

Presenter:	Nicholas C. Oleck, BA
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Purpose: The stage of maturation of the pediatric facial skeleton at the time of injury has a significant impact on both facial fracture patterns and management strategies. For instance, the relative prominence of the pediatric cranium during the early years of life affords protection to the structures of the midface, while delayed aeration of the frontal sinuses may predispose younger patients to frontal bone fractures. The dentition status of a pediatric patient may have similar implications in the setting of facial fracture. In this study, the authors examine the effect of dentition status on facial fracture patterns and management strategies at an urban, level one trauma center.

Methods: A retrospective chart review was performed for all cases of facial fracture occurring in the pediatric patient population at a level 1 trauma center (University Hospital in Newark, NJ) between 2002-2014. A database including patient demographics, facial fracture and concomitant injury patterns, and operative management data was constructed and analyzed.

Results: A total of 72 patients with mixed dentition met inclusion criteria for our study and were compared against patients with primary (n=35) and permanent (n=305) dentition. The mean age at presentation was 9.2 years, with a male predominance of 68%. The most common fracture etiology was pedestrian struck accident (n=23), fall (n=21), motor vehicle collision (n=12), and assault (n=9). The most frequently identified facial fractures were that of the orbit (n=31), mandible (n=21), nasal bone (n=19), and frontal sinus (n=14). Additionally, eight Le Fort and four nasoorbitoethmoid fractures were identified. Twenty-one patients (29%) required operative management for one or more facial fractures. Operative intervention was required in 38% of mandibular fractures, with 6 patients requiring only maxillomandibular fixation and two requiring ORIF with titanium plating. Nine cases of orbital fracture (29%) were managed operatively – two with absorbable plates, two with Medpor implants, and the remaining with titanium plating. Management of all nasal fractures requiring operative intervention was accomplished through closed reduction. Concomitant injuries included skull fracture (n=35), traumatic brain injury (TBI) (n=35), intracranial hemorrhage (ICH) (n=21), and long bone fracture (n=12). Seventeen patients required admission to the intensive care unit. Patients with permanent dentition were significantly more likely to sustain frontal sinus and Le Fort fractures ($p < 0.01$), as well as skull fracture, ICH, and TBI ($p < 0.01$) as compared to those with mixed dentition.

Conclusion: The dentition status of a pediatric patient may have significant implications in both patterns of injury and operative management strategies in the setting of acute facial trauma. Our study finds that Le Fort and frontal sinus fractures were significantly more common in patients with permanent dentition. Severe concomitant injuries such as ICH and TBI were also significantly more likely in this cohort. A patient's dentition status may also play a role in the decision for ridged fixation of mandibular and orbital fractures, as well as the method of maxillomandibular fixation in maxillary and mandibular alveolar fracture.

Minimally-Invasive Sympathicotomy for the Treatment of Hyperhidrosis: After Twenty Years of Practice, What Have We Learned?

Presenter:	Francesco Simonacci, MD
Co-Authors:	Nicolo Bertozzi, MD, Gianluigi Lago, MD, Carlo Fante, MD, Edoardo Raposio, MD, PhD
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Introduction: Hyperhidrosis is a frequent disorder with an estimated prevalence of 3% in the general population. This condition carries relevant impairments in social relationships for patients. Hyperhidrosis can affect different anatomical areas with palmar region being the most disturbing for everyday activities and social relevance. Several conservative and topical treatments are available for the patients but their efficacy is often limited and temporary. Video-assisted thoracoscopic sympathicotomy of T2 and T3 ganglia with a minimally invasive technique represent a definitive treatment for palmar and axillary hyperhidrosis [1,2].

Materials and methods: This minimally invasive approach for thoracoscopic sympathicotomy was first described by Raposio et al. two decades ago [3]. This single-entry thoracoscopic procedure is carried out with a specifically modified endoscope equipped with optic fiber and a wire loop for electrocautery at its distal end. Since 1997, 781 patients have been treated at our department and 1562 sympathicotomies have been performed.

Results: Out of 781 patients, 734 reported complete resolution of palmar hyperhidrosis. In 47 subjects, the procedure could not be completed due to the presence of anatomical anomalies. We have also observed a 44% incidence rate of vascular structures overlying sympathetic ganglia, lung adherence, and retro-pleural fat that complicated the surgical procedures. In 6 patients symptoms relapsed after the procedure, most likely due to accessory sympathetic pathways. Of these, two underwent revision surgeries and were successfully treated. Only 2 patients complained of generalized compensatory hyperhidrosis. No major complication was observed. Surgeries were performed as one-day surgery procedure. Mean operative time was 45 minutes.

Conclusions: Video-assisted thoracoscopic sympathicotomy represents a definitive treatment for palmar and axillary hyperhidrosis and it should be considered when conservative options failed to relieve the symptoms. This minimally invasive approach provides effective resolution for this disorder with minimal post-operative complication rate. However, the relatively high rate of vascular structures overlying sympathetic ganglia, lung adherence, and retro-pleural fat can potentially complicate the procedure thus preventing less experienced surgeons from obtaining positive surgical outcomes.

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Incidence of Ganglion Cyst Formation after Wrist Arthroscopy: A Longitudinal Analysis

Presenter: Danielle H Rochlin, MD
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Purpose: Ganglion cysts are theorized to occur secondary to leakage of synovial fluid from a tear in the scapholunate ligament or wrist capsule. An analogous injury is created in an iatrogenic manner with portal placement during routine wrist arthroscopy. We hypothesized that wrist arthroscopy increases the risk of developing a wrist ganglion cyst.

Methods: Using the MarketScan Outpatient Services Database, individuals who had a diagnosis of wrist ganglion cyst without an arthroscopy procedure were identified using ICD-10 codes to establish a baseline incidence in the general population. Patients who underwent wrist arthroscopy and developed an ipsilateral wrist ganglion cyst postoperatively were identified using CPT and ICD-10 codes. Exclusion criteria included patients who had a wrist ganglion diagnosis prior to or at the time of arthroscopy, had bilateral wrist pathology, or did not have a diagnosis indicating laterality. Predictor variables included: age, gender, comorbidities, and arthroscopic procedure performed. Multivariable logistic regression was used to analyze outcomes.

Results: Among 24,718,751 unique outpatients, 39,832 patients had a diagnosis of a wrist ganglion cyst (0.16%) during encounters from October 2015 to December 2016. 2,420 patients underwent wrist arthroscopy during this time period. Of this group, the majority of patients were women (60.0%) and average age was 40.5 years [standard deviation (SD) 14.9, range 11 – 65 years]. Rates of diabetes (0.04%), obesity (0%), nicotine dependence (0.04%) and connective tissue disorder (0%) were low. Indications for arthroscopy most commonly involved osteoarthritis (8.3%), other joint derangements or disorders (78.9%), dislocation and sprain (56.7%), and synovitis (23.2%). Arthroscopic procedures performed included: diagnostic arthroscopy with or

without synovial biopsy (3.4%); lavage and drainage for infection (0.1%); partial or complete synovectomy (8.1%), triangular fibrocartilage complex (TFCC) excision, repair, and/or joint debridement (80.0%); internal fixation (1.5%); or a combination of these procedures (15.9%). Postoperatively, 30 patients (1.24%) were diagnosed with an ipsilateral wrist ganglion with a mean time to diagnosis of 4.0 months (SD 2.4, range 0.2 – 9.0; Figure 1). Significant predictors of postoperative ganglion diagnosis included female gender [odds ratio (OR) 4.0, $p<0.01$] and TFCC and/or joint debridement (OR 0.1, $p<0.01$) as the arthroscopic procedure performed.

Conclusions: Wrist arthroscopy is associated with a postoperative incidence of ganglion cyst formation that is nearly 8 times the rate of the general population. Surgeons should consider discussing ganglion cyst formation as a possible risk when obtaining informed consent for wrist arthroscopy. Additional studies are needed to investigate techniques that minimize risk.

Reawakening Neuritis of the Median Nerve after Carpal Tunnel Release: Defining and Predicting Patients at Risk

Presenter: John Roberts, MD
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Purpose: Patients with longstanding carpal tunnel symptoms can develop neuritis of the median nerve following decompression as increased blood flow "re-awakens" the nerve, resulting in transient and paradoxical, worsened neuropathic pain. We hypothesize that pre-operative variables can predict which patients are most at risk for this phenomenon to guide patient counseling and post-operative satisfaction.

Methods and Materials: A retrospective chart review was performed on all patients who had undergone either open or endoscopic carpal tunnel release at a single institution between January 2013 to December 2017. Patients demonstrating increased pain with "pins and needles" in the median nerve distribution post-operatively were included. Exclusion criteria included patients under the age of 18, acute carpal tunnel syndrome, concern for incomplete release or need for early revision surgery, and multiple procedures at the time of carpal tunnel release. A control group was randomly selected for comparison. Demographic data, medical history, carpal tunnel history, and EMG/NCS findings were recorded. Matched groups were evaluated with two-sample t-tests, Wilcoxon Rank Sum tests, and chi-squared analyses.

Results: A total of 647 patients were identified of which 15 were found to have symptoms consistent with median nerve "reawakening." All patients either had significant improvement in post-op EMG/NCS studies or ultimately had resolution in their carpal tunnel symptoms at long-term follow up. Compared to the matched group, the reawakening cohort was older, had a longer duration of symptoms, and were more likely to have it occur in their dominant hand. Furthermore, EMG findings were more likely to show increased fibrillations and sharp waves in abductor pollicis brevis.

Conclusions: Median nerve reawakening following carpal tunnel release has not been previously described but occurs in 2.3% of all patients with carpal tunnel. This frequency is much higher in older patients with prolonged symptoms. Other predictors include advanced age, longer duration of symptoms, and evidence of abductor pollicis brevis damage on EMG. Pre-operative counseling of patients at high risk for the reawakening phenomenon can help guide post-operative care and increase patient satisfaction when it occurs.

The Effects of Postoperative Physician Phone Calls for Hand and Wrist Fractures: A Prospective, Randomized Controlled Trial

Presenter: Scott N Loewenstein, MD
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Purpose: Hand and wrist fractures are common injuries and lead to significant loss of productivity and ability to perform activities of daily living. Poor compliance with postoperative instructions can predispose to complications, patient dissatisfaction, and permanent disability. We sought to identify if a phone call by a physician in the week following surgery for hand and wrist fractures improves patient outcomes, satisfaction with treatment, and compliance with treatment recommendations.

Methods: We prospectively enrolled consecutive adult patients undergoing outpatient surgery for isolated hand and wrist fractures in a single, metropolitan level-one trauma center from January 2018 through December 2018. Patients were randomized to either a standard postoperative course or to receiving an additional physician phone call reviewing the postoperative instructions during the week following surgery. The primary endpoint was Brief Michigan Hand Questionnaire score change (bMHQ), which was measured through survey just prior to surgery and at least one month after surgery. Secondary endpoints included overall satisfaction with care on a 5-point Likert scale, compliance with treatment recommendations, and presence of

postoperative complications. Patients in the phone call study arm were surveyed for clarity of discharge and follow-up instructions. The surgical team was blinded to treatment arms.

Results: The majority of patients were right-handed (70.8%), Black (58.3%), male (70.8%), and had an annual income less than $30,000 (58.3%). Starting at one month following surgery, average change in bMHQ score demonstrated 26% improvement, but there was no difference in the absolute change in bMHQ score between groups (12.2 vs. 6.5, p=0.69). Similarly, most patients were satisfied with their care preoperatively (89.5%), immediately postoperatively (85.7%), and late postoperatively (73.3%), but the average late postoperative Likert score did not differ between groups (1.4 vs. 2.5, p=0.21). There was a stronger correlation between patients' hand function, as measured by bMHQ scores, and satisfaction with care starting 1 month after surgery (R^2=0.502, p=0.002) than preoperatively (R^2=0.252, p=0.029). Immediately following surgery, 83% of responding patients reported their follow-up appointment time was clear, all believed their discharge instructions were clear, and 83% felt immobilization instructions were clear. The average readability of discharge instructions was grade 7.7, which was below the average education of the patient population (75% had at least completed high school). In spite of this, 13% of patients removed their own cast or Kirschner wires, 67% did not follow-up within a week as recommended, and 63% did not complete the post-operative treatment recommendations in order to be satisfactorily discharged from care. Thirty-three percent of patients had complications, which included pin site infections, bleeding, delayed wound healing, and pain necessitating emergency room visit.

Conclusions: A postoperative phone call by a physician does not result in enhanced patient satisfaction or improved outcomes among the hand and wrist fracture patient population. Based on these findings, we do not feel that phone call follow-up is an effective use of resources. In certain clinical settings, patients treated for hand and wrist trauma have high rates of non-compliance with treatment, and the need for identifying interventions to improve patient outcomes is paramount.

Separating Fact from Fiction: A Longitudinal Examination of Chronic Regional Pain Syndrome Following Treatment for Dupuytren's Contracture

Presenter:	Danielle H Rochlin, MD
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Background: Rates of Chronic Regional Pain Syndrome (CRPS) following Dupuytren's contracture release remain unclear. Rates have been reported to range from 2.4% to 18.5% based on single institution case series (1,2). This study sought to provide a national perspective on the incidence of CRPS following treatment of Dupuytren's contracture and to identify patient factors to target for risk reduction.

Methods: Using the MarketScan Outpatient Services and Medicare Supplemental Insurance Outpatient Services databases, individuals aged 18 years or older who developed CRPS within 1 year of treatment of Dupuytren's contracture were identified using the ICD diagnosis code for CRPS Type 1. Exclusion criteria included patients who had a prior diagnosis of CRPS, had less than 1 year follow up, or were treated concurrently with both collagenase injection and an operative procedure. Predictor variables included: age, gender, comorbidities, employment status, region, and type of procedure. Patients who underwent a postoperative stellate ganglion block were also noted. Multivariable logistic regression was used to analyze outcomes.

Results: 48,317 patients received treatment for Dupuytren's contracture from 2007 to 2015. Average age was 61.9 years [standard deviation (SD) 10.5, range 18 – 97 years], and 72.1% of patients were male. A minority of patients had comorbidities including diabetes (3.3%), obesity (0.6%), or active smoking (1.5%). Treatment for Dupuytren's contracture included: collagenase injection (9.1%); closed palmar fasciotomy (5.7%); open palmar fasciotomy (2.5%); palmar fasciectomy with zero (7.7%), 1 (19.2%), or multiple (1.6%) digit releases; or a combination of operative procedures (55.2%). 102 patients (0.21%) were diagnosed with CRPS at a mean of 3.2 months (SD 1.8, range 0.3 – 9.0 months; Figure 1) following treatment for Dupuytren's contracture. Fifty-eight of these patients (56.9%) underwent postoperative stellate ganglion block. Significant predictors of CRPS included younger age [odds ratio (OR) 0.95, confidence interval (CI) 0.93-0.97, $p<0.001$], female gender (OR 1.83, CI 1.23-2.73, p=0.003), Southern region (OR 2.63, CI 1.37-5.05, p=0.004), palmar fasciectomy including release of 1 (OR 9.37, CI 1.27-69.11, p=0.028) or more than 1 digit (OR 33.62, CI 4.12-274.65, p=0.015), and multiple operative procedures (OR 11.62 , CI 1.60-84.41, p=0.015).

Conclusions: Based on this study, the incidence of CRPS Type 1 following treatment for Dupuytren's contracture is likely lower than previously reported. Risk factors include younger age, female gender, and more extensive operative procedures, particularly those involving fasciectomy with release of 1 or more digits. Patients with these characteristics should be targeted for pre- and postoperative risk reduction measures to limit the development of CRPS.

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Dexamethasone for the Reduction of Post-Operative Pain Following Open Carpal Tunnel Release: A Randomized Controlled Trial

Presenter: Andrew Penn Worden, MD
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Introduction: Carpal tunnel syndrome (CTS) is one of the most common neuropathies seen in the upper limb. Once the diagnosis is made, multiple treatment modalities are available for management of this condition. Conservative treatments include wrist splinting and corticosteroid injection. Injections often provide symptomatic relief for patients with mild to moderate disease, especially for pain[1]. These injections are usually given either as sole treatment, or as a bridge before surgery can be performed. Definitive carpal tunnel release (CTR) surgery is performed either awake with local anesthesia or under procedural anesthesia. Post-operative pain is typically treated with a combination of NSAIDs and narcotics. Nationally, overconsumption of narcotics is a critical issue. The use of steroids in conjunction with local anesthesia has not been studied in the literature. Our objective was to determine whether the addition of dexamethasone to the local anesthesia given during carpal tunnel release will reduce post-operative pain and the consumption of narcotics post operatively.

Methods: We conducted a randomized, double-blinded study at a single academic institute. Patients undergoing an elective CTR surgery were included. Exclusion criteria included uncontrolled diabetics, minors, traumatic or emergent case, and patients undergoing a concomitant surgery. Included patients were randomized to either the control or treatment arms. Patients in the treatment arm were given an injection of 10mg dexamethasone with their local anesthesia at surgery versus local anesthesia alone for the control group. Post-operatively, patients logged their pain scores on a 0-10 scale at set time intervals of 8 hours, 24 hours, 48 hours, 72 hours, and one week post-operatively. Patients were also asked to record how many narcotic, acetaminophen, or NSAID pain pills they used. Two-sample Wilcoxon and Matlab-

pairs signed-rank tests were then performed to analyze the data. P values were adjusted with Hochberg's method.

Results: Eighty-one patients were enrolled: 40 in the treatment arm and 41 in the control arm. Average pain scores were lower in the steroid group at 8 hours (2.23 SD 3.04 vs 3.45 SD 2.94; p=0.017), 24 hours (2.61 SD 2.46 vs 3.23 SD 2.88; p=0.351), and 48 hours (2.00 SD 2.19 vs 2.03 SD 2.51; p=0.745). Pain scores were higher in the treatment arm at 72 hours (1.74 SD 2.09 vs 1.44 SD 1.87; p=0.574) and 7 days (1.37 SD 1.76 vs 0.61 SD 1.08; p=0.031). No p-values exceed their Hochberg limits for significance. There was no significant difference in the number of acetaminophen pills (2.93 SD 6.93 vs 1.31 SD 2.96; p=0.837), NSAID pills (3.56 SD 7.24 vs 2.30 SD 6.51; p=0.678), and narcotic pills (4.17 SD 5.96 vs 4.36 SD 5.10; p=0.325) between the two groups.

Conclusion: Intra-operative dexamethasone administration during CTR did not reduce pain levels or number of narcotic pain pills taken in the first post-operative week. Further research evaluating non-narcotic pain reducing modalities for CTR is warranted.

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A Novel 3D Printed Hand Model to Simulate Bony Fixation with Kirschner Wires without Fluoroscopy

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Purpose: Simulation has become a mainstay in medical training. The field of three dimensional (3D) printing offers additional benefits to medical simulation, allowing for the development of affordable, custom anatomic models. Surgical sub-specialties, like plastic surgery and orthopedics, can reap significant benefits from this technology. Specifically, developing the art of operative planning and mastering unique procedural skills are essential to the armamentarium of the plastic surgeon. One skill that is particularly difficult to master in early training is the use of Kirschner wires (K-wires) for bony fixation of the hand and wrist. Brichacek et al. have used 3D printing for this specific training purpose, but their construct of silicone and iron-

based bones requires fluoroscopy for evaluation of metacarpal K-wire placement, involving more than minimal risk of radiation exposure to trainees (Brichacek et al., 2018). Herein, the purpose of this project is to develop a 3D printed hand and wrist model that serves as a training and evaluation tool for K-wire placement that is novel, cost-effective, durable and does not require fluoroscopy.

Methods: This novel hand model utilizes 3D printing technology and silicone molding. Data obtained from a CT scan of a healthy hand and wrist was used to 3D print a reusable mold for the fabrication of the silicone based 'soft tissue.' CT scan data was also used to print out the bony structures of the hand and wrist (carpal bones, metacarpals and phalanges) from ABS Filament on a UPrint SE+ 3D printer (Stratasys, Eden Prairie, MN). 3D printed bones were placed in the 3D printed mold and sealed with silicone to recreate the surrounding soft tissue. Thin filaments connecting the bones were broken after the silicone set, allowing for realistic simulation of hand joint mobility. Bony structures were exchanged and replaced after use via a palmar incision.

Results: To test durability of the model 20 K-wire placements were performed. Preliminary trials demonstrated the silicone to be durable, withstanding multiple K-wire passes without breakdown. Additionally, the metacarpal bones were easily replaced for repeat use.

Bones were intentionally printed with a linear infill pattern (lattice matrix) to evaluate disruption of the lattices by K-wire passes. Accuracy and proficiency of K-wire placement is assessed by direct visualization of the disrupted matrix compared to conventional assessment with fluoroscopy.

Total cost of material for each hand model was $25.00. For reference, the largest bone in the hand (metacarpal) could be replaced for a material cost of $0.50.

Conclusions: Implementation of 3D printing and silicone casting can be used to produce a cost effective and reproduceable training tool for bony fixation of the hand and wrist. We are currently validating our 3D printed K-wire placement hand and wrist model for educational utility among plastic surgery residents. Radiation exposure can also be avoided by studying the placement of K-wires through direct visualization of the altered 3D printed matrix.

Sources:

Brichacek M, Diaz-Abele J, Shiga S, Petropolis C. Three-dimensional Printed Surgical Simulator for Kirschner Wire Placement in Hand Fractures. *Plastic and Reconstructive Surgery – Global Open*. 2018;6(3).

Nerve Allografts for Finger Replantation: A Prospective Pilot Study of Sensory Recovery and Functional Patient-Reported Outcomes

Presenter:	Johnny Ionut Efanov, MD
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Purpose: Reconstruction of peripheral nerve gaps represents a considerable challenge for surgeons, despite traditional microsurgical technique of nerve autografts and recent advances in biological substitutes for nerve regeneration. Nerve allografts have emerged as viable alternatives for selected indications, although sparse literature has investigated its use in avulsion-type finger replantation. The aim of this study was to determine functional patient-reported outcomes and sensory recovery at 6 months in patients with nerve allografts applied in the context of finger replantation.

Methods/Materials: A prospective pilot study was conducted in a provincial referral center for microsurgical replantation of upper extremity amputations. Patients with avulsion-type amputations that were amenable to replantation were recruited in the emergency department from January to June 2018. Nerve deficits over a segment of 5 to 30 millimeters were repaired with allografts (Avance Nerve Graft®, Axogen Inc., Alachua, Florida). At 6 months of follow-up, patients were evaluated for sensory function with two-point discrimination, functional patient-reported outcome as evaluated by the Disabilities of the Arm, Shoulder and Hand (DASH) and scar burden with the Patient and Observer Scar Assessment Scale (POSAS).

Experience: A total of 7 patients were included in this pilot study, a majority identifying as male (71.4%) with a mean age of 34.7 (range 20 to 56). Mechanism of injury were avulsion-type in 4 patients and crush-type in 3 patients. All seven patients underwent successful vascular replantation and were discharged after a mean of 8.5 days.

Results: An average of 2.5 mm of nerve gap was repaired with allografts in this cohort, either on one digital nerve (86%) or both digital nerves of a finger (14%). At 6 months of follow-up, only two patients reported two-point discrimination of less than 1cm on the disto-lateral aspect of the allografted nerve. Mean scores on the DASH and POSAS were 28.47 and 23.33 respectively at 6 months.

Conclusions: This is the first study investigating systematic use of nerve allografts in avulsion-type finger replantation. Sensory and functional recovery can be obtained in a minority of patients with nerve allografts.

A Comparative Study Using Electromyography to Assess Hand Exercises for Rehabilitation after Ulnar Nerve Decompression

Presenter: Colton G. Boudreau, MSc
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Purpose: Ulnar nerve (UN) entrapment is common peripheral neuropathy and can lead to dysfunction of both sensory and motor function of the hand. Surgical release is the mainstay of treatment, but post-operative rehabilitation of UN innervated intrinsic muscles is an area lacking evidence.

Methods: Surface electromyography (EMG) was used to assess the activation of UN innervated muscles during four exercises in ten healthy participants. Intrinsic muscles included abductor digiti minimi (ADM) and first dorsal interosseous (FDI), while flexor carpi ulnaris (FCU) was studied for extrinsic activation. Baseline signal was measured by maximal finger abduction with digits taped. Exercises included rotation of Baoding balls, squeezing stress ball, 100 lb grip device and finger abduction against a rubber band. Normalized percent activation of each muscle during exercises was calculated by dividing the root mean square (RMS) EMG signal by the baseline RMS for that muscle.

Results: Rubber band resistance (RBR) finger abduction shows significantly increased activation in ADM compared to all other exercises tested ($p<0.001$). For FDI, RBR and grip device showed similar results statistically, both of which were significantly more effective than other exercises ($p<0.001$). Extrinsic muscle FCU showed similar activation with both stress ball and grip device, both of which were more than 3 times more effective than other exercises ($p<0.001$).

Conclusions: Findings indicate that RBR is superior in terms of intrinsic muscle activation as compared to other tested exercises. Grip device showed similar activation for the FDI but showed significant recruitment of extrinsic FCU. Among the four exercises tested, our findings show that to best target the intrinsic hand muscles without fatiguing extrinsic muscles, the inexpensive and practical RBR exercise would be most beneficial in post UN release rehabilitation.

New Surgical Tips for the Treatment of Extracranial Arteriovenous Malformations after Multilpe Embolizations

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Introduction: Extracranial high-flow arteriovenous malformations (HF-AVMs) are complex pathologies that need to be managed in referral centers with multidisciplinary consultation. Typical localizations include the face, oral cavity, and extremities. Because of high mortality and morbidity, surgery has often been avoided in favor of embolization treatment or observation. Introduction of several technical modifications and better coordination with interventional radiology have put surgery back in therapeutic plans. We would like to demonstrate that surgery has a more significant role than previously thought, used in combination with interventional radiology.

Methods: All patients with a diagnosis of extracranial AVMs and a surgical procedure included in the treatment plan were enrolled. Clinical presentation, location, embolization agent and techniques used, surgical procedures, procedural complications, clinical and imaging follow-up were included in the analysis. Anatomical involvement, the definition of limits, functional impairment, number of embolizations, type of resection, reconstruction method, blood transfusion, and hospital stay were evaluated. Endpoints were the evolution of the AVM stage, morbidity, mortality, a collection of surgical tips, regrowth rates and need for additional procedures.

Results: Between January 2000 to December 2017, we collected the data of 17 patients (mean age at study entry 45.4 years (17-77.9 y). The number of embolizations per patient increased with lesion complexity, an average of 7.96 (1-24) embolization sessions per patient. After multiple embolizations, better lesion identification was observed. In 12 patients, total excision was accomplished, and in 5, subtotal resections were performed to favor function. Primary closure was performed in 6 cases, local flaps were performed in 8 cases, axial flaps were performed in 3 patients. Regrowth rates were influenced by limits between arteriovenous malformations and surrounding tissues (11 percent of cases with precise limits versus 48 percent of lesions with imprecise limits; $p = 0.021$) and by type of resection (8 percent of cases after total resection versus 46 percent after subtotal resections; p =

0.015). Speech disorder was observed in one case, intraoperative bleeding with transfusion in 2 cases, hypertrophic scars in two cases, and lip deformity in one case. We used transfixing sutures around the arteriovenous malformation worked as a tourniquet and assisted in obtaining a bloodless resection in all the facial cases. We used the Harmonic shears (Ethicon Inc. Somerville, New Jersey, United States) in all our cases.

Conclusions: Ethanol embolization with surgery can control adequately a large proportion of patients with extracranial AVMs. Multiple therapeutic embolizations seem to increase surgical safety and suggest an additional positive effect besides bleeding control. Preoperative definition of limits and establishment of conditions for total resection are critical to determining management and risk of regrowth. The use of transfixing sutures around the arteriovenous malformation as a tourniquet and of the Harmonic shears were critical in our ability to obtain a bloodless resection.

Risk Factors for Amputation Following Lower Extremity Free Tissue Transfer in a Chronic Wound Population

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Purpose: Chronic wounds of the lower extremity pose a number of challenges for management by surgeons. Non-healing, infected, or otherwise complicated wounds may fail local wound care, often leading to amputation. Historically, there has been a debate regarding limb salvage microsurgical free tissue transfer (FTT) vs amputation. When utilized appropriately, lower extremity microsurgical free tissue transfer can lead to successful limb salvage in a majority of patients. Limb salvage, as opposed to amputation, can have a profound impact on quality of life, independence, and mortality. However, limb salvage requires costly multidisciplinary care that becomes increasingly expensive if there is flap failure, necessitating a return to the operating room. Identifying independent risk factors for amputation following FTT can help in the decision-making process.

Methods: A retrospective chart review identified all patients undergoing FTT to the lower extremity by the senior author (KKE) between 2011-2018. 135 patients were included in the study, of which 117 patients (86.7%) had successful limb salvage and 18 patients (13.3%) received an amputation following FTT. Data collected included

patient demographics, medical comorbidities, wound location, lower extremity angiography, and type of free flap.

Results: 12 men (66.7%) and 6 women (33.3%) underwent amputation following FTT, while 81 men (69.2%) and 35 women (29.9%) had successful limb salvage following FTT. Demographics between the groups were similar, including age (amputation: 54.3±11.1, limb salvage: 54.7±14.6, p=0.8981) and BMI (amputation: 29.2±5.8, limb salvage: 26.8±3.6, p=0.0911). The most common comorbid conditions were hypertension (50.4%), diabetes (47.4%), and peripheral vascular disease (23.0%), and the most commonly utilized flap was the anterolateral thigh flap (53.3%). On univariate analysis, diabetes mellitus was associated with a 3.79 times increase in the risk of undergoing amputation following FTT (p=0.0097, OR 3.79, 1.05 - 13.75) and a 20 times increase with end-stage renal disease (p=0.0074, OR 20.0, 1.95 - 204.96). Additional factors that increased the risk for amputation were hindfoot wound location (p=0.0006, OR 6.51, 2.02 - 20.94), elevated pre-FTT HbA1c levels (amputation: 8.4±2.4, limb salvage: 7.0±1.8, OR 1.41, 1.004 - 1.99, p=0.0451), and higher pre-FTT platelet count (amputation: 332.8±114.4, limb salvage: 257.8±78.7, OR 1.01, 1.001 - 1.02, p=0.0100). Interestingly, patients receiving a gracilis flap had a 6.93 times increased likelihood of undergoing amputation (p=0.0283, OR 6.93, 1.55 - 30.89).

Conclusion: Many previous studies on this topic have centered on flap outcomes, success rates and overall limb salvage rates. This is the largest series to report risk factors for amputation following FTT for limb threatening defects. Our study finds that there are distinct risk factors that are associated with increased risk for amputation following FTT to the lower extremity. Poorly controlled diabetes mellitus and end-stage renal disease are associated with higher likelihood of amputation. Other factors, such as hindfoot wound location and gracilis flap reconstruction, also have a higher likelihood of requiring amputation. These findings may aide surgeons in choosing appropriate patients for FTT and predict those that are more likely to need amputation. Further evaluation with multi-institutional data may identify additional risk factors.

Surgical Technique for Targeted Muscle Reinnervation at the Time of below-Knee Amputation

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Purpose: Targeted Muscle Reinnervation (TMR) has been shown to improve neuroma pain and prevent neuroma formation by providing sensory nerves a pathway for growth thus avoiding formation of a symptomatic neuroma. This procedure has been studied in the lower extremities for amputees with neuroma or phantom limb pain; however, there are no descriptions of the entire surgical technique when performed with below knee amputation (BKA) and posterior skin flap closure. We present our current surgical technique for flap design, identification of donor and recipient nerves, and nerve coaptation.

Methods: The anterior BKA incision is designed 10-12 cm distal to the tibial tuberosity with transverse length 2/3 the circumference of the calf. The posterior skin flap is designed extending distally by the same distance as the anterior arc. Marks are made on the skin to approximate the locations of the commonly used recipient motor entry points (tibialis anterior, extensor digitorum longus, peroneus longus, flexor digitorum longus, and soleus). Donor nerves that are identified for coaptation include the saphenous, sural, tibial, deep and superficial peroneal. The initial dissection is made under tourniquet.

The saphenous nerve is identified through the anterior incision running in the subcutaneous tissue and is dissected distally prior to transection. The remainder of the anterior tibial skin is removed from the crural fascia. The superficial peroneal nerve is identified distally as it emerges between the extensor digitorum longus and peroneus longus muscles, transected and dissected proximally. The anterior compartment muscles are dissected to identify the deep peroneal nerve, the motor entry point branches are identified, stimulated and left intact until nerve transfer.

Osteotomies are made and the deep posterior compartment musculature is dissected from the bones completing the amputation. The tibial nerve is identified between the deep and superficial posterior compartments and motor entry point branches are preserved. The sural nerve is identified in the subcutaneous tissue at the distal end of the posterior skin flap and a tug test confirms its location in the midline proximally. The nerve is brought through the midline of the soleus and heads of the gastrocnemius for transfer. The vessels are ligated and the tourniquet is deflated for hemostasis. The motor entry points are confirmed with the nerve stimulator and transected. Preferred nerve coaptations performed include the deep peroneal to the motor entry point for tibialis anterior or extensor digitorum longus, superficial peroneal to peroneus longus, tibial to flexor digitorum longus, and saphenous and sural to entry points for the soleus. Transfers are followed by skin flap closure.

Results: TMR with BKA has been performed on 6 legs using this technique. Motor entry points were able to be stimulated while under tourniquet dissection (< 40 min.). Indications included trauma, wounds with chronic pain, and frostbite.

Conclusions: This method facilitates identification of all donor and recipient nerves efficiently, maintaining the ability to stimulate motor entry points while under tourniquet dissection. This procedure should be considered in patients experiencing chronic pain prior to amputation to prevent neuroma formation and phantom limb pain.

Sticking to What Matters: A Modern Approach to Split-Thickness Skin Graft Fixation with Fibrin Glue

Presenter:	Charles A. Messa IV, BS
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Introduction: Split-thickness skin grafts (STSG) remain a valuable tool in the reconstructive surgeons armamentarium. Various surgical techniques exist for fixation of STSG. Traditionally, staple or suture fixation serve as the gold standard of care, however, these techniques are often associated with increased pain and numerous office visits. Fibrin glue, a widely-used surgical adhesive, has key components which directly impact adherence and hemostasis. In this study, we aim to compare clinical outcomes of STSGs following fibrin glue versus mechanical fixation.

Methods: All patients who underwent a STSG performed by two plastic and reconstructive surgeons from January 2016 to March 2018 were retrospectively analyzed. The two cohorts consisted of patients undergoing a STSG with fibrin glue (FG) or mechanical fixation (MF: suture or staple). Cohorts were matched by wound according to wound size, wound location, and BMI. Operative and outcome data were analyzed and compared.

Results: A total of 56 patients with 66 wounds were included (FG: n=23, 34 wounds, MF: n=33, 34 wounds). Demographic information was similar between both cohorts including BMI (FG: 28 kg/m^2, MF: 29kg/m^2; p=0.254), diabetes (p=0.155), smoking history (p=0.768), and wound size (FG: 280.6 cm^2, MF: 241 cm^2; p=0.754). Grafts were applied to the lower extremity (85%), upper extremity (6%), scalp (6%), and perineum (3%). There was no significant difference between the groups regarding time to 100% graft take (FG: 30.1d, MF: 39.9d; p=0.220), length of stay (FG: 3.16d,

MF: 3.62d; p=0.700), or graft complications at 180-days (FG: n=3, MF: n=6; p = 0.476). A 42% difference in wound adjusted operative time (FG: 46.0 min, MF: 71.0 min; p=0.080) was identified with fibrin glue fixation, however not statistically significant.

Conclusion: Fibrin glue for the adherence of skin grafts remains largely unexplored, specifically in a general wound reconstruction population. The use of fibrin glue for split-thickness skin graft fixation shows comparable clinical outcomes to mechanical fixation, with a decrease in wound-adjusted operative time. This study highlights the safety and efficacy of fibrin glue for STSG fixation in a matched controlled cohort of diverse wounds. The implementation of fibrin glue for STSG has the potential to benefit practice workflow, by minimizing healthcare resources and operative time, in addition to providing successful clinical outcomes.

When the Mesh Goes Away: An Assessment of Clinical Outcomes and Quality of Life Following Poly-4-Hydroxybutyrate (P4HB) Mesh Reinforcement for Complex Ventral Hernia Repair

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Introduction: While mesh reinforcement has improved clinical outcomes in ventral hernia repair (VHR), notable disadvantages have arisen with both synthetic and biologic meshes such as increased infection rates and increased cost, respectively, with variable recurrence rates. Long-term resorbable mesh presents an encouraging option for complex ventral hernia repair, designed to leverage the benefits and improve the deficiencies of synthetic and biologic mesh. This study aims to assess the clinical outcomes and quality of life (QoL) of patients undergoing poly-4-hydroxybutyrate (P4HB) mesh reinforcement for complex ventral hernia repair.

Methods: A retrospective review was conducted of all consecutive VHR with P4HB mesh reinforcement from October 2015 to January 2018 by a single surgeon. Patient demographics, operative outcomes, and QoL were evaluated. Pre and post-operative QoL was assessed using the HerQLes questionnaire. Descriptive statistics and linear regression analyses were performed.

Results: Seventy patients (n=70) undergoing VHR with P4HB mesh were included. Average age and BMI was 59.4 years (23.2 – 81.4) and 33 kg/m^2, respectively. High

risk comorbidities included diabetes (23%), obesity (59%), hypertension (59%), and history of smoking (50%). Ninety-five percent of patients underwent more than one previous abdominal surgery, in which 36% (n=25) presented with a recurrent hernia. Average defect size was 323 cm^2 (25 cm^2 – 972 cm^2), where cases were primarily clean (64%) or clean-contaminated (26%), and modified Ventral Hernia Working Group (VHWG) class II (n=35, 50%) or III (n=25, 36%). P4HB was primarily placed in the retromuscular plane (80%), followed by an onlay (20%) and fixated with either suture (n=51, 73%) or fibrin glue (n=19, 27%). Over a mean follow-up of 24 months (range 12.2-41 mo.), the hernia recurrence rate was 4% (n=4). Hernia recurrence occurred an average of 285 days (range 209-368 days) post P4HB repair. Average length of stay was 5 days (0-38). Post-operative complications consisted of superficial delayed wound healing (n=12, 19%), seroma (n=6, 9%), and cellulitis (n=4, 6%). Of the 22 surgical site occurrences (SSO), only 5 (7%) required surgical intervention. Multivariate analysis identified a significant trend for SSO in non-clean cases ($p=0.023$). There were no instances of mesh infection or explantation. Comparisons in pre and post-operative QoL (n=59, 84%) identified a significant improvement in overall QoL ($p=0.001$) and at each follow-up window ($p<0.005$). No significant differences were identified in post-operative QoL, regardless of complication or hernia recurrence.

Conclusions: P4HB reinforcement for complex VHR is associated with favorable long-term clinical outcomes, acceptable complication rates, including hernia recurrence, and a significant improvement in QoL. This study further supports the benefits of biosynthetic mesh to serve as a viable construct for ventral hernia repair in a complex patient population.

The Rich Get Richer: Osseous Chimeric Versatility to the Anterolateral Thigh Flap

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Purpose: The lateral circumflex femoral system (LCFA), which supplies the anterolateral thigh (ALT) flap territory, offers a plethora of tissue types for composite, functional reconstruction. However, the ability to include a reliable and flexible osseous component is limited. Based on cadaveric dissections, we describe an isolated

LCFA branch to the femur separate from the vastus intermedius that can be included in ALT flap harvest in cases requiring bony reconstruction.

Methods: Cadaveric dissections were undertaken to define the descending branch of the LCFA (db-LCFA). Dissection began by identifying vastus lateralis septocutaneous and/or musculocutaneous perforators to the skin paddle after marking an appropriate skin paddle. This was followed by dissection of db-LCFA pedicle proximally until convergence of vascular plexus was encountered. At this point, careful dissection of this plexus was performed identifying multiple branches, with particular focus on the deep myo-osseous perforators to the vastus intermedius (VI).

Results: Six thighs in four cadavers were dissected. After elevation of a standard fasciocutaneous skin paddle based on perforators from the db-LCFA, all branches at the plexus were carefully dissected. Consistent in all specimens (6), we were able to identify a trifurcation of systems at the plexus: 1) the superficial lateral system supplying the traditional anterolateral thigh flap 2) the superficial medial system supplying the rectus femoris muscle 3) the deep system consisting of usually two myo-osseous branches found on the undersurface of plexus. The deep major branch was the larger and lateral of the two, providing multiple branches within the VI parenchyma while the deep minor branch perforated through VI more medially with a clear supply to the anteromedial portion of the femur.

In five specimens, the minor branch was reliably located within one centimeter distal to the rectus femoris branch and approximately one centimeter proximal to a separate branch entering and supplying the vastus intermedius. In one specimen (16.7%), there was a common trunk that then split into the familiar orientation with a myo-osseous branch extending into the femur medially and another supplying the vastus intermedius more laterally. The length of the minor branch from the plexus to insertion into the femoral periosteum was approximately 6-8 centimeters. The length of the major branch extending into the vastus intermedius muscle from its origin was approximately 2-3 centimeters.

Conclusions: In conclusion, we define the vascular anatomy of the lateral circumflex femoral system supplying the anterolateral thigh flap by identifying separate femur bone and vastus intermedius muscle branches emanating from the proximal pedicle. In providing vascularized femur, another level of utility is added to the already versatile ALT flap, making it a considerable option for composite defects requiring osseous reconstruction.

Reconstruction of Lower Extremity Defects Using the Serratus Anterior Free Flap: A Systematic Review and Retrospective Case Series

Presenter: Aneesh Careers, BHSc
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Purpose: Distal third lower extremity reconstruction with free flaps is associated with high rates of failure. [1] They pose unique challenges with respect to their functional and aesthetic considerations. The free serratus anterior muscle flap remains a first-line choice at our institution due to reliable harvest, malleability with split digitations, and optimal tissue bulk. The objective of this study was to perform a systematic review evaluating postoperative outcomes of distal third leg reconstruction with the serratus flap and compare it with a retrospective review of cases at our institution.

Methods: A systematic review of the literature was conducted using Pubmed, Embase, and Cochrane Library. Articles reporting reconstruction of lower extremity and foot defects using free serratus flaps in adults were included. Articles reporting fascial flaps were excluded. A retrospective cohort study was performed to report outcomes and Lower Extremity Functional Scale (LEFS)[2] scores for free serratus flaps from 2014 to 2018 at our institution. Major complications were defined as requiring intervention in the operating room, and minor complications were defined as requiring conservative or bedside management. At our institution, the maximum size of the serratus flap was 20 x 25cm, the average pedicle length was 12cm, and only the lower 3-4 slips of the muscle were harvested.

Results: Thirty-five articles totaling 198 flaps were included, 125 (63%) of which were serratus-only flaps and 73 (37%) were chimeric flaps. The mean patient age was 40 years and the most common defect etiology was trauma in 54%, followed by chronic wounds in 38% of cases. The flap survival rate was 97%, and the major and minor complication rates were 10% and 13%, respectively. There were 4 cases of donor site complications, none of which were scapular winging. Of the 9 cases included in our retrospective analysis, 7 (77%) were serratus-only flaps and 2 (22%) were chimeric flaps. The mean age was 33 years and the most common defect etiology was chronic would in 55%, followed by trauma in 45% of cases. The flap survival rate was 100%, and the major and minor complication rates were 0% and 44%, respectively. No losses of function at the donor site were noted. The flap revision rate for debulking was 0%. The average time to flap healing was 89 days and the average LEFS score was 58/80, which indicated a favorable return to function postoperatively. Mean follow-up time was 18.4 months.

Conclusions: We provide the most robust evidence to date that serratus flap reconstruction is safe, effective, and associated with positive functional outcomes for lower extremity defects.

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Symptomatic Neuromas in Lower Extremity Amputees: Implications for Pre-Emptive Targeted Muscle Reinnervation

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Objectives: Stump neuromas are a debilitating consequence of amputation. Although nerve surgery including targeted muscle reinnervation (TMR) may offer lasting improvement[1], many now advocate for TMR at the time of index amputation in order to avoid symptomatic neuroma formation. It is as of yet unknown which nerves are responsible for the majority of painful lower extremity neuromas, and how TMR outcomes compare to other surgical techniques for neuroma management.

Methods & Materials: A retrospective chart review was performed for 32 lower extremity amputees (33 total limbs) who underwent surgery for symptomatic neuromas. Patients were stratified by amputation level and surgical technique for neuroma management. Pre- and post-op VAS pain scores and phantom limb pain (PLP) were also gathered. Outcomes of interest included which nerves were involved in neuroma formation, and changes in pain. The relative frequency of each specific nerve involvement in painful neuroma formation was calculated as were relative changes in pain.

Results: Thirty-three limbs underwent surgery for painful neuromas. A total of 78 painful neuromas were identified with 67% of patients presenting with multiple

neuromas at their initial surgery. In patients with confirmed neuromas in their AKA stump, 80% had a single neuroma of the sciatic nerve. Among BKA limbs, the superficial peroneal nerve was affected in 76%, medial or lateral sural in 59%, saphenous in 48%, and deep peroneal in 41%. Symptomatic neuroma formation of the tibial nerve was particularly, rare, affecting only one BKA patient. Overall, 83% of all neuromas were managed by neuroma excision with implantation into muscle and 10% by excision with TMR. Traction neurectomy, centro-central coaptation, nerve capping, and excision with allograft repair combined for the remaining 7%. Average percent improvement in pain at 30-day follow-up was 67% for the TMR cohort vs 45% for others. Phantom limb pain improved or resolved in 75% of TMR patients (vs 43% for other techniques) and no TMR patients experienced worsened PLP (vs 43% of other techniques).

Conclusions: In this retrospective study the majority of patients undergoing surgery for lower extremity neuroma pain had multiple painful neuromas. The majority of AKA patients presented with sciatic neuromas. In BKA patients, neuromas were most often seen in the superficial peroneal, saphenous, deep peroneal, and sural nerves, while symptomatic tibial neuromas were quite rare. Additionally, patients undergoing neuroma excision with TMR nerve transfer saw larger improvements at one-month post-op and final follow-up compared to those treated by other techniques. Overall these findings support the case for using TMR to treat symptomatic amputation stump neuromas and prophylactically address nerves most commonly associated with painful neuromas at the time of primary amputation.

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Comparative Effectiveness Analysis of Complex Lower Extremity Reconstruction: Outcomes and Costs for Biologic-Based, Local Tissue Rearrangement, and Free Flap Reconstruction

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Background: Lower extremity (LE) soft tissue reconstruction poses a significant surgical challenge, representing a heterogeneous and often complex clinical situation associated with high rates of failure and morbidity. Various surgical techniques exist for reconstruction, but limited high-quality data exist to inform treatment strategies and patient counseling. We aim to evaluate the effectiveness and cost of three common surgical reconstructive modalities for LE defects using a multi-institutional, longitudinal dataset and rigorous matching approach.

Methods: All adult patients with LE wounds who underwent biologic wound matrix (BWM), local tissue rearrangements (LTR), or free flap (FF) reconstruction were retrospectively reviewed (2010-2017). Cardinality Matching balanced cohorts' comorbidities and wound characteristics. Success for BWM was defined as providing an adequate wound bed for Split-Thickness-Skin-Grafting, whereas, success for LTR and FF was defined as not needing an additional coverage procedure. Graft success at 180-days was the primary outcome while readmissions, reoperations, and costs were secondary outcomes.

Results: A total of 501 subjects (166 BWM, 190 LTR, and 145 FFs) were evaluated. Average age of the entire cohort was 55.9 years old and BMI was 29.3 kg/m^2. Median wound size for BWM, LTR, and FF are as follows: 29.5, 30.0 and 120.0 cm^2 ($p<0.0001$), respectively. Median wound ages also differed significantly with BWM wounds (55 days) being much older than local tissue rearrangement (30 days) and free flaps (42 days) ($p=0.007$). Matched subjects (n=312; 104/group) were analyzed. Reconstruction success at 180 days for BWM, LTR, and FF was 69.2%, 91.3%, and 93.3% and total costs per subject were $34,877, $35,220, and $53,492, respectively. Free flap cases tended to be longer (408 vs. 50 and 85 minutes for BWM and LTR, respectively, $p<0.001$) and FF patients had a greater length of stay in the hospital (7 vs. 2 and 5 days for BWM and LTR, respectively, $p<0.001$). Readmissions (OR=1.58, 95% CL 0.95-2.61) and reoperations (OR=1.46, 95% CL 1.00-2.15) were greater for FF. Amputation rates were highest for BWM (n=15, 14.4%) compared to LTR (n=6, 5.8%) and FF (n=4, 3.8%) ($p=0.017$). Using conditional logistic regression models, predicted probabilities of success demonstrated that LTR, if achievable, provides great success at low cost. FF was most effective with large, traumatic wounds but at higher costs and longer length of stay(LOS). BWM was least effective but successfully treated older, obese patients without exposed bone at low costs and decreased LOS.

Conclusions: Data presented in this large, multi-institutional study highlights the relative clinical benefits of a customized surgical approach to lower extremity reconstruction based upon patient and wound characteristics. We effectively compare three treatment modalities using an advanced matching technique. We demonstrated that FF is the most successful reconstructive option however it leads to greater length

of stay, increased numbers of readmissions, reoperations, and high costs. Local autologous tissue rearrangements, if achievable, provides successful coverage at minimal costs and decreased readmissions and reoperations. BWM, although not as successful, can be effectively used in certain patient populations while reducing costs and decreasing length of stay.

Evaluation of Efficacy and Safety of Votiva for Vaginal Restoration

Presenter: Aviva Preminger, MD
Co-Authors: Joey Kurtzman, BA, Carey Campbell, MD, Jennifer L. Walden, MD
Affiliation:

Purpose: A multi-site, randomized, prospective study designed to evaluate the safety and efficacy of the Votiva bipolar radiofrequency device for vaginal rejuvenation.

Methods and Materials: This multi-site, randomized, prospective study was conducted between March 2018 and February 2019. Subjects underwent 3 treatments of the vulvovaginal area using radiofrequency unit Votiva FormaV and FractoraV or placebo. Study duration for each subject was approximately six months. Efficacy was measured and evaluated by validated questionnaires including: The Vulvovaginal Symptoms Questionnaire, Vaginal Laxity Questionnaire (VLQ), Urogenital Distress Short Form (UDI-6) and Incontinence Impact Questionnaire Short Form (IIQ-7), Female Sexual Function Index (FSFI) and the Female Sexual Distress Scale-Revised (FSDS-R).

Number of Cases and Follow Up: 22 Control Subjects and 20 Treatment Subjects completed the all 3 treatments and 34 Subjects in total completed all follow ups.

Results: A series of paired-samples t-tests were employed, with the dataset split between control and treatment groups. Every dependent variable was tested from time 1 to time 3, and time 3 to time 5 separately for the control and treatment groups. While across most metrics women showed improvements across time, those in the Votiva treatment group demonstrated immediate and drastic improvement that sustained over time compared to patients in the control group. Specifically, from the first to the third treatment, Votiva patients saw improved Kegel Pressure ($M=69.98$, $SD=24.7$ vs. $M=78.40$ $SD=20.23$, conditions; $t(18)=-3.18$, $p=0.005$), VVSQ Anxiety ($M= 0.19$, $SD= 0.23$ vs. $M= 0.09$, $SD= 0.17$, conditions; $t(20)=2.60$, $p=0.02$), VVSQ Sexuality ($M=0.44$, $SD=0.29$ vs. $M=0.13$, $SD=2.32$, conditions; $t(15)= 2.32$, $p=0.04$), UDI ($M=23.02$, $SD=14.73$ vs. $M=13.16$, $SD=11.22$, conditions; $t(18)=3.84$, $p=0.001$),

IIQ7 (M=0.38, SD=0.61 vs. M=0.17, SD=0.32, conditions; t(18)=2.51, p=0.02), FSDSR (M=21.21, SD=18.18, vs. M=12.95, SD=12.04, conditions; t(18)=3.21, p=0.005), and FSFI (M=17.96, SD=8.49 vs. M=26.55, SD=5.78 , conditions; t(19)=-4.66, p<0.001) significantly more quickly compared to those in the control group. The improvement from time one to three remained sustained over time 3 to 5 (six months) and in one instance, for the UDI, there was further improvement at time 5. From the third to the fifth treatment, Votiva patients saw UDI scores (M=15.51, SD=12.28 vs. M=10.88, SD=10.02, conditions; t(17)=2.70, p=0.02). There were no significant adverse events.

Conclusion: In sum, there is sufficient evidence to suggest the Votiva treatment is effective in improving metrics for 7 measures. Moreover, while there seems to be an overall trend of improvement regardless of group membership, those in the treatment group demonstrated more immediate and sustained improvement compared to those in the control group.

The Ethics of Penis Transplantation: A Systematic Review

Presenter:	Kevin M. Klifto, PharmD
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Purpose: We conducted this systematic review to document ethical concerns regarding human penis allotransplantation and how these concerns have changed over time.

Methods: We searched six databases (MEDLINE via PubMed, Embase, CINAHL, Scopus, Web of Science, and Google Scholar) from inception to November 9, 2018 to find articles addressing ethical concerns related to penis allotransplantation. Inclusion criteria were articles written in English on the topic of penis allotransplantation that discussed at least one bioethical principle. Data was extracted and categorized into the four bioethical pillars: autonomy, beneficence, nonmaleficence, and justice. We assessed theme frequency by publication year and temporal trends. A sub-analysis of the Bioethical pillars and themes specifically addressing the first penis transplantation case performed in 2006 were extracted and evaluated separately.

Results: Search results yielded 142 citations. Thirty-nine articles were eligible and included in the final data extraction and analysis. Publication years were 2006 through 2018 with an average of 3 publications per year (range: 0 to 12). The most frequently

addressed bioethical pillar was nonmaleficence with themes included in 37 of 39 articles (95%), followed by beneficence (36 of 39, 92%), justice (32 of 39, 82%), and autonomy (29 of 39, 74%). Top concerns pertaining to nonmaleficence included the risk-benefit ratio (n=30, 81%) and risks of long-term immunosuppression (n=29, 78%). Top concerns regarding beneficence included restoration of bodily function, integrity, or aesthetics (n=33, 92) and improved QOL (n=25, 69%). Top concerns pertaining to justice included patient selection (n=25, 78%), burden to donor family, and impact on deceased donor solid organ donation (n=13, 41%). Top concerns regarding autonomy included patient informed consent (n=18, 62%), and donor or donor family informed consent (n=16, 55%). Bioethical issues in reference to the 2006 case were mentioned in 29 of 39 articles (74%); nonmaleficence was most often addressed, mentioned in 27 of 29 articles (93%).

Conclusions: Penis transplantation has been a topic of much ethical debate. During the 12-year study period, nonmaleficence was the most common recurring ethical pillar with the two most common themes being risks and benefits for undergoing the procedure and the need for life-long immunosuppression. The first attempt in 2006 that resulted in the graft being removed greatly influenced the field of penis transplantation.

Convolutional Neural Network Models for Automatic Pre-Operative Severity Assessment in Unilateral Cleft Lip

Presenter:	Meghan McCullough, MD
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Background: Despite the wide range of cleft lip morphology, consistent scales to categorize pre-operative severity do not exist. Machine learning has been used to increase accuracy and efficiency in detection and rating of multiple conditions, yet it has not been applied to cleft disease. We test a machine learning approach to automatically detect and measure facial landmarks and assign severity grades using pre-operative photographs.

Methods: Pre-operative images were collected from 800 unilateral cleft lip patients, manually annotated for cleft-specific landmarks and rated using a previously validated severity scale by eight expert reviewers. Five convolutional neural network (CNN) models were trained for landmark detection and severity grade assignment. Mean

squared error (MSE) loss and Pearson correlation coefficient for cleft-width-ratio (CWR), nostril-width-ratio (NWR) and severity grade assignment were calculated.

Results: All five CNN models performed well in landmark detection and severity grade assignment with the largest and most complex model, ResNet, performing best (MSE = 24.41, CWR correlation = 0.943, NWR correlation = 0.879, severity correlation = 0.892). The mobile-device compatible network, MobileNet also showed a high degree of accuracy (MSE = 36.66, CWR correlation = 0.901, NWR correlation = 0.705, severity correlation = 0.860).

Conclusion: Machine learning models demonstrate the ability to accurately measure facial features and assign severity grades according to validated scales. Such models hold promise for the creation of a simple, automated approach to classifying cleft lip morphology. Further potential exists for a mobile-phone based application to provide real-time feedback to improve clinical decision making and patient counseling.

An Experimental Animal Model for Postsurgical Lymphedema of the Head and Neck

Presenter:	Giulia Daneshgaran, MD
Co-Authors:	Michael N. Cooper, BA, MS, Connie B. Paik, BS, Andrea Y. Lo, BS, Cynthia Sung, BS, Wan Jiao, MD, PhD, Sun Young Park, MS, Ivetta Vorobyova, BS, Tea Jashashvili, MD, PhD, Yang Chai, DDS, PhD, Alex K. Wong, MD
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Introduction: Head and neck lymphedema (HNL) is a disfiguring disease affecting over 75% of patients treated for head and neck cancer. The mainstay of HNL treatment is achieved through conservative measures with varying rates of success and poor long-term patient adherence. Animal models of lymphedema are used to test pharmacologic and microsurgical therapies, which can offer improved outcomes compared to standard conservative therapies. However, no animal model for HNL has been described in the literature to date. The purpose of this study is to describe the first reproducible rat model for head and neck lymphedema.

Methods: Thirty-six (36) rats were split into 2 groups: 1) 18 experimental animals received combined lymphatic injury consisting of cervical lymph node dissection followed by irradiation, 2) 18 control animals received sham surgery. Fluorescence imaging was performed to map green fluorescent protein (GFP)-expressing lymphatics in experimental animals and identify cervical lymph nodes for dissection. Outcomes measured at postoperative days 15, 30 and 60 included neck circumference,

maximum face width (zygion-to-zygion), and fat volume within the head and neck region as measured by magnetic resonance imaging (MRI). Lymphatic drainage was measured at day 60 via indocyanine green (ICG) lymphography, after which animals were sacrificed for histological and molecular analysis. All outcomes were statistically analyzed using Student's *t*-test.

Results: Postsurgical lymphedema was observed 94% of the time in experimental animals (17/18). Compared to controls, experimental animals experienced significantly more head and neck growth at all timepoints as measured by neck circumference (12% mean difference at final timepoint, $P<0.0001$), maximum face width (10% mean difference at final timepoint, $P=0.0003$), and fat volume (18% mean difference at final timepoint, $P=0.04$). Experimental animals had significantly slower lymphatic drainage than control animals as measured by ICG clearance at 8, 24, 48, 72, 96, 120, and 144 hours following ICG injection ($P<0.05$). Histological analysis of experimental animals revealed 83% greater subcutis thickness ($P=0.0083$) and 38% greater dermal thickness ($P=0.1247$) compared to controls, indicating subcutaneous tissue expansion. Molecular analysis revealed that experimental animals had 66% greater relative expression of transforming growth factor-β1 (TGF-β1) mRNA, indicating increased fibrosis.

Conclusion: Experimental animals receiving combined lymphatic injury with surgical lymph node dissection and irradiation developed changes consistent with postsurgical head and neck lymphedema. This was evidenced by significant growth in all head and neck measures, slower lymphatic drainage, subcutaneous tissue expansion, and increased fibrosis compared to control animals. In conclusion, we demonstrate that combined lymphatic injury in rats leads to a reproducible model of head and neck lymphedema that can be used to investigate therapies for the treatment of this disfiguring disease.

Low Dose CT Scans for Postoperative Evaluation of Craniomaxillofacial Fractures: A Pilot Clinical Study

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Background: It is common practice for surgeons to obtain a craniomaxillofacial computed tomography (CT) scan to evaluate fracture reduction and implant positioning following the surgical reconstruction of facial fractures. CT scans contribute to the potential stochastic health risk from cumulative radiation exposure. This study was aimed at testing the hypothesis that an ultralow dose CT protocol is effective for postoperative diagnostic evaluation of craniomaxillofacial fractures.

Methods: This observational study was conducted at a Level 1 Trauma Center. We included patients for whom CT was indicated for postoperative evaluation of their reconstructed craniomaxillofacial fractures. Postoperative craniomaxillofacial CT was performed utilizing an ultralow dose protocol (0.1 milliSieverts), rather than the standard protocol (3.6 milliSieverts). A craniomaxillofacial surgeon and a radiologist independently interpreted the images to determine whether the image quality was adequate for assessing fracture reduction and implant position. It was decided a priori that any inadequate ultralow dose CT would require repeat scanning utilizing the standard protocol. The primary endpoint was the need for repeat CT, as determined by the surgeon or radiologist.

Results: Twenty patients met inclusion criteria. Mean radiation dose (total dose-length product) from the ultralow dose protocol was 71 mGycm vs 532 mGycm for the preoperative CTs which were performed using the regular protocol ($p < 0.001$). All 20 patients' ultralow dose postoperative CTs were determined to be satisfactory. No patient required repeat CT secondary to poor image quality of the ultralow dose scans.

Conclusions: Our ultralow dose CT protocol which delivers 7.5-fold less radiation than the standard protocol appears adequate for routine postoperative evaluation of reconstructed facial fractures. Larger prospective studies may be warranted.

Endothelial Cell Replacement - a Novel Platform for Bioengineering of Personalized Vascular Composite Allografts

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Background: Vascularized composite allotransplantation (VCA) is an emerging area of reconstructive surgery, involving transplantation of extremities, face, abdominal

wall, larynx, penis and uterus. However, chronic rejection and long term complications of lifetime immunosuppression remain key barriers in this field.

Perfusion decellularization has been proposed as a promising method for generating non-immunogenic organs from allogeneic or xenogeneic donors. Decellularization is used to remove the cellular content of an organ, leaving behind 3D extracellular-matrix with preserved ultrastructure and biochemical composition. It has been utilized to generate cell-free scaffolds from various human organs, including kidneys, hearts, lungs, livers, pancreas and more recently VCA including upper extremity [1], face [2] and ears [3].

However, the ability to recellularize cell-free VCA scaffolds with multiple patient-specific cell types in a spatially-controlled manner remains challenging and must be addressed before such an approach can be successfully utilized in humans.

The aim of this study is to address these limitations by testing a modified decellularization technique. The proposed method is based on the understanding that endothelial cells play a critical role as initiators, participants and targets of both acute cellular and antibody-mediated allograft rejection. Hence, selective elimination of donor endothelial cells lining the VCA vasculature while preserving the remaining tissue intact and viable, may reduce immunogenicity and achieve tolerance.

Methods: Rat and porcine hind limbs were cannulated through the iliofemoral vessels and perfused in-situ under controlled flow conditions designed to selectively eliminate donor endothelial cells while keeping the remaining tissue intact and viable. Preservation of vascular patency was assessed in-situ by fluoroscopic angiography. Efficacy of cell removal has been assessed by histology. Stem cells isolated from human placentae were used to assess the ability to replace endothelial cells in rat limbs.

Results: Perfusion decellularization of limbs under controlled flow conditions resulted in successful selective removal of endothelial cells. Sub-endothelial tissues remained intact and viable. Placental stem cells readily engraft within de-endothelized limb vasculature. In-situ limb perfusion while keeping it in its native anatomical location yielded less peri-organ dissections and better control of perfusate leakage.

Conclusions: Our findings suggest that limited decellularization of donor endothelial cells followed by re-endothelization with non-immunogenic cells is feasible and may be used to generate fully functional, possibly tolerable VCA for transplantation.

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Pilot Data of Near-Infrared Spectroscopy during Surgery Successfully Differentiates Viable Tissue from Areas of Ultimate Necrosis

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Purpose: Skin flap necrosis is a problematic complication following reconstructive surgery that imparts significant morbidity to patients. The purpose of this study was to prospectively evaluate the capacity of a novel device, that measures tissue oxygen saturation (S_tO_2) using near-infrared spectroscopy (NIRS), as a potential alternate to SPY-imaging to predict skin flap necrosis.

Methods: The first 42 of 100 patients undergoing oncologic resection and reconstruction between January 2018 and January 2019 were prospectively analyzed in this preliminary study. Clinicians were blinded to device S_tO_2 measurements (Kent Imaging Inc, SnapshotNIR system, Calgary, AB) taken intra-operatively after closure and at follow-up. Measurements were categorized as (1) control areas not affected by the procedure, (2) distal skin flap zones and (3) areas of necrosis. These areas were retrospectively demarcated by two blinded assessors on follow-up images and transposed onto anatomically correlated intra-operative$S_tO_2$measurements. Mean

$S_tO_2$values were compared using a single-sample t-test and ANOVA to determine differences in oxygenation.

Results: Forty-two patients were enrolled and 51 images were included in the analysis. Oncologic procedures were predominantly breast (22), post-extirpative melanoma (13) and sarcoma (3) reconstructions. Nine patients (20.9%) and 11 surgical sites developed SFN. Mean intra-operative $S_tO_2$measurements for control areas, areas at risk, and areas of SFN were 74.9%, 71.1%, and 58.3%, respectively. Relative to control areas, mean intra-operative S_tO_2 measurements were lower by 17.5% (p=0.01) in ultimate areas of SFN and in areas at risk by 5.8% (p=0.003). Relative to areas at risk, mean $S_tO_2$measurements from areas of ultimate SFNwere lower by8.3% (p=0.04).

Conclusion: NIRS showed differences in skin flap perfusion that were associated with clinical outcomes. A 100-patient experience should yield reliable $S_tO_2$values to guide intra-operative decisions to either preserve viable tissue or resect poorly perfused areas.

Axonal Regeneration in Autologous Grafts: Does Donor Nerve Axonal Count Influence Clinical Outcomes?

Presenter:	Miranda A Chacon, BS
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Purpose: The gold standard of treatment for long-standing facial palsy is two-stage free functional muscle transfer (FFMT); of these reanimation procedures, 60% achieve an excellent result. Studies of nerve regeneration have revealed that the axonal load of the donor nerve influences the number of successfully regenerating axons in facial reanimation surgery (1-3). Thus, this work assesses the impact of varying myelinated axonal counts in autologous nerve grafts on clinical outcomes of facial nerve surgery in a rodent model.

Materials and Methods: Six week old YFP-16 female rats were allocated into three groups: Direct Nerve Repair (**DNR**, n=50), Small Nerve Graft (common peroneal nerve, **SNG**, n=50), and Large Nerve Graft (sciatic nerve, **LNG**, n=50). All grafts were inset into the Posterior Auricular Nerve. Ear movement recovery was monitored as a measure of functional outcome in the affected ear, with the unaffected ear used as a control. At designated post-operative weeks (POW), ear movement was measured

and specimens were excised for imaging with electron microscopy. Axon counts were measured proximal (PAC) and distal (DAC) to the neurorrhaphy as well as within the graft. Total Success Ratio (TSR), or the ratio of axons to successfully regenerate across the specimen, was calculated.

Results: The posterior auricular nerve (PAN), sciatic nerve (ScN), and common peroneal nerve (CPN) had significantly varying axon counts. PAN demonstrated the lowest axonal count. For the DNR group, the DAC was significantly lower than the PAC at all POWs, with a maximum TSR of 80%. LNG had a significantly larger DAC than SNG at POW12 and beyond. The TSR for SNG and LNG were significantly lower at all POWs when compared to DNR, with maximums of 38% and 56% respectively. All groups reached maximum TSR at POW12. A significant direct relationship was present between distal axon counts and ear motion recovery for all values.

Conclusions: These results demonstrate a significant correlation between increasing axonal count distal to neurorrhaphy in autologous grafts and successful ear motion recovery, supporting the conclusion that axon counts in autologous grafts influence the functional outcome of surgical repair. Nerve grafts with a greater native axonal count were demonstrated to yield superior nerve regeneration results and movement recovery.

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Heat Stress Promotes Myofibrillogenesis during Myogenesis

Presenter:	Samuel R Boas, BS
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Significance: Hyperthermic treatment of cellular tissues is an emerging modality for biomedical applications. However, specific effects of the timing and temperature of heat stress on muscle regeneration after injury remains understudied. This study aimed to characterize how high myogenic capacity Muscle Derived Stem Cells (MDSCs) respond to hyperthermic therapy.

Methods: MDSCs from murine hind limb tissue were isolated using a standardized isolation protocol that used Type 1 collagen for cell sorting. MDSCs ($1x\ 10^6$/well) from pre plate 3/4 were cultured and allowed to expand to confluence at different temperatures intervals (37, 39, 41°C) over a course of five days. Myotube differentiation was quantified at specific times (1,3,5 days) using immunofluorescent cell staining and quantification of cellular morphology. Statistical analysis was preformed using SPSS.

Results: MDSCs demonstrated significant changes in morphology based on temperature and temporal changes. Early transient moderate and severe hypothermia promoted myotuble growth. MDSCs cultured at 39°C and 41°C grew significantly longer at 48 hours (515, 478 mm) when compared with control myotubules cultured at 37°C (339 mm)($p<.001$, $p<.001$). However, prolonged severe hypothermia was deleterious to muscle growth and cell expansion. At 72 hours, MDSCs cultured at 41°C had a significantly lower nuclei density (1454 nuclei/mm^2) than MDSCs cultured at 37°C (1890 nuclei/mm^2)($p=.008$), and after five days, MDSCs cultured at 41°C (803 nuclei/mm^2) had a significantly lower nuclei density than MDSCs cultured at 37°C (1800 nuclei/mm^2) and 39°C (1624 nuclei/mm^2)($p<.001$, $p<.001$).

Conclusion: MDSCs treated with early/transient (<72 hours) moderate hyperthermia (39°C) demonstrate significant improvement in myotube growth. Persistent and severe hyperthermia significantly decrease muscle growth and cell division using an in vitro cell expansion model. Future studies quantifying cellular processes through pathway-focused high-throughput gene expression profiling analyses will provide greater insight into the mechanism of heat mediated muscle regeneration after injury prior to invivo modeling.

Braxon Biological ADM Wrapping for Treatment of Capsular Contracture: A Preliminary Study

Presenter: Stefania de Fazio, MD, PhD

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Capsular contracture and BIA-ALCL are intimately connected with a strong pathologic foreign bod reaction[1] but not all patients can afford a total autologous breast reconstruction.

The new biological acellular dermal ADM "Braxon®" (Decomed S.r.l., Italy) offers complete breast implant coverage, becomes revascularizated and repopulated by fibroblasts and "hides" alloplastic materials from severe immunitary reactions. [2]

With these assumptions, we developed a preliminary study to assess the effectiveness of Braxon® for the treatment of capsular contracture.

Since September 2018, 17 patients with Baker III and IV capsular contracture who couldn't stand autologous reconstructions were enrolled in the trial. Surgery consisted in implant change with pocket arrangement (maintaining the same one) and prosthesis coverage with Braxon®, a pre-shaped 0.6mmthick ADM that totally wraps anatomical breast implants. Pre-operative demographic data, local conditions, surgery details and postoperative recovery data were collected; a preliminary outcome was drawn up at 3 and 6 months with Breast-Q assessment and surgeons' clinic evaluation.

Twenty-one procedures were performed: four bilateral and thirteen unilateral implant-exchanges. Mean age was 57 years old, mean BMI was 23. 65% of patients were not-smoker, 17% were ex-smokers, 18% were current smokers. 29% of breasts received radiotherapy, 65% of patients received chemotherapy and 71% of breasts had a pinch test ≤1cm. All patients underwent total capsulectomy except for the posterior wall and maintained the previous pocket. The new implant sized between 195cc and 585cc and was macro-textured in six cases, micro-textured in fourteen cases and polyurethane-surfaced in one case. 5 breasts developed a "red breast syndrome".

Four patients encountered implant loss: two developed an immediate severe local reaction; two developed an unexpected implant exposition two months after surgery. Particularly, two of these patients had previous mastectomy and radiotherapy in the 90s, both underwent chemotherapy and more than two implant-exchanges during the years, and both had pinch test ≤1cm.

For patients who succeed the surgery, our case series clinical results showed limited signs of capsular contracture and nice visual appearances.

Comparing pre-operative and post-operative self-administered Breast-Q questionnaires, we found improved scores for Psychosocial, Sexual Well-being and

Physical Well-being of Chest modules, and Satisfaction with Breast modules provided statistically significant better scores at the latter examinations.

Statistical association was found between implant loss and radioteraphy.

We assume that a “conservative” treatment for capsular contracture can embrace the coverage of the implant with Braxon®, but proper preoperative selection is fundamental: patients with a precarious perfusion of the mastectomy flap as heavily radio-treated women should not be considered for this type of procedure. A longer follow up and a multivariate analysis are needed, but clinical results are encouraging and patients demonstrate their satisfaction.

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Reconstruction of Traumatic Defects of Fingers with Dorsal Metacarpal Artery Perforator Flap

Presenter: Dun Hao Chang, MD
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Introduction: Reconstruction of soft-tissue defects of fingers is challenging because of the limitation of local tissue restoration. The dorsal metacarpal artery perforator (DMAP) flap is a vascular island flap raised on the dorsum of the hand, and it is a good choice of finger reconstruction by replacing like with like in single operation. This flap is based on the dorsal metacarpal artery or the palmar arterial system via dorsopalmar anastomosis. The consistency of the cutaneous perforator makes DMAP flap more reliable, and the dissection is also straightforward and easy.

Materials and Methods: From Nov 2016 to May 2019, 10 patients suffered traumatic injury to their fingers, resulting in various soft tissue defects. These patients who underwent DMAP flap for the soft tissue reconstruction were studied. Five patients received the flap surgery in an emergent setting as a primary procedure, and the other 5 patients had the surgery for secondary reconstruction.

Results: The patients were 9 males and 1 female, average age 43 (17-66) years old. The average flap size was 4.9 x 2.0 cm; one flap was based on the first DMAP, 6 flaps were based on the second DMAP, one was based on the third DMAP, and 2 were based on the fourth DMAP. All the donor sites were closed primarily. Nearly half of the flaps had temporary venous congestion, but most of the flaps survived well ultimately. Only two patients had flap partial necrosis, and one required additional skin grafting and another underwent conservative treatment with eventful wound healing.

Conclusions: The DMAP flap can offer thin and pliable skin to reconstruct finger defects within one-stage surgery. It's simple to harvest with minimal donor-site morbidity. The DMAP flap is the ideal flap for resurfacing soft-tissue defects of finger proximal to the fingertip.

Enhancing Melanoma Pathological Reporting in an Irish Tertiary Referral Centre.

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Background: Pathological assessment of tissue is a critical aspect in the multidisciplinary management of malignant melanoma. Histological parameters of the primary tumor are the strongest predictors of outcome in patients with clinically localized primary melanoma and strongly influence the next stages of management. Traditionally, the British Association of Dermatology (BAD) guidelines for melanoma pathology reports used in Ireland, however the International Collaboration on Cancer Reporting (ICCR) have developed an internationally agreed, evidence based dataset for pathological reporting of cutaneous melanoma. [(1)] The purpose of this audit was to enhance the quality of melanoma pathologic reporting in a tertiary referral center in the west of Ireland.

Methods and Materials: All primary melanoma pathology reports were evaluated from February 2018 to January 2019. Data was retrieved from the Galway melanoma multi-disciplinary meeting. Compliance with ICCR guidelines was assessed.

Results: 168 malignant melanoma pathology reports were analyzed. 84 of these were dated from February 2018 to June 2018 (initial-audit), and a further 84 from July 2018 to January 2019 (re-audit). Initial audit reports contained 71.2% of the ÔrequiredÕ

ICCR pathological features, and 62.8% of the ICCR ÔrecommendedÕ features. Re-audit findings showed 94.0% of the ÔrequiredÕ ICCR pathological features, and 87.2% of the ICCR ÔrecommendedÕ features.

Conclusions: Accurate pathological reporting is essential to accurate melanoma diagnosis. Our closed-loop audit results show that improvements can be made in terms of pathological reporting of melanoma. Following this study, our institute has closely adopted the ICCR guidelines and plan to re-evaluate practice over the next year.

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Using a Turnover Flap Combined with a Rotation Flap for Recalcitrant Tracheoesophageal Fistula and Tracheostoma Malacia: A Case Report

Presenter: Chun-Chia Chen, MD
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Background: We illustrate a surgical method to resolve a case of recalcitrant tracheoesophageal fistula as well as tracheostoma malacia, caused by a placement of voice prosthesis. Placement of voice prosthesis for voice restoration is believed as a simple method after total laryngectomy[1]. However, a too wide and nonclosing tracheoesophageal fistula, ultimately a complication, can result in considerable morbidities, such as chronic chocking and aspiration pneumonia. The prosthesis must be removed definitely in this circumstance. Most tracheoesophageal fistulas close spontaneously in few days after removal of voice prosthesis or after local debridement[2]. Closure of the persistent tracheoesophageal fistula is challenging and sometimes refractory. Primary closure was believed only as first surgical act in simple patients who have not received radiotherapy treatment. A recalcitrant tracheoesophageal fistula requires a well-vascularized and double layered barrier between tracheostoma side and esophageal side with non-tension repair[3-5]. This technique provides a turnover flap for esophageal site closure and a rotation flap for tracheostoma side coverage as well as reduces redundant peri-tracheostoma skins to eliminate tracheostoma malacia simultaneously.

Case report: A 70 year-old female patient undergoing a voice prosthesis insertion sustained iatrogenic tracheoesophageal fistula, and tracheostoma malacia after removal of prosthesis. A series of surgical intervention were performed but failed. We designed a turnover flap combined with a rotation flap to correct the tracheoesophageal fistula and tracheostoma malacia successfully. The satisfactory result was obtained in a ten-month follow-up.

Results: Using redundant local skin flaps of tracheostoma, we successfully managed an iatrogenic tracheoesophageal fistula caused by a voice prosthesis. The patient was weaned from a tracheostomy tube two weeks postoperatively and no recurrence was noticed in a ten-month follow-up.

Conclusion: A turnover Flap combined a rotation flap is a good choice for a recalcitrant tracheoesophageal fistulae with tracheostoma malacia. It provided a simple and safe method and may be considered as the initial surgical treatment.

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Biofluorescence Modulation: A New Era in Woud Healing?

Presenter: Stefania de Fazio, MD, PhD
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Nowadays Fluorescence Biomodulation has become one of the most promising treatment in wound healing. Based on the ability of specific chromophores, activated by a blue Led lamp, to restart the healing cascade, this treament can be used for chronic ulcers, burns, surgical incisions and a new frontier has been opened in order to prevent pathological scarring as keloids. Here we present our personal experience with this device.

Materials and methods: 20 patients affected by chronic ulcer or burns or pathological scars ahve been treated with fluorescence biomodulation. Every patient has undergone to informed consent, pictures, measurement of the lesions, a VAS score and a quality of life evaluation. The evaluations wad odne at the first session and at the end of the treatments. The median total amount of session has been 10 for each patient (minimun6 maximum 16).

Every sessions has last 5 minutes 2 times/week. The follow up of teh patient has been at 1-3-6 months after the treatments.

Results: The treated patients presented an interesting recovery of the cicatrization with a consequent reduction of the wound volume, up to some cases with complete re-epithelialisation, which remained stable even at the subsequent controls.
The advantages found can therefore be summarized in the following points:

- Management and reduction of inflammation, pain and bacterial colonization;
- Management and reduction of maceration of perilesional tissue;
- Good response in granulation tissue growth and reduction in lesion volume;
- Rapid acquisition of the method thanks to the system's ease of use;
- Good tolerability on the part of the patient.

Conclusions: The use of the technology is very fast and simple, consisting of 5 minutes of treatment (application of the gel and supply of light for 5 minutes) for 2 applications per week, and can be used both directly in the patient's bed (in patient), during hospitalization, both in the dressing office (out patient), as the LED source is easily transportable.
The treatment proved to be non-invasive, well accepted by patients, simple to administer, and free from adverse events related to it, while remaining contraindicated in patients with a history of skin hypersensitivity and / or photosensitizing treatment.

Robotic-Assisted Microsurgery for Vascular Microanastomosis

Presenter: Chih-Sheng Lai, MD
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Objectives: Da Vinci Surgical System has made great strides in surgery. However, its application in plastic and reconstructive surgery is still in the preliminary stages of development. Robotic surgical systems can provide a clear and three-dimensional (3D) image of the surgical field with magnification of up to 20 times. The high-definition visualization technology and ergonomically designed surgeon's console of robotic surgical systems allow the surgeon to work for long periods without developing neck or muscle fatigue. It can also eliminate the operator's physiologic tremor. This study presents our experience with robotic-assisted microsurgery in vessel anastomosis in free forearm flap reconstruction for the patient with oropharyngeal cancer.

Materials and Methods: This study was a retrospective review of consecutive adult patients and we recruited 13 patients (10 men and 3 women) who underwent reconstructive operations using a free radial forearm flap with robotic-assisted microsurgery for oropharyngeal defects after tumor extirpation. Between May 2013 and August 2017, we had the current existing limited experience (1 artery and 13 veins) with microsurgical vascular suture using Da Vinci system. Two Black Diamond micro needle drivers (Intuitive Surgical) were introduced to perform vessel anastomosis in an end-to-end fashion using 9-0 nylon (Figs. 1, 2). The anastomotic patency was confirmed by Acland test to ensure that proper antegrade blood flow through the vascular junction had been accomplished (Figs. 3).

Results: Thirteen patients underwent operation for oropharyngeal reconstruction with robotic-assisted microsurgery. There were 10 male patients and 3 female patients with a mean age at presentation of 52 years (range, 39–65 years). There were 1 artery and 13 veins which were anastomosed by using robotic surgical system. The diameter of recipient blood vessel ranged from 1.5 to 3.5 mm (mean, 2.36 mm). The diameter of donor blood vessel ranged from 1 to 4 mm (mean, 2.0 mm). The operative time of vessel anastomosis ranged from 28 to 60 minutes (mean, 38.9 minutes). The number of suture stitches for vessel anastomosis ranged from 7 to 10 stitches (mean, 8.2 stitches). There were no intraoperative complications, and the vascular patency rate was 100%. Hematoma developed in 1 patient 2 weeks after surgery due to an abrupt rise in blood pressure.

Conclusions: Lack of haptic feedback in robotic-assisted microsurgery will not affect the success rate of vessel anastomosis. Increasing appropriate practice and experience can reduce the operative time. The application of a robotic surgical system seems to be a safe option in the free flap reconstruction of oropharyngeal defects without lip or mandible splitting. Our finding demonstrate that the robotic surgical system does have potential for performing vascular microanastomosis. Although robotic surgery is a developing technology, it has huge potential and will play a central role in long-

distance remote control surgery in the future. We believe in the near future robotic-assisted microsurgery could herald a new era in microsurgery.

Smartphone Thermal Imaging for Preoperative Perforator Mapping in Breast Reconstruction with DIEAP Flaps

Presenter:	Orla Hennessy, MB BaO BCh, MCh
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Background: Perforator based flaps are now the mainstay of autologous breast reconstruction practice. Despite available radiological investigations ranging from Doppler ultrasound (US) to CT angiography (CTA), finding and quantitatively assessing perforators remains a complex and imprecise process, often complicated by factors such as variable anatomy, prior surgery and body habitus. In this study we assess the use of infrared thermographic imaging (IRT) as a novel modality to aide preoperative localisation of perforator vessels.

Methods: Women undergoing elective breast reconstruction with Deep Inferior Epigastric Artery Perforator (DIEAP) flaps were recruited between August 2017 and July 2018 in Galway University Hospital. All had CTA and Doppler US mapping of arterial perforators pre-operatively as standard. Additional abdominal thermal images were taken using a FLIR ONE smartphone compatible camera. Thermal hotspots were compared with Doppler markings and CTA findings.

Result: Twenty six flaps were analysed. Seventy perforators were marked by Doppler US, with a mean of 2.92 perforators per flap (±SEM 0.15, SD 0.72). Forty (57%) had a corresponding hotspot on IRT. Overall, there was a statistically significant positive correlation between the number of perforators detected by Doppler US and IRT ($r=0.573$, $n=26$, $p=0.003$), kappa index 0.65. Eighty four perforators were identified by CTA, with a mean of 3.5 perforators per flap (±SEM 0.14, SD 0.66). Fifty eight (69%) had a corresponding hotspot on IRT. There was a statistically significant positive correlation between the number of perforators detected by CTA and IRT ($r=0.504$, $n=26$, $p=0.012$), kappa index 0.60.

Conclusion: Thermography is an inexpensive, portable, non-invasive imaging technique, which shows statistically significant correlation to CTA and Doppler US in mapping perforators. This may be used as an alternative or adjunct to current techniques, providing additional information which may translate into reduced operating time.

Clinical Versus Histopathological Diagnosis of Non-Melanoma Skin Cancer

Presenter:	Jordan E Wilkinson, MBChB
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Background: Non-Melanoma Skin Cancer (NMSC) is the most frequently diagnosed malignancy globally. While the mortality rate for NMSC remains low when compared to other neoplasms, it places a substantial burden on healthcare systems worldwide due to its rising incidence.

As with all cancer, successful management hinges on an accurate diagnosis. In NMSC the margin of excision is often determined by the histopathological type and subtype. In some cases it is possible to excise the NMSC with the required histological margin such that a single procedure is all that is required. In other cases a diagnostic procedure is indicated prior to planning the definitive procedure.

Aim: Our aim was to estimate how accurately we diagnose the type of NMSC we perform procedures on and how that accuracy varies.

Methods: We reviewed the clinical impression of the surgeon written on the pathological request form in 200 consecutive cases of NMSC diagnosed in one Histopathology Laboratory, and compared this to the histopathological findings.

Results: The clinical impression of the surgeon was correct in approximately two thirds of cases. The remaining third of incorrect clinical diagnoses varied across specialties and Histological types.

We demonstrate these findings graphically.

Conclusion: While we do diagnose NMSC accurately the majority of the time, it is still a surprising finding. Further studies and analysis are needed to establish (a), what type and subtype are misdiagnosed most frequently and (b), which group or specialty would benefit from targeted education if any.

The Use of the Pruritus Severity Scale in the Burns Patient: A Pilot Study

Presenter:	Ciaran M Hurley, MB BCH BAO MRCS
Co-Authors:	Christina Buckley, MD, Jack F Woods, MB MCh MRCS, James Clover, Senior Lecturer and Consultant
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Introduction: Pruritus, the sensation of itch can be experienced by up to 87% of patients following a burn injury. It can be a distressing and disabling feature of burns recovery. Currently, pruritus is assessed using a Visual Analogue Scale (VAS) and the Itch Man Scale (IMS) which have been validated in the burns population. These scales are limited due to their single faceted nature and there is merit in establishing a more advanced, multi-dimensional severity scale. This novel scale may lead to more focused treatment as it documents location severity as well as duration of pruritus.

Aim: To validate a novel pruritis severity scale (PSS) for use in the burns patients in Cork University Hospital.

Methods: Data was prospectively collected on all burns patients in Cork University between March 2015-Sept 2016. Children were excluded as they were unable to participate in formal pruritus assessment. The PSS was compared with existing IMS and VAS scales using pearsons correlation score (SPSS^{TM}).

Results: 70 patients were identified during the 18-month period. 40% reported significant itch symptoms. The mean PSS was 6.8. The PSS was validated using bivariate correlation analysis against current valid measures of itch showing positive linear correlation and proved to be statistically significant ($r= 0.74, 0.71$ $p= <0.01$).

Conclusion: PS is a new valid method of objectively assessing pruritus severity. It is advantageous due to its multi-faceted assessment of itch which may lead to better guide treatment of pruritus in burns patients.

The Moleculight I:X Device in Plastic Surgery: A Novel Wound Intelligence Device

Presenter:	Ciaran M Hurley, MB BCH BAO MRCS
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Introduction: Current practice in the outpatient setting for diagnosing wound infections is limited to clinical assessment of signs and symptoms. Subsurface bacterial burden can be missed during standard wound examination protocols. The MolecuLight i:X™ visualizes the presence of potentially harmful levels of bacteria through endogenous auto-fluorescence without the need for contrast agents or contact with the patient. The intended use of the device is to assist with the management of patients with wounds by enabling real-time visualization of potentially harmful bacteria.

Method: A single-centre prospective observational study was conducted in Cork University Hospital in an outpatient plastic surgery wound care clinic. Patients had their wounds photographed under white and autofluorescent light with the MolecuLight i:X device™. Autofluorescent images were compared to the microbiological swab results.

Results: 33 patients and 52 swabs were included. 95.4% (n=41) were positive for bacteria growth. Staphylococcus aureus was the most common bacterial species identified. The MolecuLight i:X™ device had a sensitivity of 100% and specificity of 78% at identifying pathological bacteria presence in wounds on FL-imaging. The positive predictive value was 95.4%. The negative predictive value was 100%. It demonstrated a sensitivity and specificity of 100% at detecting the presence of Pseudomonas species on FL-imaging.

Conclusion: The MolecuLight i:X™ device is a safe, effective, accurate and easy-to-use auto-fluorescent device which improves the assessment of wounds in the outpatient clinic setting. In conjunction with best clinical practice, the device can be used to guide clinicians with the use of antibiotics and specialized dressings.

The Usefulness of Modified Tenzel Flap for Reconstruction of Periorbital Defect

Presenter: Kyung Ah Lee, PhD
Co-Author: Jinan Cha, MD
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Purpose: Reconstruction of extensive eyelid defects is quite challenging. Although numerous procedures have been proposed for reconstructing periorbital defects, but there is no universal method.

Tenzel flap, known as semicircular flap, is most commonly used technique to reconstruct eyelid defects affecting one-third to two-thirds of the eyelid. [1] We accepted the usefulness of this method, have extended the indications to reconstruct the defect around the eyes.

Methods: Seven patients underwent reconstruction with a modified Tenzel flap after wide excision of malignant skin lesion. Indications, complications, and outcomes were evaluated.

The indication of classical Tenzel flap is for covering the full-thickness defect of the lateral lower eyelid between 25% and 60%. [1-2] We extended the indication of the flap including medial portion of lower lid defect, typically after excision of malignant skin lesion.

The procedure starts with the removal of tumor lesion. The design of modified Tenzel flap begins as semicircle at the lateral canthal area as classical Tenzel flap and extends along the subciliary line to cover the defect on medial lower eyelid. Then the flap is raised in a subcutaneous plane, and dissected widely until the flap has adequate mobilization to cover the defect.

Results: All the flaps survived and healed well with minimal scarring and natural palpebral outline. None of the patients complained postoperative epiphora or ocular irritation.

The follow-up time ranged from 1 to 28 months, with a mean of 7.6 months. No other late complication was observed until the end of follow up.

Conclusion: This series of cases with modified Tenzel flap show in aesthetically and functionally satisfactory outcome. Alternative flaps covering periorbital defect have some limitations to consider.

The Tripier flap is limited in size especially in a vertical direction and often involves 2 stages. [3] Mustarde cheek rotation flap cannot be free from flap descent due to its direction of rotation and its size of the flap,[4] and also leaves scar at cheek eminence which can be conspicuous in asian people.

Compared to traditional procedures, modified Tenzel flap was shown to have several advantages including one stage operation, shorter flap incision, less noticeable scar, and effective prevention of complications such as lower eyelid ectropion and distal flap necrosis.

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Application of Kuhnt-Szymanowski Procedureto Lower Eyelid Blepharoplasty

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Purpose: Lower lid blepharoplasty is performed with a variety of maneuvers. Conventional lower lid blepharoplasty with anterior fat removal has a risk of potential lower lid malposition. [1)] Some aging patients who want lower lid blepharoplasty consultation are not suitable for operation because of lower lid laxity or history of blepharoplasty. [1)] In this article, we applied the Kuhnt-Szymanowski procedure, one of the most popular procedures for paralytic ectropion, for aesthetic lower lid blepharoplasty and obtained good aesthetic results. [2)]

Method: We performed Kuhnt-Szymanowski procedure on 26 cases of lower lid blepharoplasty with fat reposition. The skin-muscle flap is dissected, and then the tarsal plate is exposed. From the lateral edge of the eyelid, the full thickness of the pentagon tissue including tarsal plate and conjunctival mucosa is excised. The tarsal

plate is approximated together with a 6-0 absorbable suture and then the conjunctival wound is closed with a 6-0 absorbable suture. At the lateral end of the skin-muscle flap the excess cilia and skin are resected. The skin wound is closed (Fig. 1).

Result: Most of the patients were satisfied with the aesthetic results during the postoperative follow- up period. There were no recurrences of lower eyelid bulging, lower lid malposition, or wound-related complications (Fig. 2, Fig. 3).

Conclusion: From our experience, this procedure can be performed safely in combination with other procedures to enhance lower lid appearance and useful to patients with poor lid tone or laxity. Especially in cases of patients at high risk of ectropion, we can excise a large amount of excess skin with the procedure. Thus, it can increase indications for lower lid blepharoplasty. It is not only safe, effective and aesthetic but also prevents ectropion.

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Oxygen Plasma Surface Modification of Silicone Breast Implant on Capsular Contracture and Adverse Immune Response

Presenter: Shin Hyuk Kang, M.D., Ph.D.
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Background: Breast implants are widely used in the plastic surgery field. However, these materials still require improvement. In this study, we evaluated whether hydrophilic modification of the hydrophobic silicone implant surface using oxygen plasma treatment can reduce various adverse immune response and capsule formation with improved biocompatibility and mechanical property.

Methods: Smooth, micro textured, and macro textured silicone implants were treated with oxygen plasma at proper power and time. Surface hydrophilicity after oxygen

plasma treatment was confirmed by measuring the water contact angle. We evaluated the change of protein absorption, cell viability, mechanical property, and in-vivo tissue of modified surface implant.

Results: The contact angles of the each type of silicone implants decreased to less than 10°â€ža immediately after plasma treatment. Plasma treated group significantly inhibited protein adsorption and showed improved tensile strength in mechanical evaluation compared to the control group. We observed no topographic changes on the surface of the implant with the SEM image. In the cell study, the cells were evenly distributed on the plasma treated surface. In vivo study, we confirmed decreased capsule thickness, collagen fiber, number of inflammatory cells, expression of TGF-β1 and α-SMA were detected. Also, the amount of activation of a series of cytokines related to macrophage activation and T cell response was reduced.

Conclusions: Oxygen plasma modification is a cost effective and promising method that can be applied clinically to reduce adverse immune responses and decrease capsular contracture by increasing the hydrophilicity without changing the topography of various textured types of implant surfaces.

Transconjunctival Fat Reposition for Tear Trough Deformity with a Bidirectional Cog Thread

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Purpose: Recently, transconjunctival fat repositioning has been developed, varying from internal and external fixations, to correct tear trough deformities. Although internal fixation methods provide a secure and durable fixation, the use of external fixation methods is more widespread because of the simplicity of the procedures, thus enabling fast fixation[1-4]. However, problems with external fixation include patient tolerance and risks of relapse and infection. In this regard, we introduce a new method for fat repositioning that has the advantages of internal and external fixation procedures.

Methods: We retrospectively reviewed 220 patients who underwent this procedure from January 2017 to June of 2018. Through transconjunctival incision, dissection was done along the preseptum to arcus marginlais where the periosteum is to cut to make subperiosteal or supraperiosteal pocket. For fixation of redraped medial and central fat pads, we used 15cm 2-0 size of U-shaped absorbable polydioxane(PDO)

cog thread which has double arm needle on each end. One end of the thread entered the fat pads to engage to the mid portion of the thread. Then both double arm needles externalized from the pocket out to the cheek skin. After the reposition of fat pads to the pocket, cut was then made close to the exit of each thread with an adequate traction.

Results: Our mean follow-up was 6 months. No complication as infection or palpation of knots occurred. 8 patients developed relapse which required additional fat removal. Only 3 patients had dimple which was solved with manual massage.

Conclusion: Our method using a bidirectional PDO cog thread has advantages over other previous methods, including (1) a simple procedure that enables fast fixation; (2) wide fixation with a single thread; (3) firm fixation during 6–8 months, which prevents relapse; and (4) avoiding external knots that may help prevent infection. With our method, we provided satisfactory results for patients with tear trough deformities with minimal laxity of the lower eyelid.

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Pmpc Networks As Biomembrane-Mimicking Coating Alleviate Capsule Formation Around Silicone Breast Implants

Presenter: Ji Ung Park, MD
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Purpose: Despite their popular use in breast surgeries, the limited biocompatibility of silicone implants can induce severe side effects, including capsular contracture – an excessive foreign body reaction that forms a tight and hard fibrous capsule around the

implant. In this research, we intended to elucidate the detailed mechanism of the PMPC-based inhibitory effect against inflammation and following fibrous capsular formation [1-2].m

Methods: Protein and cell interactions related to the activation and proliferation of macrophages were carefully examined on the PMPC cross-linked network which was covalently grafted on PDMS surfaces in high density. Furthermore, as an initiative effort to examine the effect of the PMPC network surface on capsular formation in a larger animal model, we analyzed the fibrous tissues around the silicone-gel-filled breast implants, which are popularly used in human breast augmentation, in a pig model

Results: Silicone implants were covalently coated with biomimetic and zwitterionic polymer, Poly(2-methacryloyloxyethyl phosphoryl choline) (PMPC), with or without crosslinkers. Adsorption of fibrinogen were declined on PMPC-coated silicone. The number of adhered macrophages and the amounts of released cytokines (MIP-1α, MIP-1β, IL-8, TNFα, IL-1α, IL-1β and IL-10) were dramatically decreased when PMPC was introduced. *In vivo* 6-month porcine experiments revealed PMPC effects could persist in long-term insertion when PMPC was coated with crosslinkers. 25%-decreased capsular thicknesses, 31%-reduced inflammatory cells. IHC assay for TGF-β, myeloperoxidase, α-smooth muscle actin, and VEGF also revealed 44%, 59%, 14%, and 74%-reduced OD on crosslinked PMPC-silicone compared to silicone. Thus, high density of PMPC coating makes foreign silicone implants stealth-like so significantly reduced inflammation and capsule formation.

Conclusions: Our study can be one of landmarks to demonstrate the process of capsular formation and the effectiveness with validity and safety of the MPC-grafted silicone implants in higher animal models as critical preclinical practices.

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The Appropriate Choice of Type of Dual-Plane Techniques for Breast Augmentation Using Motiva™ and Bellagel Micro™ Implant

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Purpose: These days there are a lot of concerns about using anatomical textured implant for breast augmentation due to some reports of Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) development, while its results are quite ideal for aesthetics of female breast contour. Necessarily micro-textured round implants are emerging as an alternative, obtaining the advantages of textured implant yet reducing the risk of cancer as much as possible. But they would not be enough to expand lower pole of breast because of their soft characteristics. To overcome the limitations of the aesthetical aspect, such as upper pole excessive fullness and restriction of lower pole expansion, dual plane technique of type II or more can be helpful to reduce restriction power from breast tissue. We evaluated the benefit and aesthetical results of this technique to improve postoperative breast contour especially in Asian females.

Methods and materials: 22 Asian female patients who underwent bilateral primary breast augmentation in type II or III dual-plane technique using micro-textured implant (Motiva Ergonomix™ and Bellagel Micro™) between February 2017 and December 2018 were reviewed retrospectively. All subjects were followed longer than 6 months postoperatively. Photographs (frontal, bilateral oblique and lateral views) respectively taken at pre-operation, 1 month, 6 months and 12 months post-operatively were evaluated. The aesthetical results were assessed by two different plastic surgeons.

Results: 20 Korean and 2 Chinese female patients were involved in the study. The dual plane technique of type II or III was associated with higher aesthetical scores making sufficient volume expansion of lower pole and less excessive volume increment of upper pole.

Conclusions: A high type of dual plane more than type II for breast augmentation using micro-textured breast implant appears to be an aesthetically beneficial method with excellent contour outcome. It can be one of the key determinants affecting result resolving the problem of the defects of micro-textured round implants substituting for anatomical implant reluctant to use with successful achievement though further randomized prospective study will be needed.

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Naevus Sebaceous Excision in Children; Is It Necessary?

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Background: Nevus Sebaceous refers to a benign, congenital hamartomatous lesion of the pilosebaceous follicular unit. While it is recognised that these lesions are capable of malignant transformation into BCCs, the incidence is still debated[1,2]. Definitive treatment is with full thickness excision, however, the necessity and timing of excision to prevent possible future malignancy remains unclear, with many authors arguing that prophylactic excision is unnecessary[3]. The aim of this study was to analyse the management of naevus sebaceous over a ten year period in a tertiary referral paediatric unit.

Method: A retrospective analysis of all sebaceous naevi excised in a ten year period was conducted, from January 2007-December 2017 inclusive. Cases were identified from histological specimens and operative notes were examined.

Results: A total of 189 paediatric patients had excision of a sebaceous naevus during this period, with an average age of 6.4 years (range 4months-18years). Of these, 37 required a staged procedure (20%), with three requiring the use of tissue expanders. Four patients developed post-operative alopecia, four developed problematic scarring, one required evacuation of haematoma and one required excision of a post-operative pyogenic granuloma. Two patients required steroid injections for keloid scarring, one

required excision of a hypertrophic scar and one required scar revision. For management of alopecia, one patient required serial excision in two stages, one excision with rotation flap and two patients required the use of tissue expanders. 99% of patients required general anaesthetic (n=187). 43 patients (23%) required more than one GA, with an average of 2.5 general anaesthetics per patient. No carcinoma was identified.

Conclusion: Excision of sebaceous naevi in children usually requires general anaesthetic and may require more than one procedure to excise the primary disease or to manage the consequences of surgical intervention. We propose that excision of sebaceous naevi during childhood in order to avoid malignant change is not essential. Observation and selective excision of suspicious lesions during adulthood is an alternative strategy. Excision of large lesions for cosmetic benefit can be considered, but in most cases can be delayed until the patient is mature enough to participate in the decision.

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Toxic Epidermal Necrolysis after Acute Burn Injury

Presenter: Sharon Kennedy, MB, BCh, BAO (Hons), MSc
Co-Authors: Elizabeth Concannon, MB, BCh, BAO (Hons), MSc, Odhran P Shelley, MB BCh
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Toxic epidermal necrolysis is a rare, potentially fatal disorder that involves large areas of skin desquamation. Patients with toxic epidermal necrolysis are frequently referred to burn centres for expert wound management and early comprehensive critical care as this has been shown to improve patient outcome and mortality. The authors describe the first report of medication-induced toxic epidermal necrolysis occurring in a patient during acute burn management in a tertiary burn care facility. The patient sustained a 17% total body surface area flame burn to her face, chest, bilateral upper

limbs and bilateral lower limbs while escaping from a wildfire. She required extensive debridement and allografting to manage burn injured areas and additional areas of epidermal loss from subsequent toxic epidermal necrolysis, amounting to a total body surface area of 90%. Definitive burn wound closure was achieved using autologous split-thickness skin grafting once donor sites healed and became suitable for harvest 3 weeks after the onset of toxic epidermal necrolysis. Grafts achieved complete take and the patient was discharged home following rehabilitation.

Carboxytherapy-Induced Fat Loss Is Associated with VEGF-Mediated Vascularization

Presenter:	Junho Park, MD
Co-Authors:	Jeong Jin Chun, M.D, Sun Jae Lee, M.D., Syeo young Wee, M.D., Chang yong Choi, M.D., PhD
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Purpose: Carboxytherapy is the transcutaneous administration of CO_2 gas for therapeutic purposes. Although this non-surgical procedure has been widely used for reducing localized adiposity, its effectiveness on fat loss in obese patients and its underlying mechanisms remain unclear.

Materials and Methods: C57BL/6 mice were fed with a high-fat diet for 8 weeks to generate obese animal models. Obese mice were randomly assigned to two groups: One group was administered air to both inguinal fat pads (air/air), and the other group was treated with air to the left inguinal fat pad and with CO_2 to the right inguinal fat pad (air/CO_2). Each group was treated every other day for 2 weeks. Morphological changes and expression levels of genes associated with lipogenesis and vascularization in fat were determined by histological and qRT-PCR analyses.

Results: Mice treated with air/CO_2 showed lower body weights and blood glucose levels compared to air/air treated mice. Paired comparison analysis revealed that CO_2 administration significantly decreased adipose tissue weights and adipocyte sizes compared to air treatment. Additionally, CO_2 treatment markedly increased vessel numbers and expressions of Vegfa and Fgf1 genes in adipose Tissues. The expressions of Fasn and Fabp4 genes were also modestly reduced in CO_2 treated adipose tissue. Moreover, Ucp1 expression, the target gene of VEGF and a key regulator in energy expenditure, was significantly increased in CO_2 treated adipose tissue.

Conclusions: Carboxytherapy is effective in the reduction of localized fat in obese patients which is mechanistically associated with alteration of the vasculature involved in VEGF.

The Hybrid Reconstruction of Facial Defect Using Three-Dimensional Printed Patient Specific Implant and Free Tissue Transfer

Presenter: Seung Eun Baek, MD
Co-Author: Suk-Ho Moon, MD
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Objectives: The reconstruction of facial defects is challenging because surgeons must consider their anatomical complexity, previous surgical history, soft tissue contracture after radiation therapy, and aesthetic result. To overcome these challenges, both bone and soft tissue defects should be reconstructed simultaneously. We performed hybrid reconstructions using 3D-printed patient specific implant (PSI) and autologous free transfer to achieve satisfactory results and postoperative outcomes.

Materials and Methods: Two patients visited our facility for the reconstruction of facial defects after the treatment of malignant tumors. Both patients had history of wide excision including orbital wall resection and enucleation, followed by several radiation therapies, and facial bone reconstruction using plates and screws. Severe soft tissue contracture was developed around the eye socket. The design of implant was based on the mirror images of the contralateral unaffected bone structure, and PSI was manufactured using 3D-printing technology. During surgery, we removed foreign bodies from the previous operations, and released soft tissue contracture. The 3D PSI was inserted to reconstruct the skeletal defect. After that, we elevated the chimeric anterolateral thigh (ALT) flap with two skin paddles from thigh to cover the soft tissue defects.

Results: There was no complication including foreign body reaction, inflammation and infection for 18 months follow up period. All patients were satisfied with functional and aesthetic outcomes. No atrophy of the autologous tissues around the implant was found, and the contour and volume were well preserved. Mild soft tissue thinning appeared partially on the transferred autologous tissues which required several fat injections for correction.

Conclusions: Simultaneous skeletal reconstruction using 3D-printed patient specific implant with autologous free soft tissue achieved satisfactory facial contour without major complications immediately following surgery. Also facial symmetry after the

surgery was well preserved post-operatively. We believe that this hybrid method for facial reconstruction will become one of the most useful reconstructive plans for bone and soft tissue defect of face.

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Head and Neck Injury in Major Trauma: A 4-Year Retrospective Analysis of Patterns and Surgical Workload in an Irish Major Trauma Centre

Presenter: Abdulrahman Mohamed, B.Dent.Sc, MFDS RCSEd
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Introduction: A considerable number of trauma patients sustain some form of head and neck injury, often with considerable associated morbidity and mortality. [1]

Major trauma describes serious and often multiple injuries where there is a strong possibility of death or disability. [2]

The Trauma Audit Research Network (TARN) is Europe's largest database of major trauma patients. [3]

While head and neck injury has been widely documented in the literature, there are few studies on it in major trauma patients.

This study is aimed to address this important gap in the literature, particularly in the

context of increasing development of Irish and European trauma systems.

The management of trauma forms a major workload of plastic, maxillofacial and ENT surgery departments.[4]

Knowledge of head and neck involvement in major trauma is important in guideline development, efficient hospital resource allocation, and surgeon training.

Purpose: To determine the prevalence of head and neck injury in major trauma in an Irish population to assess the sociodemographic (age, sex) and clinical patterns (injury types, mechanisms) underlying it.

Method: The TARN database was searched for entries with head and neck injuries between 2014-2017 admitted to Cork University Hospital (CUH). Descriptive data analysis was carried out with the data generated.

Results: Twenty-one per cent of major trauma patients treated in CUH between 2014-2017 (n=503) sustained some form of head, face, or neck injury.
Males were considerably more affected than females (M:F 2:1).
The most common mechanism of injury was falls, accounting for over half of all causes, followed by RTAs (20%) and this varied depending on age and sex.

The elderly (65+) were the most affected age group. There were 217 counts of soft tissue injury, and 610 counts of bony fractures, the most common of which being scalp contusions and cranial vault fractures respectively. Eighty-seven percent of patients underwent some form of surgical procedure. Plastic surgery was the most commonly performed on face and neck injuries. Direct wound closures, ORIF of facial bones and wound exploration were the most commonly performed. Neurosurgery was the most commonly performed on head injuries. Median length of stay was 9 days and the 30-day survival rate was 84%.

Conclusion: Head and neck injury is commonly seen in major trauma, affecting patients of all ages and genders. It produces significant injury as well as surgical workload. Further research with a larger national sample is needed to allow more accurate assessment of its impact on morbidity, mortality and the healthcare system.

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A New Technique Using 'septal Turn over Flap' to Create a Natural Lateral Double Eyelid Fold When Performing Upper Blepharoplasty

Presenter: Hea Kyeong Shin, MD, PhD
Co-Author: Jung hwan Kim, MD
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Background: When performing upper blepharoplasty, if the double eyelid fold curves rapidly at the lateral end, it can gives an unnatural impression. To make a long and laterally extended double eyelid fold is a challenging problem for plastic surgeons. Because, there is no tarsus beyond the lateral palpebral fissure[1], so we cannot fix the dermis of lower skin flap to the tarsus beyond the lateral palpebral fissure[2]. And, levator aponeurosis runs deeper at this point, so the double fold line may become deep and abruptly end at this point[3]. Therefore, the authors' goal is to introduce a new technique which uses ‘septal turnover flap’ to make laterally extended double eyelid fold. And to evaluate how much the most lateral fixation point moves with this ‘septal turnover flap’.

Methods: Patients who underwent upper blepharoplasty (with septal turnover flap technique) between 2017.03 and 2018.02 were included in the study. Sixty-two lids in 31 patients were subjected to this operation. The horizontal palpebral fissure(HPF) length of both eyes were measured before surgery. We also measured and recorded the extent of the most lateral fixation site before and after performing septal turnover

flap. The patients were followed up for 6 months postoperatively and evaluated for complications and satisfaction.

Surgical technique: To make a septal turnover flap, proceed to levator idenficiation in the usual way. Next, find the conjoined tendon where the levator aponeurosis, anterior septum, and posterior septum meet. Dissection is performed until the most lateral side of the conjoined tendon. If the dissection cannot proceed any further, make an incision into the anterior septum for the amount of lateral extension that is sufficient to turn over. The flap is then turned over to the anterior and lateral side to create a septal turnover flap. Next, fixation was performed between the most lateral point of the turn-over septal flap and the dermis of the lower skin flap.

Result: The mean HPF length was 25.9 ± 3.2 mm and the mean extended length of 'the most lateral fixation point' was 3.6 ± 0.9 mm. The ratio between 'Extended length' and HPF was 0.14. There were no revision surgeries and no direct complications associated with the use of this technique

Conclusion: The most lateral fixation point moved about 3.6 mm laterally by using the septal turnover flap technique. As a result, the most lateral fixation point was laterally moved about 14% of the patient's own HPF. Therefore, it is possible to prevent deep and abruptly end double fold lines caused by the conventional upper blepharoplasty technique. Septal turnover flap can be easy and satisfying method that achieves the natural double fold line by move the fixation point more laterally.

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Skin Micro-Graft for Refinement of Cleft Lip

Presenter: Lei-Ming Sun, MD, PhD
Affiliation: Beauty-Safe clinic, Taipei

There are many methods of cleft lip repair. Despite of these genius methods there often exists a secondary deformity at the vermilion portion. The defect may be tiny but it is a stigma for patients. Simple excision or using a local flap is often impossible. Fat graft is not suitable to treat such tiny defects and is notorious for its high absorption rate.[1] Dermal graft is a good option, but traditional method owns many limitations. Here we proposed a novel method named skin-micrograft to overcome these aforementioned drawbacks. Â Â

Patients and Methods: Five patients were enrolled in this method. They aged from 23 to 44. Of these 5 patients, one was a bilateral cleft deformity and 4 were unilateral. The common complaints are the dimpling of vermillion and upper lip. One patient also complained nasal sill defect and one patient a vermillion notch.

The surgical method began with harvesting of the posterior auricular skin. The harvested dermis is minced into small pieces of about 2 mm in diameter. Multiple stab incisions were made with a 18-gauge needle along the scar. The minced dermises were buried to the subcision pocket via the stab incisions. The whole scar with all stab wounds were covered with the DuoDerm® sheet without any suture. All patients were operated at outpatient clinic. Â Â Â Â Â

Results: The mean follow-up was 11 months. Satisfying results have been achieved in 4 patients (Fig. 1, 2). Only one patient with a 40% graft resorption at 7 months postoperatively had complaints (Fig. 3).

Discussion: The vermilion of the medial portion of the cleft lip is usually deficient. Fat grafting may be of benefit, but it has to be done during immediate cleft lip repair.[2] Local flaps such as the Abbe flap or tongue flap require a second operation and may leave donor site ugly scars. Plastic surgeons have been used dermal graft to repair this defect.[3] However, the traditional method is too extensive to make a long incision along the scar to create an adequate pocket.

We proposed a novel concept composing of subcision plus minced dermis graft, i.e. skin micro-graft, to overcome these drawbacks. Patients were operated at an outpatient clinic with local anaesthesia. Instead of a long incision, tiny stab incisions were made along the scar. Dermis were minced before inset. Since small dermal pieces have higher contact surface/volume ratio than the large one, this will theoretically achieve a higher survival rate than the traditional graft method.

Conclusions: This skin-micrograft method is an effective method to correct these defects. It is simple and reliable and can be completed at an outpatient clinic.

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Toxicity of Polyacryamide Gel Injection to Breasts and Its Management

Presenter: Jo-Chun Hsiao, MD
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Introduction: Polyacrylamide gel (PAAG) has been used for soft tissue augmentation and contour correction in face and breast since 1995. Take advantage of its ease of application, minimally invasive and low technique demand under local anesthesia, PAAG has attracted many patients worldwide to undergo the procedure. The injected material is believed to be an atoxic, non-immunogenic ,non-irritable that can be injected directly into the human body as a permanent tissue expander. However, triggered by heat or ammonia polyacrylamide can be degraded to toxic monomer, which has teratogenic, carcinogenic and neurotoxic character.

Patients and methods: We collect the patients who have history of PAAG injection then received surgical excision and immediately reconstruction by a single surgeon at Chang Gung Memorial Hospital from September 2009 to May 2018. The clinical signs and symptoms, reconstructive procedure, image finding, pathological result are reviewed by charts retrospectively, and we also compare the successful rate, acute and chronic complication, revision rate between different reconstructive procedures. In order to prove the toxicity of the degraded monomer by PAAG, we extract the urine sample from the patients and lay person. The level of N-acetyl-S-(propionamide)-cysteine (AAMA) measured by LC–MS/MS system (Varian, Palo Alto , CA) is applied as the biomarker of indirect evidence of PAAG toxicity.

Results: There are 16 patients received implant insertion after PAAG removal, and 2 patients underwent free flap reconstruction. Both procedures have 100 % successful rate. Patients who had PAAG injection has higher N-acetyl-S-(propionamide)-cysteine (AAMA)than the control group ($P<0.05$)

Conclusion: We offered the protocol to take care of these patients : careful history taking, chronological signs and symptoms, detailed physical examination, T2-weighted MRI exam, meticulous surgical planning for immediate reconstruction, and post-operative pathological result. Patients who received pectoris muscle excision have higher possibility of further revision surgery. This is the first study to provide objective data to prove the risk of PAAG injection by indirect evidence from urine sample. There is statistical significant difference between study group and control group among the N-acetyl-S-(propionamide)-cysteine (AAMA) level. Moreover, immediate reconstruction after PAAG removal is safe by experienced surgeon to gain symmetric and optimal aesthetic result without acute complication.

Audit of Perioperative Antimicrobial Prophylaxis in a Plastic Surgery Service

Presenter: Jack F Woods, MB MCh MRCS
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Introduction: Surgical site infection (SSI) rates occur in 1 – 5 % of operative cases. Perioperative antimicrobial prophylaxis (PAP) forms a significant component of prevention of this morbidity, in addition to appropriate patient preparation, maintenance of sterile fields and surgical technique. There is an unclear understanding of the optimum antimicrobial prophylaxis in Plastic Surgery, with a risk of underprescribing leading to SSI or overprescribing leading to antimicrobial resistance and unnecessary expense. We aimed to mitigate these risks by introducing, implementing and auditing new guidelines for PAP in Plastic Surgery at our institution, based on the best available international evidence.

Methods: A first cycle audit was completed based on existing guidelines for PAP in our hospital, including all operative procedures over a two-week period. Subsequently, changes to the guidelines were developed and adapted in consultation with the Microbiology service. Following implementation, a two-week second cycle audit was completed. We monitored the indication, agent, dose/route, timing, duration and SSI within 30 days.

Results: Our first cycle results revealed a SSI rate of 3.15% (4/127). PAP was inappropriately managed in 37% (47/127) of patients. An incorrect agent was given in six cases. Timing of administration was erroneous in five cases. 27 patients were given post-operative courses of oral antibiotics of varying duration despite no indication. No second dose was administered during cases > 4 hours in 2 of 3 cases.

Subsequent to this, guidelines were altered and the second cycle results showed improved adherence to guidelines, a reduced SSI rate and less inappropriate prescribing.

Discussion: Current practise of PAP in Plastic Surgery is haphazard and often inaccurate. We aim to provide an evidence-based approach to PAP in our institution which may be audited on a prospective basis and applicable to the wider Plastic Surgery community.

Giant Lipoma in the Hand

Presenter: Kwang Seog Kim, MD, PhD
Affiliation: Chonnam National University Medical School, Gwangju

Background: Lipomas are the most common benign form of soft tissue tumor in the body. [1] Although they are commonly found on the upper extremity, their occurrence in the hand is rare. [2] Giant lipomas of the hand, defined as greater than 5 cm in diameter, are extremely rare. [3] In this report, the author presents a patient with a giant lipoma on the palmar side of a hand.

Methods: A 49-year-old man presented with a soft and fixed lump in the left hypothenar area. The mass was not tender, but it was associated with symptoms of tingling sensation and paresthesia in the left ring and little fingers that had lasted for 4 years. Preoperative image studies revealed an encapsulated and multilobulated mass, which measured 8 cm × 5 cm × 2 cm. Under general anesthesia, the mass was operated by a T-shaped skin incision. The mass was mainly located in the subcutaneous layer, however, deep extensions were seen reaching into the carpal tunnel, the hypothenar muscles, and intertendinous spaces between the left index and little fingers. To enable a complete excision of the mass, the common palmar digital nerve of the ulnar nerve passing through the mass was temporarily transected. After complete excision of the mass, the nerve was coapted again under microscopy.

Results: With the exception of temporarily reduced sensation in the left ring and little fingers immediately after surgery, no particular complications were noticed. Basic histologic examination identified the specimen as a lipoma and further immunohistochemical studies ruled out the possibility of malignancy. Complete sensory recovery was achieved 6 months after surgery, without any sign of recurrence.

Conclusions: Although giant lipomas in the hand can extend to vital components such as neurovascular structures, muscles and tendons, meticulous en bloc resection can provide excellent results without any complications.

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Perceptions of Plastic Surgical Practice Amongst Other Medical Professionals

Presenter:	Laoise Coady, BA, BM BCh BAO, MSc, MRCSI
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Background: Plastic surgery is an evolving and innovative specialty which encompasses both aesthetic and reconstructive work. It is our experience that the breadth of our specialty is poorly understood by other medical professionals both within the hospital and in primary care. As the majority of our work arises from referrals from other healthcare workers, the aim of this study was to assess whether our colleagues are aware of the role of the plastic surgeon in a variety of clinical settings, and whether patients are therefore being assessed appropriately.

Methods: A web-based anonymous survey was administered to healthcare professionals from varied backgrounds. Respondents were presented with clinical cases in which we considered plastic surgical involvement to be routine, in Ireland. Respondents were asked to identify the most appropriate surgical specialty they deemed should be involved in clinical management of each scenario.

Results: A total of 190 survey responses were collected. Respondents included public health nurses, physiotherapists, GPs, Non Consultant Hospital Doctors and Consultants from 25 medical and surgical subspecialties.

Respondents believed plastic surgeons to be the most appropriate experts to manage necrotising fasciitis (53.44%), nerve repair (73.54%), skin cancer (64.74%), digital replantation and (81.05%), burns (98.94%).

Other specialties than plastic surgery were deemed the most appropriate to perform cleft palate and lip surgery, oculoplastic and craniosynostosis surgery.

In a number of clinical scenarios which form core components of the plastic surgery syllabus, including open lower limb fractures, head and neck reconstruction and chest wall reconstruction, our colleagues did not believe plastic surgeons were the most likely specialty to be consulted.

Conclusion: Our findings show a heterogeneous level of understanding of the role of the plastic surgeon in clinical practice amongst other medical professionals. As the field of plastic surgery continues to evolve, we believe the education of other healthcare professionals on the scope of our practice is essential to ensure the ongoing appropriate and timely referral of patients for clinical management.

Nasal Tip-Plasty Using 3D PCL Mesh

Presenter: Eunsoo Park, Md, PhD

Co-Authors: HeeYong Kang, Md, Seungmin Nam, MD, SeokHwan Kim, MD

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Purpose: For achieving beautiful shape in Asian rhinoplasty, correction of tip projection is very important because of blunt nasal tip. Polycaprolactone (PCL) is an U.S. FDA-approved synthetic biodegradable polymer and is easily fabricated into three-dimensional (3D) structures. In this study, we performed tip plasty using PCL implant. Suitability, safety and efficiency of this procedure were evaluated.

Methods: 20 patients were recruited. PCL was fabricated based on 3D printing into various size, various shape (dumbbell or ball) implant. Closed surgery was performed by marginal incision and dissection in the subperichondrial plane. In three patients, open procedure was performed by transcolumellar incision for definite fixation. The material was inserted inferior to medial crura or superior to dome according to implant shape. Results were evaluated by gross morphological assessment and patient satisfaction survey. Tip projection is evaluated as the distance from alar base to the nasal tip. Related complications, were recorded.

Results: There were significant improvements in tip projection. Eleven patients was satisfied to results. Implant remained in their initial location. There is no infection, nostril asymmetry, rotation or deprojection of the tip. In one patients hypertrophic scar was presented in mucosa. Another one patients underwent wound necrosis, but after 1 week secondary healing was completed by conservative treatment. Average surgical time was 30 minute.

Conclusion: PCL implant is easy to improve nasal tip shape and produce a safe result. Also that will make operative time shorten by skipping autologous cartilage harvest. Therefore, tip plasty using PCL implants designed by 3D printing can be effective and safe technique.

Efficacy of Q-Switch 1064 Nm Nd: YAG Laser on Split Thickness Skin Graft in Long Term Study

Presenter:	Atthawit Mangkornwong, MD
Co-Authors:	Sitthichoke Taweepraditpol, MD, Warangkana Tonaree, MD, Apirag Chuangsuwanich, MD
Affiliation:	Mahidol university, Bangkok

Background: Hyper-pigmentation and non-pliability after split-thickness skin graft procedure is a common problem in Asian skin . This can cause distress to the patients. Various treatments have been attempted but still have unsatisfactory results. Q-switch 1064 nm Nd: YAG laser has been used as a standard treatment for hyper-pigmented skin lesions, but there is no any report in treatment of hyper-pigmented skin graft and improve skin texture with Q-switch 1064 nm Nd: YAG laser.

Objectives : To evaluate the efficacy of Q-switch 1064 nm Nd: YAG laser on skin grafts compared to untreated skin grafts and normal skin.

Materials and Methods: A prospective case-control trial study was conducted between September 2017 to September 2018 at the outpatient unit, Division of Plastic and Reconstructive Surgery, Department of Surgery, Siriraj Hospital, Mahidol University, Thailand. Half area of the skin grafts was treated with Q-switch 1064 nm Nd: YAG laser for 4 times, and the other half left untreated. Treatment results were evaluated with clinical photograph, assessment of melanin index (MI), erythema index (EI) and Elasticity parameters at baseline, 2 weeks after each session, 1 month after the final treatment and every month until 1 year, with untreated sites as the control.

Results: There are 10 patients with split thickness skin graft were enrolled in this study. Most patients had split thickness skin graft at lower extremities after burn treatment. After 4 sessions of Q-switch 1064 nm Nd: YAG laser treatment, the melanin index decreased when compared to normal skin (p=0.232) and to the untreated skin graft (p=0.770). The elasticity of the treated skin graft also increased significantly when compared to normal skin (p=0.039) and the untreated skin graft (p=0.846). The erythema index decreased when compared to normal (p=0.432) and to the untreated skin graft (p=0.164), No complications recorded in this study.

Conclusion: This study showed that Q-switch 1064 nm Nd: YAG laser treatment can be an another modalities in hyper-pigmented skin graft treatment and also can reduce erythema and soften the split thickness skin graft.

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Efficacy of Triamcinolone and Lidocaine-Triamcinolone Mixture in Keloid Treatment

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Co-Author: Wilasinee Udkhamtiang, MD
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Background: Triamcinolone acetonide intralesional injection is an option in keloid treatment. Lidocaine has usually been mixed with triamcinolone to reduce pain during injection. Previous experimental studies found that lidocaine could inhibit fibroblast proliferation but there is no clinical study about lidocaine-triamcinolone mixture effect in keloid volume reduction.

Objective: To study the efficacy of lidocaine-triamcinolone mixture on keloid treatment compared with Triamcinolone acetonide alone.

Methods: Between October 2017 and February 2018, total 15 patients were enrolled in this study and randomly divided into 3 groups : Group I received only Triamcinolone 40mg/ml intralesional injection alone , group II received Triamcinolone 40 mg/ml mixed with 2% lidocaine in 1:1 , Triamcinolone 40 mg/ml with 2% lidocaine with adrenaline (1:100,000) in 1:1 in Group III . All patients received the treatment every 4 weeks for 4 times . After16 weeks, the patients were evaluated for volume reduction ,Vancouver scar scale and Visual analogue score. Kruskal–Wallis test and Fisher's exact test was used for statistical analysis.

Results: The average age of the patients was 39 years old (16-65years old) The location of keloid was knee, other were face, ear, chest, shoulder and leg. Mean duration of keloid was 14.6 months. The initial size of keloid started form 0.57 ± 0.50 ml in Group I, 0.62 ± 0.210 ml in Group II and 0.98 ± 1.00 ml in Group III . There is no any significant difference in demographic data . We found that no significant volume reduction was observed among 3 groups (group I :0.34±0.52 ml, group II :0.41±0.43 ml, and group III:0.53±0.93 ml, p-value=0.65). But the percentage of volume reduction in group II was noticeable (group I; 47.95%, group II; 62.1%, and group III; 42.07%, p-value=0.521). All patients in group B also showed improvement in scar pliability.

Conclusion: Lidocaine-triamcinolone mixture might have higher efficacy than triamcinolone alone in term of keloid volume reduction and scar pliability. We will further study in the larger population in the future.

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Flying Brevet - a Technique for Mastectomy in Female to Male Gender Reassignment Surgery

Presenter: Jeannine McManus, MBBS, BSc, MPH, MS
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Background: Several techniques are described for chest wall contouring in female-to-male (FTM) transgender patients, each with specific applications and limitations. Factors to consider are the aesthetic requirements of the male chest, elimination of anatomical female breast features, operative technique, scar minimisation and success of outcome. We describe a technique for FTM patient chest wall reconstruction known as the 'Flying Brevet' technique. This procedure is tailored to FTM patients, but can also be used for large gynaecomastia patients. We present a description of the technique with a retrospective review of outcomes and case series of patients that have undergone this procedure.

Methodology: This is a retrospective review of a single surgeon experience with 99 consecutive patients who have undergone the Flying Brevet. The approach involves a semicircular areolar incision, with superior skin resection and glandular resection. A planned second stage procedure may be performed for larger breasts if required.

Results: Nipple sensation was intact in most cases. 8% incidence of postoperative haematoma, one case of fat necrosis, one case of partial nipple-areolar-complex (NAC) necrosis and one case of full NAC necrosis in the series. There was one postoperative infection and 6% incidence of hypertrophic scarring.

Conclusions: The Flying Brevet provides a consistent method of mastectomy for FTM chest wall reconstruction. It permits large glandular and skin resection in ptotic breasts.

Complications of the Surgical Excision of Encapsulated Versus Non-Encapsulated Lipomas: A Retrospective Analysis

Presenter: Won hyuck Do, MD
Co-Author: Youngwoong Choi, M.D., Ph.D
Affiliation: Inje University, Seoul

Background: Lipomas are common benign soft tissue tumors composed of mature white adipocytes. Lipomas on the trunk and limbs rarely present a diagnostic problem, and surgical excision is the mainstay of management [1]. The histological features include a well-circumscribed and lobular mass covered with a thin fibrous capsule. However, lipomas that are poorly demarcated from the surrounding fat are often encountered during surgery despite postoperative histologic diagnosis. We investigated the complications associated with different types of lipomas.

Methods: This retrospective study included 119 patients who underwent lipoma excision and computed tomography (CT) imaging in our clinic between January 2011 and August 2018. Patients who had lipomatosis or other lipoma subtypes such as hibernoma, fibrolipoma, angiolipoma, myelolipoma, or spindle cell lipomas were excluded to ensure unbiased analysis. We classified the lipomas as encapsulated or non-encapsulated according to the histology, CT findings, and clinical criteria. If more than 25% of the circumference of the lipoma was encapsulated in at least one plane with a smooth, linear margin, as specified by Roberts et al. [2], the mass was defined as an “Encapsulated lipoma” (Figure 1,2).. The complications included in this study were delayed wound healing (healed after 14 days of surgery), recurrence, seroma, and hematoma formation.

Results: Encapsulated and non-encapsulated lipomas were diagnosed in 89 (74.8%) and 30 (25.2%) patients, respectively. Encapsulated lipomas occurred most commonly on the head, whereas non-encapsulated lipomas occurred most commonly on the neck and trunk (P=0.000, P=0.002, P=0.031). Analysis with Fisher’s exact test showed a statistically higher incidence of delayed wound healing with non-encapsulated than encapsulated lipomas (P=0.014). The rates of seroma or hematoma formation and recurrence showed no statistically significant differences between the groups. Hematoma and seroma were treated with continuous aspiration and compressive

dressing in 5 cases, stitch out and old blood clot removal and re-suturing in 2 cases. All patients were healed without complication after the procedure described above.

Conclusions: In conclusion, when comparing the incidence of postoperative complications, it is important to preoperatively classify the types of lipoma using CT imaging. Direct excision is adequate for removal of encapsulated lipomas. However, non-encapsulated lipomas might require alternative methods, such as ultrasonic liposuction, to prevent post-operative complications. Our study results will help reduce the incidence of scarring by providing guidance on appropriate surgical methods.

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Combined Glabellar and Cheek Flap for Nasal Reconstruction after Cutaneous Squamous-Cell Carcinoma Resection

Presenter: Carlos Augusto Cutini, MD
Co-Author: Jorge Augusto Cutini, MD
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Cutaneous squamous-cell carcinoma represents one of the most frequents skin's neoplasm[1], and its treatment is based on surgical resection with free margins of healthy tissue[2]. When this type of carcinoma is located on the face, the surgical planning could need to include more than one local reconstructive flap.

We present a case of an 86 years old, male patient with a cutaneous squamous-cell carcinoma located on the dorsal nasal region. Surgical excision with healthy tissue margin, confirmed with intraoperative margin assessment, was performed. The remaining defect consisted on an area of 7 $cm^{2.}$ The reconstruction was executed with a combination of a glabellar and cheek flap, due to its the size, under local anesthesia. The deferred histological exam confirmed the absence of neoplastic cells on the specimen's margins and no complications was evidenced after a 3 months follow up.

Selected patients could benefit of combined local flap's reconstructions instead of more complex surgical intervention that required general anesthesia. Other strategies, like skin graft reconstructions, could lead to an aesthetically displeasing result.

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Surgical Anatomy of Vascularized Submental Lymph Node Flap: Re-Designing Single Lymph Node Perforator-Based Flap

Presenter: Nutcha Yodrabum, MD
Co-Author: Parkpoom Piyaman, MD
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Background: Vascularized submental lymph node flap includes Ia and IIb sublevel of the neck and highlights submental artery as major arterial supply. To reduce flap dimension, submental perforators have been exploited whereas anterior belly of digastric muscle (ABDM) has been spared. Nevertheless, topographic relationship between the two is still elusive.

Methods and Materials: 40 vascularized submental lymph node flaps were harvest from 23 fresh cadavers. Colored polymer was injected into external carotid arteries prior to the harvest for visualization of the arterial supply. The harvest also included part of submandibular salivary glands and whole ABDMs to preserve topographic relationship. The lymph nodes and related structures were studied macroscopically and by tracing under light microscope.

Results: Median number of lymph nodes was 4 nodes (range 2~8) comprised of 3 (0~7) submental nodes (supplied by submental a.), and 1 (0~4) submandibular node (by facial a.). Submandibular nodes contributed 39.7% of Ib nodes but none in Ia. The

submental artery branched off 2~8 perforators which were originated lateral (44.4%) or deep (43.6%) to ABDM. Most of the perforators supplied not only skin paddle but also lymph nodes via hilar arterioles. Much of Ia nodes, 71.7%, recieved arterial supply located deep to ABDM. Majority of hilar arterioles, 78.9%, were branched from the perforators whereas only few were originated directly from submantal artery. Diameter of the perforators were 0.50 ± 20 mm.

Conclusion: Lymph node guarantee could be achieved by inclusion of submandibular lymph node gaining 4 nodes (2 ~ 8), totally. Dissection deep to ABDM could risk damaging arterial supply to most of Ia nodes (71.7%). Ib submental perforators had high prevalence, but not constant, pre-op doppler U/S is recommended. Skin and Ib lymph nodes shared route of arterial supply via submental perforators. Inclusion of skin paddle could benefit as visual monitoring for viability of the transplanted nodes. Vascularized lymph node flap could be re-design as "1 lymph node + 1 perforator-based + skin paddle".

Synergistic Effect of Adipose-Derived Stem Cells and Fat Graft on Wrinkles in Aged Mice

Presenter: Jae Hoon Jeong, MD, PhD
Co-Authors: Kikap Kim, MD, Ph D, Sukwha Kim, MD, Ph D
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Background: We investigated the synergistic effects of adipose-derived stem cells (ADSCs) and fat graft on skin wrinkles in a nude mouse model of chronological aging.

Methods: After 50 weeks of chronological aging, 44 female BALB/c nude mice were classified into four groups; 1) negative control, 2) injected subcutaneously with fat on the back skin (0.5 cm^3), 3) injected with ADSCs (1×10^5 cells in 0.5 cm^3 Hank's balanced salt solution), and 4) injected with both fat (0.5 cm^3) and ADSCs (1×10^5 cells in 0.5 cm^3 Hank's balanced salt solution). The degree of wrinkling was evaluated using replica analysis, and skin biopsies were performed after 4 weeks. The dermal thickness and density of collagen were determined. Type I procollagen and matrix metalloproteinases (MMP) levels were determined using real-time polymerase chain reaction (qPCR) and western blot analysis. Tropoelastin, fibrillin-1, and CD31 levels were evaluated using immunohistochemistry.

Results: Based on the total wrinkle area, there was significant wrinkle reduction in the fat graft and ADSC with fat graft groups. Type I procollagen mRNA and collagen levels were significantly higher in the ADSC with fat-treated group than in the ADSC- and fat-treated groups. In addition, the ADSC with fat grafted group exhibited significantly higher CD31 expression level than the ADSC- and fat-treated groups.

Conclusions: Both ADSCs and fat graft have wrinkle reducing effect and synergistically affect collagen synthesis and neovascularization.

Comparison of Smooth, Textured and Polyurethane Surface Implants from the Perspective of Biofilm and Capsule Formation Under Local Antibiotherapy: An Experimental Study

Presenter:	Mehmet Suhan Ayhan, Professor, MD
Co-Authors:	Safa Manav, MD, Erkan Deniz, MD, Suheyla Esra Ozkocer, MD, Cigdem Elmas, Professor, PhD, Erdem Sahin, MD, Meltem Yalinay, Prof, MD; PhD
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Introduction: Capsule contracture is not a rare complication after breast augmentation. Biofilm formation and implant surface structure seem to have a role in etiology. Although capsular contracture around implants with different surfaces have been studied, the impact of surface structure on biofilm formation has not yet been clarified. In this study, we compared biofilm formation on breast implants with different surfaces, after standardized bacterial contamination and also effect of local antibiotic use on biofilm formation on different surfaces.

Materials and Methods: Twenty-four Long Evans rats were used. Rats were divided into four groups. Mini implants *(Polytech/Germany)* with three different surfaces *(smooth, textured and polyurethane-coated)*were placed on the dorsum of each rat.

Group-1: Sterile implants placed directly in pockets

Group-2: Implants were incubated in *Staphylococcus epidermidis* medium before implantation.

Group-3: Implants were incubated in *Staphylococcus epidermidis* medium andinserted in *Rifamycin*solution before implantation.

Group-4: Sterile implants were inserted in *Rifamycin*solution before implantation

All rats were sacrificed at three months. Clinical (Baker scoring), microbiological (scanning electron microscopy, microtiter plate), histological (capsule thickness, inflammatory cell density)and immunohistochemical (actin protein amount / sequence) evaluations were performed.

Results: Capsule contracture developed only on infected textured implants. Textured and PU implants showed more biofilm formation than smooth implants. Capsule thickness, inflammatory cell density and actin accumulation were highest on textured implants. Actin sequence was parallel and concentric on textured; but in irregular array on PU implants.

Conclusion: In presence of bacterial contamination, textured implants have the most propensity of developing capsular contracture comparing to smooth and PU implants at three months after implantation. Biofilm formation is less on smooth implants. Despite high bacterial load and biofilm formation, PU implants are resistant to CC, probably due to irregular actin array. Use of local antibiotics reduced biofilm formation on all surfaces, but didn't prevent capsular contracture on textured surface.

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Revision with Anatomical Restoration of the Mobile Tracheostomy Scar and Retraction

Presenter: Jae Young Cho, MD
Co-Authors: Jin Woo Jang, MD., Sang Yoon Kang, MD, PhD
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Purpose: Most tracheostomy has the spontaneous closure by secondary intention. The scar is depressive and retracted having motion of up and down with swallowing. Even persistent fistula is remains. Several methods cover the tracheostomy scar surgically as simple excision, bilateral v-y advancement, or using the allodermal matrix, etc. These methods have deficit to correct the mobile scar from Up and down movement of trachea due to adhesion of skin and fibrotic subcutaneous scar tissue. We present our method and results of an layer by layer restoration of anatomical structure and revision of tracheostomy scar.

Method and Material: The indications for mobile tracheostomy scars contain patients, who wants revision by free will, have stable mental status without infection on wound or generally, and will be get notable aesthetical improvement. The surgical methods are as follows. The full procedure is explained to the patient and to whom it may be concerned. After confirming the mobile scar and being the fistula, under the local anesthesia with supine position, the incision was made as oval shape design through the original tracheostomy scar. The Scar tissue of skin and subcutaneous tissue was extirpation and the dissection goes to the root of the scar tissue till approach the tracheal ring. Most of the scar tissue is removed and small scar tissues flaps are made on the bottom. The scar flaps are sutured as turn over each other. From the bottom, sharp dissections are made for removal of all attached tissue and restoration of anatomical structure. First, we find the sternohyoid muscle bilaterally and direct closed on the midline, and dissect the sternothyroid muscle and its fascia for closure. After closure the muscle, we confirm the disappearance of the up and down movement on swallowing resulted from scar adhesion. Next platysma muscle are dissected from both side and closed vertically. The subcutaneous fatty layer and adjacent aponeurotic tissue are closed transversely for prevent adhesion from muscle. Skin is closed with fine technique and no drain.

Results: We have 20 patients including one patient having the trachea fistula for 2010 to 2018 with average 12months periods. The patients were satisfied and have no more mobile scar on swallowing. Wide scars and depressions are controlled with aesthetic view. There is no complication like as inflammation, infection, hematoma, seroma, voice change, fistula formation, recurrence of fistula, widening or hypertrophic scar or, recurrence of adhesion.

Conclusion: The mobile tracheostomy scars and retraction, even fistulas are compromised to the patients during the swallowing and social activity. We have good results from the revision and anatomical layer by layer restoration for the mobile tracheostomy scars and retractions. We present that this method is reliable to correct the sequela of tracheostomy scars healed secondary intention and have superiority than other method in functional and aesthetic aspect.

Diced Acellular Dermal Matrix Combined with Autologous Fat Grafts for Reconstruction of Partial Breast Defects

Presenter:	Bommie Florence Seo, MD, PhD
Co-Authors:	Jin Tae Cho, MD, Yong Suk Kim, MD, Sung-No Jung, MD
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Purpose: This study was performed to evaluate the feasibility of reconstruction using a combination of diced acellular dermal matrix(ADM) combined with autologous fat grafts in patients receiving breast conserving surgery(BCS).

Methods and Materials: 17 female patients undergoing BCS for unifocal invasive breast cancer with an estimated excision dimension of 5cm or less at the longest axis were included. In all patients, extensive preoperative communication was performed during which local flaps were suggested as the first option. In patients that did not desire an extramammary flap donor site, autologous fat grafts (donor site: lower abdomen in all 17 patients) combined with human donor ADM was planned. It was also agreed on that if, during the mastectomy, a more extensive defect was inevitable, a tissue expander would be inserted for delayed reconstruction. After the excision was performed by the breast surgeon, autologous fat was harvested using the wet technique from the lower abdomen via a single incision in the lower midline of the umbilicus in all patients. Fat was injected based on the Coleman technique, slowly into multiple layers of the subcutaneous tissue surrounding the defect, and the pectoralis fascia layer. The endpoint of injection was any sign of blanching for the skin flaps, or when clinically considered saturated. In the central defect, human donor acellular dermal matrix diced into 1x1x1cm sized cubes were inserted. Subcutaneous sutures and surgical strips were used for closure, and no drains were inserted. Mild compression was applied using elastic bandages during the first postoperative day, after which the patient used a mastectomy bra without additional compression. Follow up was performed weekly for one month after operation, and then monthly during the whole period of radiation therapy. Evaluation was done for infection signs, or seroma. Visual symmetry and softness were evaluated by both the surgeon and patient. The patient rated satisfaction on a scale of 1 to 5(very satisfied) every time she visited the clinic.

Summary of Results: 17 patients with an average age of 56 years received a partial mastectomy performed by a single breast surgeon. An extended periareolar incision or radial incision was used. The nipple areolar complex was completely excised in 1

case. The average weight of the excised breast tissue was 120.7grams. The average maximum diameter was 4.8cm. 8 of the defects were located in the lower outer quadrant, 6 in the lower inner quadrant, 1 in the upper outer quadrant and 1 in the upper medial quadrant. The average volume of injected fat was 53.7milliliters, and the range of ADM cubes used was from 10 to 25. There were no patients who experience clinically detectable seroma or infections. From around 2 weeks after surgery until during radiation therapy, the reconstructed tissue felt nodular, with some resolution during the year after radiation was finalized. Patient satisfaction was on average 4.5.

Conclusion: Although with limitations considering softness and suppleness, diced ADM with autologous fat graft may be an option for patients undergoing BCS that do not desire local flaps or other methods of reconstruction.

Predicting Wound Complication of Immediate Breast Reconstruction after Neoadjuvant Chemotherapy

Presenter:	Jaemin Lee, MD
Co-Authors:	Hyung Chul Lee, MD, Seung Ha Park, MD, PhD, Byung Il Lee, MD, PhD, Eul Sik Yoon, MD, PhD
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Purpose: Immediate breast reconstruction and its oncologic safety has changed paradigm of treatment of breast cancer, even in patients with locally advanced disease. As the role of neoadjuvant chemotherapy has well established in advanced breast cancer, its impact on surgical outcome has been questioned even in the reconstruction perspective. However, there is still unsettled debate on wound healing complication after immediate breast reconstruction, and there is still remaining vacancy of standardized, individualized approach of breast reconstruction to patients who just finished their challenging treatment. It is reasonable to doubt that certain type of cytotoxic regimen or specific type of patient characteristics may be critical to vulnerability to complications. Thereby, we aimed to analyze complication in immediate breast reconstruction after neoadjuvant chemotherapy with its oncologic factors.

Method: Retrospective review of patients who underwent immediate breast reconstruction between March 2014 to March 2019 in a single center was conducted. Patients attribute, surgical characteristics with reconstruction options, as well as oncologic factors such as regimen of neoadjuvant chemotherapy, period between surgery and last chemotherapy session, toxicity during neoadjuvant chemotherapy

were analyzed with complication profile such as major wound complication, infection, seroma, and hematoma. Univariate and multivariate logistic regression were used to analyze factors ($p < 0.05$) and Fischer's exact test was done in subgroup analysis

Result: Total 299 patients including 47 (15.7%) patients with neoadjuvant chemotherapy were included. Multivariate analysis revealed neoadjuvant chemotherapy (adjusted OR 5.467, $p<0.001$) and diabetes (adjusted OR 3.679, $p = 0.011$) were related to major wound complication. Complication analysis further showed neutropenia during neoadjuvant chemotherapy was a significant predictor of major wound complications in neoadjuvant chemotherapy recipients. (adjusted OR 6.179, $p=0.026$). Cyclophosphamide & doxorubicin followed by docetaxel regimen showed higher wound complication in the neoadjuvant chemotherapy group (Fischer's exact test, $p=0.041$)

Conclusion: In this review, neoadjuvant chemotherapy was associated with increased major wound complication. Hematologic toxicity was a significant predictor of wound complication in neoadjuvant chemotherapy group. Patients who presented toxicity during neoadjuvant chemotherapy should intensely monitored for their wound care and further larger cohorts should precisely guide impact of neoadjuvant chemotherapy regimen and timing of surgery to patients of immediate breast reconstruction after neoadjuvant chemotherapy.

Abbreviation: Neoadjuvant chemotherapy, NAC

Declarations of interest: none

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Mastopexy with Implants in the Time of Bia-ALCL

Presenter: Guillermo Siemienczuk, MD
Co-Authors: Sandra Filiciani, MD, Mariano Etcheverry, MD

Affiliation: Rosario Surgical Center, Rosario

Background: Today's concern about the problem of Breast Implant Associated Anaplastic Large Cell Lymphoma (BIA-ALCL), which undoubtedly has come to our specialty area to stay for a long time, compels us to reconsider mastopexy's key concepts.

Objective: Describe our mastopexy surgical technique with these new concepts.

Technique: 1¼ - BREAST AUGMENTATION

A. Incision in the inframammary fold.

B. We place smooth implants on the partial sub-pectoral plane, or John Tebbetts[2] dual plane (sub-glandular and submuscular), with Omar VenturaÕs modification[3] (Fig. 1) that is sub-fascial and submuscular (Respecting the 14 steps of W.P. Adams[4])

C. We fix the inframammary fold with PDS 2/0 sutures so that it does not descend.

D. We close the incision in the subcutaneous plane with vicryl 2-0.

2¼ - MASTOPEXY

A. We adjust skin resection to the new volume obtained with the implants, adapti ng Òin situÓ the previous marking (Fig. 3).

B. We perform the incisions of the mastopexy to remove the excess of tissue (Fig. 4).

C. The lateral pillars of the vertical incision are carved and sutured with Vicryl 2.0. We also use PDS 2/0 sutures and incolor 3/0 Vicryl, then close the skin with Nylon 3/0 running subcuticular suture.

D. We make a round block with 3/0 nylon very deep, with buried knot and so that it passes unnoticed and it cannot be exposed.

3¼ - Finally, we put micropore on all the sutures.

Conclusions:

BIA-ALCL make us reconsider some surgery concepts about breast implants. This explains why we have stopped using textured implants.

Transposing these new concepts on the breast augmentation to the mastopexy with implants, we place smooth implants in double plane and then perform the mastopexy, as if they were two different surgeries.

We prevent excessive tension in the vertical and periareolar sutures, and in the very unlikely case that they present dehiscence, it will not leave the implant exposed, and because of this, we will not have to remove it.

This way of surgery make all our mastopexy procedures have T inverted scars. We already know that is far from ideal, but we prefer to deal with the subsequent treatment to improve their qualities, rather than having to face the possible seroma, or the implants exposure and capsule.

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High Definition Tummy Tuck

Presenter: Ricardo a Babaitis, MD
Co-Authors: Rita M Grande, MD, Francisco J. Villegas, MD
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Ever since Dr. Saldahna presented the abdominolioplasty technique (1), and Dr Villegas presented the TULUA technique, the treatment of the abdomen has reached new expectations to try to obtain even better results . The authors standardized steps whereby to safely perform association of the TULUA technique with High Definition liposuction.

Methods: Prospective evaluation was performed to all patients subjected to the TULUA technique with High Definition LASER or VASER liposuction between March 2015 to March 2019. The technique involved general anesthesia. The TULUA technique (2) is a modified abdominoplasty characterized by (1) transverse elliptical plication of the lower abdominal wall, (2) no undermining of the flap above the navel, (3) unrestricted liposuction, (4) umbilical amputation and neoumbilicoplasty by skin graft, and (5) low transversely placed abdominal scar. When performing the High Definition liposuction, there are 3 distinctive components highlighted by the authors , 1) mark linea alba once the neo umbilicoplasty has been performed. 2) mark the linea semilunaris before resecting the abdominal flap, taking care to match the preoperative marks under the incision so as to not move the flap when suture is done. 3) do not mark the inferior muscle belly of the rectus abdominis muscle because is going to change place when the flap is sutured. The patients also underwent fat grafts in pectoral, deltoid and gluteal region at the same time. The results were evaluated by the surgical team and the patients answered a satisfaction survey.

Results: The technique was performed on 30 patients, 9 male patients and 21 female patients, ages from 26 to 62 years (mean 45 years). The results are evaluated by the surgical team with follow-up ranged from 4 months to 4 years. There were no medical complications . Seroma (30%), haematoma that required medical treatment (3.33%) , and elevation of navel and lower transverse scar (10%) were reported. High percentage of patients answered a survey (98%) with high rate of satisfaction (90%).

Conclusions: The authors present a new abdominolipoplasty technique combining in a safe way the TULUA abdominoplasty and the High Definition (LASER/ VASER) Liposuction, with good results and low complications.

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Body Contour in Male Patients. Liposuction and Gluteoplasty with Autologous FAT Tissue.

Presenter:	Ricardo a Babaitis, MD
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The low back and buttocks should be considered as a whole esthetic unit in the male patient and demands a total different approach from the feminine figure. The treatment of this area in males needs to improve the shape of the gluteal muscle mass through lipoinjections and recreate the superficial anatomy, taking care to even enhance the flat zone near the iliaca crest at the upper external quadrant of the gluteus through liposuction. The male high definition muscular back body figure demands liposuction in inner thighs, lumbosacral and trochanteric zones and waistline as well.

Methods: Prospective evaluation was performed in male patients subject to treatment of the gluteal zone through liposuction and lipo injection between March 2014 and March 2019.

The technique (1) involved general anesthesia, tumescent infiltration, liposuction at the inner thighs, lumbosacral and trochanteric zones, waistline and upper external quadrant of the gluteus, harvest of fat cells, decantation, and grafting with retrograde injection in different planes in the subcutaneous space (2) of the internal quadrants of the gluteal region.

Results: This technique was performed in 200 consecutive male patients with BMI under 26. The quantity of fat grafted varies from 200cc to 600cc per buttock with a mean of 400cc. The results were evaluated by the surgical team with follow-up ranged from 4 months to 5 years. Erythema was present for a mean of 3 days, ecchymosis in

trochanter area (25%) and a very low rate of infection (0.5%) that had good outcome with antibiotics p.o. were reported. Clinical assessment estimated a 30 to 50% loss of augmentation effect during the first 2 months. A satisfaction survey was answered by patients (90%). Patients were generally pleased with the final shape and volume of the buttock contour (98%).

Conclusions: Liposuction and gluteoplasty with autologous fat tissue is a safe, simple and inexpensive technique to achieve a male muscular back body shape, with low complication rate and good outcomes.

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Transgender Top Surgery: A Patient s Desire. Case Report

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Purpose: Top surgery in female to male (FtM) transsexual patients has become a milestone in the process of masculinization. It is generally the first surgery in the transition. In 2008, Monstrey et al. proposed an algorithm on how to choose the most suitable technique for mastectomy depending on the breast size and envelope, the aspect and position of the nipple-areola complex (NAC) and skin elasticity. Still, we consider that this algorithm lacks one key element: patient’s decision.

Method: We present a case in which a patient and surgeon decided, in an informed manner, his treatment. A 36-year-old trans man, who underwent inframammary skin resection mastectomy without preservation of the NAC. In a second surgery, after edema had resolved and the thorax tissue was settled, both nipples were reconstructed using a star-flap as an outpatient surgery. A month after this procedure, both areolas were tattooed.

Result: We present pictures of the two-staged procedure, showing a very good aesthetic result and a high patient satisfaction.

Conclusion: Although standardized techniques are important, the surgeon should include individual patient's preference in the decision. We consider that not all patients fit into algorithms and that patient choice should be taken into account as part of the decision making process.

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DUAL Phase Liposuction Technique. Approach to the Anterior Unit in Male Patient.

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The dual phase laser liposuction technique is a great tool for the treatment of patients to accomplish the nowadays male high definition muscular shape figure. So as to obtain balance and harmony in the results, it is useful to consider abdominal wall, hips, pelvis, pectoral zone and shoulders as whole esthetic unit.

Methods: Prospective evaluation was performed of all male patients subject to dual phase laser liposuction between March 2014 and March 2019. Patients antecedents of criolipolisis, mesotherapy and hidrolipoclasia and massive weight loss were recorded and pre and post photos were taken. The technique involved general anesthesia, diode LASER operating at 980nm, first phase total power 20W was delivered into the subcutaneous tissues only, to specially treat fibrotic areas due to criolipolisis, fostatilcoline mesotherapy, hydrolipoclasy. In the second phase, the diode LASER was at lower power (15-W), to generate skin retraction. The LASER was applied under the skin with retrograde motion without risk of skin burns. This phase was to treat localized fat deposits associated with skin laxity, like arms, inner thighs, supraumbilical zone and waistline. To calculate the optimal cumulative energy, in

both phases, a total energy dose of 7kJ/10x10-cm area was used as a safety parameter to prevent treatment complications (1). Harvest of fat cells was done through a tumescent liposuction, decantation and retrograde injection of fat cell was done in a strict adherence to the subcutaneous plane in previously marked shoulders and pectoral zones to achieve the desired definition at the correct places (2). The results were evaluated by the surgical team with follow-up ranged from 4 months to 5 years. A satisfaction survey was answered by patients.

Results: A total of 200 male patients were included, BMI under 26. Patients age ranged between 17 and 57 years, (mean 30 years). Patients registered antecedents of criolipolisis (30%), fostatidilcoline mesotherapy (30%), hydrolipoclasy (10%), and massive weight loss (5%). The quantity of fat grafted in the deep subcutaneous plane varied from 150cc to 250cc (mean of 220cc) per deltoid zone, and 100cc to 200cc (mean of 180) per pectoral zone.

Very low rate of infections (1.5%) , seroma (10%), fibrosis (5%), hyperpigmentation (1%), pseudo bursa (0.5%) and erythema for 2 to 5 days, (mean 3 days) were reported. There were no medical complications. High percentage of patients (97%) answered a survey with high rate of satisfaction (98%).

Conclusions: The dual phase laser liposuction technique is useful to achieve esthetic balance in the high definition muscular male figure where it is mandatory to approach abdomen, chest and shoulders as a whole esthetic unit. This technique is simple, easy and has low rate complications and patients are highly satisfied.

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Chest Wall Masculinization for Female to Male (FtM) Transgender Population: A Single Surgeon s Experience in Argentina.

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In the last five years, we have experienced and increased demand for gender affirmation surgery, abided by the changes in Argentina's laws that oblige healthcare companies to finance these surgeries. Chest contouring, or "top" surgery, is one of the most relevant features for the transgender population, as it is considered to be the point of no return in gender affirmation.

At Hospital Italiano, we have performed thirty five FtM chest surgeries since 2014, with varied sizes. Out of these, we have found particularly challenging, breasts over 400 grams (each breast). In these surgeries we must deal with multiple components, among the most important are: loose skin and large Nipple Areola Complex (NAC). Moreover, patients with larger breasts tend to use binders to disguise them more often. The weight of the gland was based on the weight of the resection.

According to our surgical protocol, we performed a total of 35 FTMTS in patients 18 years or older, in a four year period between 2014 and 2018. All patients were operated under general anesthesia and mean hospital stay was 24 hours. Hormonization therapy was interrupted before and after the planned surgical procedure. We present our experience.

Mean age at the time of surgery: 22 years old (18 to 38 years old). Mean BMI: 23 (21.1 – 34.6). 7 patients (20%) were smokers at the time of surgery and 2 (5.7%) were past smokers. There were no diabetic patients and 3 (8.6%) patients were treated for hypertension. Other co morbidities included: hypothyroidism, depression and latex allergy. 25 patients (71.4%) had started harmonization therapy before surgery and suspended it. All patients were categorized as grade 1 or 2 in the American Society of Anesthesiologist scale. Our complication rate was 20% (7 patients) out of which 5 had minor epidermolysis requiring local treatment, 1 seroma which was evacuated by ultrasound guide, 1 patient had a hematoma that was controlled and resolved, and 2 patients needed revision surgery for dog ears (1 had had epidermolysis and the other a hematoma) .

To conclude, chest wall masculinization is the point of no return in gender affirmation surgery. The procedure is harder than a mastectomy because it, in essence, is not a mastectomy. We are perfecting the process, yet, so far, we have achieved good results with a low proportion of complications with no severe complications to date.

Lip Lift As a Complement in Facial Features Remodeling Surgery

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Introduction: The lips are a defining feature of youth, beauty, and femininity.1
Because of its importance in facial contouring we take special care in upper lip procedures. Lip lift techniques include subnasal resection alone or in combination with open rhinoplasty.2,3

Surgical Technique: We use the subnasal lip lift, an indirect lip lift. The superior incision extends from 1 alar crease to the other, goes inferior to the nostril sill crossing the base of the columella. The lower incision is parallel to the upper incision. When combining it with open rhinoplasty, a V-shaped columellar incision is performed in the lower 3rd of the columella which is connected with the subnasal incision line. The marginal incision for the rhinoplasty is performed as usual. The are a variation with an endonasal scar. The amount of skin resection ranged from 3 to 7 mm and is based in preoperative analysis in conjunction with desired dentalshow.4 It is important not to over resect. The skin and the subcutaneous tissue are removed taking care of the orbicularis muscle. The created defect is closed in 2 layers in a free tension manner. The 1st subcutaneous layer is closed with 4-0 suture (Monocryl, Ethicon). Skin layer is closed with 6-0 suture (Ethilon, Ethicon). Skin sutures are removed between 5 and 7 days after the surgery.

Conclusion: The lips are a defining feature of youth, beauty, and femininity. To use a technique that the surgeon masters perfectly, finishing with a very precise closure to leave the best possible quality of scar are some details to keep into account.

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The Use of a Simulator Software and Customized 3D Printed Breast Molds As a Method to Optimize Abdominal-Based Flap Breast Reconstruction.

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Background Aesthetically pleasing and symmetrical breasts are the goal of reconstructive breast surgery. Sometimes, however, multiple procedures are needed to improve a reconstructed breast's symmetry and appearance. Recent advances in 3-dimensional (3D) surface imaging and printing technologies allowed for improvement of autologous breast reconstruction symmetry. While 3D printing technology gets faster, more accurate and cheaper, the technology required to obtain proper 3D breast images, such as laser scanners or 3D photogrammetric cameras, remains expensive. In this study, we present our preliminary experience with the use of a more affordable technology to obtain 3D images named Crisalix® and customized printed breast molds in optimizing autologous breast reconstruction.

Methods A 3D contralateral breast imaging is performed before surgery using the simulator software. The obtained image is mirrored and exported to a 3D printer. A customized breast mold is created based on the 3D image. Then, abdominal-based flap surgery is performed, where the breast mold is used to determine the required flap volume and to shape the breast mound in height, width, projection and orientation.

Results Two patients reconstructed with abdominal-based flaps were included in this series. Objective assessment of cosmetic outcome revealed that good breast symmetry was achieved in all cases.

Conclusions The use of this 3D aesthetic surgery simulator software, although originally conceived for aesthetic purposes, seems to be an affordable and great alternative to the expensive technology currently used to generate the 3D breast images required to create customized molds for autologous breast reconstruction.

Red Breast Syndrome (RBS) Associated to the Use of Polyglycolic Mesh: A Case Report.

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Background: Some patients undergoing breast reconstruction with Acellular Dermal Matrix (ADM) develop postoperative erythema overlying their ADM grafts named Red Breast Syndrome (RBS). This entity has never been related to the use of a synthetic mesh. Herein we report the first case in the medical literature of RBS associated to the use of a polyglycolic acid mesh.

Methods: We present a case of a 61-year-old patient who underwent bilateral nipple-sparing prophylactic mastectomy because of BRCA-1 gene mutation. The patient was reconstructed with a direct-to-implant approach, and the implants were covered with a Polyglycolic acid Mesh. Twenty days after the reconstruction, she presented with a blanching erythema of both reconstructed breasts without signs of infection on the area covered by the mesh: Red Breast Syndorme.

Results: The patient denied symptoms like fever or tenderness and presented with no clinical signs of infection. Her laboratory tests were within normal range. We decided to watch and wait. The patient continued strict controls in the outpatient setting. Gradually, the erythema begun to disappear, and it resolved spontaneously.

Conclusions: RBS has only been described with the use of ADMs, but since in this case the mesh was made of polyglycolic acid, we suggest RBS should be considered either with the use of biological or synthetic meshes. The importance of its differential diagnosis resides in distinguishing it from an infection.

An Analysis of Melanoma Recurrence Following Negative Sentinel Node Biopsy

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Background: The status of the sentinel lymph node is one of the strongest predictors of disease recurrence in patients with intermediate thickness and thick primary melanomas. Nonetheless, a proportion of patients develop recurrence following a negative Sentinel Lymph Node Biopsy (SLNB).

Aims: To assess the incidence and sites of subsequent disease recurrence amoung SLNB-negative patients and to analyse clinicopathological characteristics associated with disease recurrence.

Methods: Clinical and pathological characteristics, as well as recurrence data were recorded for all SLNB patients from 2008 to 2018. Multivariate Cox proportional hazards regression models estimated the hazard ratio (HR) and 95% confidence

interval (CI) for the association between clinicopathological factors and development of recurrence following a negative-SLNB.

Results: Overall, 107 negative SLNB were analysed (mean follow-up 44 months), and 19(17.8%) developed subsequent recurrence. Mean time to recurrence was 26.5 months (range 4 - 76). Five patients (4.7%) recurred within 12 months, and were therefore considered as a false negative SLNB. Sites of recurrence were local 2(11%), in-transit 2(11%), nodal 9(47%) and distant 6(32%). Multivariate analysis found head and neck site [HR 2.67; 95% CI 1.77-7.60, P < 0.001], tumour thickness (HR 1.16; 95% CI, 1.04-1.30, P = 0.01) and the presence of ulceration (HR 1.18; 95% CI 1.06 - 1.32, P = 0.01) to be predictive of recurrence following a negative-SLNB.

Conclusion: Patients with head and neck melanoma, thicker primary tumours and the presence of ulceration had an increased risk of developing disease recurrence following a negative-SLNB. The findings confirm the importance of continued surveillance to monitor recurrence amoung SLNB-negative patients. Melanoma which recurs after negative-SLNB may exhibit different tumor biology, and an improved understanding of this is required in order to individualise treatment and surveillance strategies.

Complication Classification in Plastic Surgery

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In comparison to other surgical fields, there is no objective classification described for complications in plastic surgery. Besides PROM`s, Plastic surgeons continue considering Clavien-Dindo criterion, which underestimates several relevant aspects.

Our purpose is to describe and apply a classification for plastic surgeons, that can enable patient followment, medical staff achievements registration and comparison between services with a unique criterion.

We designed a table of complications and applied it to our patients. The table includes asessment of scar, sensibility, Infection, Collection, and personal satisfaction, with a minimum score of 0 (ideal), to a maximum worst of 12.

We show graphical examples, with preoperative and postoperative images.

Plastic surgery does not have a worldwide consensus on how to classify complications. PROMs, while widely used, only include subjective criteria. A group in Cambridge in 1994 and another in Paris in 2009, have described two proposals, although with several drawbacks. Our classification includes postoperative aspects of interest in plastic surgery, that Dindo Clavien`s do not consider: sensibility, scar aspect and personal satisfaction. Therefore, Clavien´s 1rst and 2nd scores are fragmented into more specific qualities of postoperative care. We encountered our classification easy to use: in 10 seconds we can fulfill an evaluation that considers both, objective and subjective aspects of the postoperative patient. Moreover, it can be used not only for aesthetic surgery but to reconstructive and plastic surgeries. Finally, we believe this classification could be useful to compare results among different institutions.

Tissue Engineering-Based Wound Healing of Soft Tissue Defects Involving Anterior Tibia Area

Presenter: Kijae KIM, MD
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Purpose: Soft tissue defect on anterior tibia area is hard to treat when bone/perichondrium is exposed. Free flap coverage is usually used in this area. However, it is associated with disadvantages such as surgical burden, cosmetic outcome, and so on. . This case shows a male patient who had a 5*5 cm sized wound with perichondrium exposure in anterior tibia area.

Methods: A 46 year-old man visited our clinic with perichondrium exposed ulcerative lesion on the right anterior tibia area. Surgical debridement was carried out multiple times and NPWT was applied for a month. But perichondrium exposure remained affected and volume defect was considerable

We planned to use a dermal substitute based on porcine atelocollagen (Pelnac, Eurocollagen). Pelnac was applied two times at 1 week interval. Granulation tissue filled whole wound site especially where perichondrium was exposed. However there was unfilled residual volume defect. We used artificial dermis (Megaderm, L&C Bio) and stromal vascular fraction.

Two weeks later, we used fetal keratinocytes(Kaloderm, tegoscience) to promot3 epithelization.

Results: A month later, the wound was completely healed without any complication.+-+66

The contour was great and the skin color was fairly similar to the surrounding area.

Conclusion: This case suggests that tissue engineering therapy with artificial dermis and stromal vascular fraction is an effective alternative treatment for coverage of soft defects involving lower extremity with exposed bones. It is better than flap coverage for specific patients.

Analysis of Outcomes of Pharyngolaryngoesophagectomy and Reconstruction in a Single Institution

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Introduction: Pharyngolaryngoesophagectomy (PLO) operations require extensive resections and reconstructions, carrying significant risks of morbidity and important quality of life implications. We aimed to investigate outcomes from recent PLO and reconstruction procedures at our institution.

Methods: A retrospective review of patients requiring PLO and reconstruction over an 11 year period from 2008-2018 was conducted. Information collected included patient demographics, diagnosis, procedure, margins of excision, reconstructive method, length of stay, complications, speech and swallow outcomes and survival data.

Results: A total of 30 patients fulfilled the inclusion criteria. Of these, 16 patients had reconstruction with free jejunal flaps, 2 had free tubed ALT flaps and 12 received gastric pull-ups. The average patient age was 61.67 (range 47-77) and 27/30 patients were smokers. The median length of stay was 56.5 days (range 15-124). There were two peri-operative mortalities. Twelve patients survived beyond 2 years post-operatively. 18 patients received adjuvant treatment. There was a 14% (4/28) early return-to-theatre rate and a 11% fistula rate. Functioning swallow was established in 79% of patients (22/28). Speech was restored 75% of patients, the majority using an electrolarynx, or a Blom-Singer valve in those who had secondary tracheoesophageal puncture.

Discussion: There are satisfactory outcomes from PLO and reconstruction procedures at our institution in comparison to the international literature.

Transferring the Protective Effect of Remote Ischemic Preconditioning on Skin Flap Among Rats By Blood Serum

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Purpose: The aim of this study was to show whether the protective effect of remote ischemic preconditioning (RIPC) on flaps can be transferred among different individuals with the transfusion of blood serum

Methods and Materials: Blood serum was taken from rats without any procedure (Group x), rats 1 hour (Group y) and 24 hours (Group z) after performing RIPC and the remaining rats were divided into six groups. While the random pattern skin flap was performed only in the back region in Group 1, and it was performed 1 hour (Group 2) and 24 hours (Group 3) after induction RIPC. Flap surgery was performed after the intravenous injection of serum obtained from Group x in Group 4, from Group y in Group 5, and from Group z in Group 6. After 7 days, the ratios of viable areas in the flaps of the remaining rats were calculated.

Results: When the viable area ratios in the flaps to the whole flap area were calculated, it was found out that the viable area ratios in Group 2 (61.6%), Group 3 (75.6%) and Group 6 (74.2%) were statistically significantly higher compared to Group 1 (51.5%), Group 4 (52.6%) and Group 5 (58.7%), that viable area ratios in Groups 3 and 6 were statistically significantly higher compared to Group 2, and that there was no difference between Groups 3 and 6.

Conclusion: This study showed that RIPC forms a protective effect on the flaps and that this effect could be transferred among individuals with blood serum.

Long Term Experience with the Bidimensional Labia Minora Reduction

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Background: In 2011 we presented a technique for reduction of the labia in width and length dimensions by deepithelialization and a smaller inferior wedge resection. Because of this, the technique was named the bidimensional technique. We aim at presenting a long-term clinical experience with this technique.

Methods: A retrospective review of all patients' clinical records who underwent this technique was undertaken. A long-term follow-up was carried out by telephone. Patients' overall satisfaction with the procedure and final result was rated on a scale of 1 to 5, where 1 was poor, 2 was fair, 3 was good, 4 was very good and 5 was excellent

Results: From October 2005 to December 2018, 56 women with an average age of 27 years (range 18–47) underwent this technique. In all patients, the wound healed very well. There were no cases of tip flap necrosis. Two patients had an immediate postoperative bleeding and another one a small hematoma that drained spontaneously. One patient developed an infection that responded well to antibiotics. By a telephonic survey, 36 patients rated the procedure and results as excellent, 14 patients as very good and 3 as good. Three patients were not reached.

Conclusions: The technique provides a tension-free closure and adequate vascularization to the healing edges of the superior labial flap, which reduces the chances of wound dehiscence. The associated resection of a full thickness posterior wedge, avoids a festooned appearance and the resulting scar is posteriorly placed where is easy concealed providing excellent cosmetic results and long term overall satisfaction.

Facial Lifting with FAT GRAFT

Presenter: Javier Vera Cucchiaro, MD
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Introduction: the combination of the facelift with treatment of the deep structures with fat grafts, allows us to treat 86% of our patients with a short incision technique, avoiding retro-auricular dissection, an area of frequent complications such as hematoma and injury of the greater auricular nerve.

In addition, the fatty graft helps to reposition volume lost due to aging (deflation), and secondarily it improves the quality of the skin.

Material and Methods: 179 patients were treated from January 2016 to May 2019, with this surgical routine and 25 patients were excluded because they had necks with abundant skin and subcutaneous cellular tissue (enlarged incisions). There were 172 female patients and 7 male patients, aged between 39 to 72 years and with average of 48 years.

In all cases a treatment of the deep structures with a High-SMAS was used and fixed to the zygomatic process with no-absorbable suture type mononylon 3-0, associated with fatty graft at supra-periosteal and intramuscular level. We use tumescent infiltration that facilitates dissection has allowed us to obtain less edema and ecchymosis in the post-operative.

Results: Of the 179 patients we had hematoma in 2 patients (1.1%), paresis of the upper lip in 2 patients (1.1%), overcorrection in 2 patients (1.1%), secondary neck treatment in 8 patients (4.4%), hypertrophic scar in 12 patients 96.7%), without any cases of necrosis. In 78% we performed neck opening in the middle line of the Platysma and Digastric treatment.

The placement of the fatty grafts is performed at the end of the Lifting after having fixed the High-SMAS and before performing the skin closure. On average 40 to 60 cc is used for the entire face and when it is not associated with a lifting and it is only volumetric treatment we use between 60 to 80 cc.

Discussion: It is necessary to perform a pre-operative diagnosis of the areas to treated with fatty grafts, evaluating the amounts of fat to be placed and preventing an excess of grafts. Currently our routine for the preparation of fat is by decanting, we have already used centrifugation, growth factors and even stem cells, but according to the to the literature and experience we have returned to decanting and a delicate handling of adiopose tissue with micro-cannulas in diameter between 0.8 to 1.2 ml.

The concept of restoring lost volume is not new, but in the last decade it has been accepted and used routinely in most surgical facial treatment, so it is excellent complement to the treatment of the facial structures and allows optimizing the results with minimal risk of complications.

Conclusions: The combination of the treatment of deep structures with High-SMAS and the association of fat grafts in an intramuscular and supra-periosteal plane, have allowed us to obtain an up grade in our patients as well to have greater durability of the results, when treating volumen loss at the facial level.

Fibroblast Growth Factor-2 Stimulates Proliferation of Human Adipose-Derived Stem Cells Via Src Activation

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Human adipose-derived stem cells (hASCs) is a subset of mesenchymal stem cells (MSCs), it has been regarded as one of the most promising stem cells in the fields of plastic surgery and regenerative medicine[1]. Fibroblast growth factor-2 (FGF-2) is widely used in clinical work and plays a crucial role in proliferation of hASCs[2-5]. However, the signaling pathways in hASC activated by FGF-2 remain unclear. In this study, hASCs were cultured with different concentration of FGF-2, and proliferation was assessed. Effects of FGF Receptor (FGFR) inhibitor, ERK1/2 inhibitor, PI3K/Akt inhibitor, JNK inhibitor, and p38 MAPK inhibitor and Src inhibitor on the proliferation were investigated. We assessed the effect of FGFR inhibitor on several signaling enzymes in protein level, such as ERK1/2, JNK, p38, and Akt. The involvement of Src activation by FGF-2 was also examined. Results showed FGF-2 remarkably promoted proliferation of hASCs, and stimulated cell progression to the S and G2/M phases. The proliferation was blocked by various inhibitors mentioned above. Activation of protein kinases on several signaling pathways such as AKT, Erk1/2, JNK, and p38 was blocked by FGFR inhibitor. We also found that Src, the downstream kinase of FGFR, was activated by FGF-2 and the activation was cancelled by FGFR inhibitor. MEK1/2, a downstream kinase of Src was parallely regulated by FGF-2. The Src inhibitor markedly blocked the proliferation of hASCs via inhibition of Src and MEK1/2. In conclusion, the Src activation is indispensable for FGF-2-mediated proliferation on ASCs, and the subsequent activation of multi-signaling pathways.

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Algorithm of Treatments for Pigmentary Disorders of the Face: A Prospective Observational Study in Asian Patients.

Presenter:	Chikara Takekawa, MD
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Background: Most patients with facial pigmentary disorders have multiple disorders. However, there is no definitive treatment algorithm for all pigmentary disorders.

Objective: To investigate the clinical efficacy and safety of the combination of the Q-switched alexandrite laser and the carbon dioxide laser with ZO SKIN HEALTH® for facial pigmentary disorders.

Patients/Methods: This prospective observational study enrolled 251 patients with at least one facial pigmentary disorder. We assessed treatment efficacy and investigated which disorders were most responsive to combination treatment and the relationship between doctors' skills, outcomes, and dropout rates.

Results: There were 246 patients with lentigo senilis, 186 with moles, 79 with melasma, 53 with seborrheic keratosis, 17 with acquired dermal melanocytosis, and 16 with freckles. Overall, 227 patients completed treatment. Post-treatment outcomes were excellent in 97, good in 113, fair in 17, and poor in 0 patients. Freckles were the most responsive, and acquired dermal melanocytosis was the least responsive. Patient withdrawal and treatment outcomes did not differ significantly based on the doctors' skills. Overall, 3.2% of patients had adverse events.

Limitations: This study did not involve a control group.

Conclusions: Our combination algorithm improved several pigmentary disorders of the face simultaneously, regardless of the doctors' proficiency level.

Recent Trends of Hand Injuries in Kyoto for This 10 Years

Presenter:	Satoshi Takada, MD

Co-Authors: Toshihiro Kitayama, MD, Rhuku Ozawa, MD
Affiliation: Shojukai Kyowa Hospital, Kyoto

Background: Kyoto is one of the most famous cities in Japan that attracts more than 50 million tourists every year. At the same time, there are many world-famous companies and a lot of subcontracting factories in Kyoto. Kyowa Hospital is located in Kyoto and specialized in hand injuries. We investigate the contents of the surgeries for hand injuries in this hospital and report the current situation of the hand injuries in Kyoto.

Method: We investigate the components of the surgeries for hand injuries performed in operation rooms from 2009 to 2018. Survey items are age, sex, injured fingers, causes and operation method.

Result: The total number of the surgeries is 1349 persons and 1827 fingers. The number of the replantation of the amputated finger is 356 fingers. The total number of the surgeries has been decreasing slowly, however, the number of the replantation has been flat for 10 years. The most frequent cause of injuries is the industrial accident and the average age has been rising gradually.

Discussion: In Japan, it is said that the mechanization and automation in factories are progressing. This reduces the total number of hand injuries. Otherwise, the number of the people who do not follow the manual does not decrease and they are injured seriously. It is thought that rising of the average age symbolizes aging of working population in Japan.

Detailed data will be presented in the posters at the conference.

Long Term Quality of Life and Complications with Syndromic Craniosynostosis

Presenter: Yoshiaki Sakamoto, MD, PhD
Co-Author: Kazuo Kishi, MD, PhD
Affiliation: Keio University School of Medicine, Tokyo

Introduction: Although studies have analyzed long-term stability of cranioplasty and midface distraction with craniosynostosis, to date nobody has investigated long-term quality of life and complications in adults with syndromic craniosysotosis. The purpose of this study was to investigate the long term life in adult syndromic craniosynostosis.

Methods: Among syndromic craniosynosotosis patients including Crouzon syndrome, Apert syndrome, and Pfeiffer syndrome, the patients who had been performed cranioplasty and midface advancement and they were over 20 years of age were included in this study. We investigated the inconvenience in daily life and the disease currently undergoing treatment as well as the presence of marriage and children.

Results: Crouzon syndrome were 9, Apert syndrome were 5, and Pfeiffer syndrome were 4 aged 22-48 years old (mean 31.4±9.2 years old). Among them, only one case of Crouzon's syndrome is marrying, and there was only the same case where there is a child. Four cases of corneal disorder were observed in Crouzon's syndrome. In Apert syndrome, two cases had visual field contraction, one case with Pfeiffer syndrome and cataract was recognized. No dental problems were observed in either case.

Conclusions：Only one case is marrying, which was a small proportion compared with the average age of marriage in Japan. Significantly, it was high rate of the orbital problems that caused inconvenience in any disease. Even after completion of the series of treatments, the importance of ophthalmological follow up was suggested.

The Free Abdominoplasty Flap in Breast Reconstruction - the Untold Story

Presenter: Richard B Hamilton, MD, FRACS
Co-Author: Ingemar Fogdestam, MD, PhD
Affiliation: Hamilton House Plastic Surgery, Adelaide, SA

This year marks the fortieth anniversary of the first use of a free abdominoplasty flap in breast reconstruction. Before this operation the options open to a woman who had undergone a mastectomy and who was seeking some sort of breast reconstruction were extremely limited. The main approach available at the time was a multi-staged pedicled flap taken from the abdomen – a procedure that took several months to complete, was extremely taxing on the patient and very uncertain of outcome. Understandably, it was not often performed. The free abdominoplasty flap operation, performed in Gothenburg, Sweden in 1979 changed all that. Microsurgery had made possible an operation that could in one session reconstruct a breast. This operation, and the pedicled TRAM flap which followed two years later, transformed breast reconstructions from rarely performed procedures to common operations. This is all part of recorded history. What is not known is the major Australian contribution to this pioneering work. Bernard O'Brien had established a Microsurgery Research Unit which became part of St Vincent's Hospital in Melbourne in 1976. The whole operation was planned there, all the anatomical research was carried out in the unit's

cadaver laboratory, and both the microsurgeons who were to perform the operation, one Swedish and one Australian, were trained there. And all the time that this preparation was being carried out in Melbourne, The Sahlgrenska Hospital in Gothenburg , Sweden, where the trailblazing operation was to take place, did not even have a microsurgery unit. On the fortieth anniversary of the operation, it is time to finally acknowledge Australia's contribution to its success.

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W9 Peptide Had the Potential to Contribute Bone Reconstruction By Enhancing Osteogenic Differentiation of Human Adipose-Derived Stem Cells

Presenter:	Yuki Otsuki, MD, PhD
Co-Authors:	Takashi Nuri, MD, PhD, Masaaki Ii, MD, PhD, Kazumasa Moriwaki, PhD, Michio Asahi, MD, PhD, Koichi Ueda, MD, PhD
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The reconstruction of bone defects is a critical process for reconstructive surgeons. Autologous bone graft is the standard treatment for bone fusion and healing. Donor sites of bone, e.g., iliac crest, rib, tibia, and calvarium, are generally used, but the patients suffer from numerous postoperative effects, such as postoperative pain, altered sensation, infection, hematoma, and scarring. Bone reconstruction with bone tissue engineering (BTE) is a recent and promising therapeutic approach to avoid donor site problems.

W9 is a peptide that abrogates osteoclast differentiation via blockade of nuclear factor-κB ligand (RANKL)-RANK signaling, which activates bone formation. However, W9 stimulated osteogenesis in osteoblasts and mesenchymal stem cells[1]. The present study demonstrated that the W9 peptide promoted osteogenic differentiation of human adipose-derived stem cells (hAdSCs) even under non-osteogenic differentiation culture conditions. W9-treated hAdSCs exhibited several

osteocalcin-expressing cells and great mineralization compared to the BMP2-treated hAdSCs, which suggests that the W9 peptide had potent osteogenic potential in hAdSCs. W9 treatment also markedly enhanced the phosphorylation of p38, JNK, Erk1/2, and Akt, and BMP2 treatment only enhanced the phosphorylation of p38 and Erk1/2 in hAdSCs. hAdSCs did not express the RANKL gene, but W9 treatment upregulated Runx2, Collagen type IA and TGF receptor genes and increased Akt phosphorylation. These results suggest that the W9-induced potent osteogenic induction was attributed to activation of TGF and the PI3 kinase/Akt signaling pathway in hAdSCs.

W9 may also induce the osteogenesis of AdSCs and form ectopic bone, which will be examined in our next series of in vivo experiments. The results of the present and future studies may contribute to bone reconstruction with bone tissue engineering (BTE).

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Risk Factors of Macroscopic Hemoglobinuria after Sclerotherapy Using Ethanolamine Oleate for Venous Malformation

Presenter: Masahide Fujiki, MD, PhD
Co-Authors: Mine Ozaki, MD, PhD, Akihiko Takushima, MD, PhD
Affiliation: Kyorin University School of Medicine, Mitaka-shi

Background: Sclerotherapy is an essential component of treatment for venous malformation, and ethanolamine oleate (EO) is known as a useful sclerosant agent. However, macroscopic hemoglobinuria (MH) and subsequent renal impairment are severe complications after sclerotherapy using EO. The present study aimed to clarify the risk factors of MH for better perioperative management for venous malformation.

Methods: Data collected during 130 procedures from 94 patients, who underwent sclerotherapy using EO for venous malformation, were retrospectively analyzed. Preoperative and operative variables, including sex, age, preoperative body mass index, location, depth, type of lesion, size, number of procedures, type of drainage

vein, ratio of sclerosant to air, and injected total dose of 5% EO per body weight (BW), were examined. Univariate analysis and multivariate logistic regression were performed to determine the possible risk factors for MH.

Results: Following sclerotherapy, MH occurred in 27.7% of patients, but no case developed postoperative renal impairment due to aggressive hydration and haptoglobin administration. On univariate analysis, diffuse lesion, lesion size ≥50 cm^2, and total injected dose of 5% EO ≥0.18 ml/kg were found to be the risk factors of MH. Multivariate logistic regression analysis identified a total injected dose of 5% EO ≥0.18 ml/kg as the significant independent factor contributing to MH risk.

Conclusions: Macroscopic hemoglobinuria is a reversible complication if immediate and appropriate interventions with aggressive hydration and haptoglobin administration are performed; therefore, it should be closely monitored following sclerotherapy, especially when using 5% EO ≥0.18 ml/kg.

Efficacy of Collagen-Gelatin Sponge with Sustained Release of Basic Fibroblast Growth Factor for Intractable Skin Ulcers

Presenter:	Yoshiaki Shingyochi, MD, PhD
Co-Authors:	Erika Ando, MD, Ayaka Karibe, MD, Gaku Nojiri, MD, Rica Tanaka, MD, PhD, Hiroshi Mizuno, MD, PhD
Affiliation:	Juntendo University, Tokyo

Introduction: Type I collagen sponge is widely used for skin defect coverage. A newly-developed hybrid collagen sponge which contains 10% alkaline-treated gelatin, termed collagen-gelatin sponge (CGS), has an ability of sustained release of a variety of growth factors. The objective of this study is to evaluate the efficacy of CGS with sustained release of basic fibroblast growth factor (bFGF) for intractable skin ulcers.

Materials and Methods: CGS (PELNAC Gplus®; GUNZE, Kyoto, Japan) and a human recombinant bFGF (Fiblast® spray; Kaken Pharmaceutical, Tokyo, Japan) were used in this study. Totally 8 patients with intractable skin ulcers on the feet (6 cases associate with ischemia and diabetes and 2 cases with collagen diseases) were treated with CGS with bFGF. CGS with bFGF was changed weekly up to 3 weeks, depending on the healing situation. Furthermore, negative pressure wound therapy (NPWT) was applied directly onto the CGS with bFGF in 7 cases.

Result: Size of the wounds was reduced and granulation was accelerated in 6 cases, in which 3 cases of spontaneous epithelization and 3 cases of subsequent skin grafting

was achieved, respectively. The rest of 2 cases were ceased because of the maceration of the normal skin around the wounds.

Conclusions: These findings suggest that CGS impregnated with bFGF accelerates wound healing in intractable skin ulcers and seems to be one of the ideal devices for the treatment of such ulcers. Moreover, since bFGF can be sustained in CGS, it was considered that NPWT can be applicable with CGS with bFGF simultaneously.

Utility of a Finger-Mounted Tissue Oximeter in Flap Perfusion

Presenter:	Yuki Matsushita, MD
Co-Authors:	Hidekazu Fukamizu, PhD, Masatsugu Niwayama, PhD, Naoki Unno, PhD, Naohiro Kanayama, PhD
Affiliation:	Hamamatsu University School of Medicine, Hamamatsu City

Introduction: We developed a finger-mounted tissue oximeter with near-infrared spectroscopy to evaluate the fetal tissue oxgen saturation transvaginally. This study aimed to investigate whether this device is useful in evaluating blood flow in random pattern flaps (RPF) and arterial flaps (AF).

Material and Methods: Twenty SD rats were used. For RPF, a McFarlane-type caudally based skin flap (2 x 8 cm) was designed on the dorsum of the rat. For AF, an epigastric artery island flap (3 x 5 cm) was raised. The blood flow was evaluated using the oximeter and a laser Doppler. In RPF, the value of 30 minutes and 24 hours after the operation was measured to find whether the necrosis range could be predicted. In AF, the value after clamping the vessels for 30 minutes was measured to investigate whether it reflects the ischemia.

Results: In RPF, the mean values of rSO_2 at the proximal and the distal of the flap 30 minutes after the flap elevation were 46.8(±7.72) and 34.6(±7.70), respectively. Those 24 hours after the flap elevation were 47.3(±5.20) and 33.2(±8.55) , respectively. In AF, the mean values of rSO_2 before and after the clamping were 52.1(±6.91) and 35.4(±5.31), respectively. A significant decrease of rSO_2 was observed at the distal of RPF and after the clamping of AF.

Conclusion: This device is compact, handy, non-invasive and inexpensive. -It allows relative evaluation of blood flow, but further studies are needed to determine the cut-off values of rSO_2.

Elevation of Thin Pudendal Artery Flap Using Fat Thickness Data in Vulvovaginal Reconstruction

Presenter: Masao Fujiwara, MD, PhD
Co-Author: Hidekazu Fukamizu, PhD
Affiliation: Hamamatsu University School of Medicine, Hamamatsu

Background: Majority of defects after excision of vulvovaginal skin cancers is shallow in depth. A thin flap is thus suitable for pudendal defects.

Objective: To create a thin pudendal artery flap, the relationship between fat thickness and age or body mass index (BMI) was examined.

Methods: A total of 12 flaps in 7 cases were enrolled. In the initial 3 cases, five flaps were elevated in the subfascial plane of the gluteus maximus muscle based on the conventional method. In the 4th case with thick adipose tissue, the flap was elevated in the plane just below Camper's fascia (CF). We then adopted this modified flap elevation method in 7 flaps of the 4thto 7th cases. By using computed tomography, we evaluated the perineal fat thickness (PFT) and gluteal fat thickness (GFT) to determine the thickness of the flap.

Results: All flaps survived completely. In all flaps prepared with the modified method, debulking was not required. The mean PFT (34.4 ± 2.8 mm) of the patients less than 70 years of age was significantly higher than that of patients of 70 years or more (21.0 ± 3.5 mm). The mean GFT (18.4 ± 1.1 mm) of the patients with BMI≥25 was significantly higher than that of patients with BMI<25 (11.8 ± 1.2 mm).

Conclusions: To create a thin pudendal artery flap, the method of elevating the flap in the plane just deep to CF should be adopted, especially in patients less than 70 years of age or with BMI≥25.

Cephalic View of Breast Helps to Assess the Patient's Satisfaction

Presenter: Hiroki Mori, MD, PhD
Co-Authors: Noriko Uemura, MD, PhD, Kentaro Tanaka, MD, PhD, Makiko Inoue, MD, PhD, Tsutomu Homma, MD, Haruka Koga, MD
Affiliation: Tokyo Medical and Dental University, Tokyo

Background and aim: In standard photography of breast, anterior, oblique, and lateral view photos are recommended. On the other hand, patients may watch the breast from the cephalic. In this study, we evaluated the anterior and cephalic view photo of reconstructed breasts, and performed patient outcome studies using questionnaire survey.

Methods: Fifty-six autologous breast reconstruction with abdominal or latissimus flap were included in this study. The cephalic view was taken at 60-70 degrees' elevation angle. The anterior and cephalic view photos were evaluated about symmetry. Questionnaire survey was composed of patient's own frequency of anterior or cephalic view, satisfaction of anterior and cephalic view. Breast Q Reconstruction module (post-operative) was also performed. Each was composed of 4 or 5 points scale.

Results: Mean follow-up was 64.8 months. The cephalic view photo score was different from the anterior one in 32%. Patient's frequency of anterior or cephalic view was equivalent. It showed tendency that someone looked both, and others looked neither. Although the satisfaction from anterior or cephalic view showed different score in 30%, they showed correlation(correlation coefficient 0.69 in anterior, 0.67 in cephalic) with Breast Q score.

Conclusion: Patient outcome study suggested that surgeons can grasp the patient's evaluation and satisfaction with the cephalic view of breast. Cephalic view should be used to discuss with patients and be added as standard photography of the breast.

A Case Report : Staged Reconstruction and Adjuvant Brachytherapy in the Treatment of Soft Tissue Sarcoma at the Mandible Region

Presenter: Erika Dokoshi, MD
Co-Authors: Akira Saito, MD, PhD, Yoshitada Hoshino, MD
Affiliation: Hokkaido University Graduate School of Medicine, Sapporo

Adjuvant brachytherapy following resection in soft tissue sarcoma is used to reduce local recurrences or preserve neurovascular structures[1),2)], but the case of head and neck region is rare. We report a case of the staged reconstruction combined with adjuvant brachytherapy after soft tissue sarcoma resection at the mandible region.

A 53-year-old male was diagnosed with a leiomyosarcoma of mandible region after previous surgical excision and underwent an additional wide local excision. Immediately following resection, brachytherapy catheters were inserted and the

wound was covered with a tie over dressing. Brachytherapy was initiated after the first postoperative day. After completion of brachytherapy, the tie over dressing and catheters were removed and the wounds covered with NPWT dressing. The resulting wound was closed with a free radial forearm flap. There were no postoperative complications and no recurrence during 9 months' follow-up.

There are immediate and staged reconstructions for the wound following soft tissue sarcoma resection combined with adjuvant brachytherapy. To our knowledge, adjuvant brachytherapy has often used immediate reconstruction technique[3),4)], but we underwent staged reconstruction to avoid flap irradiation and complications resulting from brachytherapy catheter placement and dislodgment in the case of immediate reconstruction with flap.

In addition, we used tie over dressing during brachytherapy catheter placement, because the wound couldn't be covered with NPWT dressing. Tie over dressing is easy and able to apply in various area, therefore this case suggests that it may be one of useful methods for temporary wound coverage in head and neck region during brachytherapy.

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Modiolus Reconstruction Using Fascial Suspension with a Free Flap for Full-Thickness Oral Defects Involving the Oral Commissure

Presenter: Kaoru Sasaki, MD, PhD

Co-Authors: Masahiro Sasaki, MD, Junya Oshima, MD, Michiko Owaki, M.D, Akio Nishijima, M.D, PhD, Yukiko Aihara, MD, HIronao Hanihara, M.D, Mitsuru Sekido, MD, PhD

Affiliation: Tsukuba University, Tsukuba-shi, Ibaraki-ken

Introduction: Modiolus reconstruction is important if the oral commissure on one side including the modiolus is removed. There are few reports that summarized multiple cases about modiolus reconstruction with a free flap for full-thickness oral defects involving the oral commissure. In this study, we sought to examine modiolus reconstruction using fascial suspension with a free flap for full-thickness oral defects involving the oral commissure and considered the proper fascial placement.

Patients and methods: We retrospectively analyzed 6 oral carcinoma cases in which modiolus reconstruction was performed. The tumor resection resulted in a lip defect of 10% to 80%. The defect types comprised 2 labial, 2 buccal, and 2 mixed types. The flap was from the anterolateral thigh (5 patients) or the radial forearm (1 patient). All the flaps survived. The upper and lower orbicularis oris muscles were connected to the masseter muscle by means of Y-shaped (4 patients) or V-shaped (2 patients) slings using the fascia lata or palmaris longus tendon

Results: Almost all the patients achieved good static facial appearance without lip deviation or drooping. Mouth opening, oral commissure narrowing, and diet were satisfactory as the dynamic result.

Conclusion: Modiolus reconstruction using fascial suspension is a suitable method to maintain the lip balance easily and to achieve good oral function and natural facial appearance for full-thickness oral reconstruction involving the oral commissure. Especially, V-shaped modiolus has an advantage in terms of the natural oral commissure.

Treatment of Infectious Thoracic Aortic Aneurysm By Prosthetic Graft Replacement and Latissimus Dorsi Muscle Flap - Anatomical Analysis of Intrathoracic Approach By Cadaver Dissection and Clinical Applications -

Presenter: Kazuhiro Toriyama, MD, PhD

Co-Authors: Takafumi Uchibori, MD, PhD, Hideyoshi Satoh, MD. PhD, Yukiyo Tsunekawa, MD, Chisato Koyama, MD, Takatoshi Ueki, D Sci, Hisao Suda, MD, PhD, Yuzuru Kamei, MD, PhD

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Objective: For those patients in which the omentum could not be used, infectious thoracic aortic aneurysm (infectious TAA) is indicated to replace it with prosthetic graft and wrap it with latissimus dorsi muscle flap to prevent postoperative graft infection. However, there are few reports about the intrathoracic approach of the muscle flap to wrap the graft circumferentially. Therefore, we performed cadaver dissection and analyzed the adequate intrathoracic approach and applied clinical cases.

Methods: Anatomical analyses were performed using two cadavers that were fixed by the Thiel method. From 2016 to 2017, four patients underwent surgical management for infectious TAA. The locations of infection were all descending aorta. We retrogradely reviewed the results of treatment of intrathoracic infectious TAA by graft replacement and latissimus dorsi muscle flap according to anatomical analyses.

Results: In cadaver dissection, when we allow the muscle flap to pass through the second intercostal space (ICS) dorsally, the flap wrapped total descending aorta well. When the muscle flap was passed through the 5th or 6th ICS, the flap wrapped distal descending aorta thoroughly. Clinically, Full-circumference wrapping closure beyond the grafts could be achieved by such approaches. The infection was controlled postoperatively and there was no recurrence.

Conclusions: It is anatomically and clinically possible to wrap the graft circumferentially when we allow the muscle flap to pass through the second ICS for total descending aorta and the 5th or 6th ICS for distal descending aorta. The infection and recurrence were well controlled postoperatively.

Rapid Progression of Scalp Melanoma in a Pediatric Patient

Presenter: Tomohiko Yamaguchi, MD
Affiliation: JA Shizuoka Kouseiren Enshu hospital, Hamamatsu

Pediatric malignant melanoma, occurring the age of 20 years, is a rare tumor representing 2.6% of all malignant melanomas. [1] It is more often amelanotic, nodular and thicker at diagnosis than the adult form, resulting in diagnostic delays. [2] A 2-year-old Japanese girl had congenital melanotic nevi(CMM), consisting of brown and black lesions on the left forehead and the hair-bearing left temporal scalp, respectively. She received irradiation with Alexandrite laser 4 times between 5 and 17 months of age for her left forehead lesion, and its color became lighter. For the hair-bearing temporal lesion, only watchful observation was conducted. At 24 months of age, the size of the

lesion was 13 × 11 cm. There was no particular change until 29 months of age, but the black lesion of the temporal area rapidly grew at 31 months. An excisional biopsy specimen showed malignant melanoma with tumor thickness (Breslow thickness) of 8.5 mm. An extensive resection was performed and there was no lymph node metastasis, however, 12 weeks after surgery, cervical lymph node metastasis and lung micro metastasis were observed. Although adjuvant chemotherapy was started with nivolumab or ipilimumab combination therapy 14 weeks after surgery, tumor metastasis was progressed to whole body. Unfortunately 39 weeks after surgery, she died of dyspnea. When CMN develop superimposed papules/nodules, ulcers and color changes, histopathological evaluation is a prerequisite to exclude melanoma. Curettage of CMN in neonates has a potential to lower risk of melanoma not only by numerical reduction in nevus cells but also by removal of "active" melanocytes. [3] Our case indicates that early biopsy or curettage is a considerable choice even in a moderate-sized CMN.

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Surgical Treatment Strategy for Diabetic Forefoot Osteomyelitis

Presenter: Miki Fujii, MD, PhD
Co-Author: Hiroto Terashi, MD, PhD
Affiliation: Kitaharima Medical Center, Ono

Introduction: The aim of this study was to propose an appropriate surgical treatment for diabetic forefoot osteomyelitis (DFO) involving ischemia or moderate to severe soft tissue infection.

Materials and Methods: The records of 28 patients with osteomyelitis were retrospectively studied. All patients had undergone surgery based on preoperative magnetic resonance imaging examinations and histopathological or culture analyses

confirming the surgical bone margin. The appropriate surgical margin, crucial factors for early healing, and prognosis after complete resection of osteomyelitis were examined. After healing, patients were followed up to assess prognosis (range 32–1,910 days, median 546 days).

Results: The healing rate of nonischemic cases of DFO with negative surgical margins was 100% and that of ischemic cases was 84.6%; the ambulatory rates for both types of cases were 100%. No wound (and/or osteomyelitis) recurrence was observed. Nine new cases of DFO developed in six patients (21.4%; eight were due to vascular stenosis, and one was due to biomechanical changes in the foot.) After complete resection of osteomyelitis, preoperative and postoperative C-reactive protein levels and the size of the ulcer were significant predictors of early healing ($p<0.05$, 0.01, and 0.05, respectively).

Conclusion: The appropriate surgical margin should be set in the area of bone marrow edema, based on magnetic resonance imaging examinations after revascularization. In cases with high preoperative or postoperative C-reactive protein levels, long-term antibiotic therapy is recommended, and surgery should be planned after the C-reactive protein levels decrease, except in emergencies.

The Usefulness of New Closed-Type Intra-Wound Continuous Negative-Pressure and Irrigation Treatment That Enables Local Irrigation.

Presenter: Hisashi Migita, MD
Affiliation: Kurume University School of Medicine, Fukuoka

Background: When infected wounds must be closed, Intra Wound Continuous Negative Pressure and Irrigation Treatment(hereinafter referred to as “IW-CONPIT”),which we have reported so far, is a very effective method because wounds can be cured by applying negative pressure while irrigating the closed cavity.

However,this conventional method had several problems that there was a shunt from irrigation tube to aspiration tube, early adhesion of non-infected parts in the wound resulted in insufficient cleaning of infected wounds.

Therefore, We developed a method to clean the part to pinpoint and got almost satisfactory results.

Methods: 10Fr irrigation tube and 16Fr aspiration tube are connected and are placed on a site to be cleaned in the wound. The slit portion of the irrigation drain is placed and start continuous negative pressure irrigation.

Results: This method was performed in 9 patients(mean age,64.7years,range;34 to 82 years,4 men and 5 women). By region, there were 1 mandible, 1 neck, 4 anterior chests, 1 abdomen, and 2 lower legs. All patients were cured without infection.

Conclusion: By connecting the aspiration tube and the irrigation tube, this method has enabled pinpoint cleaning of the most likely source of infection in the wound for a certain period of time. This method is an effective method that can prevent the occurrence of infection in infected wounds that must be closed after debridement. There is a possibility to get healing by cleaning the part to pinpoint of cases with foreign objects such as plates, etc.

Free Flap for Oropharyngeal Cancer Patient Complicated with Intraoral Dehisced Wound Resolved By Rotated Nasolabial Flap--One Case Report

Presenter: Yen-Wei Chen, MD
Affiliation: Taichung Veterans General Hospital, Taichung

Introduction: Oropharyngeal patient who had received multiple surgeries such as wide excision and free flap reconstruction, and radiation therapy sometimes suffered from total flap failure, partial flap loss, or poor wound healing, given to its poor tissue quality and disruption of vascular supply. The commonly used pedicle or free flap may become bulky when the defect was small. In this case, we present a recurrent tongue cancer patient receiving multiple surgeries and radiotherapy, suffered from intraoral wound dehiscence and was reconstructed with rotated nasolabial flap.

Case presentation: The patient is a 40 years old male with medical history of right tongue cancer status post hemiglossectomy and right neck lymphadenectomy. Tumor recurrence over oral cavity and oropharynx was noted, and wide excision, functional neck dissection, and mandible osteotomy were performed. Mandible was reconstructed with metal plate and defect reconstructed with ALT flap. Intraoral wound dehiscence at oral base was noted after the surgery. Debridement and rotated nasolabial flap reconstruction were performed. Wound healed well with inevident scar after the surgery.

Discussion: Total flap failure, partial flap loss, or poor wound healing were sometimes observed in oropharyngeal patient, due to their poor quality of tissue and compromised vascular supply caused by multiple surgeries and radiotherapy.

Commonly used flaps may be too bulky for small defects from partial flap loss or wound dehiscence. According to previous studies, nasolabial flap may be a good choice of flap selection in covering defect about 2 to 3cm in diameter, or 5x5cm defect with bilateral flaps. Even though the blood supply of nasolabial flap was attributed from facial artery, which is often ligated during neck dissection, study shows no adverse effect on the flap¡¦s survival, presumably because of its rich subdermal plexus. It is relatively easy to approach and had cosmetic benefit with an inevident scar.

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Experience of a Practical Method with Double or Triple Rotation Flaps Forreconstruction of the Complicated Wound

Presenter: Yen-Wei Chen, MD
Affiliation: Taichung Veterans General Hospital, Taichung

Purpose: Closure of surgical or traumatic defects offers several challenges to the reconstructive surgeon. An ideal flap is able to close the primary defect, yet minimize the subsequent secondary defect. A local flap matches most of the skin color and texture to the recipient site. A method, which can be widely applied for all the defect, which procedure is easily performed, and whick successful rate is high is rare. We present a practical method with double or triple rotation flaps for reconstruct all the surgical wound combined with implant exposure or traumatic soft tissue loss combined with bone exposure.

Materials and methods: Fourteen patients with complicated wounds, including defect with vital organ or implant exposure, in the trunk, limbs or scalp were studied over the period from April 2017 to December 2018. Eight defects were located in skull(57%), two defects in sacrum(14%), two defects in legs(14%), one defect in back(7%) and the last one in perineum(7%). Nine patients were female(64 %) and five

patients(36 %) were male. Age from 18 to 90 years old, average was 54 years old. Eleven defects were reconstructed with double rotation flaps and another three defects were reconstructed with triple rotation flaps.

Result: All patient with surgical defect or traumatic soft tissue loss received reconstruction with local double or triple rotation flaps. All cases were reported no flap failure, wound dehiscence or infection. All patients returned back to normal daily work within one week after removal of stitches according to surgical site. The follow-up period was from two months to 22 months with an average vital organ- or implant explosure-free interval of 15 months.

Conclusion: We describe a practical method for repairing all the defects, even complicated wound, with a double or triple rotation flaps that are not only low complication rates but also easy application. The flap may be performed anywhere that tissue is available on opposing sides surrounding an approximately circular defect. There are many manners that a complicated defect can be closed: by regional flap, distant flap or free flap. However, the procedures except our method need both high surgical technique and long learning curve. Moreover, they were always complicated with higher flap failure rates and poor cosmetic results. We believe our method of closure is simple, good color and texture match, high survival rate and lower complication rates.

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A Low-Cost Training Model Using Pig Belly Meat for Harvesting of Deep Inferior Epigastric Artery Perforator Flap

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Objectives: In breast reconstruction, deep inferior epigastric artery perforator (DIEP) flap is one of the most popular flaps due to its versatility. However, the dissection of perforators is difficult and complex for beginners. Here we propose a DIEP flap elevation model using pig meat.

Methods: We use a portion of the pig belly with rind. In the pig abdominal wall, there are rectus abdominis, internal oblique muscles and external oblique muscles similar to humans. The anterior sheath tends to be slightly thinner than humans. There are cutaneous muscles on the anterior sheath.

The trainee places the lateral side (the rib side) in front, cuts off the skin from the middle of the external oblique muscle, and cuts the cutaneous muscle down to the deep fascia. The subsequent steps are almost the same as the actual DIEP harvesting. The trainee identifies the skin perforator while pulling the tissue to the median direction, dissects the anterior sheath, splits the rectus abdominis muscle, and reaches the DIEA main vessels. Overall satisfaction was high. When the blood was drained very well, there was a tendency for the difficulty to harvest because the blood vessels collapsed and there was no coloration.

Discussion: The dissection of the perforator requires a certain skill. There are training by human cadaver and living animals, both of which are highly effective but expensive. The pig meat training proposed here is low cost and highly useful, for the purpose of giving trainees successful experiences and removing the barrier to clinical practice.

Ceiling Culture-Derived Preadipocytes (ccdPAs) Keep Higher Adipogenic Potential Than ASCs Because of Epigenetic Status of DNA Methylation and Histone Modification

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Background: Two types of cells can be harvested from subcutaneous adipose tissue. The one is adipose-derived stem cells (ASCs) and the other is ceiling culture-derived preadipocytes (ccdPAs). We previously reported that ccdPAs keep higher adipogenic differentiation potential than ASCs even after seven weeks of culture. Little is known about the epigenetic differences, which may contribute to differences in adipogenic potential, between these cell types.

Purpose: The purpose of this study was to address the adipogenic potential and underlying epigenetic status of ASCs and ccdPAs.

Materials and Methods: ASCs and ccdPAs were cultured from abdominal subcutaneous fat tissues of three metabolically healthy, lean females. To evaluate the adipogenic potentials of undifferentiated ASCs and ccdPAs, two types of epigenetic assessment were performed using next generation sequencing: DNA methylation assays with a 450K BeadChip; and chromatin immunoprecipitation assays (ChIP-Seq) for trimethylation of histone H3 at lysine 4 (H3K4me3).

Results: Focusing on the promoters of adipogenic master regulator peroxisome proliferator activated receptor gamma (PPARG) gene, we found that CpG methylation levels of PPARG transcript variant 1 (PPARG v1) promoter were higher in ASCs than in ccdPAs in. In contrast, H3K4me3 levels of PPARG v1 promoter were higher in ccdPAs than in ASCs. Both results were consistent with cellular functional difference between ASCs and ccdPAs.

Conculusion: Epigenetic status of PPARG promoter of ccdPAs is in status in which transcription proceeds more easily than ASCs. Our results enhance our understanding of these cell populations and will facilitate further application of ASCs and ccdPAs in regenerative medicine.

Lipoabdominoplasty with High Definition Sutures

Presenter: Javier Jesus Jesus Vera Cucchiaro, MD
Affiliation: AESTHETIC CLINIC, Salta

Introduction: lipoabdominoplasty with HDS (High Definition Sutures) allows one to obtain better abdominal modeling with the simulation of the rectus abdominis tendinous intersections and its vertical edges while maintaining a lower percentage of complications such as seromas and hematomas.

It is an evolution of the Lipoabdominoplasty technique described by Osvaldo Saldanha(1) that any board-certified plastic surgeon can apply it to differentiate oneself from the non-specialist doctors who promote bad publicity for our specialty.

Materials and Methods: All female patients who were treated with this surgical technique, from November 2016 to January 2019, totalizing 132 patients, with a mean age of 42 years (range between 29 and 63 years) and a mean BMI of 26 Kg/m2. We had 57 patients (43%) who were secondary cases: previous lipoaspiration in the abdomen in 46 patients and previous lipoabdominoplasties in only 11 patients.

In all of our patients, plication of the rectus abdominis and obliques with X-points was performed as described by Nahas. Vaser liposuction (UAL) was used in primary cases and laser assisted (LAL) in secondary ones. The liposuction is performed in a tunnel separating the semilunar line from the supra-umbilical area with 4.0- or 5.0-mm cannulas. Two to three stitches of nonabsorbable suture (mononylon 2-0) are placed at the level of each semilunar line, fixing it towards the midline and below in the abdominal wall.

Results: The use of PTS (Progressive Tension Sutures) (2,3) added just 3 to 5 minutes to our average lipoabdominoplasty's total time and the HDS, just 5 to 8 minutes more.

Concerning complications, we had a 1.6% incidence of seromas, 3.2% incidence of abnormal scarring treated under local anesthesia, residual lipodystrophy treated under local anesthesia in 4.8% of the cases and associated with sedation in 1.8% of the cases. We had no cases of hematoma, DVT or TEP.

Discussion: The association of PTS and HDS promoted a synergy between these two types of sutures, allowing to reduce the tension of the flap, thus improving the quality of umbilical and abdominal scars, while decreasing the incidence of seromas and hematomas and avoiding the use of suction drains. The surgical time was slightly increased (10 minutes on average) with a low impact on total costs since the added material (mononylon and polyglactin 910 sutures) are inexpensive. Diminishing flap's excessive tension also has the benefit of avoiding localized fat necrosis.

Conclusions: This surgical technique allows us to differentiate ourselves from non-specialist physicians, with more refined results in the abdominal contour, with a patient's high satisfaction rate and a low rate of seromas and hematomas.

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High Definition Liposuction Protocol and Surgical Design

Presenter: Arian Mowlavi, MD

Affiliation: Cosmetic Plastic Surgery Institute, Laguna Beach, CA

Utilization of ultrasound assisted liposuction techniques has expanded and enhanced traditional liposuction results. By virtue of increasing the capacity of fat removal, referred to as high definition liposuction, a new concern regarding accommodation of skin redundancy has appeared. The present paper outlines a detailed protocol to optimize and objectify high definition liposuction results. We introduce the high definition liposuction(HDL) body scale which takes into account three factors including fat excess, skin redundancy, and skin texture. High Definition Liposuction (HDL) Body Scale has been designed to objectify “Patient Selection” considerations above to guide both surgical plan and to objectify improvements in patient results. The HDL Body Scale ranges between 2 to 10 points with patients' scores determined by degree of excess fat as well as skin texture and skin redundancy. Patient scores determine the surgical design intended to achieving a High Definition results assigned to scores of near perfect 9 or 10). We will present over 50 patient cases that have utilized the HDL body scale demonstrating 1) preoperative score assignments ranging from 2 to 8; 2)customized surgical design based on score assignments, and 3)objective near perfect 9 or 10 score postoperative results. Surgical designs will be demonstrated ranging from a)use of ultrasound assisted liposuction only (preoperative scores of 7 to 8), b)use of simultaneous ultrasound assisted liposuction and helium activated radiofrequency (preoperative scores of 6 to 7), c)use of ultrasound assisted liposuction and a mini-tuck procedure (preoperative scores of 5 to 6), and d)use of staged full tucking procedures followed by ultrasound assisted liposuction following 3 month delay (preoperative scores of 2 to 5). Utilization of ultrasound assisted liposuction provides the opportunity to achieve high definition results when appropriate preoperative patient selection and customized surgical design is implemented.

Drainless Abdominoplasty with Concomitant Liposuction: How Sparing Scarpa's Fascia Enables Drain Free Body Contouring

Presenter: Vinod K. Chopra, MD
Co-Authors: Lawrence Gray, MD, Brannon Brannon Claytor, MD
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Purpose: Abdominoplasty results in significant open cavity, and seromas following surgery drives most surgeons to utilize drains post-op. This does not reduce the incidence of post-operative seromas to zero, nor does it make for a positive patient experience. Maintaining the lymphatic drainage within Scarpa’s Fascia allows for autogenous fluid management following surgery.

Methods and Materials: A retrospective review of the data was performed on 179 patients that underwent Scarpa's sparing abdominoplasty with concomitant liposuction over a 6-year period. Post operatively, chemoprophylaxis was given for DVT prophylaxis of indicated per the Caprini scale. The Scarpa's fascia is spared on the inferolateral aspect on both sides. The dissection is carried down to the rectus fascia centrally, to allow for full rectus plication. Surgical dissection is done after liposuction and preferentially the cut function of the cautery is employed. Coag is only used at blood vessels. The entire flap is removed as a single unit from preoperative markings. The upper flap is dissected with discontinuous undermining, thus maximally preserving rectus perforators.

Results: Data analysis showed that the average age was 44 years (SD=11). Average patient weight was 76.43 kg (SD=7.4). Average BMI was 28.4 kg/m^2 (SD=0.85) Average operative time was 165 minutes (SD=24.75). The average amount of fat liposuctioned was 702 g (SD=628) with average flap resection weighing 1.68 kg (SD=1.75). Complication rates were as follows: overall 16.8%, seroma 4.5%, hematoma 0.5%, dehiscence 2.2%, PE 0.5%, suture granuloma 5.1%, UTI 0.5%, and erythema 1.1%

Conclusions: Concomitant liposuction with abdominoplasty allows for discontinuous undermining enabling direct skin excision and preservation of Scarpa's fascia. This preserves blood flow and innervation to the abdominal wall, which improves autoregulatory homeostasis. Minimizing cautery dissection and preserving the Scarpal layer minimizes serous fluid production, thus obviating the need for surgical drains. Doing so allows earlier mobilization and showering, eliminates complications from the drain itself, and dramatically improves patient satisfaction. The incidence of complications in this study is comparable to patients who are treated with drains.

Abdominoplasty Boundaries: Speed; Symmetry; Scar; And Safety

Presenter: Maher M. Anous, MD
Affiliation: Anous Esthetic Surgery, Beverly Hills, CA

Purpose: To re-examine the philosophy of a popular operation that, in this day and age of evidence-based results, is conspicuously lacking both a metric starting goal and a measurable end result. This communication proposes to introduce such rigorous analytical criteria, allowing surgeons to understand why the operation is either indicated or better avoided; to plan applicable designs meeting the measurable selection criteria; to safely, efficiently and rapidly perform the surgery based on a pre-

planned design; to obtain adequately concealed scars meeting esthetic goals; and to objectively and convincingly parade results based on verifiable criteria.

Methods and Materials: The following anatomical points and lines are used as boundaries:

- XSS: Xiphi-Sternum Standing.
- XSR: Xiphi-Sternum Recumbent.
- CMS: Costal Margin Standing.
- CMR: Costal Margin Recumbent.
- LMT: Lines of Maximal Tension (divergent tangent lines from XSS to CMR).

Youthful, athletic and attractive figures have no measurable separation between XSS and XSR or between CMS and CMR. It is the degree and type of separation that will dictate the TYPE of surgical design needed as well as the EXTENT of the tracing. Furthermore, the surgeon's goal becomes the restoration of point and line concomitance, an easily verifiable postulate.

Experience: 889 consecutive abdominoplasties were performed using fixed lines of reference tailored to individual bodies.

Summary of Results: There were a total of 604 M-designs; 261 FDL-designs; 12 Manta Ray designs; 7 Inverted-V designs; 3 U-designs (obsolete); 1 Half Manta Ray design; and 1 Reverse Abdominoplasty. Mortality was 0.22% (2/889). The detectable rate of DVT was 3.6% (32 patients). Mean surgical time was 76 minutes for the M-design and 134 minutes for the FDL design. There were 6 bleeding episodes (0.67%) and 13 seromas (1.5%). Infection rate was 0.8% (7/889). Given the more aggressive nature of the FDL- design, the incidence of incisional breakdown (any opening larger then 2 inches in any direction) was 42% (109/261) although this infrequently affected the finality of the result. All M-design scars were assessed (by the author) as more favorably placed (in the thighs flexion crease lines) than comparative results posted on the Internet although the quality of the scar likely suffered, in part due to the extent of the resection. Reaching the ideal goal of "landmark concordance" in the 137 subjects under later consideration was possible in 59% of M-designs (52/88); 26% of FDL-designs (11/43); 20% of Manta Ray designs (1/5); and 100% of Reverse abdominoplasty (1/1). The results were consistently higher for patients operated on for a second time, either following a procedure done elsewhere or as take backs (secondary abdominoplasties). Based on these results, modification of certain technical aspects of design and performance were introduced.

Conclusions: The adoption of various pre-planned tracings dictated by body habitus and point separation has had a major (and radical) impact on the design and conduct

of the surgery, making it more agile hence positively influencing safety (less anesthesia exposure). With the newly introduced methodology it is now possible to apply rational selection or exclusion criteria then to objectively judge and compare results.

Assessing Abdominoplasty Aesthetics - Do Plastic Surgery Patients See Things Differently?

Presenter: Dylan Joseph Peterson, BA
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Affiliation: Stanford University, Stanford, CA

Introduction: Satisfaction is an important outcome for cosmetic plastic surgery procedures and hinges upon improvement of aesthetics. Understanding the salient features that draw focus when assessing aesthetics is important for maximizing perceived outcomes. Eye-tracking technology provides an unbiased method for determining the features that draw attention when evaluating aesthetic plastic surgery. This study aimed to characterize viewing patterns of plastic surgery patients and laypeople when assessing pre- and post-abdominoplasty images.

Methods: Twenty women who previously underwent cosmetic procedures and twenty women without a prior history of cosmetic procedures were shown eight pairs of pre- and post-abdominoplasty images in both AP and lateral views (32 images total). Image pairs were randomized to whether pre- or post-procedural images came first. Participants viewed each image until they decided upon an aesthetic rating (scored 1-10), while an eye-tracking device (Tobii X2-60, estimated accuracy: 6mm, Tobii Inc.) recorded participants' gaze. Groups were compared using two-tailed, independent t-tests.

Results: The average improvement in rating between pre- and post-procedural images was 30.4% higher in the patient group than in the lay group ($p < 0.05$). The patient group spent 22.6% less time evaluating the images on average ($p < 0.05$); however, the patient group spent proportionally more time fixated on features of interest (20.4% of their time spent viewing images on average vs 10.0%, $p < 0.001$). Specifically, the patient group spent proportionally more time fixated on the umbilicus (25.6% vs 11.6%, $p < 0.001$) and scar line for AP views (13.2% vs 5.1%, $p < 0.001$) and more time fixated on the abdominal curvature for lateral views (7.6% vs 3.6%, $p < 0.001$). There was no significant difference between the groups in terms of fixation on the flanks or back curvature. Both groups tended to fixate on the umbilicus first for AP

views (63.0% of all samples) and the abdominal curvature for lateral views (35.5% of all samples). Overall, each group had similar viewing patterns in terms of the time it took to first fixate on a particular feature and number of times they fixated on each feature. There was no correlation between the time a participant spent viewing an image and the aesthetic rating the participant gave it.

Conclusions: Eye-tracking enables determination of features which draw gaze and attention and may be used to help assess surgical outcomes. With this technology, we found that women who previously underwent cosmetic procedures view post-procedural images more favorably and require less time to assess images. However, these women were more targeted viewers, spending proportionally more time fixated on key features, such as the umbilicus, scar line, and abdominal curvature, than women who have not undergone cosmetic plastic surgery. Finally, the umbilicus was the most heavily fixated upon feature for both groups in our study, suggesting it strongly draws focus and therefore is a structure surgeons should dedicate increased care and attention on during abdominoplasty procedures.

Review of Insurance Coverage for Abdominal Contouring Procedures in the Post-Bariatric Population

Presenter:	Ledibabari M. Ngaage, MD
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Introduction: The post-bariatric population experience excess skin laxity, particularly in the abdomen which can be surgically corrected by abdominal contouring procedures. Third-party insurers have subjective requirements for coverage, which can limit patient access to treatment. We aim to evaluate current insurance coverage for abdominal contouring procedures for this population.

Methods: We conducted a cross-sectional analysis of insurance policies for coverage of panniculectomy, lower back excision (LBE) and circumferential lipectomy. We also evaluated coverage of abdominoplasty as an alternative to panniculectomy. Insurance companies were selected based on their market share and state enrolment. A list of medical necessity criteria was abstracted from the policies that offered coverage.

Results: Of the 55 companies evaluated, 98% possessed a policy that covered panniculectomy versus 36% who would cover LBE ($p<0.0001$), and one third

provided coverage that would permit circumferential lipectomy. Of the insurers who covered panniculectomy, only 30% would also cover abdominoplasty. Documentation of secondary skin conditions was the most prevalent criterion in panniculectomy policies (100%), whereas impaired function and secondary skin conditions were most common for coverage of LBE (73%, and 73%, respectively). Frequency of criteria for panniculectomy vs LBE differed most notably for: (1) secondary skin conditions (100% vs 73%, p=0.0030), (2) weight loss (45% vs 7%, p=0.0106), and (3) duration of weight stability (82% vs 53%, p=0.0415).

Conclusion: We propose a comprehensive list of reporting recommendations to optimise authorisation of abdominal contouring procedures. For the post-bariatric population, panniculectomy is covered more often and has more standardised criteria than LBE or circumferential lipectomy. However, all have vast intra-company and inter-policy variations in coverage criteria, hindering access to procedures even among patients with established indications.

Efficacy of Postoperative Local Anesthesia in Reducing Pain and Opioid Usage after Elective Body Contouring

Presenter: Derek B Asserson, BS
Co-Author: David E Sahar, MD
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Background: Pain management in the postoperative cosmetic surgery patient has traditionally been achieved with narcotic medications. In an effort to minimize side effects and prevent addiction, plastic surgeons are searching for novel ways to provide adequate analgesia. We conduct a meta-analysis that looks at the application of bupivicaine and lidocaine in the form of nerve blocks or pain pumps for patients who underwent elective body contouring procedures, namely abdominoplasty, breast augmentation, or reduction mammoplasty.

Methods: A search of the PubMed/MEDLINE database for articles including the terms ‘postoperative analgesia’ OR ‘postoperative pain management’ AND ‘in plastic surgery’ OR ‘in cosmetic surgery’ OR ‘in elective surgery’ yielded 148 papers, which was brought down to 73 after initial screening by title. Inclusion criteria were then applied to remove those not written in English, those without access to the full text, and those without extractable data on outcomes, leaving 6 investigations to examine.

Results: Within the six studies that met inclusion criteria, 2,131 patients were identified as having had some form of elective body contouring. Of these, 55% were put into experimental groups that received an intervention (bupivicaine or lidocaine in a nerve block or pain pump). At the 24-hour mark following each operation, pain scores were computed on a 1-10 scale and opioid dose-equivalents were noted. Those who received the intervention had an average pain score of 4.14 compared to 7.24 for those who did not, and required an average of 4.85 narcotic doses versus 10.02. In each case, an independent samples t-test yielded a statistically significant difference ($p<0.001$).

Conclusions: The opioid epidemic has extended to all surgical specialities, including plastic surgery. Implementation of a local anesthetic postoperatively seems to be an efficacious and cost-effective mechanism to not only help with pain, but also lower the need for narcotics. The field of plastic surgery, especially with respect to body contouring procedures by choice, can continue to do its part in fixing a worldwide issue.

Skin Only Versus Fascial Plication: Centralizing the Umbilicus during Tummy Tuck

Presenter: Jessica Vavra, MD
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Purpose: The umbilicus is often not a midline structure. Centralization of the umbilicus during an abdominoplasty is routinely performed at the level of the skin; however, this is associated with a high rate of postoperative reversion. We propose using an eccentric fascial plication centered around the midline in order to maintain postoperative centralization of the umbilicus.

Methods: A retrospective study was conducted of all patients between 2015-2018 who underwent abdominoplasty with either skin only (concentric plication) versus fascial (eccentric plication) umbilical centralization. Fishers exact test was used to compare the two groups and assess differences in rates of umbilical reversion.

Experience/Summary: Forty-nine patients were included in the study; the majority was female (n=47) and Caucasian (n=32). Twenty-eight patients underwent concentric plication and twenty-one had eccentric plication. Mean BMI in the concentric and eccentric groups were 32 kg/m2 and 29.3 kg/m2, respectively. Average

follow up was 13.5 months for concentric plication and 6.7 months for eccentric plication. Of those who received concentric plication, ten patients (34%), had their umbilicus revert to the preoperative position, while none in the eccentric plication group reverted, ($p<0.0031$).

Conclusion: Midline placement of the umbilicus during an abdominoplasty is important in providing symmetry to optimize aesthetics. Eccentric fascial plication maintains the centralization of the umbilicus when compared to concentric fascial plication with skin-only centralization.

In-Vivo MRI Investigation of Gluteal Vein Anatomy in Relation to Gluteal Fat Grafting

Presenter:	Sergey Y Turin, MD
Co-Authors:	Megan Fracol, MD, Eric Keller, MD, Michael Markl, PhD, Jeremy Collins, MD, Daniel Krochmal, MD, John YS Kim, MD
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Purpose: Deaths in gluteal autografting procedures are likely secondary to tears in the large gluteal veins, allowing for macroscopic fat emboli. Data is lacking on the precise location and caliber of the veins in question - the inferior and superior gluteal veins (IGV and SGV). Using MRI Angiography, we endeavored to more precisely describe these structures to improve the safety of these procedures in the future.

Methods: A historical cohort was analyzed to map the location of the SGV/IGV. It included 9 female patients who underwent MRA pelvis as part of their workup for cryptogenic stroke. Average age was 36 and average BMI 26.82. All scans were conducted in the supine position.

A prospective cohort of 7 female volunteers, funded by a grant from the Aesthetic Surgery Education and Research Foundation (ASERF) also underwent MRA pelvis in the supine, prone, prone with a bump (jack-knife), left and right decubitus positions in one session after a single contrast administration. Average age was 28.67 and average BMI was 21.77. The caliber and the course of the IGV and SGV was mapped versus the coccyx, posterior superior iliac spine (PSIS), and the greater trochanter of the femur (GT).

Results: The SGV tributaries run on the lateral side of the iliac crest before coalescing to exit into the pelvis at 52% of the distance laterally between the coccyx and the GT, and 44% of the distance vertically from the coccyx to the PSIS, on average.

The IGV has a large trunk running superomedially, spanning between 31% and 58% of the distance between the coccyx and GT and between 11% to 37% of the vertical distance between the GT and the PSIS.

The IGV is most superficial inferolaterally, on average 56mm deep to the skin (the muscle 27mm thick and subcutaneous fat 30mm thick on average).

The major trunks of the SGV and IGV run in the plane deep to the muscle layer, with much smaller tributaties in the bellies of the muscles themselves.

In the prone position, the IGV and SGV have an average caliber of 5.96mm and 5.63mm. With a bump under the prone volunteer's pelvis (jack-knife position), these calibers decreased by 21% and 27%, respectively. In lateral decubitus positioning, the SGV and IGV caliber on the 'up' side of the patient decreased by 14% and 15%.

Conclusion: This is the first in-vivo study of gluteal vein anatomy. The SGV courses adjacent to the iliac bone and the IGV courses superomedially in the area most likely to be grafted. The major trunks of both vessels are immediately deep to the muscle layer. Positioning the patient prone with a bump under the hips decreases the caliber of the IGV and SGV as well as the smaller intra-muscular branches in this cohort. Positioning in the lateral decubitus position appears to also decrease the elevated vein caliber, but to a lesser extent. These data will guide development of anatomically-based zones of safety and relative zones of danger.

Resolution of Autoimmune/Inflammatory Symptoms after Debridement of Gluteal Silicone Injection: Correlation or Causation?

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Introduction: As modern aesthetic trends shift to fuller, more dramatic curves, the number of cosmetic gluteal augmentation procedures have also increased dramatically. [1] In an attempt to "enhance" gluteal appearance, individuals have sought out silicone injections, which in recent years has become a frequent illegal practice. After undergoing injection, some of these individuals develop a wide range of both local and systemic symptoms. The Autoimmune/inflammatory Syndrome Induced by Adjuvants (ASIA) was defined in 2011 by Shoenfeld et al. as a condition in which the

exposure to an adjuvant leads to an aberrant autoimmune response. [2-3] The purpose here, is to present our series of 10 patients who presented with ASIA Syndrome after a history of undergoing illegal gluteal injection of silicone, with prompt resolution after surgical excision of the foreign material.

Patients and Methods: A retrospective chart review identified ten (10) patients diagnosed with ASIA Syndrome after having undergone gluteal injection with an adjuvant. Demographic, pre-operative, and post-operative clinical data was collected, as well as pre-operative Magnetic Resonance Imaging (MRI), which allowed for evaluation of the extent of soft tissue involvement. Patients were considered to have ASIA syndrome according to Shoenfeld's diagnostic criteria: (when 2 major criteria were present, or when 1 major criterion & 2 minor criteria were present). Each patient underwent operative debridement of the injected material and had a minimum of six months follow-up after surgical intervention, to assess for symptom resolution and/or recurrence.

Results: The mean age at symptom onset was 37 years of age (range 25-45 years), the mean latency period between gluteal injection and symptom onset was 31.4 months (range 4-49 months). All patients had silicone gluteal injection performed in the United States by an aesthetician, except for one case, which was performed in Colombia, by a physician. General weakness, myalgia, pruritis, chronic pain, lower extremity numbness, chronic fatigue, sleep disturbance, and skin discoloration were the most frequently reported symptoms. In all cases, the debrided material was reported to be silicone, by the pathologist. Following surgical debridement of the injected silicone, every patient reported complete symptom resolution within 3 weeks of their last debridement procedure. Mean follow-up time after debridement was 10.2 months (range 6-21 months).

Conclusion: This case series demonstrates that despite FDA warning, patients are still being augmented with injectable silicone. All patients in this series had complete resolution of all symptoms shortly after surgical debridement, without any recurrence during the follow-up period. Given the limitations of this study one would be hard-pressed to draw a causal relationship between patients receiving silicone injection and the development of their reported symptoms, or that surgical debridement was responsible for their symptom resolution.

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Optimizing Brazilian Buttocks Lifts Using the Buttocks Assessment Tool

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The buttock is an essential feature of the female silhouette. This has led to the rise of Brazilian Butt Lift (BBL) as one of the most popular plastic surgery procedures in recent years. Despite the popularity of this buttocks augmentation and reshaping procedure there remains no prevailing standard for the ideal buttocks size and shape. In fact, we have observed a wide range of desired buttocks size and shapes amongst our patients. During a BBL procedure, fat from the abdomen, back, flank, thighs, and even the buttocks itself are removed and/or transferred into the buttocks to achieve improved shape and size. We have observed that Brazilian Butt Lift goals can be subjective with respect to the amount of volume and shape desired and can be affected by age, cultural, and ethnic differences. As a result, the satisfaction of patients undergoing BBL is subject to achieving each patient's unique goals. In order to define each patient's desired buttock shape and volume, we have designed the buttocks assessment tool in order to objectify patient goals and results. The tool assesses desired buttocks fullness (PA view: waist to hip ratio) and the desired buttocks projection (Profile view: waist to buttocks projection) utilizing a range of digitally altered buttock sizes and shapes with the addition of maximal fullness and projection varied at high, middle, and low buttocks levels. A survey of over 300 patients will present demonstrating variation of desired buttocks size and shape based on patient's age, cultural, and ethnic differences. This tool has become critical to understanding patient goals, ensuring delivery of patient desires, and objectifying BBL results.

Atypical Mycobacteria Infections Following Gluteal Fat Transfer Procedures Performed in the United States

Presenter:	Adekunle Elegbede, MD
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Introduction: Atypical Mycobacteria (ATM) infections are known complications of fat transfer procedures performed outside of the United States. The presentation of these atypical Mycobacteria infections is indolent and non-specific. Therefore, they are only diagnosed early if there is a high index of suspicion, and diagnosis can be missed because of the erroneous belief that they are only contacted following cosmetic tourism outside of the United States. Our objective was to present cases from our experience that challenge this misconception.

Methods: We conducted a retrospective review of patients who presented to Johns Hopkins Hospital with an ATM infection following a plastic surgery procedure. We then performed a literature review using three databases to identify texts pertaining to ATM infections following plastic surgery procedures in the United States.

Results: We present two cases of atypical Mycobacteria infections following fat grafting to the buttocks that were performed at surgical centers located in the United States. Both patients presented at our center 4 weeks after Brazilian Buttock lift procedures at two different outpatient surgery centers in Miami, Florida. Both patients eventually required hospitalization, long term IV antimicrobials, and serial surgical debridement or extensive local wound care.

Conclusion: These cases provide evidence that atypical Mycobacteria infections are not exclusive to liposuction/ fat grafting procedures performed outside the United States. Clinicians should have a high index of suspicion for these infections in patients that present with draining, nodular skin lesions following fat grafting procedures, even when the surgery was performed within the United States. Additionally, these cases highlight the existence of travel for cosmetic tourism to destinations within the United States. The cost and responsibility of managing complications from these procedures is significant and may burden the healthcare system in locales remote from where the cosmetic procedure was performed.

Improving Safety in Gluteal Augmentation: Potential Role of Corticosteroid Prophylaxis in the Prevention of Micro-Fat Embolism Syndrome

Presenter:	Tyler Safran, MD

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Introduction: Complications associated with gluteal augmentation procedures using autologous fat grafts are unacceptably high. Plastic surgeons continue to evaluate associated complications and explore preventative measures to reduce such complications. Microscopic fat embolism syndrome (micro-FES) has been recently identified as a potentially fatal complication following gluteal augmentation using autologous fat grafts. Recent safety recommendations may be insufficient for its prevention. This systematic review evaluates the potential role of corticosteroid prophylaxis for the prevention of micro-FES in gluteal augmentation procedures.

Methods: A systematic search was performed using the National Library of Medicine (PubMed), Medline and Embase databases. Search terms were those pertaining to studies reporting on the efficacy of prophylactic corticosteroid administration on micro-FES incidence in a high-risk surrogate population.

Results: Thirteen articles met the inclusion criteria for review, comprising two studies reporting on the efficacy of a single intravenous (IV) corticosteroid dose for the prophylaxis of micro-FES, nine studies reporting on multiple prophylactic IV doses, and two additional studies reporting on the efficacy of inhaled corticosteroids in this context. The prophylactic efficacy of multiple IV doses of methylprednisolone, or a single larger dose, was established, while the efficacy of inhaled corticosteroids remains elusive.

Conclusion: A single peri-operative IV dose of methylprednisolone may be most appropriate for use by plastic surgeons for the prevention of micro-FES in the gluteal augmentation population. The safety and implication of this therapy on wound healing and fat graft survival are discussed. Finally, further recommendations pertaining to the prevention, timely recognition, and effective management of micro-FES are presented to continue improving the safety outcomes of this procedure.

Avulsion Fat Grafting Gluteoplasty

Presenter: Gaurav Bharti, MD
Affiliation: Hunstad Kortesis Bharti Cosmetic Surgery, Huntersville, NC

Introduction: There continues to be a steadily increasing demand for buttocks contouring procedures. Patients presenting with buttock deflation and ptosis require not only volume replenishment but also an excisional procedure to achieve the desired result. Systematic reviews comparing gluteal augmentation techniques show the lowest rate of complications with fat grafting as compared to autologous flap or implant augmentation[1–3]. Although fat embolism is a dreaded risk, subcutaneous placement of fat has been shown to be safe and effective[4,5]. Drawing inspiration from Hunstad's avulsion brachioplasty and avulsion thighplasty[6,7], we have developed a technique called avulsion fat grafting gluteoplasty which combines liposuction, skin removal, and gluteal fat grafting. This technique preserves vasculature and lymphatics. As seroma is the most common complication after buttocks lift[8,9], the avulsion technique may mitigate this risk and as well as the risk of hematoma. Lipo-body lifting has been previously described and has been shown to have a decreased rate of seroma and hematoma. [10,11] With our combination technique, we seek to improve buttocks aesthetics by incorporating fat grafting for volume correction and minimize complications by utilizing the skin avulsion technique.

Methods: Every patient who underwent avulsion gluteoplasty by a single surgeon was reviewed and included in the study. Seven patients were included with an average age of 48 (range 34-62) and average BMI was 24.7 (range 20-31). Six patients were Caucasian and 1 was black.

Technique: Markings are performed by bimanual palpation to gather excess tissue with the final incision line centered low so that it is hidden beneath undergarments. The operation is performed prone under general anesthesia. Power-assisted liposuction of the resection pattern, and possibly other marked areas, is performed and fat is harvested for transfer. In the area of the resection pattern, thorough liposuction of the superficial layer is performed with a basket tip cannula to separate the skin from the underlying tissues. After verifying the markings, skin incisions are made through the dermis and tissue is avulsed from medial to lateral on both sides. Deep closure of the SFS and dermis is performed followed by fat grafting into the subcutaneous plane in the buttocks. After completion of fat grafting final skin closure is performed.

Results: All patients were satisfied with their result. One patient, who underwent gluteal implant removal developed bilateral gluteal seromas in the old implant pockets treated with serial aspiration. There were no other complications.

Conclusions: Avulsion gluteoplasty is safe and effective with a low complication rate. This technique is ideally suited to patients with buttock deflation and ptosis who need combined skin reduction and volume augmentation.

Circumferential Lower Body Lift with Auto-Buttock Augmentation: A New Approach.

Presenter: Tim S Peltz, MD
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Introduction: With continuously rising BMIs in our society and the growing access to bariatric surgery, body lift procedures are becoming more and more common. These contouring surgeries are invasive surgical interventions and indications have to be well thought through. One of the main problems in lower body lift surgeries is the resulting "flat buttock syndrome". We want to present a new simple staging concept for the surgical contouring of the lower body and describe our method of auto-augmenting the gluteal region in a circumferential body lift. The aim of this research project was also to establish portable 3D scanning as an objective research method to evaluate body contouring surgeries.

Material and Methods: So far 45 patients underwent a circumferential lower body lift procedure since 2017. 25 patients underwent the procedures without auto-augmentation of the gluteal region and 20 patients were operated including an auto-augmentation of the buttock area. To augment the buttock area a modified perforator flap technique was applied (modified SGAP rotation flap). Results of both groups were compared regarding operating time, complication rates and buttock projection result. Surface scans were performed with a portable Artec Eva high resolution 3D scanner. Patients were scanned pre-, directly post-surgery and additionally 12 months post-surgery.

Results: Portable 3D scanning in an operative setting is practical and straightforward to perform. No harm or risk is added to the surgical procedure or patient. In the 20 patients who underwent the body lift procedure with SGAP buttock augmentation, a significant improvement of buttock contouring was detected immediately after surgery. Aesthetic results can be individualised to patient’s wishes/expectations: -by flap design (shape, width, length, thickness) -by pocket dissection (shape, width, depth) -by flap fixation (sutures, infra-gluteal fold reconstruction). The pronounced projection improvements measured directly after the surgery were only detected to a smaller extend after 12 months, nevertheless still improved in regards to volume distribution and projection when compared to the non-augmented group. Complication rates were not significantly higher in the augmentation group when compared to the conventional body lift group.

Conclusions: The auto-augmentation of the gluteal region in a body lift procedure via "SGA perforator rotation flap" is safe, reliable and an effective technique to overcome

the undesired flat buttock problem accompanied with conventional lower body lift procedures. 3D scanning is an objective method to compare and evaluate techniques in body contouring surgery. More patients and longer follow-up intervals will show if the improved buttock projection results achieved with SGAP auto-augmentation surgeries prevail over time.

Anatomical-Radiological Study on Gluteal Danger Zones

Presenter:	Edoardo Dalla Pozza, MD
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Background: The "Brazilian" gluteal augmentation procedure has proven to be a dangerous and potentially deadly procedure. Fat injections with cannulation of gluteal veins and sciatic nerves have been described and reported in literature. [1-3] This study aims to map and better describe the localization and caliper of dangerous structures of the gluteal region, dividing the three-dimensional area in layers from superficial to deep. Therefore, a delineation of the "danger zones" of the "Brazilian" buttock augmentation would be the final purpose of this effort, with the intent of helping the surgeon limiting the potential complications during gluteal fat injections.

Methods: 20 dissections were performed in 10 fresh latex-injected cadavers. The dissection was performed layer by layer from skin to periostium evaluating the vascular density, size and vessel trajectory in the subcutaneous, intramuscular and submuscular planes. Each vessel and major nerve was tracked on a xyz axis. The diameter size of each vessel was measured with a digital caliper and recorded.

In collaboration with the interventional radiology unit of the Verona University Hospital, (Verona, Italy), data from 30 MRAs will be analyzed to compare our ex-vivo findings in an in-vivo model. Localization and size of arteries, veins and nerves will be traced on the same xyz axis after examination of T1, T2, STIR sequences and 3D reconstructions.

A map of the danger zones of the gluteal area will be estimated from our results after normalization to standardize the variability of different individuals.

Results: Common patterns of distribution of veins of the gluteal area were noted in the subcutaneous plane. They presented mainly as veins comitantes to perforating vessels from the superior and inferior gluteal arteries. An average number of 25

vessels per cadaver were documented in this layer (range 16 to 32) with the smallest average artery (0.9 +/- 0.3 mm) and vein diameter (1.05 ±0.22mm)

A similar pattern repeated within the gluteus maximus. Intramuscular vein diameters increased to 1.3 ±0,3mm. Tributaries from the Inferior and Superior Gluteal vessels travel on the deep surface of the Gluteus maximus (respectively 2.2 +/- 0.04 and 1.8 +/- 0.2 mm diameter in the arteries and 3.5 ±0.99 mm and 3.85 ± 1.9 mm in the veins). The superior and inferior gluteal veins diameter were 7.61±2,24mm and 13.65±6,55mm respectively. The superior and inferior gluteal arteries were significantly smaller (3.47 +/- 0.2 mm and 4.3 +/- 0.6 mm).

Conclusion: The subcutaneous plane includes frequent and small vesssels. The deeper and more medial planes of the gluteal region house larger and more prominent vessels and nerves which if penetrated could be the cause of fat embolism, nerve damage and death.

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Concept of Fat Grafting for Facial Contouring and Rejuvenation

Presenter: Amani Landoulsi Landoulsi Helal, MD
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Background: Recent anatomical findings have suggested that facial fat distribution is complex and changes with age. Here, we developed a grafting technique based on the physiologic distribution and volume changes of facial fat compartments to achieve a youthful and natural-appearing face(1). The key to fat grafting in the face is to appreciate and use the ability of fat to transform and rejuvenate the tissues into which it is placed(2,3,4). The first attempts of fat grafting to the face were performed to not only restore fullness but also improve the quality of the tissue into which the fat was grafted, including scars.

Method: Our presentation addresses technical considerations for facial rejuvenation, we demonstrate best practices of fat harvest, preparation and insertion with a strong emphasis on the basic science of what is really needed to insure maximum survival of the fat graft. We will also demonstrate the anatomy of the fat compartments of the face and present a concept of Injectable Tissue Replacement, which is a protocol to replace all areas of fat and bone loss with anatomic placed and anatomically sized fat grafts (Millifat, Microfat and Nanofat)(5). New concepts of addressing nasal and orbital aging as well as pyriform aperture recession and bony contouring will be presented. Retrospective review of 50 cases over 2 years was performed to evaluate the effectiveness of this approach.

Results: Follow-up ranged from 6 to 24 months. Satisfactory results were achieved in 96 percent of cases. Typical cases were also reviewed.

Conclusions: The present study provides the anatomical and clinical basis for the concept of compartmentally based fat grafting(1). It allows for the restoration of facial fat volume close to the physiologic state. With this procedure, a natural and youthful facial contour could be rebuilt with a high satisfaction rate.

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Masculinizing Chest Reconstruction in Transgender and Nonbinary Individuals: An Analysis of Epidemiology, Surgical Technique, and Postoperative Outcomes

Presenter: Nicholas G Cuccolo, MD

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Background: Reconstruction of the chest is an important component of transition in the transmasculine population that can substantially improve gender incongruence. Recent improvements in social stigma and changes to insurance legislation have led to a sharp rise in gender affirmation surgeries across the country, the most common of which being chest reconstruction. However, there is still debate regarding the optimal technique for transmasculine chest contouring and few studies have explored complication rates between the various approaches. The aim of this study was to evaluate the demographic characteristics, surgical technique, and postoperative outcomes following transmasculine chest contouring.

Methods: Using International Classification of Diseases codes, we isolated all cases of gender affirmation surgery from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database (2010-2017). Current procedural terminology codes were used to categorize patients by reconstructive modality: reduction versus mastectomy (+/- free nipple grafting [FNG]). Univariate analysis was conducted to assess for differences in demographics, co-morbidities, and postoperative complications. The 2-sided unpaired *t* test was used to assess the difference in means of continuous variables, whereas categorical data was compared using the Chi-square test. Multivariable regression analysis was used to control for confounders.

Results: A total of 755 cases were isolated, of which 591 (78.3%) were mastectomies and 164 (21.7%) were reductions. Compared with mastectomies, a higher rate of obesity was noted in the reduction cohort (34.4% versus 43.5%, p=0.031). No significant differences were noted in terms of age or other co-morbidities. Mastectomies had shorter operative times but similar length of stay when compared to reductions. Plastic surgeons performed the majority of procedures overall (87.2%). General surgeons performed nearly 10 times as many mastectomies as they did reductions ($p<0.001$).

Rates of postoperative complications were low, with 4.7% (n=28) of mastectomies and 3.7% (n=6) of reductions experiencing at least 1 all-cause complications. Postoperative complication rates were not statistically different between mastectomy with FNG (3.4%) and skin-sparing mastectomies (5.6%). After controlling for confounders, there was no difference in terms of risk of all-cause complications between mastectomy and reduction or between FNG and skin-sparing mastectomy.

Conclusion: Mastectomy and reduction mammaplasty are both safe procedures for chest reconstruction in the transmasculine population. Furthermore, mastectomy techniques involving FNG had comparable postoperative complication profiles when compared to techniques that did not involve FNG. Overall, these results may be used to encourage shared decision making between patient and surgeon such that the reconstructive modality of choice best aligns with the desired aesthetic outcome.

Improved Promis Scores after Gender-Conforming Mastectomy

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Objective: Item banks of the Patient Reported Outcome Measurement Information System (PROMIS) have a mean t-score of 50, referent to the general US population [1]. Higher t-scores indicate a higher level of the specific health domain, with a change of 5 points being considered a clinically meaningful change [2]. Our study objective was to describe and analyze mean t-score changes in PROMIS before and after gender-conforming mastectomy in female-to-male transgender patients.

Methods: This study is a retrospective, longitudinal analysis of PROMIS surveys completed by all female-to-male transgender patients referred to the senior author's practice for gender-conforming mastectomy between October 2016 and July 2018. Surveys were administered preoperatively and at the 1-, 3-, and 6-month postoperative visits and included six PROMIS measures: Satisfaction with Social Roles and Activities, Anxiety, Depression, Emotional Support, Social Isolation, and Anger. A total of 77 patients completed 121 surveys. Differences of Least Squares Means with Tukey-Kramer adjustment was used to analyze the differences in mean t-scores between visits. A Linear Mixed Effect Model was employed to accommodate both fixed and random effects from non-independence in the data with adjusted $p < 0.05$ considered statistically significant.

Results: Compared to the general US population, subjects in the preoperative period (n=22) reported worse Anxiety (t-score 62.70 ±8.11) and Depression (55.21 ±9.09) and better Emotional Support (56.24 ±7.33), while no clinically-significant difference was noted in Satisfaction with Social Roles and Activities (47.53 ±8.34), Social Isolation (53.65 ± 6.34) or Anger (53.26 ± 9.23). At 6 months postoperatively, subjects' Anxiety and Depression improved to being clinically similar to the general US population (n=11; 53.55 ±8.06, 47.40 ±9.43, respectively).

Compared to the preoperative period, clinically- and statistically-significant improvements were noted in the mean t-scores at 1-month (n=20) in Satisfaction with Social Roles and Activities (+5.92, p=0.01), Anxiety (-8.50, p<0.01), Depression (-8.33, p<0.01) and Social Isolation (-5.79, p<0.01). These favorable changes persisted at 6-months from surgery (+12.05, p<0.01; -7.01, p=0.01; -8.05, p<0.01; -8.34, p<0.01 respectively). Significant improvement in Anger was noted at 1-month postoperatively (-5.45, p=0.03), but statistical significance was not maintained at 6-months (-5.24, p=0.19). There was no significant change postoperatively in Emotional Support.

Conclusions: Female-to-male transgender patients in our study reported lasting improvements in Satisfaction with Social Roles and Activities, Anxiety, Depression, and Social Isolation after undergoing gender-conforming mastectomy. Compared to the general US population, our subjects reported higher levels of Anxiety and Depression before surgery and similar scores to the population mean after surgery. Our study is the first to describe PROMIS t-score changes following gender-conforming mastectomy.

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Feminizing Mammoplasty Outcomes in the First Publicly-Funded Transgender Health Program: Safe Surgery Is Possible in This Underserved Population

Presenter: Laura L Barnes, MD
Co-Authors: Daniella M Cordero, BS, Dhivya Srinivasa, MD, Michael J. Terry, MD
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Introduction: The Gender Health San Francisco program (GHSF) at Zuckerberg San Francisco General Hospital (ZSFG) is the first publicly funded transgender program in the United States. From August of 2016 to June of 2018, 61 feminizing mammoplasty operations were performed by a single surgeon, including 5 revisions for patients who had their primary surgery performed by other providers. To date, no other studies have investigated feminizing mammoplasty outcomes specifically in an

underinsured/uninsured transgender population. This cohort presents unique challenges due to their health, social, and financial circumstances. Our aim is to evaluate feminizing mammoplasty outcomes in this unique subset of the transgender population.

Methods: Manual EMR review was performed, and demographic, surgical and clinical data was collected for all feminizing mammoplasty cases for a single surgeon, all within the GHSF program. Additionally, standard pre- and post-operative measurements (notch-to-nipple distance, nipple-to-IMF distance, nipple-to-nipple distance and bust/chest size in cm) were obtained when available. Major and minor complication rates were assessed.

Results: The data of 61 patients was analyzed. 95.1% of these patients had state-funded health insurance (e.g., Medicaid, Healthy SF), while the remaining patients were covered under Medicare. Of these patients, the mean age was 39.0±11.3 years. 23.0% of these patients were diagnosed with psychiatric comorbidities, including anxiety, depression, bipolar and unspecified psychotic disorders. 19.7% of these patients had a diagnosis of HIV and 8.2% had a diagnosis of HCV. The average follow-up period was 3.4 months, with a range from 0.3 to 21.9 months. 73.7% of implants were placed in the subpectoral plane and 26.3% were placed in the subglandular plane. The average volume of implant was 462.1±120.3 mL. Pre-operative and post-operative measurements were as follows: average notch-to-nipple distance increased from 21.9±2.7cm to 23.3±2.4cm; average nipple-to-IMF distance increased from 5.4±1.6cm to 9.2±1.9cm; average bust-to-chest ratio increased from 1.08±0.03 to 1.15±0.04. There was one major complication (surgical revision for capsular contracture), and no minor complications.

Discussion: Patients seeking surgery through GHSF are often of the lowest socioeconomic status, on average older patients, and tend to have more significant medical comorbidities. In particular, the rate of HIV in this population (19.7%) was significantly higher than the national average for transgender women, reported as 3.4% in 2015[1]. However, stringent criteria to assess eligibility for surgery, as well as a robust patient navigator support system, allows us to offer gender affirming surgery to this otherwise underserved population. Our data reflects successful aesthetic outcomes including improved nipple areolar complex position from a natal male chest to an aesthetic feminine chest, and adequate lower pole expansion. We demonstrate that even in this particularly vulnerable subset of transgender patients in San Francisco, feminizing mammoplasties can be successfully performed with favorable outcomes and low complication rates.

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Gender-Affirming Chest Reconstruction in Trans-Male Patients: A Retrospective Review of 145 Consecutive Masculinizing Mastectomies

Presenter: Andre Alcon, MD
Co-Authors: Adrienne Kennedy, MS, Ines Gueneau, BS, Esther Kim, MD
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Background: Masculinizing chest surgery is often the initial procedure sought in female-to-male transgender patients. Previous treatment algorithms have relied on breast size, breast ptosis, and skin elasticity for choosing the appropriate technique. We reviewed our experience utilizing inframammary mastectomy and free nipple grafting (IMFNG) as a simplified, reliable approach to transgender male chest surgery.

Methods: We evaluated 145 consecutive mastectomies, either IMFNG or peri-areolar mastectomy (PAM) performed by a single surgeon from 2013 to 2018 at the University of California, San Francisco. Re-operation within 30 days was the primary outcome. Demographic data and post-operative complications including hematoma, nipple loss, surgical site infections, hypertrophic scarring, elective revision surgery, and minor revisions was collected for further statistical analysis and comparison.

Results: There were 137 IMFNG procedures performed with a median length of follow-up of 15 weeks (IQR=6-32 weeks). Only 8 PAM were performed with a median length of follow-up of 12 weeks (IQR=4-73 weeks). Overall, patients who underwent IMFNG exhibited larger breasts with more ptosis and poorer skin quality than patients who underwent PAM. Consequently, significantly more breast tissue was removed from patients who underwent IMFNG than PAM; 456 g compared to 85 g, respectively. A total of 3 (2%) IMFNG patients required re-operation and readmission within 30 days to evacuate hematomas while no patients in the PAM group required re-operation within 30 days. All patients were routinely discharged home on the day of surgery.
Of 45 IMFNG patients who had more than 6 months of follow-up, 58% were noted to have hypertrophic scarring, half of which received Kenalog injections to help mitigate their scars. Approximately 38% of IMFNG patients exhibited some degree of nipple hypopigmentation and 27% of IMFNG patients received nipple tattoos to correct the hypopigmentation and/or size mismatch. All 8 PAM patients had more than 6 months of follow-up and experienced a significantly higher rate of revision surgery (50%) to correct contour irregularities or asymmetries compared to patients who underwent IMFNG (2%). In contrast, a larger proportion of patients who underwent IMFNG required minor revisions performed in the office (15% vs. 0%).

Conclusions: This study represents one of the largest, most detailed analysis of gender-affirming masculinizing chest surgery to date. Although roughly 15% of patients with long-term follow-up required office procedures to achieve the final desired result, this is significantly smaller than the revision rates published in past series that required additional surgery in the operating room. Traditionally, breast reduction principles in cis-gendered female populations such as scar minimization and per-areolar approaches have been favored by plastic surgeons performing gender-affirming masculinizing mastectomies; however, there are no patient-reported outcomes studies evaluating patient preferences when it comes to scarring, symmetry, and nipple position. Anecdotally, patients presenting to our clinic valued adequate removal of the breast mound, symmetry, and an overall masculine appearance over scar length and position. Consequently, IMFNG is our preferred technique because it creates the most masculine appearing chest and provides the most consistency and reproducibility.

Differences in Chest Measurements between the Cis-Female and Trans-Female Chest Exposed to Estrogen and Its Implications for Breast Augmentation

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Background: Gender confirming primary breast augmentation is becoming more common. Treatment of gender dysphoria through transition from the male to trans feminine phenotype relies on an adequate acquisition of female secondary sex characteristics.[1] Despite estrogen therapy, many patients fail to achieve adequate breast growth and require implant-based augmentation to realize a more feminine chest shape.[2] It is important to understand these anatomic differences and associated implications for surgical planning.

The purpose of this study was to compare the demographic and anatomical differences in cis-female and trans-female populations.

Methods: This was a retrospective analysis of trans-female patients and cis-female patients undergoing primary breast augmentation at a single institution between September 1998 and February 2018. Transgender patients had a diagnosis of gender dysphoria and met all World Professional Association for Transgender Health (WPATH) criteria for gender confirmation surgery (GCS) and had been on exogenous

estrogen for at least one year prior to consultation. Follow up was to first postoperative appointment at one month.

Results: Eighty-two trans-female and 188 cis-female patients undergoing primary breast augmentation were included. Trans-female patients were older (40.37 versus 34.07), more likely to have psychological comorbidities (50% versus 12.23%), and had a higher BMI, 27.46 kg/m2 versus 22.88 kg/m2, (p=1.91E-07) than cis-female patients. Cis-female patients most commonly had an ectomorph body habitus (52% versus 26%) while trans-female patients most commonly had an endomorph body habitus (40% versus 7%). There were significant differences in preoperative breast measurements including sternal notch to nipple (SSN), breast width (BW), and nipple to midline distance (N-M) between groups, but not in nipple to inframammary fold distance (N-IMF). The ratio of BW/N-IMF was statistically significant (p=2.65E-07 on right), indicating that the similarity in N-IMF distance did not adjust for the difference in breast width.

Conclusion: The trans-female and cis-female populations seeking primary breast augmentation have significant demographic and anatomical differences.[3] Trans female patients had a significantly higher rate of smoking history and psychiatric comorbidities, similar to what has been previously described in the overall transgender population.[4] While surgical similarities exist between the operative choices and technique for cis-female and trans-female breast augmentation, marked differences also exist. Plastic surgeons treating these patients should be familiar with these differences and understand the needs specific to this patient population for surgical decision making and planning in order to optimize outcomes for trans-female patients.

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Defining Breast Implant Illness: Patient-Reported Outcomes after Breast Explantation

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Purpose: Breast Implant Illness (BII) after aesthetic breast enhancement remains an understudied syndrome with patients attributing a menagerie of symptoms to breast implants including joint/muscle pain, hair loss, abdominal discomfort, fatigue, decreased memory and concentration, numbness and tingling in extremities, dry eyes, blurry vision, breast pain, rash, hives, flu-like symptoms, and difficulty breathing. We hypothesized that patients presenting with BII constellation syndrome would have significant improvement in patient-reported outcomes after implant removal/capsulectomy surgery. The aim of this study was to evaluate the symptoms of patients presenting for breast explant/capsulectomy surgery and measure patient-reported outcomes before and after surgery.

Methods: A retrospective study of all patients presenting to a single-surgeon plastic surgery practice requesting removal of breast implants over a two-year period was conducted. Patients were given a pre-operative survey evaluating 11 commonly cited symptom domains on a linear continuous aggregate scale from 0 (absent) to 5 (very severe). Patients received the same survey at each post-operative visit; pre- vs. most recent post-operative survey score was used for comparison. Statistical analysis included paired T-tests for parametric comparative data.

Results: Sixty-nine (69) patients were identified during the study period with a pre- and post-operative response rate of 100%. Average survey post-operative day was 161 (median: 133; range: 3-540). The average pre-operative survey score and symptom severity was significantly higher, 27.8/55 vs. the average post-operative score of 9.3/55 ($p<0.01$). All 11 symptom domains demonstrated statistically significant improvement ($p<0.05$), including numbness and tingling in the extremities, arthralgias and myalgias, alopecia, memory/recall, dry eyes, chronic fatigue, breast pain, rash/urticaria, irritable bowel syndrome, flu-like symptoms, and difficulty breathing.

Conclusion: This study demonstrates patients presenting with constitutional symptoms after breast augmentation had consistently and significantly improved quality of life as reported in multiple study domains after implant and capsule removal. While Breast Implant Illness remains understudied and controversial in the

plastic surgery literature, our study findings highlight the potential health benefits of removal of breast implants in select breast augmentation patients.

Outcomes of Reduction Mammaplasty in Obesity: Review of an 18-Year Experience.

Presenter:	Christopher Homsy, MD
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Background: Reduction mammaplasty to treat symptomatic macromastia is one of the most performed procedures in plastic surgery. Many patients with mammary hypertrophy have an elevated body mass index (BMI). Obesity, as measured by BMI has been associated with an increased risk of surgical complications, however results of studies have not been consistent.

Objective: The aim of this study was to assess the relationship between the degree of obesity and surgical outcomes following bilateral breast reduction.

Methods: A retrospective analysis of all bilateral breast reductions performed by a single board-certified plastic surgeon at Ochsner Medical Center in New Orleans, Louisiana for 2004 through 2018. Patient demographics (including age, ethnicity, comorbidities, and BMI) were collected from electronic medical records. Data pertaining to surgical complications including wound complications, nipple areolar complex (NAC) complications (partial or full necrosis), hematoma/seroma, infection, and keloid formation were all recorded. Excluded from the study were patients with unilateral reduction, history of breast cancer or radiation and patients undergoing a cosmetic reduction.

Results: A total of 1092 patients were included in the study. Patients were classified in 4 groups based on their BMI: BMI <30 (355 patients), BMI 30.0-34.9 (343 patients), BMI 35-39.9 (224 patients) and BMI >40 (170 patients). There was no statistically significant difference between different group with regards to NAC complications, major wound complications, hematoma/seroma, or infection. A higher rate of “any complication” was seen in the three obese groups compared to the non-obese (OR=1.75, 1.94 and 3.13 for groups 1, 2 and 3 respectively). When looked at complications individually, only minor wound complications were higher in all three classes of obesity compared to the non-obese ($p<0.0001$). These results did not change when analysis was adjusted for potential confounders (ethnicity, hypertension and

diabetes). Finally, a finding of potential interest: White patients' odds of any complications were 2.3 times higher compared to African-Americans.

Conclusion: Reduction mammaplasty is associated with higher overall minor wound complications in all three classes of obesity compared to non-obese patients. However, the degree of obesity does not seem to increase the risk of major wound complications, bleeding or NAC complications. These results prove that obesity does not increase the risk of major complications, and obesity should not be looked at as a prohibitive risk for reduction mammaplasty. On the other hand, we hope that our study results help guide plastic surgeons to preoperatively counsel obese patients on their potential risk profile especially with regards to minor wound complications.

Incidental Pathological Findings in Adolescent and Young Adult Reduction Mammaplasty

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Reduction mammaplasty is a safe, effective option that relieves physical and psychosocial symptoms in adolescent and young adult patients with macromastia. However, little is known about the incidence, significance, or appropriate management of incidental abnormal breast pathology identified in pediatric patients. This study aims to characterize incidental pathologic findings of adolescent and young women undergoing reduction mammaplasty and guide management of young patients with incidental breast tissue abnormalities.

Data was obtained from a retrospective chart review of 798 adolescent and young adult women who underwent unilateral or bilateral reduction mammaplasty at Boston Children's Hospital between June 2010 and May 2018. Charts were reviewed for patient demographics, indication for surgery, relevant past medical history, relevant family history, medications, breast cancer risk factors, type of surgery, and reduction mammaplasty specimen weight and histological findings.

Mean age at surgery was 17.5 years (range 11-24 years). Indications for surgery included bilateral macromastia (94.9%), breast asymmetry (4.9%), and juvenile breast hypertrophy (0.3%). 87.2% of patients had breast tissue without significant histopathologic change. Among the remaining 12.8%, findings included benign, non-proliferative lesions (e.g. fibrocystic change, ductal ectasia) in 7.4%, and proliferative

lesions without atypia (e.g. fibroadenoma, fibroadenomatoid change, pseudoangiomatous stromal hyperplasia) in 7.4%. Five patients (0.6%) had proliferative lesions associated with increased risk for invasive carcinoma, including four (0.5%) with atypical ductal hyperplasia and one (0.1%) with focal atypical hyperplasia. Patients with atypical proliferative lesions ranged from 14-19 years old and none had a personal history of cancer, first-degree family history of breast cancer, or known history of BRCA mutation.

Among all women who undergo reduction mammaplasty, prevalence of incidental overt carcinoma and high-risk proliferative lesions are low, with the largest study to date reporting 0.79% and 6.26%, respectively.[i] Our findings are lower than those reported in older women, as expected. The low rate of overt breast carcinoma in young women has caused some to advocate against routine pathologic evaluation of reduction mammaplasty specimens. However, young women with atypia may have a greater risk of developing breast cancer relative to older women with atypia, and women who develop breast cancer before age 35 tend to have more aggressive disease.[ii], [iii] The five young women with incidental atypical proliferative findings had no risk factors that would have otherwise stratified them for more rigorous breast cancer surveillance. Thus, the value of detecting incidental proliferative lesions in young women may lie in identifying those with an increased risk of developing invasive and/or biologically aggressive disease, facilitating earlier and more rigorous screening.

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9-Year Experience with a Modified Wise-Pattern Superomedial Pedicle Reduction Mammoplasty in Benign Macromastia

Presenter: Andrew A Marano, MD

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Purpose: The Wise-pattern superomedial pedicle reduction mammoplasty is a commonly performed operation with a reproducible breast shape and improved contour, but is prone to nipple retraction and wound complications at the T junction. For the past decade, the senior author has employed a modified approach that addresses both of the aforementioned complications. This study aims to update the community on our outcomes with an additional five years of experience using CHR's techniques. Additionally, we analyze the safety and efficacy of our modified Wise-pattern superomedial pedicle breast reduction in specific patient groups at increased risk of complications including overweight/obese BMI, high resection weights, smokers, and diabetics.

Methods and Materials: The modified approach involves two variations: 1) a full-thickness inverted "V" incision approximately 2 cm in width, at the junction of the breast meridian and inframammary fold; and 2) creation of a "superior ledge" which serves as the base of the nipple areolar complex through the partial-thickness excision of tissue superolateral to the pedicle. The Institutional Review Board approved this retrospective chart review. Patient demographics, intraoperative data, and outcomes were gathered from the electronic medical record and coded into a HIPAA-compliant database. Specific outcomes tracked included SSI, hematoma, seroma, prolonged wound healing, nipple loss, loss of nipple sensation, fat necrosis, and patients who underwent revision.

Results: Between January 2010 and September 2018, the senior author performed bilateral reduction mammoplasty as described above on 140 women for benign macromastia at our institution. Mean age was 40.1 years (range: 14-71), mean peri-operative BMI: 29.7 kg/m2 (19.2-44.5), mean length of surgery: 216 minutes (144-353), mean total resection weight: 1623 grams (307-5419). Mean follow up was 40 weeks (2-269). 6.1% of subjects were diabetics and 14.1% were former smokers. There were no instances of nipple retraction in this cohort. Delayed wound healing at the "T-point" occurred in 11 patients (7.4%). Partial loss of nipple sensation occurred in 34 patients, (30%), SSI occurred in 9 patients (6.4%), revisional surgery/procedures in 7 patients (5.0%), readmission/reoperation in 2 patients (1.4%), hematoma in 3 patients (2%), partial nipple loss in 3 patients (2%), and seroma in 2 patients (1.4%). Univariate logistic regression revealed that BMI was correlated with both delayed wound healing and decreased nipple sensation ($p=0.03$ and 0.03, respectively). Weight of resection was correlated with delayed wound healing as well ($n=0.02$).

Conclusions: This study reports a 9-year experience with the superior ledge, inverted-V modification of the superomedial pedicle reduction mammaplasty. Our results show favorable outcomes with no instances of nipple retraction and low rates of delayed wound healing at the T-point compared to both the literature and our previous experience prior to instituting the inverted-V closure pattern. Hematoma, seroma, infection, and nipple loss were all rare and not associated with any measured predictors. BMI and weight of resection were correlated with delayed wound healing, and BMI was correlated with decreased nipple sensation.

Gabapentin Decreases Narcotic Usage: A Critical Examination of the Enhanced Recovery after Surgery Pathway in Free Autologous Breast Reconstruction

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Purpose: Enhanced recovery after surgery (ERAS) is increasingly being used in breast reconstruction. It is a multidisciplinary approach to surgical patient care that aims to decrease preoperative stress and postoperative pain, increase quality of care, and expedite patient recovery. The benefits of ERAS for patients are manifold, however it still remains to be determined which components of the ERAS pathway are most responsible for improvement in outcomes in the setting of microvascular free tissue transfer (FTT) breast reconstruction.

Methods: A retrospective chart review was performed for 42 FTT breast reconstruction patients at a single institution. Electronic medical records were used to assess demographics, pre-, intra-, and post-operative medications, and subjective pain scores. Outcomes of interest included average milligram morphine equivalents used per day (MME), average self-reported pain, and number of anti-emetic doses given during hospital stay. Linear regression was used to determine which ERAS medications correlated to these outcomes. We examined preoperative acetaminophen, gabapentin and celecoxib; intraoperative lidocaine, ketorolac, and liposomal bupivacaine; and postoperative ketorolac, gabapentin, and acetaminophen.

Results: Post-operative gabapentin, a cortical neuronal calcium channel modulator, showed significant correlation with study variables. All else equal, gabapentin use was associated with a 59.8 mg decrease in average post-operative MME ($p=0.001$, -93.36 to -26.30); a 2.1-point decrease in average pain ($p=0.031$, -4.01 to -0.21); and a 2.5 dose decrease in the number of anti-emetic doses ($p=0.045$, -4.88 to -0.056).

Gabapentin decreased the odds of a patient receiving over 50mg of oral morphine equivalent per day by 8.3 times (p=0.0321, 1.255 to 54.707), and reduced the chances of average pain above 5 by 16 times (p=0.0079, 2.186 to 117.094). It was also associated with 8.5 times decreased odds of a patient requiring over 5 antiemetic doses (p=0.0910, .926 to 78.0261).

Conclusions: In this single center retrospective study, post-operative gabapentin use had the largest effect of all ERAS pathway analgesics on post-operative opioid use, pain, and anti-emetic use. Gabapentin should therefore be especially considered for all FTT breast reconstruction patients. The effects of the other ERAS pathway analgesic medications may require larger sample sizes to evaluate. Further studies are required further understand the effects of each component of the ERAS pathway on breast reconstruction patient outcomes.

An Examination of Smooth Versus Textured Tissue Expanders in Breast Reconstruction

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Purpose: Textured TEs (TTEs) were initially introduced to limit expander migration and reduce capsule formation, which are inherent to traditional smooth expanders. Recently, the addition of tabs on expander devices to reduce migration along with increasing concerns associated with textured devices and anaplastic large cell lymphoma (ALCL), has led to increased consideration of smooth TEs (STEs) in breast reconstruction. STEs reduce the theoretical risk of ALCL and migration can be addressed by fixation of suture tabs on the tissue expander to the chest wall. A comparative analysis of the outcomes of smooth and textured expanders is needed to ensure safety and equivalency. The aim of our study is to evaluate the early post-operative complications of smooth versus textured TEs.

Methods: A retrospective case series was conducted across all female patients who underwent immediate breast reconstruction using TEs at a single academic teaching hospital from April 2017 to September 2018. Patients with a prior history of chest wall irradiation were excluded. The primary outcome variables were the presence

early post-operative complications, namely infection, seroma, hematoma, or wound dehiscence, and failure of breast reconstruction.

Results: 53 patients with a total of 87 breasts met the inclusion criteria; TTEs were placed in 39 breasts and STEs in 48 breasts**.**Most patients studied had a therapeutic mastectomy (TTE n=15 (65.2%) versus STE n=20 (66.7%)), with nipple sparing mastectomy (NSM) being most commonly performed (TTE n=31 (79.5%) versus STE n=34 (70.8%)). There were significantly more early post-operative complications in the TTE versus STE breast reconstruction group (p=0.001).We detected a significant increase in seroma formation in the TTE versus STE group (n=12 (30.8%) versus n=5 (10%), p=0.017). There were increased rates of infection and prosthetic failure in TTE versus STE, however these were not significant findings. At the univariate level, the factors predictive of having any complication were expander type ($p<0.001$), intraoperative filler ($p<0.0001$), and intraoperative TE expansion volume (p=0.0017), with complications being greater in TTEs than STEs (n=21 (70%) versus n=9 (30%)), and associated with a larger intraoperative TE expansion volume (249.6 ± 178.7 versus 198.8 ± 124). In multivariable regression analysis, implant type (p=0.006), mastectomy type (p=0.02), and TE filler (p=0.033) significantly predicted the risk of having a complication following TE insertion; where STEs, non-nipple sparing mastectomies, and saline TE filler were less likely to be associated with a postoperative complication.

Conclusions: Here, we show that STEs had a reduced overall rate of early post-operative complications. Early results demonstrating significantly increased rate of complications in TTE versus STE merit comparative randomized prospective trials.

Breast Reconstruction after Nipple-Sparing Mastectomy in the Large and/or Ptotic Breast : A Systematic Review of Indications, Techniques and Outcomes

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Background: Over the last ten years nipple sparing mastectomy with immediate or delayed breast reconstruction has evolved to a standard surgical option for prophylactic and early breast cancer procedures. In large ptotic breasts however many surgeons remain reluctant due to a higher risk of necrosis (nipple areola complex (NAC) and/or mastectomy skin flap), based on anatomical factors and lack of adequate vascular supply. We performed a systematic review of the literature to

evaluate indications, techniques and outcomes in immediate or delayed breast reconstructions in large and/or ptotic breasts.

Methods: Pubmed and Science Direct databases were searched from January 1990 through September 1st 2018. The following search terms were used for both titles and key words: [nipple sparing mastectomy AND ("breast ptosis" OR "ptotic breast" OR “large breast” OR “breast hypertrophy” OR “gigantomastia”)]. All forms of breast reconstruction in large and/or ptotic breasts reporting indications, techniques and outcomes were included by two independent reviewers.

Results: Thirty-one studies met the inclusion criteria, yielding 1128 nipple-sparing mastectomies in 629 patients for analysis. Five studies were prospective, the others retrospective. The overall complication rate was 29,08 percent (varying from 0 to 46,91 percent). The mastectomy skin flap necrosis rate was 12 percent, the partial NAC necrosis rate 11 percent and the complete NAC rate 11 percent. The overall complication rate in one-stage reconstructions in large breasts was 37,52 percent versus 14,8 percent in delayed techniques. The incidence of necrosis in one-stage reconstructions was 5,36 percent for partial, 5,08 percent for complete NAC necrosis and 4,8 percent for mastectomy skin flap necrosis. Necrosis reported in delayed procedures was 2,15 percent for partial, 0,48 percent for complete NAC necrosis and 1,43 percent for mastectomy skin flap necrosis.

Conclusions: Decision-making in breast reconstruction after nipple sparing mastectomy in large and/or ptotic breasts is challenging and complex. The majority of studies being small and retrospective as well as the large variation in outcome rates indicates that we lack consensus on timing of reconstruction or ideal technique to be used. Many groups share their early results of recently published techniques. A noticeable difference in skin flap and NAC necrosis rates however is seen in favor of NAC delayed procedures. Randomized controlled trials are mandatory to proof this difference significantly.

The Economics of Prepectoral Vs. Subpectoral Implant-Based Breast Reconstruction

Presenter:	Jacquelyn Withers, MD
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Purpose: Prepectoral breast reconstruction is increasingly prevalent due to numerous aesthetic and patient-reported outcome benefits. However, the need for more mesh draws criticism regarding cost. There are limited studies comparing the economics of subpectoral versus prepectoral techniques. We aim to evaluate total patient cost differences between prepectoral and subpectoral breast reconstruction at our institution.

Methods: We performed a retrospective review of patients undergoing immediate tissue expander-based reconstruction at our institution from 2016-2018. We excluded patients with less than 1 year follow up, those who had concurrent gynecologic or non-reconstructive breast procedures, or those who did not receive post-operative antibiotics. In addition to clinical data, we recorded net patient charges for the initial surgery (reconstruction and mastectomy), implant exchange, and readmissions or reoperations for complications and revisions. Unilateral and bilateral cohorts were independently evaluated. Our primary outcome was the total charge for reconstruction (TCR).

Results: There were 53 unilateral reconstructions (12 prepectoral and 41 subpectoral), and 69 bilateral reconstructions (16 prepectoral and 53 subpectoral). There were no significant demographic or treatment differences in terms of age, BMI, smoking history, or chemotherapy and radiation exposure. Average follow-up was 25 months and 21 months for the prepectoral and subpectoral groups respectively.

Among unilateral reconstructions, the total charge for reconstruction at follow up was $194,000 for the prepectoral cohort and $168,000 for the subpectoral cohort ($p=0.07$) The average cost of initial operation was $17,000 more for the prepectoral group ($p<0.01$) and the average cost of implant exchange was $6,000 more in the subpectoral group ($p=0.03$). There were no differences in cost for complications, readmissions, or revisions between cohorts. Six (50%) prepectoral patients and nine (22%) subpectoral patients had at least one reoperation ($p=0.06$). Four (33%) prepectoral patients and nine (22%) subpectoral patients had at least one readmission ($p=0.42$).

Among bilateral reconstructions, the total charge for reconstruction at follow up was $240,000 for the prepectoral cohort and $220,000 for the subpectoral cohort ($p=0.19$) The average cost of initial operation was $27,000 more for the prepectoral group ($p<0.01$) and the average cost of implant exchange was $11,000 more in the subpectoral group ($p=0.01$). There were no differences in costs for complications, readmissions, or revisions between cohorts. Ten (63%) prepectoral patients and 31 (58%) subpectoral patients had at least one reoperation ($p=0.78$). Two (13%) prepectoral patients and 17 (32%) subpectoral patients had at least one readmission

(p=0.12). Subpectoral patients trended toward more admissions for pain control following any surgical procedure at 25% versus 6% (p=0.11).

Conclusions: The costs associated with prepectoral breast reconstruction were not statistically different from subpectoral breast reconstruction at our institution in patients with at least 1 year follow up. Although trends towards higher costs of total reconstruction were seen in the prepectoral group, these are likely offset by quality of life measures, less invasive nature, and decreased long term revisions for animation deformity and capsular contracture that have not yet been measured. Longer follow up may allow a more detailed assessment of any difference in overall cost between these two techniques.

Permanent Prosthesis Radiation in Implant-Based Breast Reconstruction Following Mastectomy (PRISM) Reduces Complications in Primary Breast Reconstruction: The First 5-Years of a Multidisciplinary, Accelerated Expansion Algorithm

Presenter: Daniel Maxwell, MD

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Background: The use of post-mastectomy radiation therapy (PMRT) and immediate implant based reconstruction (IIBR) has risen expediently over the past decade. PMRT remains an immutable challenge for both patient and surgeon as radiation significantly increases postoperative complications. Despite advancements in PMRT delivery and breast reconstructive techniques, little has attenuated the deleterious effects of radiation on the reconstructed breast. Literature suggests that the timing in which PMRT is delivered in reconstruction may reduce the negative effects. However, the optimal approach to integrating these therapies remains unclear. We hypothesized that radiation delivery over a permanent implant would yield optimal outcomes and devised a multidisciplinary algorithm to expedite patients to PMRT over a permanent implant in both direct-to-implant (DTI) and tissue-expander-based (TE) post-mastectomy breast reconstruction. The primary aim was to determine the optimal timing to perform PMRT following mastectomy for patients undergoing IIBR.

Methods: In this prospective, observational, multidisciplinary study, patients undergoing mastectomy with immediate or delayed, single or staged breast reconstructions were included from 2013 to 2018 from a single two-surgeon practice. Patients were counseled on the potential benefits of DTI and TE reconstruction

strategies and the possible timing of PMRT in each phase. Only patients undergoing primary breast reconstruction or reconstruction following re-excision of positive lumpectomy margins were included. Demographic, treatment, and outcomes data were collected and survival analysis was performed.

Results: Over 5 years, 400 patients underwent 592 breast reconstructions, 128 receiving PMRT, and 147 receiving neo/adjuvant chemotherapies. Patients were grouped by radiation timing prior to reconstruction (n=36, PREX), radiation over a tissue expander (n=29, TEX), and over a permanent implant (n=61: DTI=16, TE=45; PERMX). A control group (CG) not receiving PMRT (n=293) was included as a control for DTI (n=87) and TE (n=206) procedures. Median follow-up time was 23.3 months (range 0.7-72.0 months). The average patient was 52-year-old, G1P1 female with minimal comorbidities. Patients in the PERX group experienced higher average TE inflation rates (123.3 vs 65.5cc/week), reduced times to the second reconstruction stage (4.3±3.6 vs 6.0±2.9 weeks), and fewer median procedures (2 vs 3) than the TEX group. The overall incidence of any complication occurring at 1, 3, and 5, years follow-up were 14/107 (13.1%), 24/107 (22.4%), and 41/107 (38.3%, CG=35.5%). The most common complications were wound healing/mastectomy flap necrosis (19.6%) which were lower in the PREX and PERMX groups (13.6% vs 16.7% vs 32.0%) compared to the TEX group, respectively. The PERMX group, compared to TEX and PREX groups, experienced the highest incidence of capsular contracture (10.0% vs 8.0% vs 4.5%), the longest average complication-free-interval (39.6 vs 26.4 vs 18.2 weeks), and required fewer revisions for complications (28.6% vs 40% vs 50%). A higher rate of postoperative infection (12.0% 9.1% vs 3.3%; p=0.046) was observed in the TEX and PREX groups compared PERMX group.

Conclusion: Our multidisciplinary algorithm demonstrated fewer overall complications, a longer complication free interval, and fewer required operations compared to patients receiving PMRT over an implanted tissue expander.

Single Versus Stacked Perforator Flaps: A Multivariable Analysis of Fat Necrosis in Autologous Breast Reconstruction

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Background: Clinically significant fat necrosis (Grade IV) is a relatively common complication of autologous breast reconstruction with incidence ranging from 10-

39%.[1] Additional operation is often required to exclude recurrent malignancy or relieve aggravating symptoms such as pain or suboptimal aesthetics. Since tissue ischemia is thought to be a major factor of fat necrosis, much of the available literature focuses on the effect of location and number of perforators. Patients who undergo stacked free flap reconstruction typically have less available tissue at any single donor site, and thus the individual flaps tend to be smaller than single flap reconstructions, and potentially have better overall perfusion. With this in mind, this study investigates the incidence of fat necrosis in stacked free flap breast reconstruction to see if the use of multiple smaller flaps correlates with a diminished incidence of fat necrosis.

Methods: The authors conducted a retrospective review of all autologous breast reconstructions performed by senior author HS from July 2014 to December 2017. Univariate analysis of possible risk factors of fat necrosis was performed for each reconstructed breast using over 20 variables, including comorbidities, single vs. stacked reconstruction, BMI, total weight of reconstruction, number of perforators, number of venous anastomoses, and radiation therapy. This analysis was used to determine inclusion in a multivariable logistic regression model. Additionally, stacked and single flap cohorts were compared for differences in comorbidities and other surgical variables such as operative time and average flap weights. Operable (Grade IV) fat necrosis was defined as any areas surgically excised during otherwise planned second stage surgery, or as a standalone procedure.

Results: 149 patients were included in the statistical analysis and 265 breasts were reconstructed using 340 free flaps. 188 breasts were reconstructed with single flaps, and 76 breasts were reconstructed using stacked flaps (152 total flaps). Eight different free flaps were used in stacked flap reconstructions. Significant risk factors for fat necrosis in univariate analysis included BMI ($p=0.011$), diabetes ($p=0.004$), and age ($p=0.0375$). The total weight of reconstruction per breast was significantly different ($p = 0.037$) in reconstructions that developed fat necrosis (687g) compared to reconstructions that did not (603g). While there was a significant difference ($p < 0.0001$) in the weight of the average flap used in multiple stacked flap reconstruction (mean of 341g) and single flap reconstruction (mean of 600g), there was no significant difference in the incidence of operable fat necrosis per breast between stacked (23.7%) and single flap reconstructions (23.3%). Logistic regression performed showed that DM ($p=0.026$) and increasing BMI ($p=0.022$) significantly increased the risk of operable fat necrosis.

Conclusion: Although the authors previously postulated stacked flaps to have a lower incidence of fat necrosis when compared to single flap reconstructions, we found no difference between the two groups. However, we believe stacked flaps are a safe and

reliable option for patients with a lower BMI who desire autologous breast reconstruction.

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Exploring the Effect of Implant Shell on Patient-Derived Bia-ALCL Cells in Ex Vivo Biomimetic Breast Tissue

Presenter:	Matthew A. Wright, BA
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Purpose: Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL), a rare but potentially deadly complication of device-based breast reconstruction, has an incidence estimated to be as high as 1 in every 3817 cases of textured device implantation and has been implicated in 17 deaths worldwide. Present hypotheses of BIA-ALCL pathogenesis propose that bacterial biofilms present on textured implants may lead to T-cell dysregulation in the setting of chronic inflammation or genetic susceptibility, but this theory remains lacking in experimental evidence partly due to the inadequacy of present *in vivo* and *in vitro* models. The purpose of this study is to utilize our high-fidelity *ex vivo* biomimetic, three-dimensional breast model to study the effects of implant shells on patient-derived BIA-ALCL cells.

Methods: Healthy patient-derived breast tissue was processed for its individual cellular constituents including adipocytes, organoids, and the stromal vascular fraction (which also includes immunologic cells). These constituents were then suspended within 50 µl of 0.3% type I collagen matrix along with patient-derived BIA-ALCL cells at a density of 200,000 cells/mL before being plated into 6mm wells. As a control, BIA-ALCL cells were also suspended within type I collagen at the same seeding density and volume but without any breast components. Before plating, wells were lined with either textured, smooth, or no implant shells. These were 1cm by 2cm pieces of implant shell dissected from the whole implant, cleaned of any underlying residual silicone gel, and autoclaved before being placed into the wells with the superficial aspect of the shell facing into the well. Eight wells were plated per implant shell type: four biomimetic platform wells and four collagen-only controls. All groups

started at an equal density of approximately 1000 cells per three-dimensional confocal snapshot. Wells were then imaged immediately and every other day using confocal microscopy before being processed using Imaris™ software to analyze cell proliferation over time.

Results: BIA-ALCL cell proliferation was significantly more robust in the biomimetic platform relative to the collagen-only groups regardless of implant shell type. BIA-ALCL cells in both the textured and smooth shell biomimetic groups grew nearly 30% faster than those within biomimetic wells lacking implant shell, with statistical differences as early as day two following plating. By day ten, mean cell counts in the textured and smooth shell biomimetic groups were 4021±999 and 4281±633, respectively, compared with 2399±355 in the biomimetic group lacking implant shell (p=0.015). There was no statistical difference in BIA-ALCL cell proliferation between the textured and smooth biomimetic groups or among any of the collagen-alone groups.

Conclusions: Using our unique tissue-engineered three-dimensional *ex vivo* model of BIA-ALCL, we have demonstrated that BIA-ALCL cells thrive within the biomimetic platform when compared with collagen alone and that incorporation of smooth and textured implant shell leads to significantly increased BIA-ALCL cell proliferation when compared with no implant shell. These findings contribute to the implication of breast implant materials in the development of BIA-ALCL, and they demonstrate the promise of our platform for use in further investigation of BIA-ALCL pathogenesis and therapeutics.

Comparing Outcomes after Oncoplastic Breast Reduction and Breast Reduction for Benign Macromastia

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Purpose: Approximately one in eight women in the United States will be diagnosed with breast cancer in her lifetime. Recent studies suggest that oncoplastic breast reconstruction following partial mastectomy with concurrent symmetrizing breast reduction improves cosmetic outcomes when compared to standard breast conservation therapy alone. Because the approach to reconstruction following lumpectomy is dictated by the extirpation, one could hypothesize that the complication profile could be less favorable than it would be for a standard breast

reduction. The purpose of this study is to determine whether or not tailoring a breast reduction to a cancer resection has an effect on complication rates. We set out to achieve this by 1) comparing outcomes between oncoplastic breast reduction patients and those who had a breast reduction for benign macromastia and 2) comparing complication rates between the cancer side and symmetrizing side of an oncoplastic reduction.

Methods and Materials: This study was approved by the Institutional Review Board. A retrospective chart review was performed on female patients who underwent either oncoplastic breast reduction or bilateral breast reduction for benign macromastia between January 2010 and October 2018 by a single surgeon. Patient demographics, intraoperative data including operative approach, and postoperative outcomes were gathered from the electronic medical record and coded into a HIPAA-compliant database. Specific outcomes tracked included SSI, hematoma, seroma, prolonged wound healing, nipple loss, loss of nipple sensation, fat necrosis, and patients who underwent revision. Chi-square test and T-test were performed when appropriate to determine significance.

Results: A total of 211 patients were included in this study, of which 62 (29.4%) underwent oncoplastic breast reduction and 149(70.6%) underwent breast reduction for benign macromastia. Mean follow-up time was 41 and 40 weeks in the oncoplastic and benign groups, respectively. Mean age was significantly greater in the oncoplastic group (51.9 vs 39.8, p=0.00), as was the rate of diabetes (16.4 vs. 6.1%, p=0.02) and length of surgery (265 vs. 216 min, p=0.00). Total resection weight was greater in the benign group (1623 vs 1096 g, p=0.00). There were no significant differences in BMI (29.2 vs. 29.6 kg/m2 p=0.66) or smoking status (26% vs 14% former smokers, p=0.08). There was a higher rate of loss of nipple sensation in the oncoplastic group ($\chi 2$= 10.6, p=0.005), but no differences in reoperation/readmission rate, revisional surgery, hematoma, seroma, surgical site infection, or fat necrosis. Furthermore, there were no significant differences in the rates of any complications when comparing the oncoplastic breasts to the symmetrizing breasts within the oncoplastic cohort.

Conclusions: This study offers a 9 year experience with over 200 oncoplastic and benign breast reductions. While the loss of nipple sensation was increased in patients undergoing oncoplastic breast reduction, all other outcomes were not significantly different between the two groups. There were also no differences in complication rates when comparing the side of malignancy to the symmetrizing side. While oncoplastic breast reduction poses challenges that may theoretically increase rates of complication and asymmetry, our findings indicate that it can be performed with similar safety profile to that of a standard breast reduction.

The Effect of the Affordable Care Act on Insurance Status in Patients with Primary Breast Cancer

Presenter:	Sarah J Armenia, MS
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Background: The relationship between insurance status and survival outcomes in patients with cancer has been well established. Uninsured patients have increased probability for complications after cancer-directed surgery and have prolonged hospital stays. These patients also have greater odds of in-hospital mortality. In 2010, the Affordable Care Act was enacted, greatly increasing insurance coverage in the general population. Many provisions have since been implemented into health programs systematically. In 2014, expansion of Medicaid eligibility in some states played a role in further expanding insurance coverage.

Methods: The SEER registry was queried for BC diagnosed between 2011 and 2014. Rates of uninsured status were compared before and after Medicaid expansion and contrasted between states that did and did not expand coverage, stratified by inherent patient and tumor characteristics, and assessed via multivariate regression.

Results: 74,954 patients with BC were identified between 2011 and 2014. There were no significant differences in demographic, clinicopathologic, and treatment characteristics of the cohorts pre- and post- Medicaid expansion. Overall rates of uninsured status (UR) were decreased by 35.3% in states that did expand coverage (ES) but increased by 10.7% in states that did not expand coverage (NS). In NS, there was an increase in proportion of black patients who were uninsured over the study period (11.6%) whereas in ES, this proportion decreased by 40.6%. There was an increase in uninsured rate in suburban population density regions (1.9% to 2.8%) in nonexpansion states and a decrease (1.7% to 0.8%) in expansion states. Multivariate analysis yielded predictors of uninsured status, including age, race, marital status, population density, year of diagnosis, and residence in non-expansion state.

Conclusion: This study demonstrates that implementation of the Affordable Care Act resulted in increased insurance coverage for patients diagnosed with malignancies of the breast. We find the differences in uninsured rates were most significantly decreased in states that expanded their coverage and in vulnerable populations. Furthermore, insurance status is important in determining survival in multivariate models. These findings should inform further policy direction surrounding Medicaid expansion for patients with breast cancers.

Nerve Allografting for Sensory Innervation Following Immediate Implant Breast Reconstruction

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Background: There has been a steady evolution over the past few decades in post-mastectomy breast reconstruction techniques. Nipple-sparing mastectomy approaches combined with immediate reconstruction can provide excellent cosmetic outcomes for women, but absent or significantly diminished post-operative breast and nipple/areolar sensation remain major drawbacks. We present a novel technique for implant reconstruction combining several of the latest advances in both breast oncologic surgery, reconstructive surgery as well as peripheral nerve surgery to achieve what we feel to be an optimal outcome both in terms of aesthetics and sensation.

Methods: 11 women (21 breasts) underwent nipple-sparing mastectomy and single-stage, direct-to-implant, pre-pectoral breast reconstruction. During the mastectomy, a careful dissection performed along the lateral aspect of the breast allowed identification and in some cases preservation of the T_4 & T_5 intercostal nerves. In cases where the nerves could be preserved without compromising the oncologic safety of the mastectomy, they were left intact heading into the subcutaneous tissue of the lateral mastectomy skin flap. When preservation was not feasible, neurotization of the nipple/areolar complex (NAC) utilizing allograft coapted from either the T_4 or T_5 lateral intercostal nerves proximally to subareolar nerves distally identified at the completion of the mastectomy. Two-point discrimination was measured pre-operatively in all four areolar quadrants and the nipple and repeated post-operatively at 3 months and 6 months. Sensation to gross, light touch throughout the rest of the reconstructed breast was also assessed (with an added evaluation point of 1 month post-operatively), as was patient satisfaction with their overall breast and NAC sensation.

Results: At the time of submission, 7 women (13 breasts) had at least six months of follow-up, with another 3 patients (6 breasts) with over three months of follow-up. In patients with at least three months follow-up, NAC two-point discrimination was found to be preserved compared with pre-operative values in 16 breasts (84%), was worse in 2 breasts (11%) of patients and had actually improved in 1 breast (5%). All of the patients in studied had grossly intact sensation to light touch throughout the majority of, if not their entire, reconstructed breasts. All patients reported good satisfaction with their sensory outcomes. None of the women developed hyperesthesia, allodynia or other symptoms concerning for neuroma formation.

Conclusions: This initial pilot study demonstrates as a proof of concept that nerve grafting in conjunction and/or careful nerve preservation at the time of nipple-sparing mastectomy with implant-based breast reconstruction is safe and effective, with a nearly 90% rate of preserved sensation post-procedure. Longer follow-up may yield even greater return of sensation than seen here or possibly improved sensation from the pre-operative baseline, particularly in patients receiving adjuvant chemotherapy or radiation therapy that could delay neurotization.

Single-Stage Adipofascial Turnover (AFT) Flap As an Alternate Option for Large Nasal Defects Usually Requiring Two-Stage Forehead Flap

Presenter: Thomas M. Gallagher, MD
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Background: Large nasal defects involving the tip, ala and/or columella with denuded cartilage have traditionally required a two-stage forehead flap for coverage. As many Mohs patients are presenting older with more medical co-morbidities than in the past, an alternative, single-stage adipofascial turnover (AFT) flap with a full-thickness skin graft (FTSG) was developed by the senior author. The authors hypothesize that the AFT flap would have similar success rates, fewer complications and less operative expense then the traditional forehead flap.

Methods: A retrospective case control review of all patients in the senior author's practice, who underwent either a forehead flap or AFT flap between January 2016 and February 2019 was conducted. There were 18 patients identified. All patients had greater than one-month follow-up. The two groups were compared regarding success, any complications and cost.

Results: There were 7 traditional forehead flap patients and 11 patients with AFT flaps. Total complication rate was 43% (3/7) for the forehead flap group, and 18% (2/11) for the AFT flap group. The complications for the forehead group were a mortality (n=1), revisional surgery for an area of prominent tip cartilage causing flap atrophy and noticeable tip asymmetry (n=1), and airflow obstruction (n=1). The AFT group had one partial skin graft loss and one incisional dehiscence. Both healed with local wound care without additional surgery. There were no flap failures in either group. Although no official questionnaire was given, the overall patient satisfaction with their reconstructive outcomes was high in both groups, as documented in detailed follow-up clinic visits. The total operating room (OR) costs were substantially less in

the AFT group. The total OR costs charged to the forehead flap group averaged around $42,500 per patient for the complete reconstructive process, and $17,100 per patient in the AFT group. The average cost savings was over $25,000 in the AFT group.

Conclusion: This review demonstrates that the single-stage adipofascial turnover flap with FTSG is a safe, reliable and less expensive reconstructive alternative to the forehead flap. The forehead flap will remain a workhorse in nasal reconstruction, especially in patients with very large areas of exposed denuded cartilage where the AFT flap may not provide enough surface area to achieve full coverage. Further review and analysis of the subjective aesthetic results between the two methods would be helpful to determine if either method offers a significant aesthetic advantage. This could be accomplished through both patient interview/questionnaires as well as professional analysis and comparison of aesthetic outcomes completed by blinded independent plastic surgeons. This will be our aim for future studies. In our experience, both reconstructive methods offer good aesthetic results, and patients have been satisfied with their outcomes. We can conclude from our study that multiple surgeries increase the total cost of nasal reconstruction and could contribute to higher complication rates. The AFT flap is a straightforward single-stage reconstruction that may reduce the risk of complications while cutting operating costs.

Minimally-Invasive Migraine Surgery: Our Nine-Year Experience

Presenter:	Edoardo Raposio, MD, PhD
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Introduction: Migraine Headache (MH) is a very common disorder affecting 1.7–4% of the world's adult population. The first line therapy for these patients is usually a combination of conservative treatments. Despite this large variety of options available, some patients remain refractory. For such group, migraine surgery might offer a definitive solution for their medical condition. In these patients, migraine is usually caused by extracranial nerve compression due vascular, fascial or muscular structures nearby. The aim of migraine surgery is to relieve such compression at specific trigger points located in the occipital, temporal and frontal regions.

Materials and Methods: From June 2011 to December 2018, in our Plastic Surgery Unit at the University of Parma, Italy, we performed 235 surgical procedures for Migraine in patients suffering from either frontal, occipital or temporal headache [1 -

5]. In patients with occipital and temporal migraine, nerve decompression was achieved by occipital and superficial temporal artery ligation, respectively. Vessels were previously localized by mean of portable Doppler device. In patients suffering from frontal headache we performed nerve decompression with single-entry endoscopic myotomies of procerus, corrugator and depressor supercilii muscles.

Results: Among patient suffering from occipital migraine, 95% of them observed significant improvement of their condition, with 86% reporting complete relief. In temporal migraine, positive outcome was achieved in 83% of the patients (50% complete elimination and 33% partial improvement). In patient treated with endoscopic frontal myotomies, positive results were observed in 94% of the patients (32% complete elimination, 62% partial improvement).

Conclusions: Migraine is a common and debilitating condition that can be treated successfully with minimally invasive surgical procedures. We believe that vascular compression is the main causative agent in occipital and temporal MH since the outstanding outcome that can be achieved by ligation only of occipital and superficial temporal artery, respectively. Frontal triggered migraine deactivation surgery still has fairly good outcomes but we feel that something is still missing and more researches should be performed.

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Pain Drawings Can Predict Poor Surgical Outcomes in Migraine Surgery.

Presenter:	Lisa Gfrerer, MD, PhD
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Purpose: Patient selection for migraine surgery is the most important variable to ensure successful outcomes. From verbal and written descriptions alone it can be difficult to understand patients pain/trigger patterns. In our experience, a superior method to visualize pain is to ask patients to draw where the pain originates and where it radiates. We have found that there are pathognomonic pain patterns for all trigger sites that should be considered in patient selection. We typically do not operate on patients with atypical pain diagrams, as we believe they are poor candidates for surgery. There is a small subset of these atypical patients that undergo surgery based on other strong clinical findings. In this study we attempt to quantify this clinical experience.

Methods and Materials: One- hundred and six patients were prospectively enrolled in this study and asked to complete pain diagrams at screening. Diagrams were analyzed and categorized by two independent, blinded reviewers: 1) Typical- Pain over the distribution of a nerve with expected radiation 2) Intermediate- Pain over the distribution of the nerve with atypical radiation 3) Atypical- Pain outside of normal nerve distribution and atypical radiation. Surgical outcomes were documented using pre and postoperative Migraine Headache Index (MHI) calculation. MHI between sub- categories was compared using unpaired T -tests.

Results: MHI improvement was on average 73±38% in the typical, 78±30 % in the intermediate, and 30±40% in the atypical pain drawing group. Mean follow up was 14.1 months. Inter- rater reliability was 94.3% with kappa of 0.8984. There was no significant difference in MHI between the typical and intermediate group. However, there was a significant difference in MHI between the typical and atypical ($p= 0.03$), as well as the intermediate and atypical group ($p= <0.01$). The chance of achieving MHI improvement >30% in the atypical group was only 20%. A sub-group analysis of atypical pain drawings was performed to establish criteria for classification as atypical: 1) facial pain that is drawn in other areas than the frontotemporal trigger site distribution (i.e drawn at cheek, jaw, chin, anterior neck) 2) pain that starts at a location that does not correspond to a known trigger site 3) diffuse pain that is not localized to a trigger site.

Conclusion: This study suggests that surgical outcomes for patients with atypical pain patterns are significantly inferior when compared to normal or close to normal patterns. As we continue to develop algorithms to screen patients for migraine surgery, patient self-created pain drawings should be considered as an effective, cheap, and easy to interpret tool to determine candidacy for surgery.

Holographic Surgical Planning and Telementoring for Craniofacial Surgery

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Introduction: As the complexity of the craniofacial (CF) surgery increases, cases become more challenging for less experienced surgeons to perform advanced procedures. Surgical teleconsulting/telementoring by an expert physician, as a subset of telemedicine, can provide real-time guidance to inexperienced surgeons at remote medical centers. Mixed reality (MR) head-mounted displays like HoloLens (Microsoft, Seattle, WA) – modern, untethered, a network-enabled headset which "augments" computer-generated 3-dimensional (3D) virtual image/information to the real physical environment/surgical site – are potentially easier-to-use than the conventional high-cost 2-dimensional telestrator based systems.

Objective: To validate that a collaborative surgical planning application developed for HoloLens meets ease-of-use criterion on a system usability scale (SUS) criteria (mean Likert scale >3.0 with $p \leq 0.05$, 1: strongly disagree, 5: strongly agree) while two plastic surgeons, in the roles of mentor and mentee, use shared interactive annotation and linear measurement tools on CF holograms.

Methods: To demonstrate the use of MR headsets for telementoring in CF surgery, HoloLens was utilized to evaluate its usability. Teleconsulting/telementoring application with CF surgical planning tools was developed for HoloLens. Seven adult dry human skulls with several main types of facial fractures were selected. Computed tomographic imaging data were acquired, bone structures were segmented, and resulting surface mesh files were loaded onto HoloLenses. Ten surgeons (ranging from 2nd-year residents to experienced surgeons [> 300 surgeries]) were enrolled in the study. Each session consisted of two surgeons at different geographical locations wearing HoloLenses networked via an internet connection. A set of interactive dimensional measurements were performed on disfigured holographic skulls to evaluate the CF defect for collaborative surgical planning. A previously verified

distance measurement tool calibrated with a holographic phantom for HoloLens was used.[1] Optimal reconstructive options were discussed via a Voice over Internet Protocol (VoIP) and holographic annotation. The SUS was evaluated using a Likert scale questionnaire and analyzed with a Student's t-test. The latency of interaction was evaluated by comparing the navigation of shared holographic cursors from the two participants.

Results: Holograms provided enhanced visualization of 3D spatial relationships and depth perception within and between anatomic structures which could not be observed by the conventional 2D display monitors. Mean SUS score of overall participants was 3.92 ± 0.73 ($p \leq 0.05$, one-sided). Surgeons evaluated the defects and shared surgical plans using interactive holographic annotations and linear measurements facilitating discussion of bone reduction direction, incision and osteotomy design in true 3-dimensions. Latencies were acceptable for both shared holograms and VoIP.

Conclusion: The novel telementoring application met usability acceptance criteria and enabled effective holographic telementoring during collaborative CF surgical planning. Future telementoring studies will include spatially registering and augmenting patient-specific holograms on the physical surgical site to provide real-time intraoperative guidance. This will improve educational access to surgeons to enhance surgical competency and patient safety in addition to facilitating the teaching of advanced surgical skills worldwide.

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A Pain in the Neck? Migraine Surgery in Patients with Prior Head or Neck Injury

Presenter:	Ricardo Ortiz, BSc
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Purpose: A high prevalence (~37%) of prior head and neck injury has been reported in patients undergoing migraine headache (MH) surgery[1]. Conservative medical

treatment of post-traumatic MH has had limited success. It is unclear if MH surgery mirrors these unsatisfactory outcomes. In an effort to improve patient selection and preoperative counseling for MH surgery, it is critical to understand expected outcomes across specific populations, including the posttraumatic cohort. However, this subgroup has not been described in detail and their outcomes have not been compared to patients without a history of head or neck injury.

Methods and Materials: 142 subjects undergoing migraine surgery were prospectively enrolled. Preoperatively, patients were asked to complete a questionnaire on MH history, including the Migraine Headache Index (MHI) and information on prior head or neck injury. This included data on the nature of the injury, timing in relation to their MH, and whether they attributed their MH pain to the injury itself (precipitating event). The senior author performed all surgical procedures. Follow up surveys were sent to all patients at twelve months postoperatively.

Results: Of the subjects included in this study, 50% (n=71) reported a history of head or neck injury, and 30% (n=42) classified the injury as the precipitating event leading to their MH. Patients who associated their injury with the onset of their MH were significantly less likely to have a positive family history of MH. There was no significant difference in mean preoperative MHI between the atraumatic (108.8 ± 80.0), traumatic (99.9 ± 92.5), and precipitating event (90.8 ± 90.1) cohorts.

At twelve months postoperatively, there was no significant difference in MHI reduction between these three groups. The proportion of patients who experienced at least a 50% and 80% improvement in MHI per group, respectively, was: 83% and 67% (atraumatic), 76% and 68% (traumatic) (P=0.40), 71% and 63% (precipitating event). The median follow-up time was 12.9 months (interquartile range 11.8-15.2).

Conclusions: Fifty percent of patients undergoing migraine surgery at our center report a history of head and neck injury. This finding corroborates a higher prevalence of head and neck injury in patients with migraine as compared to the general population[2]. Further, this study suggests that outcomes in migraine surgery patients with a prior history of head and neck injury are comparable to those without injury. Migraine surgery candidates with a history of injury can therefore expect similar outcomes as reported for migraine surgery patients overall.

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Cost-Effectiveness of Long-Term, Targeted Onabotulinumtoxina Versus Peripheral Nerve Decompression Surgery for the Treatment of Migraine Headaches

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Background: Chronic migraines affect approximately 2% of the United States population and cost an estimated $17 billion per year. OnabotulinumtoxinA (BoNTA) is an FDA-approved prophylactic medication for chronic migraine headaches and is best injected in a targeted fashion into specific trigger sites. The purpose of this study is to determine the cost-effectiveness of long-term, targeted BoNTA versus peripheral nerve decompression surgery for the treatment of migraine headaches.

Methods: A Markov model was constructed to examine long-term, targeted BoNTA versus peripheral nerve decompression surgery. Costs, utilities, and other model inputs were identified from the literature. One-way and probabilistic sensitivity analyses were performed. An incremental cost-effectiveness ratio under $50,000 per quality adjusted life year was considered cost-effective.

Results: The mean cost of peripheral nerve decompression surgery was $10,303 with an effectiveness of 7.06, while the mean cost of long term, targeted BoNTAwas $36,071 with an effectiveness of 6.34. Decompression surgery is more effective and less costly over the time horizon of the model. One-way sensitivity analysis revealed that surgery is the most cost-effective treatment in patients requiring treatment for greater than 6.75 years.

Conclusion: Based on this model, peripheral nerve decompression surgery is the more cost-effective option for treating refractory migraine headaches requiring treatment beyond 6.75 years. The model reveals that peripheral nerve decompression surgeryis more effective and less costly than long term, targeted BoNTA over the course of a patient's lifetime.

Migraine Surgery Is an Effective Treatment and a Financially Valuable Procedure

Presenter: Nick J Albano, MD
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Purpose: As the landscape of systems-based healthcare continues to change, a greater financial emphasis is being placed on the way care is provided. From a business standpoint, costs should be minimized while profits are to be maximized. However, these tenets do not always align with delivery of optimal care. We sought to demonstrate that migraine surgery at The University of Wisconsin is both effective and financially beneficial to the hospital system.

Methods: A five-year (2013-2017) retrospective analysis of 197 patients who underwent migraine surgery at The University of Wisconsin – Madison was performed. Preoperative and postoperative Migraine Headache Index (MHI) scores were calculated. The surgical setting (outpatient vs inpatient) of the procedure was analyzed along with direct and indirect costs. Revenue and cost data were used to calculate a net profit margin.

Results: Patient MHI demonstrated a reduction in scores from 193.7 preoperatively to 48.8 postoperatively (mean reduction, 74.8%, $p<0.0001$). Ninety one percent ($n=179$) of cases were performed as outpatient procedures. Mean direct and indirect costs were $4,702.47 and $2,954.62 respectively. On average, 38% of the charged fee was received in reimbursement. Mean profit margin for a migraine surgery was 49.5%.

Conclusions: We have demonstrated that the experience at The University of Wisconsin validates that surgical management of headaches is an effective treatment as described in the literature. Migraine surgery is a convenient procedure for both the patient and the hospital as the vast majority of cases are performed on an outpatient basis. Direct and indirect costs are modest leading to a healthy profit margin. Ultimately, a migraine surgery practice is of great value to hospitals as it combines profitability with excellent clinical outcomes.

Clinical Course and Outcomes of Temporomandibular Joint Ankylosis in Patients with Craniofacial Microsomia

Presenter: Elie P Ramly, MD

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Background: Skeletal ankylosis of the Temporomandibular joint (TMJ) can have debilitating consequences. We present an institutional experience of the surgical treatment of TMJ ankylosis in pediatric patients with craniofacial microsomia.

Methods: Patients with TMJ ankylosis and craniofacial microsomia treated at our institution between 1976 and 2019 were identified through retrospective chart review including clinical records, operative reports, and imaging studies. Data collected included demographics, Pruzansky classification, TMJ ankylosis, surgical operations (mandibular procedures, tracheostomy, gastrostomy), and postoperative outcomes including re-ankylosis.

Results: TMJ skeletal ankylosis was diagnosed in fifteen patients (8 bilateral). Mean age at diagnosis was 6.7 (range: 0-18 years). Three cases of TMJ ankylosis were congenital and 12 were iatrogenic, occurring during the treatment of craniofacial microsomia (Pruzansky IIB: n=5; III: n=7). Ankylosis developed after distraction osteogenesis (DO) in 8 patients (2 of whom had been referred from other institutions) or after autologous mandibular reconstruction in 4 patients. Follow up was 12.6±6.6 years. On average, patients had 9 (range: 2-19) mandibular operations. Adjusting for length of follow up, patients having their first mandibular operation at a younger age had more frequent reoperations. Mandibular reconstruction involved costochondral grafts in 4 patients, iliac crest in 1, and microvascular free fibula transfer in 2. Gap arthroplasties were performed in 9 patients, interpositional arthroplasties in 5, and coronoidectomies in 7. One patient underwent alloplastic joint replacement. Overall improvement in mean interincisal opening (MIO) was 24.8±6.4mm. Ankylosis recurred in 73.3% of cases (3 congenital, 8 iatrogenic) and necessitated on average 3 operations (range:1-8). Tracheostomy dependence persisted in 6 (40%) patients and gastrostomy dependence persisted in 7 (46.7%). Decannulation was successful in 5 patients. Recurrence of bilateral ankylosis necessitated repeat trachesotomy in one patient. Tracheostomy was successfully prevented in 3 patients.

Conclusion: TMJ ankylosis in the setting of craniofacial microsomia reconstruction is associated with high recurrence rates requiring multiple reoperations, despite improvement in initial postoperative MIO. In patients with craniofacial microsomia, younger age at initial mandibular surgery and number of operations seem to be associated with an increased risk of TMJ ankylosis as well as tracheostomy and gastrostomy dependence.

Improved Facial Symmetry with Treatment during Active Unilateral Condylar Hyperplasia

Presenter:	Seija Maniskas, MS
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Background: Facial asymmetry due to unilateral condylar hyperplasia (UCH) may be treated through various approaches based on disease activity. Active UCH may be addressed with high condylectomy with or without concurrent or staged orthognathic surgery. Alternatively, a delayed approach may be used, in which orthognathic surgery alone is performed after the disease process has "burnt out." There is a paucity of definitive evidence beyond case reports supporting the use of a superior method for correcting facial asymmetry. Therefore, this study sought to quantify and compare pre- and post-operative facial asymmetry in UCH patients with active and burnt out disease in an effort to guide future treatment guidelines.

Methods: Pre- and post-operative three-dimensional (3D) images of patients with active and burnt out UCH (groups 1 and 2, respectively) were obtained using the Vectra 3D camera system. These patients were compared to controls who did not have any concerns with facial asymmetry. Facial asymmetry was analyzed and quantified by calculating the root mean square deviation (RMSD) between the native faces and those constructed by mirror image. Paired student's t-tests were performed to compare the RMSDs of pre- and post-operative images between the UCH groups and against controls.

Results: Forty patients were photographed (11 in group 1, 9 in group 2, and 20 controls) and 60 3D images were evaluated. The average length of follow up was 1.0 ± 1.1 years. Pre-operatively, patients in the burnt out group had worse asymmetry than those with active UCH ($p = 0.011$). Both groups demonstrated significantly improved symmetry post-operatively ($p = 0.0069$ and $p = 1.74E-4$ for groups 1 and 2, respectively). Importantly, however, post-operative group 2 patients remained notably more asymmetric compared to unaffected controls ($p = 4.75E-4$), while their group 1 counterparts showed no significant difference compared to the same controls ($p = 0.089$).

Conclusion: Treatment of UCH while the condyle is still active may result in normal facial balance, likely due to the powerful effect of high condylectomy on both arresting condylar activity and correcting vertical deformity of the mandible. In

contrast, while the delayed approach may produce significant improvements, facial asymmetry may persist. Such findings suggest that it may be preferable to intervene while UCH is active rather than waiting until the disease process has burnt out.

The Chip Score: A Method to Determine Risk of Surgical Intervention for Hemangioma Patients

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Background: Infantile hemangiomas (IHs) are the most common benign tumor of infancy and can have profound effects on the well-being of patients[1]. With the variability in use of surgery amongst providers, it can be difficult to counsel patients and their families on potential surgical treatment. Through the development of the Case Western Hemangioma Intervention Predictor (CHIP) score, this study aims to improve the consistency of counseling regarding surgery and timing of surgical referral.

Methods: This was a retrospective review of all patients (181) treated for infantile hemangiomas at a single tertiary care center over 17 years. Patients were divided equally into two groups. Descriptive statistics and correlation plots were performed on the first cohort to evaluate which disease factors (such as size, location, complications) and patient factors significantly correlated to surgical risk. These factors were used to form a CHIP score, which was then validated through logistic regression with length of medical management as a covariate against the second cohort of patients.

Results: After controlling for length of medical management, lack of medical management, functional impairment and ulceration were found to be significantly associated with surgical risk ($p<0.05$). When validated against the second half of our cohort, a CHIP score of 3 (of a maximum score of 3) was found to have a specificity of 92% and a sensitivity of 81% in predicting risk of surgical intervention.

Conclusions: Infantile hemangiomas can have clinical characteristics that may be predictors of complexity and surgical intervention. The CHIP score can assist in educating patients on surgery as a treatment option and guiding appropriate referrals.

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Indocyanine Green Lymphangiography: An Alternative to Blue Dye Detection for Sentinel Lymph Node Biopsy in Cutaneous Malignancies of the Head and Neck

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Introduction & Objectives: Sentinel lymph node biopsies (SLNB) are the gold standard for staging of invasive cutaneous melanoma and other malignancies. Traditionally, preoperative lymphoscintigraphy with a radioisotope and intraoperative use of a vital blue dye is used to identify the sentinel node and draining nodal basin. SLNB for melanoma occurring in the head and neck (HN) region can be more challenging due in part to multiple draining lymph node basins, small size of cervical nodes, and the anatomic challenges of nodal removal. In addition, the proximity of the primary site to draining lymph node basins may preclude accurate tracer identification of the SLN. Previous studies have demonstrated complications with the use of blue dyes including anaphylactic reactions, wound infections, and inconsistent identification of sentinel nodes. Staining of the lymphatic basin by blue dye can obscure and complicate the dissection. Our objective is to evaluate the equivalence in SLN detection in HN malignancies with the use of intraoperative Indocyanine Green Lymphangiography (ICG) instead of traditional blue dye.

Methods: Ten consecutive cases of primary cutaneous melanoma or Merkel Cell carcinoma of the HN without clinically evident regional metastasis undergoing SLNB with ICG and identification by the SPY-PHI Fluorescence Imaging Technology (Stryker Corp., Kalamazoo, MI, USA) in association with a preoperative lymphoscintigraphy with Spect-CT were evaluated. A total of up to 1mL of ICG was injected intradermally across four quadrants around the primary lesion. The identified nodes were confirmed through an enhanced fluorescence signal information with vivid white light images in real-time and subsequently with Gamma probe and pathological identification.

Results: All sentinel lymph nodes identified preoperatively by lymphoscintigraphy with Spect-CT were correctly identified by the SPY-PHI system. In all cases, visual localization of the lymphatic drainage through the skin helped to detect the lymph node basin. Very bright appearance of the SLN has made identification easier and dissection from nearby structures safer. Confirmation via Gamma probe and pathological evaluation were 100%. There were no complications at the injection sites in any patients.

Conclusion: In this pilot case series, the indocyanine green lymphangiography via the SPY-PHI system proved as a safe and reliable alternative for blue dye localization in SLNB of head and neck cutaneous malignancies. It showed easier SLN visualization and detection compared to blue dye injection and possibly a decreased complication profile. Longer term studies are needed to accurately assess false negative rates after undergoing SLNB via ICG lymphangiography.

Impact of Oral Beta-Blockers on Surgical Treatment of Infantile Hemangioma

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Introduction: Infantile hemangioma is the most common benign neoplasm of infancy[1]. Treatment varies according to size, location, local complications, and evolutive stage[2]. Surgical treatment in the active phases was considered one of the main options. Since 2009, the use of beta-blockers for treatment of patients with infantile hemangioma was scientifically supported. Simultaneously with the favorable results obtained, doubts about the impact on surgical indication arose. To date, there is limited data discussing these changes in surgical practice. Therefore, this study intends to answer important questions from plastic surgeons all over the world regarding the surgical management of infantile hemangiomas:

- Has the number of procedures reduced?
- Have the surgeries been delayed?
- Have the procedures been less complex?

Purpose statement: Compare management of patients with infantile hemangioma before and after the introduction of beta- blockers and assess whether pharmacological therapy changed surgical treatment in terms of numbers of cases operated, magnitude of the procedure and timing of surgery.

Materials and Methods: A retrospective cohort study was accomplished, including 278 patients with infantile hemangioma followed between 1998 and 2016. Patients with active (non-involuted) infantile hemangioma without urgent indication of treatment and with lesions in relevant anatomical sites (around eyelids, nose, mouth), with cosmetic deformities, local complications and partially obstructed orifices were evaluated. A number of 136 patients met the inclusion criteria and were divided into 2 groups, treated before 2009 (n=67, prior to the introduction of beta-blockers) and after 2009 (n =69, already including patients treated with propranolol).

Results: In the first Group (before 2009), surgery was the only treatment for 21 (31.3%) patients. From the remaining 46, surgery was combined with clinical treatment in 23 (corticosteroids, lasers), totalizing 44 (65,7%) patients treated by surgery. Surgical rate per patient was 1.47, and surgery duration per patient was 112.4 minutes.

In the second Group (after 2009), surgery was the single treatment in only 2 patients (2,9%). From the remaining 67, surgery was combined with clinical treatment in 14, totalizing 16 (23,2%) patients treated by surgery. Surgical rate per patient was 1.12, and surgery duration per patient was 71.9 minutes.
There was a marked reduction of 64.7% on the number of patients who underwent surgery and a decrease of 23.8% on the number of surgeries per patient.

Conclusions: Overall, there was an impact on the total number of surgeries and its complexity, allowing a new perspective on the surgical and clinical management of infantile hemangiomas. Beta-blockers are recommended for exclusive clinical treatment for infantile hemangioma given its clinical safety, low cost, and proven efficacy.
It seems that the use of beta-blocker can be the best pharmacological choice and a neoadjuvant indication to reduce the lesion to facilitate resection and postpone surgery.

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Direct to Surgery? Surgical Outcomes in Pediatric Patients with Infantile Hemangioma: A Retrospective Case-Control Study

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Introduction and Objectives: The effects of medical pre-treatment prior to surgical excision of infantile hemangiomas (IH) remains understudied. This study aimed to determine if there was a significant difference in surgical complications between direct to surgery and prior medical pre-treatment of patients with infantile hemangiomas.

Material and Methods: A retrospective chart review was conducted at a pediatric tertiary center between 2007-2018. Children 0-18 years who underwent surgical resection (confirmed GLUT-1 positive IH by immunostaining) were included. Visceral and congenital hemangiomas, PHACE and Kasabach-Merritt syndromes were excluded. Pre-treatment was the primary predictor for post-surgical complications (wound dehiscence, infection, scarring, repeat surgery). Pearson's chi-squared test and Fisher's exact test were used for statistical analysis. Literature meta-analysis was additionally performed.

Results: Our institution identified 185 IH patients, 85 (46%) underwent surgical resection. Of these, 32.9% had pre-treatment (PT) (8.24% propranolol, 9.41% topical timolol, 12.94% steroids, 2.35% laser); 67.1% had no pre-treatment (NPT). Pre-surgical lesion size was comparable (median size 5cm2, p=0.829). Surgical outcomes between PT and NPT were comparable for wound dehiscence, infection, scarring, and repeat surgery (p=0.162, 1.0, 1.0, 0.483), including pooled complications (p=0.448). Where documented, PT had higher functional improvement (p=0.039). Results were comparable when selecting for beta-blockers versus NPT (wound dehiscence p=0.573, infection p=0.468, scarring p=0.679, functional improvement p=0.005, repeat surgery p=0.672). Meta-analysis included 7 studies and 169 patients, 39.1% PT and 68.1% NPT. Most common PT was systemic/intralesional steroids. Five received beta-blockers. All patients had functional improvement where recorded. Complications were slightly higher for PT (p=0.041).

Conclusion: Incidence of surgical complications is comparable between direct to surgery and medical pre-treatment patients. This data supports early surgical management in appropriate patients, and our study proposes adding direct to surgery as a valid treatment arm in hemangioma protocols. Future directions include defining

appropriate candidates for direct to surgery inclusion on our institution's treatment algorithm.

Successful Reconstruction of Complex Calvarial Defects in Patients in Their Ninth through Eleventh Decade of Life Using Dermal Templates As a Safe Option

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Purpose: As the elderly population continues to rapidly grow, plastic surgeons are faced with the need to reconstruct challenging defects in patients in their ninth, tenth, and even eleventh decades of life. One such common defect is large surface area calvarial defects without remnant periosteum following skin cancer resection. Currently, there is little to no data regarding how to reconstruct or even whether reconstruction should be undertaken for these defects in this "extremely elderly" population. Here we present a case series of patients in their ninth through eleventh decades of life who presented with a complex scalp defect which was successfully reconstructed in two stages beginning with Integra, followed by a split thickness skin graft (STSG).

Methods and Materials: Records were retrospectively reviewed from 2016-2019 and all patients from one attending plastic surgeon who underwent scalp skin cancer resection followed by a complex reconstruction using Integra and a STSG, and were greater than 80 years old at the time of surgery, were included. Six patients were identified who met these criteria.

Results: Six patients with the average age of 90.5 (82-101) underwent resection of a skin cancer of the scalp (SCC (4), dermal sarcoma (1), malignant spindle cell tumor (1)) with an average size of 83 square centimeters (40-130) that included resection of the underlying periosteum. All patients had multiple medical co-morbidities, including one with prior brain tumor resection and two who received radiation to the scalp. All patients underwent a two-stage reconstruction. At the initial stage after tumor extirpation, the wound bed was prepared by burring down the exposed calvarium until there was sufficient punctate bleeding followed by placement of Integra. After an average of 14.8 days, patients underwent placement of a STSG ($8/1000^{th}$-$12/1000^{th}$of an inch) over the vascularized Integra. General anesthesia was used for five patients and MAC for one patient. The average surgery times in stages 1

and 2 were 112 and 60.7 minutes, respectively. There were no issues with integra or STSG take in any patient, with no complications or additional re-operations required. One patient developed a small area of recurrent SCC for which excisional biopsy was performed and healed completely by secondary intention.

Conclusion: Full thickness scalp defects that include the periosteum can be challenging to reconstruct, especially in the elderly with multiple medical comorbidities. This case series demonstrates that "extremely elderly" patients in their ninth through eleventh decade of life with complex, full thickness calvarial defects are good candidates for reconstruction with integra followed by a STSG. Age should not be a contraindication to complex scalp reconstruction using a dermal template, as this case series demonstrates these patients have the ability to re-vascularize the template and allow a STSG to take with minimal to no complications/morbidity, a relatively short operative time, and stable outcome.

Disease Characteristics of the Amelanotic Melanoma of the Head and Neck

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Purpose: Amelanotic melanoma is an extremely rare subtype of cutaneous melanoma. It is characterized due to the lack of melanin in the tumor cells. Its appearance does not tend to show signs of malignancy and can be skin-colored in forms of erythematous macule, dermal plaques, or papulonodular forms. To our knowledge, the tumor characteristics of this type of melanoma located on the head and neck are still not well clear. This study described the demographics and factors associated to amelanotic melanoma of the head and neck.

Methods: We analyzed the demographics and tumor characteristics of patients diagnosed with amelanotic melanoma of the head and neck (AMHN) from 2004 to 2015 by querying the National Cancer Database (NCDB). Comparison of age, gender, stage, Breslow depth, ulceration, mitotic count, and lymph node involvement was determined between the amelanotic melanoma of the head and neck with common malignant melanoma of the head and neck (CMMHN). Statistical analysis was performed using Chi-square and multivariate logistic regression model.

Results: 368 patients diagnosed with AMHN and 69,267 patients with CMMHN met the inclusion criteria. Mean age at diagnosis of the patients with AMHN was 69.04 years old. Most of them were white (98.1%) males (69.6%), and between 61 and 80 years old (46.7%). Most of the patients with AMHN had the melanoma located on the scalp and neck (34.8%) and were diagnosed at an early stage (0, I, II) of the disease (46.7%). Tumor characteristics presented in most of these patients included a Breslow depth between 2.01 to 4 mm (28.5%), without ulceration (54.6%), regression (39.4%), with a mitotic count of 1 or more/mm^2 (40.5%),and with lymph nodes negative (52.7%). The frequency of metastasis was very low for lung (1.9%), liver (0.5%) and brain (0.3%) metastases. Additionally, most of the patients with AMHN underwent surgery (98.1%), and without any radiation therapy (92.9%). When compared with CMMHN, we found that AMHN patients were more likely to be diagnosed at >80 years old (25.3% vs 18.2%, aOR: 3.28; IC: 1.09-9.84, p-value<0.03), with a Breslow depth between 2.01 to 4mm (28.5% vs 6.5%, aOR:1.92; IC: 1.15-3.19, p-value<0.01), with presence of ulceration (36.7% vs 9%, aOR:1.99; IC: 1.34-2.97, p-value=0.001) and with a mitotic count of 1 or more/mm^2 (40.5% vs 12.8%, aOR: 2.53; IC: 1.09-5.89, p-value<0.03). No statistical difference was found for gender, specific location, stage, and lymph node involvement.

Conclusion: Our study determined that AMHN is associated with older age, and negative prognostic factors like higher Breslow depth, higher mitotic count and presence of ulceration when compared with the CMMHN. The knowledge of these factors suggests the aggressiveness of the disease and help us to choose the best surgical management based on the histology and the disease characteristics.

Impact of Immediate Surgical Reconstruction Following Wide Local Excision of Malignant Melanoma

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Purpose: The role of surgical reconstruction following melanoma extirpation is well recognized. While technical considerations, such as reconstruction modality, are largely dependent on individual anatomy and surgeon preference, the optimal timing of surgical reconstruction remains unclear. Therefore, the purpose of this study was to evaluate clinical and oncologic outcomes in patients undergoing malignant melanoma extirpation followed by immediate surgical reconstruction.

Methods: We retrospectively identified patients who underwent immediate surgical reconstruction following wide local excision of biopsy proven malignant melanoma of the head and neck at our institution between January 2013 and December 2016. Patients were excluded if final pathology demonstrated non-melanoma histology or if reconstruction was not performed by plastic surgery. Patient demographic and clinical characteristics, operative variables, and relevant outcome data were collected from patient records. Descriptive statistics were summarized and chi-square tests were used for bivariate analysis in SPSS.

Results: In the duration of this study, 197 patients (139 males, 70.6%) underwent wide local excision followed by immediate surgical reconstruction. The mean age of patients at time of surgery was 67.3 years (range, 16-95 years). Of the 70 patients with a history of cutaneous malignancy, 46 (65.7%) had a prior melanoma and 26 (37.1%) patients had two or more types of skin cancers, including melanoma and non-melanoma histology. Of the 202 lesions that were resected, 138 (68.3%) were invasive (T1-4) and 64 (31.7%) were clinically determined to be melanoma in situ (Tis) following initial biopsy. The most frequent anatomic location involved was the cheek (69, 34.2%), followed by the scalp (63, 31.2%), ear (19, 9.4%), nose (16, 7.9%), temple (16, 7.9%), and forehead (14, 6.9%). Surgical reconstruction technique varied considerably in this cohort, with 34 (15.2%) lesions repaired by complex primary closure, 132 (58.9%) by adjacent tissue transfer, 39 (17.4%) by full thickness skin graft, and 19 (8.5%) by split thickness skin graft. On postoperative pathologic assessment, 21 (10.7%) lesions were upstaged and 2 (0.9%) were found to have positive margins. The mean follow up time following surgical reconstruction was 2.3 years (standard deviation, 1.4 years). Overall, 5 patients experienced local recurrence during the follow up period, with a mean time to recurrence of 7.6 months (range, 1.8-13.0 months). In an unadjusted bivariate analysis, history of melanoma (p=0.015) was significantly associated with local recurrence following resection.

Conclusion: Surgical reconstruction at time of wide local excision is a safe and oncologically sound approach for the surgical management of patients with malignant melanoma. A prior history of melanoma may be associated with recurrence.

Comparison of Different Surgical Specialties Performing Ablative Resection and Reconstruction of Cutaneous Malignancies of the Head and Neck in 1901 Patients

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Purpose: Despite continued advocacy for primary prevention, skin cancer remains the most common malignancy within the United States. With an aging population, the rising incidence of cutaneous malignancies of the head and neck (H&N) poses a challenge to healthcare availability and confronts traditions within the current practice of plastic surgery. Surgical management of cutaneous H&N malignancies is currently performed by a diverse number of surgical specialists. The objective of this study was to assess postoperative outcomes of excision and reconstruction of cutaneous H&N malignancies by these different specialists.

Methods: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP, 2005-2017) was queried by International Statistical Classification of Disease (ICD) and Current Procedural Terminology (CPT) codes for patients with H&N skin cancer who underwent excision and reconstruction by a single operative specialist. The Modified Frailty Index, an aggregate of five NSQIP comorbidities, was utilized to assess patient well-being and as a validated predictor of postoperative morbidity and mortality. Rates of 30-day postoperative complications were compared. Multivariable regression analysis controlling for operative time, reconstructive modality, disseminated cancer, and bleeding disorders was employed to generate adjusted odds ratios.

Results: In total, 1901 patients underwent excision and reconstruction of cutaneous malignancies. 55.7% (n=1059) of patients were operated on by plastic surgery (PS), while 28.3% (n=538) and 16.0% (n=304) were operated on by otolaryngology (ENT) and general surgery (GS), respectively. Reconstructive modalities statistically differed between specialties, with PS and ENT performing a greater number of flap reconstructions and tissue rearrangements. Rates of all-cause complications were statistically different, with 2.8% (n=30) of PS, 6.7% (n=36) of ENT, and 3.6% (n=11) of GS patients experiencing at least one all-cause complication ($p<0.001$). There was a positive correlation between ENT patients and all-cause complications compared with PS patients on univariate analysis (OR 2.460; $p<0.001$); however, this outcome did not persist in multivariate analysis (OR 1.674; $p=0.076$). Multivariate analysis further demonstrated that smoking, steroid use, and frailty indices of 2 and ≥3 were all-cause complication predictors.

Conclusion: The incidence of complications following resection and reconstruction of H&N cutaneous malignancies is relatively low. This study supports the involvement of plastic surgeons in management of cutaneous H&N malignancies.

Virtual Surgical Planning of Tissue Transfer: Welcome Multi-View Stereo and Finite Element Analysis

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Purpose: While virtual surgical planning has revolutionized orthognathic surgery, the same has not been accomplished for soft tissue surgery. Simulation of tissue transfer could guide surgical planning and minimize complications. The present study seeks to create a process by which Finite Element Analysis (FEA) of images in Multi-View Stereo (MVS) can analyze patient-specific virtual models to predict soft tissue deformation and stress distribution in flap design.

Methods: Multi-View Stereo (MVS) was used to convert 2D photographs of two patients with circular scalp defects secondary to melanoma excision into 3D mesh models. The scalp flaps designed on the operating table were simulated on the models using Finite Element Analysis (FEA) and the resulting stress contours were calculated. Patient A had 2 scalp defects – 4.8cm in diameter anteriorly (closed with a skin graft) and 2.5cm posteriorly (closed with a rotation-advancement flap). Patient B had a 3.6cm diameter defect in the posterior scalp, which was closed with a rotation-advancement flap with a small area of the donor site open to heal secondarily due to high tension.

Results: Using MVS, 2D photographs taken using a commercially available device (iPhone 8) were successfully converted to a 3D model of the surgical field. Direction and degree of anisotropy (collinearity of tissue fibers) were then incorporated into the model using Cox's lines. FEA simulation of the rotation-advancement flaps used to close the defects predicted stress distributions throughout the flap and surrounding scalp tissue which accurately reflected the areas of highest tension during closure. Tension across the suture lines averaged 30kPa in patient A and 50kPa in patient B. FEA of the surgical scenario for Patient B also produced the high tension profile that was seen in the OR with attempted primary closure of the donor site, confirming accuracy in simulating scenarios where total primary closure of the donor and defect sites isn’t possible.

Conclusions: This is the first successful application of computer assisted modeling to soft tissue surgery in a patient-specific scenario. We show that using the common cell phone to capture images and a commercially available software package, it is possible to accurately model the surgical scenario and use FEA to accurately predict the tissue stresses resulting from any specific flap design. This paves the way for prospective

surgical simulation to allow a surgeon to 'try out' any number of flap designs virtually with no risk before committing to the optimal one on the table. With calibration of the magnitudes simulated to those measured in the operating room, threshold for wound healing complications can be determined and flaps can be designed appropriately.

FEA and MVS allow for simulation of soft tissue surgery in patient-specific scenarios. Streamlining the steps of this process will allow real time assessment of stress during tissue transfer to minimize closing tension and achieve optimal flap design.

Plastic Surgeons and Opioid Prescription Trends in the Medicare Population

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Introduction: The current opioid epidemic in the United States has demonstrated the harmful effects associated with prescription opioids. For any surgeon, it can be difficult to balance the risks with the benefits of adequate acute post-operative pain control. In older patients, this is especially important as even short courses of opioid treatment can lead to serious side effects.[1] As new guidelines and educational efforts develop in an attempt to mitigate opioid prescription risks, it is important to consider prescriber characteristics in order to properly tailor these endeavors. The aim of this study was to describe current practices in opioid prescription among plastic surgeons treating the Medicare population.

Methods: This was a cross-sectional study using 2016 Medicare Provider Utilization and Payment data.[2,3] Surgeons were included if they had performed surgical procedures on Medicare patients and had made greater than 10 opioid claims in 2016. Opioid claims made by plastic surgeons were pulled from Medicare Part D data along with details of the claims, demographics, and location of the prescribing surgeons. Surgeons were then correlated to procedures they performed using the Medicare Physical and Other Supplier Data. Procedures were categorized into one of 6 categories (face, general, breast, reconstruction, hand, or removal of benign/malignant growth). Characteristics of plastic surgeons in the top 5% of prescribers as defined by opioid claims per Medicare beneficiary were then compared to plastic surgeons in the bottom 95%.

Results: There were 1582 plastic surgeons included from the Medicare Part D database. The surgeons in the top 5% of prescribers had a mean of 1.3 (SD 0.76)

opioid claims per Medicare beneficiary while those in the bottom 95% made 0.29 (SD 0.18) claims per Medicare patient. Region was a significant predictor ($p < 0.001$), with surgeons from the southern and western regions more likely to be in the top 5% prescribing group. Those that had at least 10% of procedures categorized as breast were also more likely to be in the top 5% group ($p<0.001$). Additionally, prescribers in the top 5% prescribed longer durations of opioids than those in the 95% group (means of 9 and 5 days).

Conclusion: Our study suggests that opioid prescribing patterns follow trends related to prescriber characteristics, such as geographic location and procedures performed. Surgeons performing breast procedures and those in the south and west were more likely to be in the 5% of prescribers. Knowledge and recognition of these trends will be helpful in targeting opioid prescriber reform within plastic surgery.

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Eighty-Nine Percent of Opioids Prescribed for Outpatient Pediatric Surgery Go Unused

Presenter:	Katherine Au, MD
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Purpose: Although much focus has been placed on the use of opioids for chronic pain, unused opioids prescribed for acute surgical pain are an important source of opioid diversion and abuse. Few studies have looked into the prescribing patterns for pediatric patients undergoing acute surgical intervention. This study describes the

opioid prescribing habits of pediatric surgeons for acute postoperative pain and evaluates the quantity of unused opioids after the conclusion of acute surgical pain.

Methods: A single institution retrospective review of all outpatient surgeries from June 2016 through April 2018 was performed. Patients were given a patient reported outcome measure tracking their daily maximal level of pain postoperatively and the doses of opioid used. With data from chart reviews and pharmacy dispensing logs, we determined the amount of opioids prescribed and pills remaining.

Results: In total, 89% of all pills prescribed went unused (4,744 doses of opioid prescribed with 4,232 unused). An average of 17.1 doses of opioid pills were prescribed to postsurgical patients, and on average 15.1 doses went unused. We found that 52% of the patients in our study did not use any opioid medications postoperatively. For patients that used opioids, an average of 3.8 doses were used, with 90% of patients using 9 doses or less. Compared to patients who had soft tissue surgery, patients who underwent bone surgery were more likely to use opioids though the number of doses used was the same as soft tissue surgery patients. However, bone surgery patients were prescribed more opioids and thus had more opioids leftover.

Conclusion: Pediatric surgeons often prescribe more opioids than necessary to treat acute surgical pain, with orthopaedic surgeons prescribing significantly higher doses of opioid medications. The opioid excess may contribute to the epidemic of nonmedical use of prescription opioids if disposed of improperly by patients and their families. More research and education are necessary to optimize post-operative pain medication prescribing habits.

Post-Operative Pain and Opioid Use Following Outpatient Pediatric Upper Extremity Surgery

Presenter: Katherine Au, MD
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Purpose: The aim of this study was to evaluate pain scores and opioid use comparing two surgical groups, non-bony versus bony upper extremity surgery. We hypothesize that the difference in levels of post-operative pain and the amount of opioid needed to treat post-operative pain is insignificant between procedures with bone manipulation and without.

Methods: We performed a single center retrospective review from June 2016 to January 2018 of pediatric patients who underwent upper extremity surgery. Those

who returned their Patient Reported Outcome Measure on post-operative pain and opioid usage were included in the study. Patient demographics and surgical CPT codes were collected from the electronic medical record. Daily maximal pain scores (visual analog scale) and number of opioid doses used were recorded from post-operative day 0 to 9. Data was analyzed using a paired-samples t-test. An alpha level of $p<0.05$ was adopted throughout the study.

Results: In total, 102 patients were included in the study; 55 had bony surgery and 47 had soft tissue surgery. Ages ranged from 6 months to 17 years old. On average, daily pain scores were higher in the non-bony population from POD#0 to POD#9 but this was statistically significant only on POD#6 (1.15v0.42, $p = .04$) and POD#7 (1.24v0.35, $p = .04$). A greater percentage of bony patients used an opioid (43% v 36%). However, on average, there was no statistical difference in the total number of opioids taken for the bony group (1.09) versus the non-bony group (1.22) ($p = .78$). Further, there was no statistical difference in the number of opioids used each day from POD#0-9 between the two groups. Analyzing all 102 patients, 75% used 7 doses or fewer of opioids; 90% used 10 or less, and 95% used 13 or less.

Conclusion: The majority of patients do not use any opioids following surgery. Bone manipulation in upper extremity surgery does not significantly increase the amount of post-operative opioids used compared to soft tissue procedures. While pain was statistically greater on POD#6 and POD#7, clinically, this difference is likely insignificant. A prescription of 7 doses of opioids will cover 75% of all patients, allowing for adequate pain control while minimizing the amount of unused opioids in the home and community.

Plastic Surgery Patient Expectations for Postoperative Opioid Prescriptions

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Purpose: The opioid epidemic is a healthcare crisis perpetuated by perioperative analgesic overprescribing. To better guide analgesic prescribing, this study evaluated plastic surgery patient expectations for postoperative opioid-based analgesic regimens.

Methods: New patients presenting to a tertiary academic plastic and reconstructive surgery clinic were prospectively enrolled from November 2017 to September 2018 to

complete a pre-consultation survey regarding their pain history and anticipated post-operative pain and analgesic regimens. Responses between cohorts expecting and not expecting post-operative opioids were compared using descriptive and univariate analyses.

Results: A total of 168 patients (63.9% female, 36.1% male; mean age 46±17 years) completed the preoperative survey prior to breast (21.9%), cosmetic (5.3%,) craniofacial (3.0%), general reconstruction (13.0%), hand (3.0%), and skin and soft tissue (49.1%) surgeries. Only twenty-eight percent of patients expected opioid prescriptions for post-operative pain management. On a standard Visual Analog Scale, patients who expected opioids anticipated greater postoperative pain (6.9 ± 2.6 vs. 4.6 ± 2.5; $p<0.05$). They also were more concerned about experiencing pain (5.8 ± 2.8 vs. 4.9 ± 2.3; $p<0.05$), expected a longer duration of opioid use (63.0% vs 37.0%; $p<0.05$), and were less interested in non-narcotic analgesic alternatives (57.9% vs. 19.8%; $p<0.05$). Patients with chronic pain (greater than 3 months duration) were more likely to expect opioids postoperatively (35.9% vs. 22.0%; $p<0.05$) than patients without chronic pain. Prior surgical experience (62.7%) and physician input (16.0%) were the strongest influences on patient expectations of post-surgical pain severity and pain control.

Conclusion: Less than one third of plastic surgery patients expect opioid pain medications after surgery, thus supporting broader use of non-opioid multimodal pain regimens. Identification and management of patient pain expectations, especially among those anticipating a need for opioids, provides a critical opportunity for pre-operative education on the benefits of non-opioid analgesics, thus minimizing opiate prescribing.

Comparative Effectiveness of Transversus Abdominis Plane Blocks in Abdominally-Based Autologous Breast Reconstruction: A Systematic Review and Meta-Analysis

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Purpose: Abdominally-based autologous breast reconstruction is the most common autologous reconstruction option following mastectomy. However, the abdominal donor site contributes significantly to postoperative pain, resulting in increased opioid use, length of stay (LOS), and hospital costs [1]. The advent of Enhanced Recovery

After Surgery (ERAS) pathways in breast reconstruction has demonstrated reductions in LOS; however, these protocols are not typically uniform and utilize many differing techniques [2,3]. Transversus abdominis plane (TAP) blocks have been reported to decrease these adverse outcomes. Given the influx of new studies on the technique and lack of a systematic review and meta-analysis, the literature was investigated to elucidate the evidence for TAP blocks as a potential driver of the benefit seen in ERAS pathways.

Methods: A systematic review was registered with PROSPERO and conducted according to PRISMA guidelines in an effort to perform a meta-analysis. Relevant studies reporting TAP block for abdominally-based breast reconstruction were extracted from PubMed, Embase, Cochrane, Scopus, and Clinicaltrials.gov prior to February 2019 and pooled for comparison. The outcomes total opioid use, postoperative pain, length of stay, and hospital costs were analyzed with a random effects model.

Results: The initial search yielded 1520 studies, ultimately narrowed to 12. A total of 1107 patients were followed with 541 receiving TAP block peri-operatively and 566 serving as controls without TAP block. Total opioid requirement (mean difference -133.80 OME; 95% CI: -170.12, -97.48) and length of stay (mean difference, -0.90; 95% CI: -1.32, -0.49) were decreased for patients receiving TAP blocks. TAP blocks were not associated with any significant differences in post-operative complications ($p = 0.68$), hospital cost ($p = 0.22$), and post-operative pain ($p = 0.86$).

Conclusion: Optimizing postoperative pain management following abdominally-based breast reconstruction is invaluable for patient recovery. Based on this review, the TAP block is associated with a reduction in LOS and opioid use, representing a safe and reasonable strategy for reducing the postoperative pain burden.

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SCIP Recommendations Vs. Extended Course of Antibiotics in Tissue Expander Breast Reconstruction

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Introduction: Surgical site infections (SSI) contribute significantly to patient morbidity and increase healthcare costs. In an attempt to lower infection rates, national guidelines have been established through the Surgical Care Improvement Project (SCIP). This protocol, developed from retrospective data, recommends administration of a single dose of antibiotics within one hour of surgery and discontinuation within 24 hours. Despite these guidelines, with the frequent use of prosthetic devices and surgical drains, many plastic surgeons continue to use antibiotics for durations greater than 24 hours postoperatively. The purpose of this study was to conduct a randomized, prospective trial utilizing the SCIP recommendations verses an extended duration of antibiotic therapy, comparing infection rates leading to prosthesis loss in tissue expander-based breast reconstruction.

Methods: A large, single center, prospective study was conducted from 2013-2018. Patients presenting for tissue expander-based breast reconstruction were randomized to receive perioperative antibiotics according to the SCIP recommendations, or an extended course of antibiotics while surgical drains remained in place. Basic demographic and patient medical information were recorded. Patients received routine postoperative follow-up. Outcomes were evaluated including tissue expander infection rates leading to expander loss, final reconstruction outcomes and additional complications.

Results: A total of 88 tissue expander-based breast reconstruction cases qualified for inclusion in our study. 39 cases (44%) received antibiotics according to the SCIP recommendations, and 49 cases (56%) received extended antibiotic therapy. No statistically significant differences were seen regarding patient demographic information, comorbidities, or additional risk factors between the two groups. Infection leading to expander loss was seen in 15.4% of SCIP cases and 22.4% of extended antibiotic cases, with no statistically significant difference seen ($p > 0.05$). Of the patients requiring re-operation secondary to infection, 8 cases received salvage therapy with placement of antibiotic-impregnated polymethylmethacrylate (4 SCIP, 4 extended antibiotics), and 9 cases underwent expander explantation (2 SCIP, 7 extended antibiotics) ($p > 0.05$). Final reconstruction was performed in 94.9% of SCIP

cases and 91.8% in the extended antibiotic group ($p > 0.05$); the rate of conversion to autologous tissue reconstruction was 18.9% in the SCIP group and 28.9% in the extended antibiotic group ($p > 0.05$).

Conclusion: Despite frequent concerns of increased infection rates with implant devices and surgical drains, this large prospective study reveals that single dose, perioperative antibiotics are as effective in infection prevention as an extended course of antibiotics. Lessening antibiotic usage with just an intraoperative dose with help decrease healthcare costs without compromising patient outcomes.

Factors Affecting Healing in Hidradenitis Suppuritiva

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Background: Hidradenitis suppurativa (HS) is a chronic and debilitating condition which causes recurrent painful nodules. Patients often progress to develop subdermal abscesses, chronic induration, and suppurative draining sinus tracts. HS causes significant debility and morbidity in patients' body image, and overall quality of life.[2] Despite this, there is typically a 5-14 year delay in diagnosis from symptom onset[2]. Treatment of HS depends on disease stage, goals of care, access to care, and frequency of symptoms. We have developed a hidradenitis suppurativa multidisciplinary program (HSMP). We present our experience with surgical treatment for patients with HS who follow in the HSMP.
Methods: We retrospectively reviewed the outcomes of all patients referred through the HSMP for surgical treatment to plastic surgery at a single institution from January 2013-December 2015. Inclusion criteria included adults with a diagnosis of HS and exclusion criteria included patients with less than 2 years follow up after surgery. Types of surgical interventions included incision and drainage with fulguration, excision with wound left open, and excision with primary repair. Demographic data, participation in a multidisciplinary program, type of surgery, healing rates, and potential factors contributing to wound healing were retrospectively reviewed in all cases using multivariate analysis.

Results: Two hundred forty-eight patients met inclusion criteria with a total of 810 involved sites. Overall, 59% of patients had Hurley stage 3 disease at the time of surgery. Healing rates of 80% were observed in stage 1 and 2 and 74% observed in stage 3. Hurley stage was not a significant predictor of healing ($P = 0.09$). Surgical

treatment consisted of 38% incision and drainage, 44% excision without closure, and 17% excision with primary closure. Incisional and excisional treatments healed 78% and 79%, respectively, at 2 years. Primarily repaired defects (grafts and flaps) were 68% healed at 2 years. Observed healing rates were uniform regardless of the number of sites involved ($P = 0.959$). Participation in the multidisciplinary program was the strongest predictor of healing (78% vs 45%, $P = 0.004$). Gender, age, body mass index, tobacco use, diabetes, pre-surgery hemoglobin, and family history of HS were statistically not significant. Continuation of immune modulating therapy within 2 weeks of surgery was a predictor of reduced healing (odds ratio 0.23, $P = 0.004$), while holding biologics for at least 2 weeks was not significant (odds ratio 1.99, $P = 0.146$).

Conclusion: Participation in a multidisciplinary program is a strong predictor of long-term success when treating HS. Hurley score and number of involved sites did not correlate with successful healing after surgery. If taking biologics, we identified 2 weeks as an appropriate break from biologics before and after surgical intervention. Healing rates were highest with ablative procedures (incision and drainage, excision) alone.

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Venothromboembolism Risk and Hormone Therapy in the Elective Surgery Patient

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Introduction: Reduction of postoperative venothromboembolism (VTE) has long been identified as a priority by the American Society of Plastic Surgery (ASPS). Transgender patients are a unique population by virtue of their exposure to cross sex hormone therapy (CSHT) and a postulated increased risk of VTE. There remains a lack of data and therefore consensus supporting this perceived risk, leading to

variations in practice with significant psychosocial implications. With an ever increasing number of gender affirming surgeries (GAS) performed annually, we sought to examine the risks and incidence correlated with CSHT and elective surgery.

Methods: A retrospective chart review was performed of all patients who underwent GAS at a single center institution between 2016-2019. Demographic information, preoperative assessment including CAPRINI scores, CSHT regimen/duration, practice of preoperative risk reduction, postoperative VTE prophylaxis management, surgery type and outcomes were examined.

Results: Between 2016-2018, 850 GAS cases were identified among 706 patients, 249 transmasculine procedures and 601 transfeminine procedures. Transmasculine surgeries included 92 hysterectomies, 92 mastectomies, 26 metoidioplasties, 31 phalloplasties. Transfeminine surgeries included 309 primary vaginoplasties, 75 revisional vaginoplasties, 93 breast augmentations, 48 facial feminization surgeries. The most common CSHT regimen was testosterone intramuscular injection for transmen, and oral estradiol with spironolactone for transwomen. Mean postoperative followup was 309 days. The mean calculated 2005 CAPRINI score was 3. Subset analysis revealed 229 cases were performed without CSHT held prior to surgery and 708 cases were performed with CSHT held 1 week prior to surgery. All patients had the same postoperative VTE prophylaxis regimen with heparin SQ started on the morning of postoperative day 1. One patient was identified to have had postoperative VTE, a 37 year old transgender woman presenting 20 days after vaginoplasty with right thigh pain. Extensive lower extremity occlusion required endovascular thrombectomy/thrombolysis and angioplasty. No pulmonary embolus was identified. Other than estradiol therapy (injection) and surgery, no perioperative risk factors were identified.

Conclusion: Prevention of postoperative VTE remains an important consideration to any surgical intervention. The current literature correlates oral contraceptive use in women and hormone replacement therapy use in postmenopausal women with an increased risk of VTE, including the postoperative setting. Lack of evidence to the contrary with regards to CSHT has resulted in a heterogenous preoperative approach by surgeons. This includes the practice of stopping hormones for weeks to month prior to surgery, despite the very real psychological burden on patients with gender dysphoria.

To date, there has never been an examination of the incidence of postoperative VTE in transgender patients undergoing GAS, or the establishment of correlation. Our large single center experience would suggest that despite the perceived increase in postoperative VTE risk in patients using CSHT, there remains no evidence to support this correlation or the practice of holding CSHT prior to elective GAS.

Initial Surgical Debridement of Morel-Lavallee Lesions Does Not Decrease Subsequent Infections

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Introduction: Morel-Lavallee Lesions (ML) are closed degloving injuries that disrupt interfascial lymphovasculature between soft tissue and muscle because of shearing forces commonly seen with blunt trauma. Infected ML can require multiple operative debridements and complex reconstruction. No treatment guidelines currently exist, thus it is unknown if initial management strategy has any effect on risk of ML infection. We hypothesized that initial debridement as compared to observation is associated with a reduction in subsequent infection.

Methods: We conducted a single-center retrospective cohort study of ML in adult trauma patients from 2012 – 2018. ML diagnoses, ML infection status, patient demographics and hospital outcomes were collected from our trauma registry and by chart review. Univariate frequentist analysis was performed.

Results: A total of 9 (15%) ML infections were found in 61 patients, of whom 34 (56%) underwent initial surgical debridement. Baseline demographics were similar between treatment groups, with the exception of increased admission blood transfusion volume in the initial surgery group. Median age was 43 years, 57% of patients were male, median injury severity score was 22, and median body mass index was 27. Twenty-three (38%) patients were successfully observed and did not require debridement. ML infection contributed to 1 (11%) death, 3 (33%) intensive care admissions, 3 (33%) hospital readmissions, and significantly greater number of surgical debridements (4 [2-10] vs 2[1-3] debridements, $p = 0.05$). Initial surgery patients had longer hospital length of stay (LOS [median 16 vs 8 days, $p = 0.006$]), but there were no significant differences in ML infection rate (18% surgery vs 11% observation, $p = 0.48$).

Conclusion: Initial surgical debridement of Morel-Lavallee lesions was not associated with decreased subsequent infection and led to more surgeries and increased hospital LOS in this small study. Given the significant morbidity and increased healthcare burden associated with infected ML, greater awareness is needed

to identify these lesions and to monitor them for subsequent infection, regardless of initial management strategy.

Correlation between Press Ganey Scores and Outcomes in Surgical Practices: A Systematic Review of Literature

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Introduction: Measures of patient satisfaction are becoming increasingly popular as changes to the American health care system led to their incorporation into reimbursement models. In our era of online surgical market, patients tend to correlate publicly available online patient satisfaction surveys, such as Press Ganey, with their presumed final surgical outcome. This review sets out to identify and critically appraise the current literature on Press Ganey and its correlation with surgical quality outcomes.

Methods: A systematic review was performed using the guidelines outlined in the Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA). A comprehensive literature search of the Medline/PubMed, Scopus and Cochrane Databases was conducted for studies published on patient satisfaction in surgical practices through August of 2018. Studies correlating clinical outcomes and financial benefits with Press Ganey scores were included and analyzed. Studies exploring patient variables associated with higher scores with no prospective correlation with outcomes were excluded.

Results: A total of 64 articles were selected and reviewed from the 124 identified. Sixteen articles, encompassing 29,208 patients, met the inclusion criteria. Correlations between Press Ganey scores and clinical outcomes were reported by 13 articles; twelve found no correlation with their respective outcomes (post-operative complications, readmissions, and length of stay). One study reported lower complications rate in patients with higher satisfaction scores.

Four articles implemented strategies to increase patient satisfaction. All 4 demonstrated improvement in Press Ganey scores; however, only 2 demonstrated financial benefits. One ended up with higher costs by 3.48%.

Conclusion: This review is the first to critically assess reported correlations between Press Ganey scores and surgical quality measures in the literature. Little, if any,

correlation was found between patient satisfaction and clinical outcomes. However, the articles demonstrated inconsistent methodology and heterogeneity in their pertinent health quality metrics. While this data questions the utility of these scores as measures of health care quality, well-designed strategy models and prospective studies to validate such results are critical moving forward.

#Plasticsurgery: A Comparative Deep Dive into Social Media and Plastic Surgery

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Introduction: As social media has become pervasive in contemporary society, plastic surgery content has become commonplace[1,2]. Two of the most engaging and popular platforms include Instagram and Twitter, and much research has been done with respect to Twitter[3,4]. However, there is a paucity of data studying plastic surgeons' involvement on Instagram, nor are there any studies comparing and contrasting the two platforms. The aim of this study was to robustly sample plastic surgery posts on Twitter and Instagram to quantitatively and qualitatively evaluate platform content differences in a comparative manner.

Methods: The hashtag "#PlasticSurgery" was systematically queried twice per day, for thirty consecutive days, on Twitter and Instagram. For completeness, "most recent" and "popular/trending" posts were analyzed and included in the study.

Results: 3867 posts were analyzed on Twitter and 5098 on Instagram. However, mean overall post volume was significantly higher on Instagram (7,975 vs. 304 per day, $p<0.0001$). A larger proportion of post authors were plastic surgeons on Twitter (60.6% vs. 54.4% of all posts, $p<0.0001$), while patients and the general public posted more often on Instagram (27.3% vs. 14.7% of post authors, $p<0.0001$). Post scope was more likely to be educational on Twitter (38.6% vs. 9.0% of posts, $p<0.0001$) and self-promotional on Instagram (67.8% vs. 39.4% of posts, $p<0.0001$). Identifiable patient information was more prevalent on Instagram (13.4% vs. 4.1% of all posts, $p<0.0001$). Overall post engagement, evaluated by mean number of "likes", was substantially higher on Instagram (917.8 vs. 1.0, $p<0.0001$).

Discussion: Understanding social media utilization as it relates to plastic surgery is important for the modern-day plastic surgeon. Social media's ability to educate and self-promote is far-reaching, and we hope to see more surgeons utilizing Instagram for educational content in the future. Additionally, this study sheds light on the ethically questionable issue of widely disseminated identifiable patient information across social media platforms.

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Chaperone Use in Plastic Surgery: An Analysis of Provider Practices and Level of Training

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Background: The earliest literature assessing the ethics of physical examination dates back to the 1800s and was borne out of allegations of misconduct on behalf of the examining physician. Medical chaperones were the byproduct of such encounters and their use in clinical medicine has continued to evolve ever since. Despite what may appear to be obvious benefits for both patient and physician, the use of chaperones varies widely and continues to be a topic of debate. The purpose of this study was to evaluate and compare current practices regarding chaperone use by plastic surgery attendings, fellows, and residents.

Methods: A voluntary survey was distributed to all ACGME-accredited plastic surgery residency programs by the American Council of Academic Plastic Surgeons. The survey included a standardized set of questions regarding physician demographics, nature of practice and training, and current practices pertaining to

chaperone use. Fellows and residents were also queried regarding their experiences with chaperone use throughout their training. Data was analyzed in a descriptive fashion, and Chi-square and Student *t*-tests were used for categorical and continuous data, respectively.

Results: We received 93 responses to date, of which 77.4% (n=72) were attendings, 3.2% (n=3) were fellows, and 19.4% (n=18) were residents. In total, 83.9% (n=78) of respondents were male and 16.1% (n=15) were female. Overall, 62.4% of respondents reported routine use of chaperones, while 8.6% reported that they 'never' use chaperones. When examining sensitive areas, such as breast, groin, or buttocks, 69.9% of physicians routinely used chaperones. Nurses and other staff members were the most common individuals who served as chaperones. Regarding justification for chaperone use, 83.9% of respondents felt it was necessary due to medico-legal concerns, 61.3% for patient comfort, and 14.0% because of (existing) institutional policies.

Male respondents had a higher rate of chaperone use compared to female respondents (71.8% versus 13.3%, $p<0.001$). When examining male patients, there was no difference in rate of chaperone use between male and female physicians ($p=0.307$). However, when examining female patients, male physicians were significantly more likely to use a chaperone ($p<0.001$). Regarding the gender of the chaperone, 67.8% use same-sex chaperones while 31.1% felt that sex of the chaperone was not relevant.

Compared with trainees, attending physicians were 1.48 times more likely to use a chaperone in any setting ($p=0.002$). Further, attendings were 2.07 times more likely to use a chaperone during sensitive examinations ($p<0.001$). Amongst fellows and residents, 61.9% (n=13) had received some degree of education regarding chaperone use during their training, predominantly through informal instruction from attendings or senior residents. 38.0% of trainees felt that more education on chaperone use would be beneficial.

Conclusions: This study provides valuable information regarding current practices in chaperone use during plastic surgery physical examination. Compared with their attending counterparts, trainees were significantly less likely to use chaperones, suggesting a possible gap in knowledge. Integration and standardization of chaperone education within plastic surgery residency training may be an effective technique to promote this practice and lead to improved patient-provider clinical experiences.

Navigating Insurance Policies in the United States for Gender Affirming Surgery

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Purpose: Patients with gender dysphoria seeking to undergo gender affirmation surgery are often challenged by lack of insurance coverage. It can be difficult for both patients and physicians to navigate various insurance policies. The authors aim to review gender affirmation surgery policies and to highlight discrepancies between qualifying criteria across top insurance companies in the United States.

Methods and Materials: The top three insurance companies in each state in the US were determined by market share. Gender affirming surgeries were categorized as "top surgery" and "bottom surgery". Each of the insurance policies were analyzed with regards to coverage of mastectomy, breast augmentation, nipple-areola complex (NAC) reconstruction, penectomy, clitoroplasty, labiaplasty, vaginoplasty, vulvoplasty, vaginectomy, vulvectomy, phalloplasty, metoidioplasty, penile prosthesis, scrotoplasty, testicular prosthesis, and urethroplasty.

Results: Coverage for gender-affirming surgery varies by insurance company, state, and procedure. Of the total 150 insurance companies identified, policies were found for 124.

While most insurance companies 122 of 124 (98%), covered mastectomy, only 25 of 124 (20%) of insurance companies covered NAC reconstruction. 35 of 124 (28%) companies excluded NAC reconstruction coverage specifically. Only 36 of 124 (29%) insurance companies covered breast augmentation

Vaginoplasty is covered by 120 of 124 (97%) of insurance companies and penectomy is covered by 118 of 124 (95%) insurance companies. Additionally, clitoroplasty is covered by 114 of 124 (92%) companies and labiaplasty is covered by 116 of 124 (95%) of companies. Despite high rates of vaginoplasty coverage, vulvoplasty is only covered by 26 of 124 (21%) insurance companies.

Vaginectomy is covered by 110 of 124 (89%) of insurance companies, however vulvectomy is only covered by 47 of 124 (38%). Phalloplasty and metoidioplasty are covered by 118 of 124 (95%) and 115 of 124 (93%) of insurance companies, respectively. Slightly more than half, 75 of 124 (60%) insurance companies covered penile prosthesis, and 7 (6%) insurance companies specifically excluded its coverage. Scrotoplasty is covered by 104 of 124 (84%) of insurance companies,

however 7 (6%) insurance companies explicitly state its exclusion of coverage. 102 of 124 (82%) insurance companies covered testicular prosthesis, yet 10 of 124 (8%) of insurance companies excluded it. While a total of 117 insurance companies covered urethroplasty, only 69 of these covered urethroplasty in gender affirmation surgery. The remaining 48 insurance companies only covered urethroplasty in FtM surgery.

Conclusion: As gender affirming surgery insurance coverage increases, the policies regarding them remain inconsistent. Bottom surgeries and female to male top surgeries are most consistently covered. Standardized policies across insurance companies would further increase access to gender affirming surgery.

Are We Preparing Patients for Gender-Affirming Surgery?: A Thematic Analysis of Pre- and Post-Operative Questions

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Introduction: Due in part to distrust of the medical field and lack of information reflecting patients' needs, the transgender community frequently turns to social media for medical information and advice.[1] This study aims to analyze the content of questions posted on social media prior to and after gender-affirming surgery (GAS). These results will better inform providers of the challenges and needs of the transgender community and increase provider awareness on how social media is utilized in this community.

Methods: Two different platforms were analyzed; the subreddit r/asktransgender and Quora. Reddit is one of the most visited social media platforms, and this subreddit is specific for transgender individuals. Given the volume of Reddit posts, data was analyzed from August 2018 to February 2019. Quora, in contrast, is a general question and answer platform that does not have specific communities or subgroups. All questions from Quora were analyzed. Questions related to GAS were identified and coded based on the content theme: treatment options, providers, pre-operation preparation, sexual function, urinary function, general recovery, risks, finance, personal, societal, and general resources. Coding was conducted by two separate individuals and agreement was measured on a sample set coded by both. Posts were also categorized if asked by an individual in either the pre- or post-operation stage.

Results: In total, 637 questions were identified across the platforms (Reddit=340 and Quora=297) and agreement between coders for the sample was high (Kappa= .752). There were 600 questions asked pre-operation and 37 asked post-operation. Individuals posting post-operative questions were more likely to post on Reddit, a platform specifically for transgender individuals, than Quora (OR 10.98, 95% CI: 3.03-35.7, $p<0.001$). Of the pre-operative questions the top 3 themes were personal (16.8%), pre-operative preparation (12%), and finance (10.7%). From a post-operative perspective, the top 3 themes were; general recovery (37.8%), personal (21.6%), and sexual function (13.6%).

Conclusion: The majority of questions being asked about GAS are from individuals in the pre-operative stage, potentially indicating lack of appropriate educational material or need to visit a medical provider. When individuals ask questions post-operation, they are more likely to do so on a platform aimed towards the transgender community. Furthermore, with general recovery and sexual function becoming top themes, these are areas that providers can specifically highlight to ensure transmission of accurate information. These results also demonstrate patient's preference for seeking post-operative advice from within their own online community.

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To Transfer or Not to Transfer? a Comparison of Length of Stay in Burn Patient Transfers over a 5 Year Period

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Introduction: Managing burn patients often requires specialized burn facilities and treatment teams, and ultimately requires transfer from an outside hospital. In fact, the majority of admissions to tertiary burn centers (50-60%) are the result of transfers based on ABA (American Burn Association) referral criteria as a guideline. Burn patients presenting to different hospitals are assessed and referred to specialized burn centers using ABA (American Burn Association) referral criteria as a guideline.

Ultimately, however, nearly ¼ of all transferred patients are discharged from the hospital in <24 hours, indicating that the initial transfer was perhaps unnecessary.

The aim of this study was to conduct a comparative analysis of the patients transferred to our facility who actually met ABA criteria but stayed less than 24h, and derive when these transfers can be avoided to decrease cost burden and patient discomfort.

Methods: This retrospective cohort study evaluated all adult burn patient transfers and consults at a single tertiary burn center between 2013 and 2017. Exclusion criteria consisted of: <18 years-old, pregnant, or non-burn injury transfers. Data were collected to include: patient demographics, details regarding the transfer and burn wound; along with hospital length of stay (LOS), requirement for surgery, morbidity, and mortality. The primary outcome measure was length of stay < 24 hours. Data were analyzed using t-test or chi-squared analysis where appropriate. P-value of less than 0.05 was used to detect significance.

Results: 618 patients transferred to a single tertiary burn center were included in the study. Within this cohort, LOS was < 24 hours for 349 patients (56.4%). Several groups demonstrated a significantly increased proportion of patients with LOS <24, and included: superficial partial thickness (SPT) burns (227 [58.7%], p< 0.001), scald burns (128 [44.9%], p< 0.01), and patients that belonged to criteria 2 of the ABA (212 [64%], p< 0.05) and did not require any surgical intervention (p< 0.001). Then, we opted to compare transfers under criteria 2 (burns involving face, hands, feet, genitalia and major joints) to all other ABA criteria which replicated the above results and showed a significantly lower LOS in criteria 2 (1.96 days; p< 0.001) with most cases being exclusively hand burns (58.9%). Finally, we stratified hand versus no hand burn patients, demonstrating a higher proportion of patients with LOS < 24 hours for: SPT burns (99 [74.4%],p< 0.001) and scald burns (52 [77.6%], p< 0.05). Laterality, %TBSA, time of transfer, distance and length of transfer time did not show significance.

Conclusion: Our results indicate that a significant portion of patients referred to tertiary burn centers under the ABA criteria are discharged from the ER or after a <24 h hospital stay. Specifically, hand burn patients with superficial partial thickness burns due to scald injuries regardless of laterality might not need to be transferred to a burn center. We suggest a more detailed approach for referral of this specific patient population to minimize unnecessary cost and maximize patient benefit.

The Incidence of Medical Device-Related Pressure Injuries in an Urban Burn Intensive Care Unit

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Introduction/Purpose: Hospital-acquired pressure injuries (HAPIs) are a significant source of morbidity and mortality for patients and a significant financial burden for hospitals, affecting 2.5 million patients yearly. In 2008, the Centers for Medicare and Medicaid Services (CMS) initiated a new policy to stop reimbursement for both stage 3 and stage 4 pressure injuries. This led to an emphasis on the importance of early detection and prevention. Hospitalized burn patients are at particularly high risk for HAPIs due to risk factors such as immobilization and impaired skin integrity. This study sought to further describe the incidence, staging, and location of HAPIs in this population, as well as determine areas for more targeted interventions.

Methods: This is a descriptive analysis using data from weekly multidisciplinary biopsy wound rounds of the burn intensive care unit (BICU). The NDNQI pressure injury survey, which includes information on restraints, Braden scores, along with HAPI staging and location, is used to document all prevalent and incident pressure injuries. MS Excel was used to perform statistical analyses.

Results: Over 39 weeks, there were 122 patients observed. The average age was 50.1 (SD 18.7) years old. Females were 38.7% of the hospitalized patient population. The average Braden score at admission was 14.9 (95% CI 14.4, 15.4) and 15.7 (95% CI 15.1, 16.2) at the time of examination. There was a total of 55 incident HAPIs with 13 medical device-related pressure injuries (MDRPIs) On average, there were 1.41 (95% CI 0.71, 2.23) incident HAPIs each week, with 45.1 incident HAPIs per 100 patients. MDRPIs were 23.6% due to nasogastric tube ties while the remaining were sacral and heel HAPIs. Of the recorded HAPIs, there were 4 stage 1s, 1 stage 3, and the rest were stage 2.

Conclusion: This descriptive analysis shows that HAPIs are more common than previously thought in burn patients, even at a multidisciplinary center. The incidence of HAPIs was 45.1 HAPIs per 100 admitted patients. This center has on average 400 admissions per year. At the incidence rates observed, there would be 180.4 incident HAPIs and 42.6 incident MDRPIs each year. Considering that the MDRPIs contribute to almost 24% of incident HAPIs, interventions to prevent them could result in improving patient outcomes, morbidity and mortality, as well as decreasing costs for both the hospitals and the patients. MDRPIs have not been studied to the same extent

as other types of pressure injuries but should be further studied as it could lead to significant growth and improvement within plastic surgery.

Why Academic Plastic Surgery Should Lead Applied Anatomy Education for First-Year Medical Students

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Purpose: Today, medical schools are increasingly emphasizing the clinical applications of anatomic knowledge. In 2014, we instituted "Applied Anatomy" within the first-year "Human Gross Anatomy" course at our LCME-accredited medical school. The course was designed and overseen by the medical school's Division of Plastic & Reconstructive Surgery. We hypothesized Applied Anatomy would positively impact first-year medical students' understanding, performance, and interest in human anatomy.

Methods and Materials: Thirteen Applied Anatomy case-based didactics were integrated into the medical school's first-year human anatomy curriculum without changing the total student hours dedicated to anatomic education. Each Applied Anatomy case-based didactic illustrated the clinical relevance and application of overlooked (or simply memorized) anatomic detail. Course instructors, each clinicians with significant expertise in regional human anatomy, also led associated cadaver dissections. Upon course completion, students from four participating classes were surveyed with six multiple-choice/Likert-scale questions. All surveys were completed anonymously and collected blindly. Data was analyzed using chi-square testing.

Results: 164 students from four participating first-year classes at our medical school completed the survey (78% response). 86% reported Applied Anatomy increased mastery of human anatomy, 77% stated Applied Anatomy improved exam performance, 87% agreed Applied Anatomy increased interest in anatomy itself, and 96% reported Applied Anatomy increased critical thinking of how understanding human anatomy affects clinical care. Nearly half (49.4%) responded that Applied Anatomy increased their interest in applying for a procedurally oriented residency. When considering future integration of Applied Anatomy into the first-year medical school curriculum, 9% of students wanted less Applied Anatomy, 61% wanted the same, and 30% wanted more.

Conclusions: Our Applied Anatomy curriculum demonstrated significant positive impact on first-year medical students' anatomy education. Plastic surgeons (especially those with craniofacial, hand, and/or microsurgery expertise) operate on more of the human body by surface area and volume than any other group of surgeons.The extremities and head/neck region in particular are characterized by highly specialized structures, delicate neurovascular anatomy, and intricate musculoskeletal function. Furthermore, reconstructive and aesthetic surgeons are always applying anatomic knowledge to solve functional and aesthetic clinical challenges easily visualized and understood by even first-year medical students. Finally, approximately half of plastic surgery done at academic institutions is in conjunction with other surgical disciplines, uniquely positioning our specialty to actively enroll partners for such a multidisciplinary educational collaboration. With today's emphasis on earlier clinical integration into medical education, we strongly advocate that a medical school's plastic surgery division/department lead the organization and instruction of a Medical School's Applied Anatomy curriculum. At our institution, we provide a modest teaching stipend to individual instructors. As we (and many others) transition to a work RVU (relative value unit) compensation model for clinical care, we are defining "educational RVU" credits that compensate surgeon educators for impactful and validated teaching initiatives such as Applied Anatomy.

National Survey of Plastic Surgery Trainees: Current Status of Gender Bias and Sexual Misconduct

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Background: While interventions aimed at mitigating sexual harassment and assault are being emphasized within medicine (JAMA 1995, 2016), these issues continue to negatively affect health care providers. Specifically, underrepresented trainees within traditionally male-dominated fields are at particular risk. Maintaining professionalism in academic plastic surgery and plastic surgery training is important.

Methods: We conducted a national survey of current plastic surgery trainees (2018-2019)using questions from the previously validated Sexual Harassment Inventory (Minneapolis Veterans Affairs Medical Center, 1998) and resident surveys (Cook et al, 1996). Analyses included Chi-squared, logistic regression, and ANOVA. Significance accepted at $p<0.05$.

Results: There were 211 responses (115 female, 88 male, 8 deferred; 15% response rate). Average age was 30.7 ±3.0 years. Races included Caucasian (n-114), Asian/Pacific Islander (n=34), Other (n=26), and deferred (n=11). Respondents included interns (n=30), residents (n=123), chief residents (n=23), fellows (n=24), and declined to respond (n=11).

The feeling of hindrance to career advancement was 10-fold greater for females ($p<0.00$), and increased with age ($p=0.00$). Women feel significantly less comfortable challenging attitudes regarding gender inequality relative to men ($p<0.0001$), with no effect fromtraining levels ($p=0.30$) or race ($p=0.67$). Gender bias/inequality has disproportionally diminishing effect with respect to career goals and ambition, affecting women disproportionately ($p<0.0001$).

Women reported experiencing sexual harassment in the form of jokes ($p=0.0022$) and comments about their body or sexuality ($p=0.0108$). Perpetrators of gender bias were diverse (attendings, 30%; other trainees, 37%; nurses/ancillary staff, 21%; patients/families, 11%; medical students, 3%).Most common reasons to not report incidents included “not worth the hassle/no change will result” (29%), “fear of retaliation, distrust in institution” (20%), “it occurs so frequently” (9%), and “advised not to report” (2%). Forty-seven percent of respondents reported at least two symptoms of depression/anxiety, with women experiencing at least three, significantly higher than men ($p=0.0128$).

Conclusions: Gender bias and sexual misconduct negatively affects female trainees’ attitudes towards their career. Females experienced gender bias most commonly from physicians. Trainees perceive a culture non-conducive to reporting incidents. These findings can guide changes and discussions surrounding workplace culture.

The Use of Vertical Rectus Abdominis Myocutaneous (VRAM) Flap for Pelvic Reconstruction: What Are the Risk Factors for Complications?

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Purpose: Perineal and pelvic defects resulting from radical surgical resection, pelvic exenteration, sacrectomy, and recurrent cancer resections are frequently large and frequently present a reconstructive challenge. These defects often require flap reconstruction to close a large skin defect, obliterate the pelvic or sacrectomy cavities,

or reconstruct the vaginal canal.[1,2] One of the most common used flaps for pelvic reconstruction is the inferiorly based Vertical Abdominis Myocutaneous (VRAM) flap.[3] This flap has reliable vascularity and can be easily prepared, providing a potentially large amount of tissue.[2] The aim of this study is to present a 25-year single institution experience with VRAM flaps for perineal and pelvic reconstruction and study risk factors associated with surgical complications.

Methods: A retrospective chart review of patients who underwent pelvic resection followed by VRAM flap reconstruction from 1994 to 2019 was done. Patient demographics, clinical and surgical characteristics, postoperative outcomes and complications were reviewed. Univariate and multivariable conditional logistic regression models were used to assess predictors of risk factors for surgical complications (wound dehiscence, wound infection, hematoma, seroma or flap necrosis). All the tests were two-sided and a value of $p < 0.05$ was considered significant. Receiving operating characteristics (ROC) curves and area under the curves (AUC) were calculated to study the effect of BMI in surgical site complications and postoperative hernia. Analyses were performed in JMP, Pro 14 (SAS Institute Inc., Cary, NC).

Results: A total of 235 patients were evaluated, with mean followup of 41.2 months (IQR7.8 – 62). On multivariate analysis, patients who had pre-existing abdominal hernia at the time of surgery (OR 3.3; [95% CI 1.3-8.6]; p=0.016), received immunosuppressive drugs (OR 6.1; [95% CI 1.4-25.9]; p=0.015), or used mesh in the donor site of the VRAM (OR 2.6; [95% CI 1.1-5.9]; p=0.031) were significantly associated with developing surgical complications. Additionally, patients with higher BMI were associated with an increased risk of developing a postoperative abdominal hernia (p=0.047). For each point increase in BMI, the odds of hernia increased by 4.9% and the optimal cutoff to predict higher hernia rates in these patients was a BMI of 32 kg/m^2 (AUC = 0.586).

Conclusion: Patients undergoing VRAM flaps for pelvic or perineal reconstruction who were immunosuppressed, had a pre-existing abdominal hernia at the time of surgery or underwent placement of mesh in the donor site are at increased risk of surgical complications. In addition, patients with high BMI have an increased risk of develop postoperative ventral hernias. Better preoperative patient selection and counselling based on the identified risk factors may help improve outcomes for patients undergoing VRAM for pelvic reconstruction.

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Outcomes and Complications Following Vertical Rectus Abdominis Myocutaneous Flap to Reconstruct Thigh and Groin Defects

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Objective: Defects localized in the thigh and groin region are present a distinct reconstructive challenge.[1] In such circumstances, the use of local flaps (pedicled tensor fascia lata or anterolateral thigh flap) can be limited if surrounding tissues have been irradiated or resected and options may be depleted if there is significant vascular involvement in the resection bed. As a consequence, distant regional or free flaps maybe needed.[2,3] The Vertical Rectus Abdominis Myocutaneous (VRAM) flap can be a suitable option for thigh and groin reconstruction, providing a reliable coverage.[2] In this study, we present our experience with the use of VRAM flaps for thigh and groin soft tissue defects, reporting patient outcomes and complications.

Methods and materials: We performed a retrospective review of the medical records of all consecutive patients who underwent VRAM flap to reconstruct proximal thigh and groin defects between 1997 to 2018. Data regarding patient demographics, clinical and surgical characteristics, postoperative outcomes and complications was collected.

Results: Fifty three patients were identified and included in this study. This included 26 males and 27 females with a mean age of 55 (15-89) years. The majority of the cases were performed to reconstruct defects after tumor resection (83%), for infected wounds (11%) and for complex wounds (6%). There was no perioperative mortality, however for patients who underwent VRAM reconstruction of oncologic defects the 1 year mortality was 11%. Twenty-three (43%) patients developed a surgical complication and 18 (34%) required surgical management. The most common complications were wound dehiscence (23%) and infection (8%).Of those who had wound dehiscence, 9 patients were taken back to the operative room for further

debridement with satisfactory wound healing. The reconstruction failed in 1 patient, requiring another flap. With a mean followup of 40.7 (10.1-57.2) months, 11 (21%) patients developed abdominal hernia. Postoperative wound complications were significantly higher in patients who received preoperative radiation (p=0.042), smokers (p=0.014) and those who had chronic kidney disease (p=0.030).

Conclusion: Patients with complex defects in the groin or proximal thigh can be treated successfully with the Vertical Rectus Abdominis Myocutaneous flap. Although the complications rates are high, the reconstruction failure rate is low. Special care should be taken in patients with preoperative radiation, smoking history and chronic kidney disease.

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Panniculectomy Performed in Conjunction with Gynecologic Surgery in the Morbidly Obese Patient - a NSQIP Analysis and Meta-Analysis Review of the Literature

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Purpose: Panniculectomy is a common procedure in plastic surgery, often performed following massive weight loss but also in patients who are still obese. One example involves the combination of panniculectomy with various gynecologic procedures. The rationale for this is based on claims that this combination will reduce complication rates, infections, operative time, blood loss, wound necrosis and generally make these procedures safer. [1, 2, 3] These studies along with others fail to provide proof of these claims for several reasons including study design, the inclusion of both morbidly obese and non-morbidly obese patients and/or a lack of comparative data. Medical practice in recent years has focused increasingly on minimizing patient

morbidity and trends in reimbursement are moving towards penalizing practices which increase complications. One patient variable which has been demonstrated to be consistently associated with increased morbidity in surgery is morbid obesity.

Methods and Materials: We reviewed the NSQIP database to assess the association of complications with panniculectomy combined with gynecologic surgery. The query identified 296 patients who had panniculectomy concomitant with gynecologic surgery and had a BMI greater than 30 out of almost 47000 patients (0.63% of patients undergoing those procedures).

Results: The results demonstrated a statistically significant relationship ($P<.05$) of panniculectomy performed in conjunction with gynecologic surgery procedures with complications including superficial infection, wound infection, pulmonary embolism, systemic sepsis, return to OR and length of operation. There were no significant relationships that were considered beneficial. We then searched the literature for studies on panniculectomy performed with gynecologic surgery. We were able to identify 5 studies that included comparative cohorts and which specifically compared gynecologic surgery with and without additional panniculectomy. A meta-analysis of the combined results demonstrated no significant and consistent benefit across the studies in measured parameters including EBL, LOS, cellulitis, wound infection or wound disruption. Operative time was significantly greater with panniculectomy, aortic lymph node yield was significantly greater in patients undergoing panniculectomy across the studies but pelvic lymph node yield was not.

Conclusions: Our review of NSQIP and the existing literature does not support the premise that there is a statistically significant benefit to patients of performing panniculectomy in conjunction with gynecologic surgery in the morbidly obese patient population. On the contrary, the NSQIP database, the largest cohort database available in the literature, confirms significant risks. In the light of the risks to patients and current direction of medical practice the addition of elective panniculectomy to gynecologic surgery should be re-considered in the morbidly obese patient population.

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Extended Drain Dwell Duration Following Muscle Flap Closure for Complex Spine Surgery Does Not Increase the Risk of SSI

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Purpose: Surgical drains are routinely used to prevent the accumulation of fluid at the operative site, an effect known to decrease the risk of seroma and theoretically lower the chance of abscess or small hematoma formation. Despite these potential benefits, significant debate exists in the literature regarding the risk that such drains might be imparting on the development of surgical site infections (SSI), and the use of prophylactic antibiotics to "cover the drain" remains a common practice despite scant evidence that closed suction drains increase the risk for SSI. The purpose of the present study is to examine our database of over twelve years of muscle flap closure following complex spinal surgery to determine the effect of drain dwell duration on postoperative wound complications including SSI.

Methods: For this retrospective review, 301 consecutive index cases of complex spine surgery with immediate muscle flap closure (paraspinous, trapezius, latissimus dorsi, and/or thoracolumbar fascia) by the senior author from 2006 through 2018 were identified. The electronic medical record was reviewed for patient characteristics, perioperative details, and outcomes. Examination of the effect of median drain dwell duration on the primary endpoint, SSI, was first conducted via the Mann-Whitney test followed by univariable logistic regression analysis for both the primary endpoint and secondary endpoints including wound complication requiring reoperation and need for hardware removal due to infection.

Results: The cohort was 50.8% male and with an average age of 59.0±18.0 years and body mass index of 27.8±6.7 kg/m^2. In 85% of cases, at least one drain was in intimate contact with the hardware and/or bone graft, and patients received no more than 24 hours of postoperative intravenous cefazolin (or other appropriate peri-operative coverage in case of documented allergy) unless further antibiotics were indicated. There were 15 cases of SSI, overall, making for an incidence of 4.9%. Drain durations were clearly documented in 271 cases. Median drain dwell duration among these cases was 19 days (IQR: 14-27 days), overall, 19 days (IQR: 14-27 days) among cases which did not develop SSI, and 22 days (IQR: 15-30 days) among cases which did develop SSI (p=0.231). Univariable logistic regression analysis also demonstrated no increased risk with longer drain dwell times for the development of SSI (OR: 1.03, 95% CI: 0.98-1.08, p = 0.282), wound complication requiring

reoperation (OR: 1.02, 95% CI: 0.96-1.09, p = 0.559), or subsequent removal of hardware due to infection (OR: 1.03, 95% CI: 0.95-1.11, p=0.528).

Conclusions: In this large retrospective series of 301 cases spanning over twelve years, we demonstrate that increased drain dwell duration is not associated with SSI, wound complication requiring reoperation, or need for hardware removal due to infection. These findings, particularly in light of the high-risk nature of the cohort in which 85% of patients had drains placed adjacent to hardware and/or bone graft, contribute to the evidence that increased drain dwell times do not place patients at greater risk of SSI and that such patients do not need prophylactic antibiotics for drain coverage.

Assessment of Malpractice Claims Associated with Pressure Ulcers

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Background: Pressure ulcers impose a significant burden on patients, the healthcare and legal systems. An estimated 2.5 million pressure-induced injuries are treated each year in acute care facilities in the United States alone. Plastic surgeons are often involved in these patient's care, particularly advanced stage ulcers. Regardless of cause or treatment setting where these wounds are incurred, many patients or their family go on to file lawsuits due in part to the development of these wounds. Consequently, institutions and sometimes physicians assume the risk of malpractice litigation or are involved as experts during these cases. There is a paucity of literature regarding malpractice claims associated with pressure ulcers. The goal of this study is to use a national legal database to characterize such malpractice claims.

Methods: Retrospective analysis of the VerdictSearch legal database was performed on all legal cases from 1987 to present that resulted in a verdict or settlement related to pressure ulcers. A Boolean search for cases containing the terms "pressure sore," "pressure ulcer," "decubitus ulcer," or "bed sore" were included in the search query. Malpractice cases were reviewed individually to ensure that they were directly related to the development of a new pressure ulcer. The final database was then analyzed using ANOVA tests and chi-square analysis, based on plaintiff demographics, primary malpractice claim, defendant qualifications and specialty, the case outcome and the amount of award in case of plaintiff decision/settlement.

Results: A total of 141 individual cases were collected and analyzed. The plaintiff's mean age was 72.5 and there were similar number of men and women plaintiffs, 52.5 vs 47.5%. The overwhelming majority of the lawsuits were for negligence, 75.9%, followed by malpractice, 22.7%. Most of lawsuits listed a hospital as the defendant (61.7%) followed by nursing homes (31.2%) then individual healthcare provider (7.1%). Of the cases available in the database, 25.5% resulted in settlements while plaintiffs and defendants won the verdict at similar rates, 34.8% and 36.2% respectively. Individual providers were most likely to receive a winning verdict (80%) followed by hospitals (37.2%) then nursing homes (25%) (p=0.035). Additionally, payouts were statistically different based on with individual providers being responsible for mean of $400,000 +/- $141,420 when they lost compared to $1,596,705 +/- $248,1178 for hospitals and $4,006,509 +/- $7,755,644 for nursing homes (F value 4.24, p=0.022).

Conclusions: This investigation attempts to analyze malpractice trends pertaining to pressure ulcers and attempt to characterize their impact on our legal system within the framework of our current healthcare system. Specifically, while providers are least likely to be named as the primary defendant in these cases, they are the most likely to win. Moreover, a hospital is twice as likely to be named as the primary defendant compared to a nursing home, but a plaintiff is less likely to receive a winning verdict against a hospital defendant and awards are lower. Factors related to both medical and legal outcomes can suggest targets for quality improvement and suggests how practitioners may work towards reducing malpractice risk and refining patient care.

The Economic Burden of Out-of-Pocket Spending for Plastic Surgery Procedures: Value from the Patient's Perspective

Presenter:	Jessica I. Billig, MD
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Purpose: Health insurance reimbursement structure has evolved with patients becoming increasingly responsible for their healthcare costs through rising out-of-pocket (OOP) expenses. High levels of cost sharing can lead to delays in access to care, influence treatment decisions, and cause financial distress for patients.[1,2] Given the possible negative effects of OOP expenses on the patient, we aim to investigate temporal trends in OOP expenses for plastic and reconstructive surgical procedures and determine drivers for increased cost sharing.

Methods: The study cohort comprised of patients undergoing the most common outpatient reconstructive plastic surgeries (skin cancer excision with closure, breast reconstruction, breast reduction, hand surgery, facial fracture repair, and scar revision/complex closure)[3], using Truven MarketScan databases from 2009-2017. Sociodemographic characteristics, insurance type and outpatient surgery location data were collected. Total cost of the surgery paid to the insurer and OOP expenses, including deductible, copayment, and coinsurance, were examined over time. OOP expenses were investigated using multivariable generalized linear modelling with log link and gamma distribution. All costs were inflation adjusted to 2017 dollars.

Results: We evaluated 3,181,125 outpatient plastic and reconstructive surgical procedures between 2009 and 2017. The adjusted mean total cost in 2009 was $1,055 and in 2017 was $1,338 (increase in 27%), and the adjusted mean OOP expenses in 2009 were $121 and in 2017 were $184 (increase in 52%). Patients undergoing hand surgical procedures had the largest increase in total cost ($1,776 in 2009 to $2,545 in 2017, increase of 43%, P<0.001) and OOP expenses ($197 in 2009 to $331 in 2017, increase of 68%, P<0.001). Procedures performed in ambulatory surgical centers accounted for the largest increase in cost sharing between 2009 and 2017 (increase of 74%), but total costs only increased 24%. Facility fees were $385 on average in 2009 compared to $704 in 2017 (P<0.001), and mean professional fees were $538 in 2009 compared to $635 in 2017 (P<0.001). In the adjusted regression, managed care, Medicare-managed care, and Medicare-fee-for-service had approximately 42%-64% of the OOP expenses compared to fee-for-service insurance (P<0.001).

Conclusion: For outpatient plastic surgery procedures, OOP expenses are increasing at a faster rate than total costs. Wide variability in cost sharing was seen across the different plastic surgery procedures, surgical location, and insurance type. For outpatient plastic surgical care that is largely elective, these temporal trends in OOP expenses must be explored and should be incorporated in the decision-making process for surgery. Given the increased scrutiny placed on rising healthcare costs, policy makers should consider the impact of cost sharing and the financial burden placed on the patient when discussing value-based reimbursement reform.

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Use of a Split Pedicled Gracilis Muscle Flap in Robotic-Assisted Vaginectomy and Urethral Lengthening for Phalloplasty

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Background: We describe the technique of robotic vaginectomy, anterior vaginal flap urethroplasty, and use of a longitudinally split pedicled gracilis muscle flap to recreate the bulbar urethra and help fill the vaginal defect in female-to-male gender affirming phalloplasty.

Methods: Vaginectomy is performed via robotic assisted laparoscopic transabdominal approach. Concurrently, gracilis muscle is harvested and passed through a tunnel between the groin and vaginal cavity. It is then split longitudinally and the inferior half is passed into the vaginal cavity, where it is inset into the vaginal cavity. Following urethroplasty, the superior half of the gracilis flap is placed around the vaginal flap to buttress this suture line with well-vascularized tissue.

Results: From May 2016 to March 2018, 16 patients underwent this procedure, of average age 35.1 ± 8.8 years, BMI 31.4 ± 5.5, and ASA class 1.8 ± 0.6. The average length of operation was 423.6 ± 84.6 minutes, with an estimated blood loss of 246.9 ± 84.9 mL. Patients were generally out of bed on post-operative day 1, ambulating on post-operative day 2, and discharged home on post-operative day 3 (average day of discharge 3.4 ± 1.4 days). At mean follow-up time of 361.1 ± 175.5 days, no patients developed urinary fistula at the urethroplasty site.

Conclusions: Our use of the longitudinally split gracilis muscle in first stage phalloplasty represents a novel approach to providing well-vascularized tissue to achieve both urethral support and closure of intra-pelvic dead space, with a single flap, in a safe, efficient, and reproducible manner.

Labia Majora Flap Scrotoplasty and Perineal Reconstruction in Phalloplasty Patients: Technique and Outcomes

Presenter: Travis J. Miller, MD
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Purpose: Phalloplasty patients often desire a pouch-like, anteriorly positioned scrotum and perineal reconstruction to achieve natural-appearing external male genitalia. The labia majora are the embryologic homologue of the scrotum, making it the ideal donor tissue for neoscrotoplasty. The flap blood supply is derived from the pudendal vascular system. Detailed review of the flap harvest technique (first mentioned by Monstrey et al in 2011[1]) and analysis of the outcomes of labia majora flap scrotoplasty and perineal reconstruction will help providers better understand and care for transmasculine patients who have had genital surgery.

Methods: We retrospectively reviewed the outcomes of phalloplasty patients who underwent either primary or secondary labia majora flap scrotoplasty and perineal reconstruction from October 1, 2017 to October 1, 2018. Bilateral elevation, rotation, and flap advancement from the posterior to anterior position formed a pouch-like scrotum. Scrotoplasty was followed by multi-layered closure of the resultant perineal wound with apposition of the inner thigh skin to complete the perineal reconstruction.

Results: The mean followup was 7 months (0.5 - 12 months). Out of the 60 total scrotoplasty patients, 47 had labia majora flap scrotoplasty and perineal reconstruction at time of phalloplasty. The remaining 13 underwent scrotoplasty secondarily. Unilateral distal flap necrosis occurred in 3 patients (5%); all 3 were ipsilateral to the groin dissection required for phalloplasty. Wound dehiscence was observed at the perineoscrotal junction and along the perineal closure in 11 patients (18%) and 1 patient (1.7%), respectively. All wounds were managed conservatively and healed well except for 3 patients who developed urethrocutaneous (UC) fistulas at the perineoscrotal junction site. Two of the 3 patients also had fistulas at the midline anterior scrotum and a concomitant urethral anastomotic stricture. All 3 patients required fistula repair, and two required urethroplasty. The patient who had a perineal wound dehiscence also had a perineal hematoma, a perineal UC fistula, and a urethral stricture. No scrotal hematomas were seen.

Conclusions: Labia majora flap scrotoplasty via a bilateral rotational advancement technique and perineal reconstruction can be safely done during or after phalloplasty. Minor wound complications are common and frequently heal with conservative management. Wounds that do not heal are often associated with a urethral complication. Hematomas of the scrotum and perineum are rare.

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Preferences of Transgender and Gender Non-Conforming Individuals in Gender-Confirming Surgical Care: A Cross-Sectional Study

Presenter:	Ilana Margulies, MD, MS
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Introduction: Increased awareness for transgender and gender non-conforming individuals may lead to increased demand for surgical interventions in gender-confirming care. However, limited literature exists regarding transgender and gender non-conforming preferences and experiences with medical or surgical care. The authors aim to characterize the medical and surgical care sought by this population, as well as their surgical preferences, motivations, and barriers to care.

Methods: An online questionnaire about opinions and personal experiences with medical and surgical care during gender transition was crafted by a focus group of plastic surgeons and transgender individuals using an iterative process. The questionnaire was publicized via regional online social networking forums in Connecticut and surrounding areas catering to transgender communities. Responses were collected from January 2014 to January 2017. Descriptive statistics and hypothesis-driven analysis using indicated statistical tests were reported ($p<0.05$).

Results: Survey responses were received from 313 participants. Participants were 97% male gender at birth and 92% Caucasian with an average age of 51.7 years (SD 13.5). 59% identified as male-to-female transgender, 20% gender non-conforming, 13% other, 4% intersex and 1% female-to-male transgender. Respondents were aware of their gender identity at a mean age of 9.6 years (SD 9.0 years), but did not begin transitioning until a mean age of 38.9 years (SD 20.8 years) with gender non-conforming respondents choosing to transition at a significantly younger age as compared with transgender respondents (29.8 years old vs. 41.4 years old, $p = 0.0061$, unpaired T-test). 67% of respondents supported allowing early transitioning with no minimum age, but 72% felt there should be a minimum age prior to gender confirming surgery (average 17.8 years, SD 1.7 years). 96% of respondents felt that insurance should cover gender confirmation surgery (GCS), but only 52% supported government-funded GCS in the case of incarceration. Only 42% of all respondents, with a significantly greater number of transgender as opposed to gender non-

conforming individuals had previously met with a physician to discuss transitioning (49% vs. 21%, p = 0.002, Chi square test). The most common physicians encountered were mental health professionals (68%), primary care providers (50%), endocrinologists (36%), and surgeons (24%). 8% of the study population had undergone GCS, 52% were interested in surgery, and 40% were not interested in surgical transition. Primary motivation for GCS included discomfort in one's current body (28%), and barriers to GCS included cost (40%) and reactions of family (40%), partners (32%), and friends (25%).

Conclusion: Transgender and gender non-conforming individuals lack medical support for gender transition, with fewer than half of survey respondents reporting a prior meeting with a physician to discuss transitioning. Perspectives on GCS preparation are consistent with current World Professional Association for Transgender Health guidelines, and offer important insight into transgender motivations and barriers to care. Although this study was limited by selection bias favoring Caucasian male-to-female transgender and gender non-conforming individuals, it elucidates important experiences and preferences of this patient population that should act as the basis of future efforts to improve the efficacy of gender-confirming care.

Gender-Affirming Breast Augmentation Surgery in Male-to-Female Transgender Patients: A Single-Center Review of Post-Operative Outcomes

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Introduction: Breast augmentation surgery is a medically necessary operation for the majority of male-to-female (MTF) transgender individuals to treat gender dysphoria. While breast development does occur with feminizing hormone replacement therapy, 70% of MTF patients desire breast augmentation surgery for inadequate breast growth[1]. Special consideration must be taken when choosing surgical techniques for MTF patients due to anatomical differences from cisgender women[2]. We reviewed our experience providing breast augmentation surgery to MTF patients to better understand the factors that influence a successful surgery.

Methods: We retrospectively analyzed all MTF breast augmentations performed by a single surgeon at the University of California, San Francisco between the years 2014 and 2018. Patients must have at least 6 weeks of follow-up data and no prior breast augmentation surgery. Demographic data, baseline measurements, surgical

techniques, post-operative complications, and elective revision surgeries were collected for review. Descriptive and analytic statistical techniques were used to summarize our data.

Results: Fifty-seven MTF patients with a median age of 37 years (IQR=28-49) underwent breast augmentation. At the time of surgery, the median time that patients had lived as the gender congruent with their identity was 5 years (IQR=3-13), and they had undergone a median of 36 months of hormone replacement therapy (IQR=18-60). Seventy-two percent of patients underwent sub-pectoral breast augmentation using the dual-plane III technique. Shaped silicone implants were used in most cases (70%, n=39) with a median implant volume of 470 ml (IQR=415-525).

The median length of follow-up was 21 weeks (IQR=6-53). There was one major complication requiring emergent return to the operating room for hematoma evacuation. Twenty-six percent of patients (n=15) experienced minor complications, consisting of a hematoma (n=2), surgical site infection (n=1), nipple necrosis (n=1), animation deformity (n=2), symmastia (n=3), capsular contraction (n=2), wrippling (n=2), and implant rotation (n=7). Twenty-one percent of patients underwent an elective revision surgery, with the majority desiring larger implants (58%). Sub-glandular augmentations correlated with higher revision rates (38%) compared to the dual planes (15%; RR=2.5; 95% CI=0.95-6.6; p=0.064). Despite revision rates, overall patient satisfaction was high.

Conclusions: To our knowledge, this is one of the larger single-surgeon series of MTF breast augmentation surgeries. Most transgender women displayed inadequate lower pole development resulting in the use of textured, anatomic implants placed in a sub-pectoral pocket using the dual plane III technique. The revision and complication rates for transgender women were comparable to previous studies on cis-gendered women [3]. Transgender women have chest characteristics that are different from cis-gendered women, ultimately affecting the surgical approach. As our understanding of breast growth in transgender patients expands, we can better tailor our surgical techniques to improve surgical outcomes.

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Male to Female Genital Reassignment: An Initial Experience

Presenter:	John Thomas Loree, BA
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Purpose: To detail the early experience and results for male-to female (MTF) genital reconstruction at an established plastic surgery practice in Western New York.

Materials & Methods: Between June 2016 and January 2019, 21 patients underwent penile inversion vaginoplasty for MTF gender reassignment. All patients fulfilled WPATH and NY State criteria for reassignment surgery and were considered good surgical candidates. Procedures were carried out by board certified plastic surgeons with over 50 years combined experience in reconstructive plastic surgery and microsurgery. Plastic surgeons carried out all surgical procedures, including catheter placement, primary surgery, revisions, and complications (including bowel and urological complications). All surgeries were carried out at a large, government-owned tertiary care center.

Results: The mean age of the 21 patients included in this study was 39 (25-64) and had mean BMI of 28.0 (16.1-47.0 kg/m^2). 13 patients never smoked, 2 were former smokers (1, 10 years since cessation), and 6 were current smokers who quit at time of surgical scheduling. Primary surgery was an orchiectomy and single-stage penile inversion vaginoplasty, which used scrotal skin to construct a clitoral hood and extend the depth of the neo-vagina. Mean operative time was 6.0 hours inclusive of anesthesia time (3.8-7.8 hours). For primary surgery, mean hospital stay was 9 days (5-20). 2/21 (9.5%) patients had blood loss requiring transfusion (2 units each, 1 intraoperative, 1 postoperative). In total there were 6/21 (29%) complications, 2 of which required early reoperation. One patient had significant wound dehiscence on POD #7, and the other had a rectal perforation identified POD #10 (closed primarily without sequelae). The other complications were intraoperative rectal injury (repaired primarily without sequelae), seroma, C-Difficile colitis, and a late urethrovaginal fistula.

14/21 (66%) have undergone revision surgery, 12/14 (85%) have undergone one revision surgery, 2/14 (15%) have undergone two surgeries. Indications for revision were: prolapse correction/deepening (8 patients), labiaplasty (7 patients), clitoral hood construction/revision (4 patients), meatal asymmetry (2 patients), urinary fistula repair (1), and posterior vaginal flap revision (1 patient). Time to first revision averaged 8.2 months (3.2-16.4). Time to second revision from first was 3 months and 11.5 months,

respectively. Hospital stay for revision surgery was 3 days or less in all patients (12/16 were same day surgeries). There were no complications from these procedures.

Conclusions: MTF gender reassignment is a novel, challenging set of procedures for the specialty of plastic surgery. With appropriate consideration and technique, penile inversion vaginoplasty is a safe, effective means of achieving this goal.

Tumescent-Based Radical Excision Cures Hidradenitis: A Prospective Cohort Study

Presenter:	Frank H. Lau, MD
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Background: Radical excision is the only potentially curative treatment for hidradenitis suppurativa (HS) lesions with reported cure rates approximately 75.6%[1]. Anecdotally, we have found that excision is uncommonly offered due to surgical site bleeding and ill-defined surgical planes. To address these challenges and improve patient access to curative HS treatments, we developed a novel tumescent-based radical excision (TRE) technique. The purpose of this study is 1) to quantify the safety, speed, and efficacy of TRE and 2) to quantify our long-term reconstructive outcomes. We hypothesize that these data will show that TRE is superior to traditional radical excision.

Methods: An IRB-approved prospective cohort study of consecutive patients with stage II and III hidradenitis was performed. Demographic and intraoperative variables were collected. Intra-operative and post-operative outcomes assessed included volume of tumescent per lesion, time for excision, type of reconstruction, complications, bleeding, need for readmission for any reason, and local recurrence rates.

Results: Between April 2016 and July 2018, 39 consecutive HS patients underwent TRE of 98 anatomic sites with average lesion size of 97 cm^2. Average excision time per lesion was 6.5 ± 7.2 minutes. Time required for excision had no significant relationship to the size of the lesion ($R^2 = 0.3$). Intraoperatively, there were 2 minor complications (2.0%), both of incomplete disease excision due to the depth of disease. Postoperatively, there were 5 minor complications (5.1%) of surgical site bleeding. 1 was brought back to the operating room where hemostasis was achieved, while 4 were controlled without return to the operating room.

The average length of follow-up was 234.0 days. Ten local recurrences (10.2%) were observed, yielding an 89.8% cure rate. The average time to recurrence was 355.9 +/- 236.9 days (range 77-776 days). Early recurrences were rare, with only 1 recurrence within 90 days post-TRE.

For reconstruction, 19 sites (19.4%) healed by secondary intention. Single-stage reconstruction was performed at 44 sites (44.9%); methods included 15 local flaps, 25 primary repairs, and 4 split thickness skin grafts (STSG). Delayed reconstruction was required for 35 anatomic sites (35.7%); techniques included 3 local flaps, 1 primary repair, and 31 STSG. Reconstructive complications included 17 wound dehiscences (17.3%), 14 partial graft losses (14.3%), 4 total graft losses (4.1%), 3 partial flap losses (3.1%), and 0 total flap losses.

Conclusion: TRE is safe, fast, and effective. Intraoperative and postoperative complication rates are low. Following TRE, HS recurrence rates are lower than with traditional radical excision, and early recurrence is exceedingly rare. Reconstruction remains challenging, with wound dehiscence and graft loss both approximately 17%. Adoption of TRE for HS will benefit both patients and surgeons.

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A New Rib Removal Technique for Torso Tapering or Securing Rib Bone Grafts

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Co-Authors:	Wendy Chen, MD, Galen Wachtman, MD, Mario G. Solari, MD, Ernest K Manders, MD
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Purpose: We aim to introduce a novel technique of 11^{th} and 12^{th} rib harvesting for aesthetic and reconstructive surgical procedures, and to demonstrate that this method is a safe and efficacious alternative to the current techniques of rib harvesting.

Methods and Materials: V-shaped dissectors were designed and mounted on curved rods, approximating the curve of the ribs. The dissection edges were mounted on each of two mirror image instruments, one for the cephalad side of the rib and one for the

caudal side. This enabled rib dissection to be performed on both sides through 4-5 cm incisions between the 11th and 12th ribs.

This was a retrospective study performed at a single institution for two plastic surgeons. Thirty-six individual ribs were resected in eight patients, for either reconstructive or cosmetic purposes. The procedure in each patient was accomplished in less than sixty minutes. Demographic data including gender, age, body-mass index, smoking status were collected. Complications including surgical site infection (SSI), pneumothorax, pneumonia, hematoma, seroma, venous thromboembolism (VTE), need for pain consultation, readmission, and length of hospital stay were assessed. Data was compared to existing literature regarding current techniques for rib harvesting.

Results: All patients reported an improved thoracic contour and were satisfied with the results. Average incision length was 4.2 cm, mean hospital stay was 7 and 1.5 days for reconstructive and aesthetic patients, respectively, and the largest defect recorded was 9.5cm x 14 cm. The only complications reported were one apical pneumothorax that required no intervention and one pain consult. There were no incidences of SSI, pneumonia, hematoma, seroma, VTE, or readmission.

Conclusions: A novel technique is described for harvesting the 11th and 12th ribs, which can be easily split for reconstructive purposes, such as cranioplasty. The same technique can be used to remove the floating ribs for cosmetic purposes in order to increase vertical waist length in male-to-female transition patients. This method is a good and safe alternative to the current techniques of rib harvesting.[1-3]

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The Cost of the July Effect in Microsurgery

Presenter: Haripriya S. Ayyala, MD
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Purpose: The "July Effect" is a term used to describe the perceived increase in complications when new surgeons enter residency or practice at the beginning of the academic year. The authors aim to investigate if this effect exists in microsurgical free tissue transfer procedures and to estimate the difference in cost.

Methods: The National Surgical Quality Improvement Program registry was queried for all free flap procedures performed between 2005-2016 (n=3405). Cases were grouped as having occurred in the first academic quarter (Q1: July 1-Sept 30) or fourth quarter (Q4: April 1-June 30). Operative time, length of stay, along with demographical data such as age and body mass index were analyzed using independent sample t-tests. Operating room and associated inpatient costs were modeled based on previously published studies. Independent sample t-test was performed to detect any difference in mean costs amongst the two timeframes. Demographical data along with rates of comorbid conditions, re-operation, re-admission and complications were compared using univariate chi squared analysis. Multivariate logistic regression was used to control for confounding variables when determining if the July effect was an independent predictor of complication risk.

Results: Out of a total of 1722 cases, 905 were performed in the first academic quarter and 817 were performed in the fourth academic quarter. There was no significant difference between Q1 and Q4 in re-admission rate (10.2 vs 8.9, p=0.378) or re-operation rate (17.8 vs 17.1, p=0.730). There was an increased rate of wound dehiscence (5.4% vs 3.2%, p=0.023) but after controlling for confounding variables and demographics, this was found to be insignificant between Q1 and Q4 (OR=1.442, p=0.541). Patients in Q1 had significantly longer operative times (519.80 min vs 485.53 min, p=0.001) and length of stay (11.09 days vs 9.39 days, p=0.002) compared to those in Q4. In addition, cost of inpatient stay and operating costs associated with each free flap were significantly increased in Q1 compared to Q4 ($25,912.40 vs 23,506.69, p=0.029; $32,306.12 vs $30,102.71, p=0.001). The total cost per quarter for free flaps was also significantly more expensive in Q1 vs Q4, with a highest average difference in cost of $350,010.64 ($4,249,952.69 vs $3,899,942.05, p=0.001)

Conclusion: There is a cost associated with the "July Effect" on microvascular free tissue transfer. Having surgery early in the academic year does not put patients at any

increased risk for major complications, but is associated with increased operating time, length of stay, and total cost.

Health Insurance Coverage of Gender-Affirming Top Surgery in the United States

Presenter:	Ledibabari M. Ngaage, MD
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Introduction: Despite the medical necessity, legislative mandates and economic benefits of gender affirming surgery, access to treatment remains limited. World Professional Association for Transgender Health (WPATH) have proposed guidelines for transition-related surgery in conjunction with criteria to delineate medical necessity. We assessed insurance coverage of "top" gender affirming surgery and evaluated the differences between insurance policy criteria and WPATH recommendations.

Methods: We conducted a cross-sectional analysis of insurance policies for coverage of top gender affirming surgery. Insurance companies were selected based on their state enrolment data and market share. A web-based search and individual telephone interviews were conducted to identify the policy. Medical necessity criteria were abstracted from publicly available policies.

Results: Of the 57 insurers evaluated, bilateral mastectomy (female-to-male, FtM) was covered by significantly more insurers than breast augmentation (male-to-female, MtF) (96% vs 68%, $p<0.0001$). Only 4% of companies used WPATH-consistent criteria. No criterion was universally required by insurers. Additional prerequisites for coverage that extended beyond WPATH guidelines for top surgery were: continuous living in congruent gender role, two referring mental health professionals and hormone therapy prior to surgery. Hormone therapy was required in a significantly higher proportion of MtF policies compared to FtM policies (90% vs 21%, $p<0.0001$).

Conclusion: In addition to the marked inter-company variation in criteria for insurance coverage which often deviated from WPATH recommendations, there are healthcare insurers who categorically deny access to top gender affirming surgery. A greater evidence base is needed to provide further support for the medical necessity criteria in current use.

Improving Plastic Surgery Resident Education and Quality of Care By Providing Outcomes Feedback Using the Surgery Report Card

Presenter: Sameer H Halani, MD
Co-Authors: Min-Jeong Cho, MD, Andrew Y. Zhang, MD
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Purpose: The future of plastic surgery is dependent on the residents in training throughout the country. As plastic surgeons, the practice of tracking and analyzing our outcomes is essential to being better surgeons and improving the quality of care for our patients. However, this feedback system is largely absent in residency training programs. To address this, we developed a Surgical Report Card (SRC) for residents performing tissue-expander (TE) based breast reconstruction focusing on clinical outcomes. This enables residents to evaluate and improve their operative technique in a systematic way and ensure better outcomes.

Methods and Materials: We performed a retrospective review of patients undergoing TE reconstruction after mastectomy, between September 2016 and July 2018, with a resident as lead surgeon. Our primary outcome was overall complication rate and was further separated to: seromas, hematomas, mastectomy flap necrosis, cellulitis, infection, and TE failure.

The approach to TE reconstruction was standardized: TEs were placed sub-pectorally, an AlloDerm sling is used, and drains were left post-operatively.

A systematic review and meta-analysis was performed to identify complication rates and demographics in the literature and was used as the comparison group for our cohort.

The SRC shows individual resident patient demographics and complication statistics and directly compares these to the values from the meta-analysis.

Results: The meta-analysis included 11 studies, with 2024 patients that underwent TE-based reconstruction, with a total of 2858 breasts. The overall pooled complication rate was 26.9%; infection was most common (8.6%); failure rate was 6.0%.

Our cohort included 144 patients (245 breasts) among 13 resident-led teams. Overall complication rate was 31.8%; infections were most frequent (17.6%) and failure rate was 7.3%. Our cohort trended towards higher BMIs (29.7 vs. 25.4, $p = 0.056$), more

diabetics (6.9% vs. 2.9%, $p = 0.06$), and more patients receiving adjuvant radiation therapy (41.4 vs 16.8%, $p < 0.0001$).

The meta-analysis was used as a benchmark for the Surgery Report Card. Every 3 months, residents receive a customized report of their cases over the course of their rotation and the duration of residency.

At the beginning of their next rotation, each resident team generates a protocol based on knowledge gained from their past outcomes to improve performance. Every three months, a new SRC is generated and an outcomes feedback program is enforced to identify deficiencies and areas of improvements.

Conclusions: The implementation our SRC reveals several salient points. First, this establishes a baseline for our residents and sets the stage for improving moving forward. Second, despite the patient cohort at our county hospital having higher BMIs, more diabetics, more patients undergoing adjuvant radiation therapy, our residents were able to safely perform TE-based breast reconstructions. Third, the SRC allows residents to critique performance and to be more thoughtful of all aspects of patient care, thus improving their competencies and improving outcomes for our patient population. Finally, the SRC creates a solid metric for residents to longitudinally track their performance and confidently progress on to the next stage of their careers.

A Single Pre-Operative Dose of Tranexamic Acid Reduces Peri-Operative Blood Loss: A Meta-Analysis

Presenter: Mieke Heyns, MD
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Purpose: Tranexamic acid (TXA) is a synthetic anti-fibrinolytic that has been used in various surgical disciplines to reduce blood loss, blood transfusions, ecchymosis, and hematoma formation[1,2]. However, its utility in plastic surgery has not been well characterized. Furthermore, there is no universal standard on the most effective dose and route of TXA administration, limiting its routine use in many centers. This study evaluates the current evidence for the efficacy and safety of a single pre-operative dose of TXA on surgical blood loss in all surgical disciplines.

Methods and Materials: With the guidance of a research librarian, in accordance with the Cochrane Handbook Medline, Cochrane Central and Embase were searched

in November 2018. Search terms included “Tranexamic Acid” AND “Intravenous”, with studies limited to RCTs in adult humans. Two independent reviewers and an arbitrator assessed articles for inclusion. Criteria included a single pre-operative bolus dose of intravenous TXA, surgical patients, and intra-operative blood loss measurement or peri-operative blood loss up to 24 hours post-surgery. Quality assessment was done using the Cochrane Collaboration risk-of-bias tool by two reviewers. Statistical analysis was carried out using Cochrane Review Manager 5.3. The primary outcome was surgical blood loss. Secondary outcomes included venous thromboembolic complications and transfusion requirements.

Results: A total of 1906 articles were screened, 57 met inclusion criteria. The majority of included studies were orthopedic (27), followed by obstetric and gynecological (16), oral maxillofacial and otolaryngology (10), cardiac (3), and only one plastic surgery study focusing on acute burn reconstruction. Across all surgical specialties (n=5698), the peri-operative estimated blood loss was lower in patients receiving TXA, with a standard mean difference of -153.33ml (95% CI = -187.79 to -118.87). The most frequently used dose of TXA was 15mg/kg. There was no difference in the incidence of venous thromboembolic events between TXA and control groups.

Conclusion: Pre-operative intravenous TXA reduced peri-operative blood loss in a variety of surgical disciplines without increasing the risk of thromboembolic events. Therefore, a single pre-operative dose of TXA should be considered, particularly for elective day surgery procedures to minimize risks of peri-operative blood loss.

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Pediatric Dog Bites: A Review of 1422 Cases Treated at a Level I Pediatric Trauma Center

Presenter:	Louisa C Boyd, MD
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Purpose: Children under the age of 14 account for over 40% of the almost 900,000 annual hospital visits associated with dog bites. Due to a number of factors, children frequently sustain dog bites to highly vulnerable regions, often necessitating intervention by plastic surgeons. This study aims to aid the novice plastic surgeon by outlining a treatment algorithm for the management of pediatric dog bites.

Methods: A retrospective review of pediatric patients who sustained dog bites and presented to Le Bonheur Children's Hospital from January 2011 to May 2017 was performed. Charts were subsequently analyzed for patient demographics, bite location, dog demographics, interventions, and outcomes. Additional visits related to the same initial injury were all entered under the same patient. Inclusion criteria consisted of the following: (1) presentation to our ER for evaluation and treatment of dog bite injury; (2) age of less than or equal to 18 years; (3) no interventions had been performed at other institutions prior to presentation; (4) follow up of at least one year. Patients were excluded if the bite source was not canine or if no true bite occurred.

Results: 1422 patients were identified over a 6.5 year-period, averaging 1 bite every 1.6 days. The typical pediatric dog bite case was male (63.5%), African-American (57.4%), and less than 10 years old (69.4%). The head and neck were the most commonly affected areas (64.7%), with the cheeks and lips being the most frequently involved (34.5%). Hospital admission was required for 133 patients (9.35%), and operative repair was deemed necessary in 30.7% of all cases. Of the patients requiring inpatient operative repair, the vast majority (81.2%) were discharged in less than 24 hours. Operative complications were exceedingly rare (2.8%), with infections accounting for the majority (91.7%). No fatal dog bites occurred in this study.

Several factors of significance related to operative intervention were identified. Age of less than 10 years was significantly correlated with surgical intervention for male patients ($p=0.0040$). Bites to the torso were significantly associated with operative need as compared to the upper extremities ($p=0.016$) and lower extremities ($p=0.005$), as were bites to the head and neck when compared to the upper and lower extremities ($p<0.00001$) The number of bites sustained further influenced surgical intervention, with more than two bites being significantly associated with operative need ($p=0.015$).

Conclusion. While great debate remains as to how to best decrease our nation's pediatric dog bite epidemic, reconstructive surgeons can help to minimize the devastating physical and psychological effects of these injures through effective and timely management of cases requiring operative intervention. Patients are much more likely to require surgical intervention if they have sustained more than two bites, are less than 10 years old and male, or have been bitten on either the torso or the head and neck. Although the majority of patients in this study were managed non-operatively, surgical management of the dog bite victim can be challenging, especially in the aesthetically demanding head and neck region.

Can the Apple Measure Augmented Reality App be Used in Plastic Surgery?

Presenter: Brian Soheil Shafa, MD
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Background: Photographic documentation and accurate measurements are essential aspects of Plastic Surgery. Technological advances have eased the burden for surgeons, allowing us to carry fewer tools and more quickly complete our evaluation and documentation. Apple's most recent operating system update introduced an augmented reality (AR) app "Measure" that allows an iPhone to act as a digital measuring tape.

Aim: To determine if the iPhone Measure app could be used to accurately measure wounds with augmented reality and compare these measurements to physically derived manual measurements.

Methods: The first stage of the study was performed by drawing markings of known dimensions on intact skin of various body parts and testing the augmented reality app's ability to accurately measure these markings. Two separate measurements were obtained and averaged to obtain our AR value. We utilized subjects with varying skin tones and compared values obtained by various users and instruments. The second stage of the study was performed by analyzing open wounds. Open wounds were measured first with the app, then with a measuring tape, then repeated with the app. Variations in lighting, angles, and devices were all considered in the use of augmented reality measurements.

Results: For the intact skin measurements the AR app performed well, accurately and reproducibly measuring markings on the upper and lower extremity measuring 1cm –

15cm in length. A male model was then used to measure sternal notch to nipple and mid-clavicle to nipple, again correctly measuring the values at 21cm and 19cm respectively. When the markings were set at sub-centimeter intervals, the AR app was unable to provide that level of specificity, but did accurately round to the nearest whole number. With respect to open wounds, AR was utilized to measure 21 consecutive wounds ranging from 1.1cm to 29cm in length. The wounds were present in the upper and lower extremity, face, scalp, and the anterior and posterior trunk. The average difference between AR and manual measurements was 0.29cm

Discussion: The apple measure app is free and automatically installed on every iOS device with iOS 12 or greater. Using the manually recorded values as baseline gold standard measurements, augmented reality measurements provided approximate, though not exact, values. The measurements were reproducible and remained constant regardless of the device used. The results were not affected by the patient's skin tone, hair, or lighting. The app provides for images with overlying measurements that can subsequently be stored securely in the patient's chart. The app is currently limited to 1cm increments but third-party apps are available that allow for sub-centimeter measurements. As a first-generation app, there is great promise in the technology, proving that there is a role for augmented reality measurement in plastic surgery and chronic wound care.

Attitudes and Preferences Regarding Plastic Surgery Presence on Social Media

Presenter:	Hillary E Jenny, MD
Co-Authors:	Nicholas Siegel, BS, Nima Khavanin, MD, Karan Chopra, MD, Justin M. Sacks, MD MBA, Robin Yang, MD
Affiliation:	Johns Hopkins University, Baltimore, MD

Purpose: This study aims to assess public attitudes towards sharing plastic surgery procedures online. Preferences for plastic surgeon presence on social media were also queried.

Methods: A 52-question survey was anonymously administered to 100 male and 100 female respondents crowdsourced through MTurk (Amazon, Bellevue, WA) from January 22-28, 2019. Subjects were surveyed with respect to: demographics, social media usage habits, and opinions regarding sharing plastic surgery experiences on surgeon websites and social media accounts.

Results: Of 200 respondents (mean age 41 years, 83% Caucasian), 46% had 4-year degrees, and the median income range was 25,000-50,000 USD. Respondents spend a

median of 1-2 hours on social media/day, and half take “selfies”. Seven percent previously had plastic surgery; 28% were somewhat/very likely to get plastic surgery in future. While the majority would prefer to look “natural”, 4% would prefer a “done look”. 28% would allow sharing of de-identified photographs of their surgery on surgeon websites compared to 17% via social media. If photos would be shared without de-identification, 12% would still allow sharing on surgeon websites vs. 9% on social media. Strikingly, 73% and 70% of respondents felt patients should be financially reimbursed for sharing photographs on surgeon websites and social media, respectively.

Female sex was the only factor associated with allowing photos anonymously shared on a website ($p = 0.01$). Factors predictive of patient willingness to allow sharing images on social media were desire for a “done look” and using social media to find a physician ($p = 0.01, 0.04$). However, respondents with two- or four-year degrees and income $\geq$\$100,000 were less likely to allow photos shared on social media ($p = 0.01, 0.04$). Age, race, time on social media, taking “selfies”, prior plastic surgery, and preference for using social media to find plastic surgeons were not associated with sharing photos in any medium. Those willing to share were not more likely to believe patients should be financially reimbursed for doing so.

Eighteen percent of respondents were more and 10% less likely to choose plastic surgeons with strong social media presence. Twenty-eight percent were more likely to choose surgeons who have had plastic surgery themselves, with 38% preferring surgeons who have had the same procedure they want. Preferring surgeons with personal plastic surgery experience was associated with preferring surgeons with strong social media presence ($p=0.02$). Twenty-nine percent preferred surgeons who post about their own plastic surgery procedure on social media, a finding associated with female sex, spending <4 hours on social media/day, and using social media to find a plastic surgeon ($p = 0.04, 0.03, 0.01$).

Conclusions: This population-based survey indicates that people interact differently with social media versus online websites, particularly when sharing their own patient experiences. Understanding public preferences regarding surgeon social media presence and sharing a surgeon’s personal plastic surgery experience may inform patient interactions and management of personal and professional social media accounts.

Evaluating the Role of Social Media in Public and Patient Selection of Plastic Surgeons

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Purpose: This study aims to assess the interplay between social media platforms and their impact on patient selection of physicians and plastic surgeons.

Methods: A 52-question survey was anonymously administered to 100 male and 100 female respondents crowdsourced through MTurk (Amazon, Bellevue, WA) from January 22-28, 2019. Subjects were surveyed with respect to: demographics, social media usage habits, and preferences for physician and plastic surgeon selection.

Results: A total of 200 respondents completed the survey. Mean age was 41 years, and 83% self-identified as Caucasian. Forty-six percent completed a 4-year degree after high school. The median income range was 25,000-50,000 USD. Respondents spent a median of 1-2 hours on social media/day. When selecting physicians, respondents had used search engines (70%) and asked friends/family (55%) or other physicians (35%). Preferences for selecting plastic surgeons included health ratings sites (55%), search engines (52%), other physicians' recommendations (44%), and reputable hospital websites (42%). Of the 7% who previously had plastic surgery, online search engines and asking friend/family/other physicians were most commonly used to find the surgeon (36%, 29%). More respondents stated they would use health ratings websites to select plastic surgeons vs. general physicians (55%, 32%), but fewer stated they would use social media (14%, 26%). However, of those who previously had plastic surgery, fewer respondents had actually used health ratings websites to find their surgeon (21%) whereas more used social media (29%).

Surgeon reputation was most frequently chosen as the most important factor when selecting a plastic surgeon; 65% of respondents based "surgeon reputation" on health rating websites vs. 16% who based it on social media presence or interaction between the provider on social media. Two factors were associated with an increased likelihood using social media to find a plastic surgeon: doctorate degree, desire for a "done look". However, those with an income >$100,000 were less likely to use social media to find a plastic surgeon. Age, sex, race, having a people-facing job, time spent on social media, and editing photos prior to posting on social media were not associated with an increased likelihood of using social media to find physicians or plastic surgeons.

Conclusions: Online resources such as social media platforms and health rating websites are playing an increasing role in physician selection. This population-based survey further identifies health-rating websites as a key player in patients' self-predicted behavior, and social media as a larger driver of actual surgeon selection than predicted. Understanding the public's engagement with social media and online resources as they relate to plastic surgeon selection will be increasingly critical for both practice patterns and patient education.

Systematic Review on the Prevalence of Venous Thromboembolism and Bleeding in Abdominoplasty Patients

Presenter:	Brittany Perzia, B.S.
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Background: Abdominoplasty is associated with one of the highest rates of venous thromboembolism (VTE) within the field of cosmetic surgery. Many plastic surgeons avoid the administration of VTE chemoprophylaxis out of concern for surgical bleeding. While previous studies have attempted to address the relationship between abdominoplasty and bleeding or VTE, poor reporting techniques remain a challenge. As a result, there has been a lack of reliable data to guide clinical practice. A systematic was performed to determine the prevalence of venous thromboembolism (VTE) and bleeding in abdominoplasty with and without liposuction.

Methods: A systematic review was performed following PRISMA guidelines using Pubmed, CINAHL and Cochrane Central from 1989 to 2018. Clinical articles in English which reported both VTE and bleeding events underwent full text review. Studies with <20 patients, lack of proper follow-up or data involving abdominoplasty with other concomitant procedures were excluded.

Results: Fourteen out of 498 articles met inclusion criteria, totaling 2130 patients. All but two reports were retrospective. Almost all patients were female (98%), mean age in the mid-40s with mean BMI = 27.7. Six studies utilized chemoprophylaxis, 4 used ambulation, compression stockings or sequential compression devices (SCDs) and 4 did not report any type of prophylaxis. VTE prevalence ranged from 0-1.9%. In total there were 12 patients with VTE events of whom 6 had deep vein thrombosis (DVT) and 6 had pulmonary embolism (PE). Bleeding ranged from 0-7.9% except in one randomized double-blind study using oral rivaroxaban that was interrupted due to

high bleeding rate of 30% (n = 40), however, neither the severity of bleeding nor its management were reported.

Conclusion: The prevalence of VTE and bleeding in abdominoplasty and abdominoplasty with liposuction was found to be relatively low. Given the level of low-quality evidence, heterogeneous data, lack of recorded follow-up at regular intervals and absence of precise definitions for complications and management, however, only weak conclusions regarding the prevalence of VTE and bleeding can be drawn at this time. This study further validates the need for proper reporting methods within cosmetic surgery.

Botulinum Toxin Type a Attenuates Hypertrophic Scars Formation By Preventing Macrophage M1 Polarization

Presenter:	Bin Fang, MD
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Background: Botulinum toxin type A has been shown to be a promising therapy for hypertrophic scars by alleviating muscle tension, inhibiting fibroblasts proliferation and influencing TGF-β1 expression[1]. However, persistent inflammation in wound healing is one of the main causes of hypertrophic scars[2]. The severity of the inflammatory response is determined in large part by pro-inflammatory M1 macrophages[3]. Studies have reported that botulinum toxin type A had an anti-inflammatory effect and could induce innate immune cell activation such as macrophages[4]. Therefore, we hypothesized that botulinum toxin type A may reduce inflammation and inhibited the hypertrophic scars formation by preventing macrophage M1 polarization.

Material and methods: Murine macrophage RAW264.7 cells were cultured and treated with LPS (to induce M1 polarization) and botulinum toxin type A for 24h. M1-type markers such as iNOS, TNF-α, interleukin (IL)-1β and IL-6 were determined by reverse transcription-quantitative polymerase chain reaction. The mouse model of hypertrophic scars was prepared by a mechanical stretch device[5] and treated with botulinum toxin type A. Histological studies were performed to evaluate scar hypertrophy by hematoxylin & eosin and Masson's trichrome staining. The pro-inflammatory cytokines such as TNF-α, IL-1β and IL-6 were observed by

immunohistochemistry. The M1 macrophages ($F4/80^+$ $iNOS^+$ cells) *in vivo* was further evaluated by immunofluorescence staining.

Results: The mRNA levels of iNOS, TNF-α, IL-1β and IL-6 of RAW264.7 cells were significantly decreased in the botulinum toxin type A treated group than the controls. In addition, histological studies and immunohistochemistry showed that local administration of botulinum toxin type A significantly inhibited hypertrophic scars formation and reduced inflammatory response with decreased expression of TNF-α, IL-1β and IL-6. Besides, botulinum toxin type A administration led to a decrease in the percentage of M1 macrophages in the scar tissue.

Conclusion: Botulinum toxin type A inhibits macrophage M1 polarization during wound healing and attenuates hypertrophic scars formation.

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Effects of Vasopressors on Circulation of Porcine Abdominal Island Flap Model

Presenter:	Jae Ho Chung, MD, PhD
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Objectives: During reconstructive surgical procedures, systemic vasopressors are frequently used to maintain normal blood pressure. However, questions have arisen regarding the pharmacologic effects of vasopressors on flap circulation. Many plastic surgeons have expressed concern about the possibility of impaired flap circulation caused by the vasoconstrictive effect of the drugs. However, the opposing argument exists that the increase of mean arterial pressure from vasoactive agents may improve flap perfusion. The purpose of this study was to evaluate the effect of commonly used vasopressors on flap circulation.

Material and Methods: The vertical rectus abdominis myocutaneous (VRAM) island flap was raised in five female pigs (38.2~40.7kg). Hemodynamic parameters were measured continuously by carotid arterial catheter. A bi-directional transonic vascular doppler flow probe and Laser Doppler perfusion monitor (LDPM) unit were applied to record the continuous change of pedicle artery flow and microvascular perfusion following intravenous administration of dopamine (3, 5, 10μg/kg/minute), dobutamine (1.25, 2.5, 5μg/ kg/minute) and norepinephrine (0.05, 0.1, 0.2μg/ kg/minute).

Results: Both microvascular perfusion and pedicle flow were generally proportional to mean arterial pressure, and all the three vasopressors improved flap perfusion and pedicle flow without deleterious effect. Norepinephrine showed the highest microvascular perfusion and dobutamine showed the highest pedicle flow rate. Mean blood pressure was the only statistically significant factor that affects both microvascular perfusion and pedicle flow ($p<0.0001$).

Conclusions: Our results strongly suggest that the foremost three vasopressors can be used for flap surgery without deterioration, and maintaining adequate systemic blood pressure is crucial for good flap circulation.

Objective Outcomes in Upper Blepharoplasty

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Goals/Purpose: The availability of objective outcome measures for facial reconstructive surgery remains lacking. Evaluations submitted by external raters or by patient selfreport may be influenced by expert knowledge, emotional antecedent, or implicit attitude. Visual markers that lead to differential perception of patients before

and after upper blepharoplasty were explored. By examining the early stages of visual processing that occur when an observer encounters images of affected individuals, we intended to reveal the focus of impression formation, thereby helping surgeons and their patients pinpoint the facial features that are most salient to viewers.

Methods/Technique: Eighty images for 13 patients who underwent upper blepharoplasty, with and without lower blepharoplasty and browlifts, were collected. Photographs were obtained before and after surgical correction (>3 months postop). Twenty lookzone regions were mapped onto each facial image, reflecting the aesthetic units of the face.

Eighty observers examined the images while an infrared eyetracking camera continuously recorded their eye movements. The observers were then asked to rate the image for character attributes (Attractiveness, Trustworthiness, Sociability, Healthy, and Capability, 17 scale). Factorial ANOVA and student ttest analysis was performed to determine significance of differences between groups.

Outcomes measured were the total number of eye fixations within different lookzone regions. Eyetracking data of pre and postoperative images were analyzed and compared.

Results/Complications: Thirteen Blepharoplasty patients were identified.

(i) The surgical intervention was found to increase observers' attention to the upper lid and periorbital area, and to decrease attention to the forehead, lower lid, and mid-cheek areas.

(ii) The surgical intervention was found to significantly increase the character ratings for all five attributes compared to preoperative controls: Sociable 3.66 to 4.01, Trustworthy 3.91 to 4.24, Attractive 3.39 to 3.75, Healthy 4.26 to 4.66, Capable 4.27 to 4.56; ($p<0.05$) except for Attractive ($p=0.059$).

(iii) For those preoperative images of brow and upper lid ptosis that resulted in clinical lid asymmetry, observers' attention was overwhelming drawn to the area of disproportion.

(iv) Our eye tracking methodology clearly reflects a trend towards normalization of gaze attention following surgical intervention. This finding was associated with the improvement in character assessment of the images in the postop cohort of images.

Conclusion: We provide data illustrating a novel and objective technique to evaluate the effect of reconstructive intervention for the upper lid and/or the brow. This

information may be used to inform patients about how these areas of facial difference are perceived, and the potential effect that surgical intervention may have on others' perception of them. This work may assist patients and their surgeons to more meaningfully focus their surgical decision making priorities.

Effect of Keratinocytes on Myofibroblasts in Hypertrophic Scars

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Purpose: Scars instigate cosmetic problems and, importantly, lead to various complications including pain, itchiness and motor impairment, caused by mismatch at the interface of the scar and normal tissues, and recurrence of the wound. Abnormal scarring, such as that in fibrosis, and keloid and hypertrophic scars, is a pathological process, distinctive from the normal physiological process of wound healing. During wound healing, myofibroblasts play a central role in matrix formation and wound contraction and, at the end of the healing, undergo apoptosis. Hypertrophic scarring is a pathologic condition in which myofibroblasts persist in the tissue. It has been hypothesized that abnormalities in epidermal-dermal crosstalk cause this pathology. Therefore, in this study, we investigated whether myofibroblasts are affected by keratinocytes.

Method: The present study was a prospective single-center study. In this study, TGF-β1(Transforming growth factor beta1)treatment was used to establish experimental myofibroblast model, termed Imyo, from the patient-derived dermal fibroblasts. The Hmyo (hypertrophic myofibroblasts) cells are the myofibroblasts isolated from the existing hypertrophic scars from patients. While both the Imyo and the Hmyo should represent characteristics of myofibroblasts, their physiological state would be different. TGF-βinduced myofibroblasts (Imyo) and myofibroblasts from hypertrophic scar tissue (Hmyo) were characterized by microarray. The analysis of microarray data using the fold change criteria $^{3}2$ revealed more than 600 upregulated genes in Imyo and Hmyo compared to control group among the 5,761 genes, from which 83 genes of significant increase were selected for further analysis.The changes in the genes expressed in Imyo, Hmyo and normal fibroblast upon co-culture with keratinocytes were quantitatively analyzed by qPCR.

Results: Based on the microarray data, among the selected pool of 83 genes with upregulated genes, 21 genes showed similar expression levels, which may indicate the genes of the stage-independent myofibroblasts. On the other hand, 62 genes whose expression levels with more than 2-fold difference between the Imyo and Hmyo may reflect the stage-specific difference in myofibroblasts. We found thatmany extracellular matrix- and smooth muscle cell-associated genes were up-regulated in Imyo and Hmyo respectively, suggesting that Hmyo are fully differentiated myofibroblasts and Imyo are less differentiated compared to Hmyo. Decreased collagen type 1 gene expression was shown in keratinocytes co-cultured Imyo and Hmyo and a-smooth muscle actin expression in Imyo increased in the presence of keratinocytes.

Conclusion: These observations strongly suggest that keratinocytes play a role in the development of pathological fibrosis in hypertrophic scar by influencing the behavior of dermal fibroblasts and myofibroblasts. We speculate that keratinocytes inhibit abnormal scarring in the early stages of scarring, when fibroblasts differentiate into proto-myofibroblasts, by reducing the expression of *COL1A1*and *αSMA,*and contribute to improving scars in the hypertrophic stage, when fibroblasts have already been differentiated, by reducing αSMA expression.We believe that this study provides the basis for understanding the pathophysiology of hypertrophic scarring and uncover new therapeutic approaches for this dysfunction.

A Tissue Expander like Scaffold with Photothermal Tumor Ablation Property for Breast Tissue Engineering

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Background: Tissue engineering based breast reconstruction after mastectomy is a promising alternative to traditional treatments(1, 2). Nevertheless, it could so far neither prevent the potential breast cancer recurrence nor solve the problem of covered skin shortage.

Purpose: Here we reported the construction of a novel breast tissue engineering scaffold. Benefiting from the photothermal effect of graphene, it can ablate breast cancer cells and recover its shape in a tissue expander-like manner.

Materials and methods: Different concentrations of graphene nanoparticles (GN) were used to functionalize the dome shaped 3D printed polyurethane scaffolds (GfS). Subsequently, GfS were remodeled into disk-like temporary shape. Afterwards, GfS were exposed to 808nm laser with different light intensity, the temperature change was captured by infrared imaging device and the shape recovery rate was measured by vernier caliper. At last, tumor ablation study was performed using MDA-MB-231 cell line in vitro under 808nm laser photothermal treatment.

Results: The scaffolds functionalized with higher concentration of GN displayed higher degree of blackness and higher temperature rising after laser exposure. In addition, light intensity was also positively correlated with the temperature rising. Laser illuminating could trigger the shape recovery of GfS from temporarily disk-like shape toward their original dome shape. The shape recovery ability of GfS is positively correlated with the light intensity. After exposing to 808nm laser, GfS could ablate the surrounded MDA-MB-231 breast cancer cells in a GN concentration and light intensity dependent manner.

Conclusion: After being irradiated by 808nm laser, the 3D printed polyurethane scaffold functionalized with graphene nanoparticles can recover its initial shape in a tissue expander-like manner and ablate the breast cancer cells. This multi-functional scaffold could potentially be used for tissue engineering based breast reconstruction to address the problem of covered skin shortage and tumor recurrence after mastectomy.

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Total Eyelid Transplantation in the Setting of a Full Face Transplant: Analysis of Postoperative Periorbital Function

Presenter:	Allyson R Alfonso, BS, BA
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Background: Prolonged impairment of mechanical and protective ocular functions, particularly blink, can compromise vision and lead to blindness if left uncorrected. However for larger full-thickness or total eyelid defects, conventional surgical techniques remain largely unable to recreate a functional eyelid. Several facial transplantation allografts have incorporated periorbital structures and variable amounts of eyelid preservation, but critical objective assessment of post-transplant periorbital function has been limited, and methodology has been inconsistent. Here, we describe a novel, objective, and standardized method for assessing functional eyelid recovery, specifically blink, using facial tracking technology. We also report the results from its application to the world's first total eyelid transplantation in the setting of a recent full facial transplant.

Methods: For an objective assessment of blink function, kinematic data were collected from a full face transplant recipient that included the world's fist total eyelid transplantation at 5 separate pre- and post-transplant time points. Using an optical facial tracking system, eyelid movements were tracked during involuntary blinking and compared to 4 healthy adult controls. Data were correlated with ophthalmological clinical examination.

Results: Significant changes in mean eye aperture were observed over time in both eyes ($p<0.0001$), with 3.5-fold and 1.5-fold increases in aperture in the right and left eyes, respectively. Although improved from the pre-transplantation state, right and left eye apertures remained significantly smaller than controls. Synchronous movement was observed between eyes. These findings correlated with considerable improvement observed on clinical exam, where the patient exhibited full functional status. Revision procedures temporarily impaired function, which eventually normalized and improved.

Conclusions: Our results show clear functional improvement following transplantation, particularly in the critical protective blink mechanism. They also suggest revisions can be performed safely to optimize aesthetic outcomes without permanent impact on post-transplant function. Facial tracking technology has been utilized to assess speech and facial expression in face transplant recipients, and our results provide further evidence of its utility in assessing facial transplantation outcomes while highlighting its potential for objective measurement of periorbital function.

Adipose-Derived Stem Cell Sheets Prepared Using Temperature-Responsive Dishes Promote Axonal Outgrowth in Cross-Face Nerve Grafts

Presenter: Kaori Fujii, MD
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Background: Cross-face nerve grafting using an autologous nerve graft to connect the contralateral functioning facial nerve to the facial nerve on the paralyzed side is an established reconstruction procedure for facial palsy. However, it takes 6 months or longer to reinnervate the paralyzed side of the face after this procedure, and atrophy of the muscles of expression occurs if the denervation time is prolonged as a result of slow axonal outgrowth. Therefore, the outcome of cross-face nerve grafting remains uncertain. Adipose-derived stem cells (ASC) are reported to have pluripotency and a paracrine effect that promotes axonal regeneration in peripheral nerves. We devised a novel cross-face nerve grafting procedure using an autologous nerve graft wrapped in an ASC sheet that was formed on a temperature-responsive dish and examined its therapeutic effect in a rat model of facial palsy.

Methods: The rat model of facial paralysis was prepared by ligating and transecting the main trunk of the left facial nerve under inhalation anesthesia in 8-week-old Lewis rats. The ASC suspensions and sheets were prepared from rat subcutaneous adipose tissue using conventional culture dishes and temperature-responsive dishes, respectively. The sciatic nerve was collected and used as a cross-face nerve graft (CFNG) connecting the marginal mandibular branch of the left facial nerve and the marginal mandibular branch of the right facial nerve. A CFNG was transplanted in 8 rats (designated the control group), a CFNG coated with an ASC suspension (1.5×10^6cells/1,000 ml) in 8 rats (a suspension group), and a CFNG wrapped in an ASC sheet (1.5×10^6cells/3.5-cm diameter dish) in 8 rats (a sheet group). Nerve regeneration was then compared histologically and physiologically between the groups.

Results: The time to reinnervation, assessed by observing the rate of contraction of the vibrissae muscles usinga facial palsy scoring system, was significantly shorter in the sheet group than in the other two groups. Evoked compound electromyography showed significantly higher amplitude in the sheet group (4.2 ±1.3 mV) than in the suspension group (1.7 ±1.2 mV) and the control group (1.6 ±0.8 mV; $P<0.01$). Toluidine blue staining showed that the number of myelinated fibers was significantly higher in the sheet group (2455 ±603) than in the suspension group (1379 ±588) or control group (590 ±586; $P<0.01$).

Conclusions: Cross-face nerve grafting in combination with ASC sheets prepared using temperature-responsive dishes promoted axonal outgrowth in autologous nerve grafts and reduced the time to reinnervation. ASC sheets may improve the therapeutic effect of cross-face nerve grafting in patients with facial palsy.

A Tarsal Tunnel Musculature Variant to Consider When Performing a Tarsal Tunnel Release in the Treatment of Diabetic Neuropathy

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Introduction: One of the treatments of lower extremity neuropathy is similar to Raynaud's disease - sympathectomy (1) with nerve decompression (2). The tarsal tunnel decompression can change lower extremity neuropathy and decrease ulceration and amputation (2), and growing evidence suggests nerve decompression as a choice treatment (3). The benefits of decompression include improvement of sensation, increased perfusion with vasodilatation, and a decrease of pain (4). We describe an anatomical study with findings of a muscle variant, the flexor digitorum accessorius longus (FDAL), in the tarsal tunnel that can affect neuropathy symptoms by acting as a space-occupying lesion, contributing to tibial nerve compression.

Methods: Dissection of forty legs on 20 cadaveric specimens was performed at West Virginia University to assess the prevalence of the FDAL muscle and also to assess the potential for neurovascular entrapment due to the mass effects of the FDAL muscle itself.

Results: After completing forty leg dissections, three variant FDAL muscles (7.5%) were identified, and their anatomical relationships to the tibial nerve and posterior tibial vasculature were noted. Photos of the FDAL muscles and further descriptions of the origin, course, relationship in the tarsal tunnel, and insertion will be presented.

Discussion: The entrapment of the tibial nerve can lead to tarsal tunnel syndrome and neuropathy. While there are many etiologies for tarsal tunnel syndrome, the presence of the flexor digitorum accessorius longus (FDAL), a variant muscle, has been shown to cause tarsal tunnel syndrome in patients (5). The incidence of the FDAL muscle has been reported as 6% of asymptomatic individuals during MRI studies and 2%-8% of lower limbs in cadaveric studies (5). Due to the prevalence of this muscle, physicians performing a tarsal tunnel decompression for diabetic neuropathy should

review the available imaging to rule out the presence of this variant leg muscle. Because of the size and location of the FDAL within the tarsal tunnel, tarsal tunnel decompression by incising the flexor retinaculum may not resolve the patient's neuropathy symptoms. An additional excision of the variant muscle may be warranted to optimize treatment efficacy.

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Analysis of Long-Term Outcomes of Ventral Hernia Repair Performed By Plastic Surgeons and General Surgeons: A Single Institution Review

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Background: Ventral hernia repair (VHR) is a common procedure performed by both plastic surgeons (PS) and general surgeons (GS). Due to the increase incidence of risk factors such as obesity, diabetes, and prior abdominal surgeries, the number of VHR being performed is also increasing. Surgeons have been tasked with operating on more complex hernias while maintaining low complication and recurrence rates. As a result, PS and GS have incorporated concurrent procedures to VHR to accomplish better abdominal wall repair. PS often perform panniculectomy, abdominoplasty, and

component separations with their VHR, yet long-term outcomes remain unclear. The aim of this study is to compare short- and long-term complication and recurrence rates stratified by PS versus GS.

Method: A retrospective chart review was performed of VHRs between January 2009 and June 2017 at a single institution. Demographics, comorbidities, concurrent procedures, hospital course, VHR complications and recurrences were recorded. Patients with defect size less than 30 cm^2or less than 6 months of follow up were excluded. Follow up was defined as surgical follow up with primary surgeon, abdominal CT or MRI scans, or surgical visits with thorough abdominal exams

Results: One hundred and eighty-one patients were included in our analysis; Group I (n= 40) underwent VHRs performed by PS and group II (n =141) by GS. There were no differences in age (55.5 vs 57.9, p =0.31), BMI (31.1 vs 32.4, p = 0.21), history of smoking (45.0% vs 45.4%, p = 0.61), or number of prior abdominal surgeries (2.6 vs 2.3 p = 0.43) in groups I vs. II, respectively. Group I was associated with larger fascial defects (**251**cm^2vs 143 cm^2, **p = 0.0004**), higher rates of component separations (**50%**vs 15.6%, **p < 0.0001**), and more concomitant procedures (**1.4**vs 0.9, **p = 0.033**) compared to group II, respectively. There were no differences in length of stay (LOS) (6.2 vs 5.0 days, p = 0.30), complication rates (25.0% vs 19.9%, p = 0.51), or recurrence rates (25 % vs 29.4%, p = 0.76) between groups I and II, respectively.Mean follow-up was 39 months.

Conclusion: In this cohort of patients undergoing VHR at a single institution, it was noted that patients operated on by PS had more complex defects yet there were no differences in LOS, complication rates, or recurrence rates as compared to GS. This data indicates that PS is well equipped to handle complex hernia repairs without increased complications.

Micro/Nanobubbles: A Novel Modality for Burn Oxygenation and Healing

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Introduction: Oxygen is one of the most important elements in all stages of wound healing. It is involved in killing bacteria during the inflammatory phase, increasing keratinocyte differentiation and reepithelization during the proliferative phase, and supporting myofibroblast differentiation and collagen cross-linking during the maturation phase. Current therapies which deliver oxygen to wounds such Hyperbaric

Oxygen Therapy (HBOT) and Topical Oxygen Therapy (TOT) are costly, not portable, and their efficacy is limited to certain wounds. A new innovation, micro/nanobubbles (MNBs), are miniature gaseous voids that allow for oxygenation of wounds. Given their high oxygen carrying capacity, MNBs offer an inexpensive technology for oxygenating burns and can be supplemented a part of hydrotherapy. The aim of this current study was to use MNBs to deliver oxygen to burn wounds and determine their healing potential.

Materials & Methods: For this study, 3-cm full thickness burns were placed on the dorsum of six (n=6) Sprague Dawley rats. Three of these rats (n=3) received topical irrigation of saline infused with MNBs for two weeks after burn placement. The remaining three rats (n=3) received the control treatment of saline irrigation alone. Spatial Frequency Domain Imaging (SFDI) was used during and after the treatment course to measure wound collagen organization and oxygenation within the burn wound and surrounding region, and to quantify the progression of burn healing out to 28 days after burn wound placement.

Results: Burns treated with topical irrigation of MNBs had significantly improved healing ($p<0.05$), tissue oxygenation ($p<0.05$) and collagen organization ($p<0.05$) when compared to saline treated burn wounds. Change in collagen organization was greatest between the two groups starting day 11 post-burn up until the end of the experiment (day 28).

Conclusion: MNB-treated full thickness burn wounds show improved healing compared to those treated with the saline control. SFDI measurements demonstrate that MNB application increases tissue oxygenation. Measurements of structural changes indicate MNB-treated burns begin to proliferate and remodel at earlier time-points than burns receiving the saline control.

Role of Leupeptin in Preventing Hind Limb Ischemic Tissue Injury

Presenter:	Irene Nozal Martin, In process
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Purpose: Prolonged tourniquet ischemia leads to progressive muscle, nerve and vascular injury. Currently, the only way to prevent injury to these tissues is by minimizing tourniquet time. Tissue ischemia leads to calpain activation and Wallerian like degeneration. Calpain is expressed in the vascular wall and is implicated in several vascular inflammatory and degenerative disorders. Leupeptin inhibits the

expression of calpain. We hypothesized that by inhibiting the expression of calpain with Leupeptin, we could diminish muscle, nerve and vascular injury after prolonged tourniquet ischemia. We undertook a study to assess the role of Leupeptin in a rat model of prolonged hind limb ischemia.

Methods: Ten male Sprague-Dawley rats weighing 300-400 grams were subjected to two-hours of blood flow occlusion in the left hind limb by application of a neonatal blood pressure cuff set to 300 mmHG[1]. Half of the rats were then randomly selected to receive twice weekly intramuscular injections of leupeptin at 12 mg/kg in saline starting right after tourniquet release while the other half received injections of saline alone. Blood flow occlusion was confirmed by the loss of a pulse detectible by a pulse oximeter and cyanotic discoloration of the limb. All animals were monitored for gait quality using the sciatic functional index (SFI)[2]. Two weeks after the tourniquet applications the animals were sacrificed. The sciatic nerves, gastrocnemius muscles, saphenous veins and arteries, were harvested from the left and right hind limbs, fixed in 10% formalin and imaged following Masson's Trichrome staining.

Results: The histological images of the gastrocnemius muscle fascicle cross-sectional areas from both the hind limbs for the two groups – leupeptin and control- were imaged using a Nikon Eclipse E800 at 10X magnification and analyzed using an imaging software - ImageJ. The difference between the muscle cross sectional areas of the left hind limbs (ischemic limbs) between these groups was found to be significant (leupeptin group- 774.57 μm^2, vs 472.70 μm^2 for the control; $p=0.043$). These two values were significantly lower as compared to their respective right muscle fascicle areas (where no tourniquet was applied; 1725.30 μm^2 and 1548.22 μm^2 for the leupeptin and control groups respectively). However, the differences in the SFI scores between these 2 groups were not found to be different ($p=0.785$).

Conclusions: The application of Leupeptin post hind limb ischemia led to greater preservation of hind limb muscles. We postulate that by inhibiting calpain, Leupeptin inhibits the pathways that trigger cell death leading to greater tissue preservation. Studies focusing on the gross and histological changes in the arteries, veins and nerves between these groups are currently being performed.

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Contrasting Preferences for Gender Affirming Surgery between Transgender and Gender Non-Binary Individuals: An Analysis of the 2015 Usts Database

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Purpose: Most transgender people identify within a binary gender framework. Gender non-binary individuals, however, do not fit into dichotomous labels such as "man" or "woman." They have a gender that is a blend of masculinity and femininity, or neither at all. Despite this wide spectrum of gender identity, surgery for gender transition remain in a binary framework. The expectation that such procedures can treat all variants of gender dysphoria may be inappropriate. Characterizing the surgical desires and identifying socio-economic factors affecting the surgical transition of gender non-binary individuals will help improve their care.

Methods: We abstracted data using the 2015 United States Transgender Survey dataset, which included >27,700 respondents from all 50 states. Based on sex-assigned-at-birth and reported gender, we stratified respondents into transwoman (MtF), transman (FtM), non-binary: assigned male at birth (MtN), and non-binary: assigned female at birth (FtN). Using univariate techniques, we compared demographic, baseline clinical, and socioeconomic variables. Additionally, we sub-stratified all gender non-binary individuals into those who received and did not receive surgery, and constructed logistic regression models to identify socio-economic factors associated with surgical transitioning.

Results: We queried a total of 26,957 respondents; 9,769 (36.2%) identified as non-binary [FtN = 7,844 (29.1%) and MtN = 1,925 (7.1%)] and 17,188 (63.8%) identified as transgender [MtF = 9,238 (34.2%) and FtM = 7,950 (29.5%)]. Compared to transgender persons, non-binary individuals were less likely to receive hormonal therapy [trans=11,794 (68.6%) *vs.* non-binary=1,249 (12.8%), P <0.001], psychotherapy [trans=12,571 (73.1%) *vs.* non-binary=2,980 (30.5%), P <0.001], and were less likely to surgically transition [trans=5,017 (30.1%) *vs* non-binary=712 (7.2%), P <0.001]. Among the non-binary population, FtN were more likely to surgically transition compared to MtN [FtN=611 (7.9%) *vs* MtN=101 (5.4%), P <0.001]. Mastectomies (N=3,729, 47.6%) and hysterectomies (N=2,637, 33.6%) were the most desired procedures by FtN; significantly lower than those requested by FtM, where mastectomies (7,640, 96.1%), hysterectomies (5,508, 69.2%) and metoidioplasties (2,063, 26%) were the most desired (all P's<0.001). Among the MtN population, facial feminization surgery (400, 20.8%), orchiectomies

(325, 16.9%), and augmentation mammoplasties (308, 16%) were the most desired surgical procedures. Surgical transition was significantly lower (P<0.001) among MtN individuals versus MtF individuals, where vaginoplasties (6,156, 66.7%), orchiectomies (5,299, 57.4%), and facial feminization surgery (4,447, 48.2%) were the most desired. Compared to transgender persons, non-binary individuals were more likely to have higher rates of psychological distress [trans=5,879 (34.2%) *vs* non-binary= 4,607 (47.2%), *P* <0.001] and were more likely to have de-transitioned in the past [trans=1,350 (7.8%) *vs* non-binary= 2,708 (27.8%), *P* <0.001]. Multivariate modeling demonstrated increasing age, female sex assigned at birth, increased education status, presence of health insurance, and receiving psychological counseling and therapy to be associated with increased rates of surgical transitioning among nonbinary respondents.

Conclusion: Gender non-binary people constitute a significant group within the gender nonconforming community. In contrast to transgender people, they are less likely to have surgically transitioned and they also place less importance on genital surgery. Additionally, we demonstrate the effect of various modifiable socio-economic drivers surrounding variable rates of their surgical transitioning.

Three Scientific Postulates and the Demise of Single Authorship

Presenter: Maher M. Anous, MD
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Purpose: To examine the evolution of plastic surgery through the articles published in *PRS* from inception till 2018 (included) and draw predictive conclusions, based on statistical analysis, pointing to the future direction of the specialty.

Methods and Materials: All issues (1946 – 2018) were reviewed for a simple count of "Single" Vs. "Group" authorship, assigning figures and incidences to the historical editors of the journal. The articles were then triaged for content relevance, selecting those with the most impact throughout the development of the publication. Density distributions were grouped according to editors' tenures. Finally, the stellar articles responsible for palpable changes in the direction of the specialty were examined for authorship and temporal editorship. Using three dominant scientific postulates, namely **Natural Selection** (Darwin, 1859); **Punctuated Equilibria** (Gould & Eldredge, 1972); and **Paradigm Shifts** (Kuhn 1962) as sounding boards, a mental image of the start, development and predictive evolution of the specialty seen through the lens of its main journal publications emerged.

Experience: Six editors presided over the first 73 years (1946-2018) of *Plastic & Reconstructive Surgery*. During this review interval 878 issues saw the light with 17,550 published articles . Of these, 688 articles were deemed "**Punctuations**", that is, of significant impact on the direction of the specialty. It is from among these "punctuations" that the 146 penultimate articles responsible for an actual "**Paradigm Shift**", and thus for a palpable change of course, would emerge.

Summary of Results: In the first 44 months (July 46-Dec 51) of the birth of *PRS*, articles authored by single surgeons accounted for 66% of the journal output. In the last 44 months (May 2015-Dec 2018), articles by single individuals had dropped to a sad 1.7% . To comprehend this phenomenon an analysis of output under the leadership of every successive editor was examined. It turned out that the drop in single authorship was inexorable: From a dominance of 68% under Warren Davis; to a robust 53% under Robert Ivy; to 45% under Kathryn Stephenson; to 34% under Frank McDowell; to an anemic 14% under Robert Goldwyn; and finally to a paltry 3% under Rodney Rohrich. This prompted a re-examination of the 17,550 articles published in the years of study for a correlation of this decline with the actual scientific content of the journal. 4% of the journals output during those 73 years was deemed of sufficient gravitas to warrant the mantle of punctuations (the remainder 96% being the "equilibrium"). In these 688 articles single authorship was only 38% of the total output. Yet the isolation of those articles responsible for revolutionizing the practice of plastic surgery, the ratio becomes inverted, with single authors claiming 58% of the 146 impact papers.

Conclusions: Natural Selection has commanded the demise of single authorship. The observed trend predicts the total disappearance from *PRS* of articles published by single individuals by the year 2022. This should not be alarming if we were to invoke the healthy representation of group authorship within the phenomenon of Punctuations but should be frightening for other reasons.

Metabolic Profiling of Skeletal Muscle during Ex-Vivo Normothermic Limb Perfusion

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Background: The goal of this study was to characterize the unique metabolic signature of skeletal muscle at 24 hours (24h) during ex-vivo normothermic human and porcine limb perfusion (NEVLP) to determine the metabolic pathway alterations that could be the cause of muscle tissue decline after prolonged NEVLP (>24 hours).

Methods: Six porcine forelimbs and seven human upper extremities undergoing NEVLP for over 24 hours were included in this study. Limb muscle biopsies were collected at times 0, 6, 12, 24 and over 24 hours from NEVLP limbs or the control limbs at cold storage (4º C). Perturbations in the metabolomic signature of the limbs during NEVLP were determined via non-targeted liquid chromatography–mass spectrometry (LC-MS)-based metabolomics. The non-targeted LC-MS was operated in positive and negative electrospray ionization modes, scanning over a mass range of 50-750 Da at 120,000 resolution in full MS mode. The XCMS-extracted peak-table was then evaluated using the in-house statistical package, MetaboLyzer. The tandem MS spectra in this study were used for ion identification in Compound Discoverer 2.1 (Thermo) using the mz Cloud spectral library.

Results: In porcine forelimbs, 39 ions with a putative ID at time point 24h were identified to be perturbed between the experimental and control groups. In human upper limbs, 58 ions with a putative ID were identified at the time point 24 hours. Taurine and tryptophan were found to be the only common metabolites validated between human and porcine limbs at 24 hours. Common pathways at time point 24h included phenylalanine, tyrosine, and tryptophan biosynthesis, tryptophan degradation, and neuroactive ligand-receptor interaction.

Conclusions: Taurine and tryptophan were the two common metabolites identified in the metabolic profiles of perfused porcine and human muscle tissue biopsies at 24h along with other metabolic pathways. The 24h time point was chosen to analyze because it was the time point in which marked muscle tissue and mitochondrial decline was observed during NEVLP. These metabolites could be indicative of muscle tissue breakdown and increased acidosis at time point 24h. The metabolomic profile of perfused muscles could be used as a new diagnostic tool to determine the effectiveness of long-term perfusion, the viability of the amputated limb and to identify early biomarkers of muscle tissue degradation in the future. Metabolomic and targeted analyses of perfused muscle tissue could also be used as a tool to target interventions and

Surgical Classification for Removal of Buccal Fat Pads. a Novel Classification for a Common Surgery.

Presenter:	Israel Espino-Gaucin, MD
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Purpose: Removal buccal fat pad is a popularized surgery for patients seeking to improve the facial contour of the middle and lower third of the face. Not all patients are candidates for this surgery and it is reserved for patients with round faces, excess cheek volume, herniation or pseudoptosis of the fat pads. At present, there is no classification to improve the understanding of the procedure. The aim of this study is to surgically classify the lateral wall of the vestibule to improve the understanding and safety of the procedure.

Method: A prospective, evaluation was made. 42 patients with facial aesthetic discomfort with excess volume in the middle and lower third of the face were operated using this classification. The lateral wall of the vestibule was divided into 3 zones: Zone 1: 0.7 mm to 10 mm superior to the Stensen duct to the upper alveolar region, Zone 2: Duct site, 0.7 mm wide. (Site and canal path), Zone 3: 0.7 mm inferior to the Stensen canal to the lower alveolar region. The technique used to buccal fat resection was making duct marking, an incision 10 mm made above the duct for buccal fat removal. Average resection of the bag was 3.7 cc. In all of them, a symmetrical amount was removed.

Result: We obtained good results and satisfaction in 96% of the patients evaluated at 7 days, 6 weeks and 3 months ($P = .01$). We used Zone 1 to extract the buccal fat pad in 28 patients because is safer, easier and with less thickness. Zone 2 is the Stensen zone, and we don't recommend this zone because the proximity with the duct and papilla. Zone 3 was used in 14 patients, finding that the procedure is longer, with greater postoperative pain and edema related to the thickness of the buccinator muscle.We found Zone 3 a safe zone to perform a mucosal resection for a intraoral meloplication. A seroma was presented in 1 patient who underwent incision in zone 3, managed with compression and oral care with improvement after 7 days.

Conclusion: Using a surgical classification contributes to the concept of facial subunits, improving understanding, decreasing postoperative complications and becomes an excellent option for the management of patients with excess volume in the middle and lower third, and pseudoptosis of the fat pads.

The New "Famous" Classification for Treatment of Zygomaticomaxillary Fractures

Presenter: Seung-Jun Lee, MD
Co-Authors: Jeongseok Oh, MD, Baek-Kyu Kim, MD, PhD
Affiliation: Seoul National University, Seoul

Purpose: The purpose of this study was to establish a new classification system and examine its feasibility for zygomaticomaxillary fractures, which can be easily applied for novice plastic surgeons, to set treatment strategies.

Method: Retrospective chart review of all "zygomaticomaxillary fracture" cases treated at a single center from 2003 to 2019 was conducted. Computed tomography images and medical records were used to collect data like sex, age, etiology, location of fracture, surgical approach, fixation points, complications (Major: enopthalmos, diplopia, midface retrusion, soft tissue infection, asymmetry, hardware infection, ectropion / minor: sinusitis, hematoma, dehiscence, hardware palpability), preoperative symptoms, time to surgery, follow up period, and duration of surgery time. Open reduction and internal fixation had been performed according to the new classification system and approach while the other groups were performed according to conventional principles.

Independent t-test and Chi-square test was performed to analyze continuous and categorical variables respectively, with *p* value less than 0.05 considered as statistically significant.

Our "FAMOUS" classification is based on the location, stability, presence of segmental fragments. It was derived from the idea that there must be an optimal number and location of approaches. We believe absolute consensus regarding the idea that proper reduction and fixation requires adequate exposure but at the same time backfiring, with wide periosteal stripping, palpability, and hardware-related problems.

Each letters of "FAMOUS" stands for the following words.

F: Frontal process of zygomatic bone

A: Arch of zygomatic bone

M: Maxillary region

O: Infraorbital rim

U: Unstable

S: Segmental

In determining the treatment plan, stability is the first criteria. If the fractured body is unstable, 4 point fixation is planned. If there is a segmented bone fragment, exposure and fixation of the region is planned. Otherwise, the basic rule of the planned number of fixation points is determined by N-1, N being the number of four regions (FAMO). The first choice of approach and fixation is M, through the Keen's approach. Dingman approach is determined by the severity of displacement, over 2mm.

Principle: N-1 points of fixation?

AM / MO / AMO -> M Single Keen's approach

FOM / FAM -> M (F) Keen's approach with or without Dingman's approach

FAMO -> M&F Keen's approach and Dingman's approach

FA -> Gilles approach or Endoscopic approach

FO -> Transconjunctival approach

A -> Gilles

O -> Transconjunctival

FAMOS -> Approach with fixation of segmental fractured area

Result: In the 16-year period, retrospective chart review of 538 patients that underwent zygomaticomaxillary fracture treatment was performed. 405 patients had been treated according to the classic principles and 133 patients had been treated with our "FAMOUS" classification and approach. The FAMOUS group showed less operation time (71.38 min vs 95.22 min*),* less hospital length of stay (2.41 days vs 4.56 days), less number of approaches (1.64 vs 2.06), less number of fixation sites (1.79 vs 2.01), less additional operations (0.75 % vs 0.99%), with p value lower than 0.05. Postoperative complication rates were also lower (Major 0.75% vs 3.70%, Minor 0% vs 0.25%), although not statistically significant.

Conclusion: The author's results suggest that the easy "FAMOUS" classification can be useful to guide novice plastic surgeons to establish a treatment plan for zygomaticomaxiilary fractures without increasing postoperative complications. It appears that it could decrease operation time, hospital length of stay, number of

approaches, and fixation points. If institutions possess the tendency of relatively less experienced junior surgeons taking care of facial bone fractures, a straightforward approach like this would be especially advantageous.

Post Traumatic Reconstruction of Nasal Valve

Presenter: Fernando G. Martinez Dorr, MD
Co-Authors: Santiago E Rosales Castiglione, MD, Alfredo Staudt, MD
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Purpose: In nasal traumatism with compromise of the beginning of the airway presenting tear of the vestibular tissue and nasal vestibule valve if they are not reconstructed inmmediately, it might be translated as synechia. This complication do not allow air entrance and leads to ventilatory insufficiency. The aim of this review is to analyze and report our experience in maxilofacial reconstructive surgery.

Method: An analysis with patients admited in our institution who have been subjected to trauma that compromises the superficial tegumentary and structural sector corresponding to the anatomy of the nasal valve.

Result: Treatment was perform according to surgical technique of bone stabilization with Bunnell stiches, rhinotomy and cheilotomy, giving back funtionality and normal architecture of vestibular nasal valve.

Conclusion: Following the axiom of reconstructive surgery, first life, second function and third form, we repair the tears of the central confluent of the face following a protocolized technique to avoid synechia and total ventilatory insufficiency, preserving the valvular function with an aceptable aesthetic result.

Management of Pediatric Nasoorbitoethmoid Complex Fractures at a Level 1 Trauma Center

Presenter: Maggie M. Luthringer, MD
Co-Authors: Thayer Mukherjee, BA, Jordan N Halsey, MD, Ian C Hoppe, MD, Edward S. Lee, MD, Mark S. Granick, MD
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Purpose: Childhood nasoorbitoethmoid (NOE) fractures are rare, accounting for only 1% of all pediatric craniofacial fractures. Management strategy within this population is challenging and requires consideration of growth rates and patterns of the upper and midface. Existing literature fails to demonstrate consensus regarding surgical and expectant treatment of these fractures. Our experience at a level one trauma center has exposed us to these cases and can provide insight into the clinical reality of managing pediatric NOE fractures.

Method: Data were collected for all pediatric NOE fractures diagnosed between January 2000 and December 2014 at University Hospital in Newark, NJ. Data on patient demographics, Glasgow Coma Scale score on presentation, concomitant facial fractures, extrafacial injuries, and management strategies were collected from those records. Two authors independently reviewed operative reports and relevant radiology.

Result: There were fifteen total pediatric NOE fractures in our cohort, with all suffering concomitant facial injury. Of these cases, five patients demonstrated Markowitz class I fracture patters, one fracture was Markowitz class II, and four fractures were Markowitz class III. Within the Markowitz class I patients, four required surgical intervention: three received titanium plate fixation and one was fixated with an absorbable plate. The one patient with a Markowitz II NOE expired from other traumatic injuries, and was never stabilized for surgery. For Markowitz III patients, all needed operative fixation. One received a resorbable plate, three received a titanium plate, one patient received transnasal wiring, and one patient required a medial canthopexy. Chronic dacryocysitis occurred in two patients with Markowitz III fractures. One patient experienced chronic epiphora. Enucleation was required in two cases. Titanium plates were placed in NOE fractures with concomitant mandibular (n=1), palatal (n=1), zygomatic (n=3), maxillary sinus (n=1), frontal sinus (n=5), and le fort (n = 4) fractures. Resorbable plates were placed in NOE fractures with concomitant zygomatic (n = 1), frontal sinus (n=2), and Le Fort (n =2) injuries. The mean number of concomitant fractures was 2.14 [Range 1-4] when a titanium plate was utilized, and 2.5 [Range 2-3] when a resorbable plate was employed.

Conclusion: Marked variability was observed in the management of our cohort. Severity of injury and concomitant craniofacial trauma necessitated an individual approach to each patient. The general principle of fixation with absorbable plates when possible was applied. However, surgeons opted for titanium plates when there were severe simultaneous mandibular, palatal, and maxillary sinus fractures. Many patients demonstrated high-grade NOE and orbital fractures requiring stronger fixation with titanium. NOE Markowitz class III factures were associated with a higher incidence of enucleation as part of the management.

Maternal Risk Factors Known during Pregnancy Associated with the Development Of cleft LIP-Palate.

Presenter: Roberto R. Galaso, MD
Co-Author: Rigoberto Aramburo Garcia, MD
Affiliation: Universidad Autónoma de México, Mexico, City.

Purpose: Cleft lip and palate (CLP) has a high prevalence and incidence in the Mexican population. CLP is a multifactor pathology and the factors that have been associated vary in the different populations studied and in some of them the association is not conclusive. It is particularly important to know the environmental factors involved in the etiology of CLP in the population of our hospital, to provide knowledge to provide prenatal counseling and to guide the prevention of exposure to these environmental factors during pregnancy.

Method: An observational, comparative, prospective, retrolective and transversal study was carried out. With unpaired case and control design. We included and interviewed 287 mothers of patients under 6 years of age who attended the CLP clinic in the Department of Plastic and Reconstructive Surgery of the Dr. Manuel Gea González General Hospital. The group of controls or referrals was formed by 287 mothers of patients under 6 years of age who attended the Outpatient Consultation of Pediatrics of the Hospital. The data was recorded in the collection formats designed for this study. Descriptive statistics were performed, calculating the absolute and relative frequencies of each exposure in the CLP group and in the control group. The chi-square test was performed to prove significant differences. Logistic regression models were performed to obtain the odds ratio for each risk factor.

Result: 287 cases of CLP and 287 unaffected controls were analyzed. 47.7% of controls and 42.2% of cases were female (p 0.18). The known maternal risk factors during pregnancy that were significant were: recurrent urinary tract infections [OR 2.3 (1.5-3.6) p 0.001], consumption of more than one cup of alcohol in the first trimester [OR 1.4 (1.2-1.9) P 0.0001], cohabitation with smokers [5.5 (3.3-9.2) p <0.0001], exposure to toxics from work in factories [11.37 (3.89-33.2) p <0.0001] and not consuming folic acid during the first trimester [OR 2.4 (1.4-4.2) p 0.0008]. No factor was associated with isolated forms of cleft lip or palate.

Conclusion: The risk factors with the greatest contribution to risk were toxic exposure, after combustion in factories and cigar derivatives due to passive smoking during the first trimester of pregnancy. Medical aspects such as the presence of recurrent urinary tract infections during pregnancy and adequate folic acid supplementation in the first trimester are relevant. The modificable nature of these

factors offers an opportunity to provide prenatal counseling and guide the prevention of exposure to these environmental factors during pregnancy in our population.

The Orbital Index: A Novel Comprehensive Quantitative Tool for Prediction of Delayed Enophthalmos in Orbital Floor Fracture Management

Presenter: Frank D Lalezarzadeh, MD
Co-Authors: Brandon J. De Ruiter, MD, Edward H. Davidson, MD
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Purpose: Early identification of surgical indication is critical to optimizing outcomes in orbital floor fracture management. Absolute indications for surgical repair of orbital floor fractures are acute muscle entrapment and globe malposition. However, identifying those at risk for delayed enophthalmos and requiring subsequent surgery remains a challenge. This study aims to validate a clinical prediction tool using CT data to stratify risk for delayed enophthalmos and establish a threshold for surgical intervention.

Method: The Orbital Index stratifies fractures by size, location, and inferior rectus rounding (fascioligamentus sling disruption); scale of 0-6. A twenty year (1998-2018) single-center retrospective analysis of orbital floor fractures was performed, scores were assigned and verified by two investigators, and correlated with treatment course. Inter-observer reproducibility across scoring components was assessed; comparing scores between craniofacial specialists, plastic surgery trainees and medical students. Providers were surveyed pre-and post-intervention to determine whether use of this tool improved understanding and communication.

Result: The Orbital Index demonstrated high fidelity, inter-observer reproducibility, and identified a score of ≥4 as a surgical threshold. Retrospective chart review identified 201 fractures meeting the inclusion criteria; 35% scored 0 (operative rate 3%), 12% scored 1 (8%), 10% scored 2 (10%), 11% scored 3 (18%), 9% scored 4 (50%), 12% scored 5 (63%%), and 11% scored 6 (77%). A statistically significant difference in decision for operative intervention was found between scores of 3 vs 4 ($p=0.04$), but not scores 0 vs 1 ($p=0.27$), 1 vs 2 ($p=0.82$), 2 vs 3 ($p=0.43$), 4 vs 5 ($p=0.43$), or 5 vs 6 ($p=0.29$). 93% of scoring across all components, aggregate Index scores, and operative decisions were within 1 point of reference. Participants demonstrated increased ability to correctly identify surgical need with use of the Orbital Index ($p=0.01$). Pre-and post-intervention surveys demonstrated increased subject self-reported understanding ($p=0.001$) and communication. ($p=0.0003$)

Conclusion: The Orbital Index is a reproducible tool to stratify risk for enophthalmos in orbital floor fracture management.

Novel Approach for Reduction of Frontal Bone Fractures Via Upper Eyelid Exposure

Presenter:	John Rose, MD
Co-Authors:	George Kokosis, MD, Chao Long, MD, Michael Grant, MD, PhD, Amir H. Dorafshar, MD
Affiliation:	Johns Hopkins University, Baltimore, MD

Purpose: Operative management of frontal sinus fractures has evolved significantly in recent years. Traditionally, wide exposure with a coronal incision was performed to visualize the frontal bone and superior orbital rim. Increasingly, patients are reluctant to accept such an invasive approach for what is often a purely cosmetic procedure. In select patients with uncomplicated fractures limited to the anterior table, novel limited-incision periorbital operative approach opens the possibility for a potentially safer and more patient-centered treatment. We describe a minimally-invasive surgical option through an upper eyelid blepharoplasty incision.

Method: Three consecutive trauma patients with unilateral fractures of the frontal sinus isolated to the anterior table were treated with an open approach through an upper eyelid blepharoplasty incision. Our series includes: a 17 year old male with depressed comminuted fracture on the right lateral forehead extending to involve the right orbital roof and the right zygomatico-frontal sinus after striking a pole playing sports (Figure 1, Case 1), an 8 year-old male with depressed comminuted fracture of the left medial forehead involving the superior orbital rim after a motorized scooter collision (Figure 1, Case 2), and a 71 year-old female with depressed comminuted fracture on the left without orbital involvement after a mechanical fall (Figure 1, Case 3). A blepharoplasty incision was used in a standardized upper eyelid crease in all three patients to expose and reduce fracture fragments of the anterior table and superior orbital rim. Pre- and post-operative CT images were obtained with 3-D reconstructions.

Result: In each case the fractures involving the frontal sinus were sufficiently exposed and successfully elevated and reduced via the described blepharoplasty approach in the upper eyelid. Fixation was achieved with a low-profile titanium plate in the first two scenarios. In the third scenario, a burr hole was placed in the orbital roof to create a defect large enough to pass a blunt instrument into the sinus for elevation and reduction. All patients were seen postoperatively with excellent

restoration of forehead contour, normal eyelid function, and no surgical site infections.

Conclusion: As frontal sinus fracture management continues to evolve, the upper eyelid blepharoplasty incision serves as a favorable alternative to the traditional coronal technique while achieving equal aesthetic results. In addition to exposing the frontal sinus, future studies are needed to confirm the utility of this incision in treating fractures of the orbital roof and superior orbital rim.

Craniofacial Fibrous Dysplasia: Surgical Management and Recurrence. Long Term Follow up.

Presenter:	Luis Alejandro Lopez Garibay, MD
Co-Authors:	David Felipe Navarro Navarro Barquin, MD, Osvaldo Ivan Guevara Valmana, MD, Laura Andrade Delgado, MD
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Purpose: The purpose of this study was to analyze the surgical management and the recurrence at a long term follow up in patients with craniofacial fibrous dysplasia at a single institution.

Craniofacial fibrous dysplasia is an uncommon facial bone pathology characterized by fibrous tissue expansion and eventual replacement of bone tissue, is the most common craniofacial bone lesion encountered by plastic surgeons. These lesions tend to overgrow causing craniofacial asymmetry, disfigurement, malocclusion, hearing impairment, and multiple ophthalmic disturbances. The lesions are usually developed during the childhood, reducing growth ratio and recurrence as the face skeleton reaches skeletal maturity (between 15-16 years old). Being such a rare pathology, it is important to carry out an adequate characterization of the disease depending on the affected bones and the function impairment of the surrounding organs in order to determine the optimal time to perform surgical treatment, still there is no consensus regarding the ideal surgical approach, some surgery centers are in favor of radical surgical approaches (radical excision) and others prefer the conservative approach (reduction burring and contouring) but it is clear that surgery represents the primary therapeutic modality.

Method: An observational retrospective study was carried out including patients diagnosed with craniofacial fibrous dysplasia that underwent bone surgical interventions between January 1993 to December 2018 at the plastic surgery department of Gea Gonzalez Hospital, Mexico City. Demographic, disease-related

(polyostotic vs monostotic disease), surgical-related (radical excision, limited reduction burring, reconstructive surgery) and recurrence data were obtained from clinical records and operative reports. In the descriptive analysis, data were summarized as means, Mann Whiney U test was used to analyze continuous variables. A local institutional research ethics board approval was obtained for this study.

Result: Eighteen patients with craniofacial fibrous dysplasia were included in this study. The disease had a female predominance with 11 (61%) cases being the polyostotic disease the most common form of presentation with 15 patients (83%), the most affected bones were the frontal and the maxilla with 7 (38%) cases each, patients ages ranged from 1- 38 with a median of 18 at the time of first surgery. Bilateral presentation was more common with 8 patients (44%), in the unilateral presentation 6 patients (33%) had right side involvement. The average follow up was 17 ±1.3 years. The most common surgery performed was reduction burring with 23 procedures (27%) followed by radical resection with 7 procedures (8%). Recurrence was demonstrated in 10 patients (55%), 7 patients had recurrence after reaching skeletal maturity, free recurrence time average was longer in patients treated with radical resection with 13 vs 9.2 years in the patients with reduction burring ($p>.05$).

Conclusion: Craniofacial fibrous dysplasia is a complex pathology that represents a therapeutic challenge for the surgeons, the optimal time and type of procedure varies because of the wide spectrum of the disease and the surgical approach should be tailored to the individual patient. In this study, we showed an overview of a single institution 17- year surgical experience in the treatment of craniofacial fibrous dysplasia.

Trends in Gender Dysphoria & Gender Affirmation Surgery in American Children's Hospitals

Presenter:	Rachel Danforth, MD
Co-Authors:	Julia A. Cook, MD, Eric M Pittelkow, MD, Sidhbh Gallagher, MD, Patrick A Gerety, MD
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Purpose: The reported prevalence of gender dysphoria among American youth has increased significantly and is estimated to be 0.2 to 1.3%. Plastic surgeons are essential to serving the needs of the transgender population, and the role of surgery in adolescents remains to be determined. The presence and treatment of gender dysphoria in adolescents at major tertiary pediatric centers is not well described nor is

the incidence of gender affirmation surgery. This study analyzes these factors from a large multicenter database.

Methods: The Pediatric Health Information System (PHIS) database was used to identify patients with encounters for gender dysphoria from 2004 through 2018. Criteria included age over 10 years and primary diagnosis code for gender dysphoria (ICD-9: 302.6, 302.85; ICD-10: F64.1, F64.2). Records were reviewed for mental health disorder, CPT codes, and encounters per year. Mann-Kendall trend test was performed to evaluate significance of trends over time.

Results: 4,731 encounters meeting inclusion criteria were identified among 2,514 patients. Mean age was 13.6 ± 2.9 years. Plastic surgeons were the primary provider in 71 encounters (1.6%). The number of encounters significantly increased from 67 in 2004 to 682 in 2018 ($p<0.01$). Diagnosis of a mental health disorder was present in 55.2% of patients(n=1387). Twenty-five patients had procedure codes consistent with gender affirmation surgery; mean age for this group was 16.9 ±2.2 years. This included 20 mastectomy/breast reductions, 3 breast augmentations, 1 orchiectomy, and 1 clitoroplasty.

Conclusion: The number of encounters for gender dysphoria in pediatric tertiary centers has significantly increased since 2004. Treatment of adolescents in this setting for gender dysphoria and gender affirmation surgery remains rare. The role of surgery for transgender adolescents remains controversial; however, these numbers are likely to increase as expertise in the field and acceptance of the diagnosis become more widespread.

Use of Subtraction PET to Identify the Source of Recurrent Sepsis after Bomb Blast Injury - a Difficult Diagnosis

Presenter:	Beniamino Forte, MB BCh BAO
Co-Authors:	Serena V Martin, MD, Chris Hill, FRCS Plas, Tom Lynch, BSc MSc MD FRCR MRCP
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Timely diagnosis of osteomyelitis is essential for its successful treatment but it is often difficult to recognise despite extensive radiological workup.[1] We outline a case of recurrent sepsis over a seven year period in a patient injured by a car bomb blast and the use of an innovative imaging technique to localise two culprit foci of osteomyelitis. This was a prolonged and difficult diagnosis due to extensive shrapnel injury and associated inflammation as well as significant anatomical disruption from

the blast. Sites of inflammation associated with shrapnel injury acted as decoys to the true foci of active infection on Fluorodeoxyglucose (FDG) Positron emission tomography/Computed Tomography) (PET/CT) and a new technique was required to differentiate these. This involved administering a course of antibiotics between two separate FDG-PET/CT scans and is known as Subtraction PET. Two sites of osteomyelitis were identified among 20-30 other sites of benign granulomatous inflammation and calcification. These two sites of infection were characterised by a significant drop in tracer uptake on FDG-PET/CT after a course of antibiotics while tracer uptake at the remaining sites remained relatively unchanged. This ultimately guided surgical excision of the sequestra and at follow up of two years, the patient has experienced no further septic episodes.

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Facial Lifting with FAT GRAFT

Presenter: Javier Jesus Vera Cucchiaro, MD
Affiliation: AESTHETIC CLINIC, Salta

Introduction: the combination of the facelift with treatment of the deep structures associated with fat grafts, allows us to treat 86% of our patients with a short incision technique, avoiding retro-auricular dissection, an area of frequent complications such as hematomas and injury of the greater auricular nerve.

In addition, the fatty graft helps to reposition volume lost due to aging (deflation), and secondarily it improves the quality of the skin.

Material and Methods: 179 patients were treated from January 2016 to May 2019, with this surgical routine and 25 patients were excluded because they had necks with abundant skin and subcutaneous cellular tissue (enlarged incisions). There were 172 female patients and 7 male patients, aged between 39 to 72 years and with an average of 48 years.

In all cases a treatment of the deep structures with a High-SMAS was used and fixed to the zygomatic process with no-absorbable suture type mononylon 3-0, associated with fatty grafts at supra-periosteal and intramuscular level. We use tumescent infiltration that facilitates dissection has allowed us to obtain less edema and ecchymosis in the post-operative.

Results: Of the 179 patients we had hematoma in 2 patients (1.1%), paresis of the upper lip in 2 patients (1,1), overcorrection in 2 patients (1,1), secondary neck treatment in 8 patients (4, 4%), hypertrophic scars in 12 patients (6,7), without any case of necrosis. In 78% we performed neck opening in the middle line of the Platysma and Digástric treatment.

The placement of the fatty grafts is performed at the end of the Lifting after having fixed the High-SMAS and before performing the skin closure. On average 40 to 60 cc is used for the entire face and when it is not associated with a lifting, and it is only volumetric treatment we use between 60 to 80 cc.

Discussion: It is necessary to perform a preoperative diagnosis of the areas to be treated with fatty grafts, evaluating the amounts of fat to be placed and preventing an excess of grafts. Currently our routine for the preparation of fat is by decanting, we have already used centrifugation, growth factors and even stem cells, but according to the literature and experience we have returned to decanting and a delicate handling of adipose tissue with micro-cannulas in diameter between 0.8 to 1.2 ml.

The concept of restoring lost volume is not new, but in the last decade it has been accepted and used routinely in most surgical facial treatments, so it is an excellent complement to the treatment of facial structures and allows optimizing the results with minimal risks of complications.

Robot-Assisted Breast Reconstruction

Presenter: Jae Young Bae, MD
Co-Authors: Seung Yong Song, MD, PhD, Dae Hyun Lew, MD, PhD, Tai suk Roh, MD, PhD
Affiliation: Yonsei University, Seoul

Robotic surgery is successfully applied in various oncologic surgeries including prostate, stomach, colon, thyroid and liver. (1) This maneuver is more ergonomic compared to conventional open and laparoscopic surgeries due to high resolution 3D cameras and highly flexible free rotated robotic arms. Our breast oncologic surgery and reconstructive team attempted robotic technique for the ablation of breast cancer and prosthetic breast reconstruction and want to share those experiences.

From November 2016 to February 2019, fifty cases of simultaneous mastectomy and reconstruction via robotic surgery were conducted. Our team used 4-6cm vertical incision along the lateral breast margin. We used Da Vinci Xi (Intuitive Company). Before starting surgery, mastectomy margin was marked with indigo carmine. To

achieve enough working space for the robotic arms, CO2 gas inflation or specially designed wide retractor were used. Nipple sparing mastectomies were performed by breast oncologic surgeon and prosthetic reconstructions were performed by reconstructive plastic surgeon. Most types of prosthetic reconstruction were possible by this process including subpectoral two-stage reconstruction, subpectoral direct-to-implant (DTI) reconstruction, prepectoral two-stage reconstruction and prepectoral DTI reconstruction. In reconstructive surgery, robot was used in subpectoral procedures for petoralis major muscle dissection and acellular dermal matrix (ADM) fixation. It was also used in prepectoral procedure for anterior ADM fixation

Most of mastectomy flaps were totally survived. The results were satisfactory to both patients and surgeons. There were no visible scars in front view of the breast. Laterally located short linear incision allows both mastectomy and prosthetic breast reconstruction.

Simultaneous cancer ablation and reconstruction for breast cancer patient using robot is viable option. (2) Oncologic safety will be confirmed after several years. However, we believe magnified field provided by robot will never be inferior to conventional surgery. Moreover, aesthetic results were superior because there were no scars in front view of the breasts. Mastectomy including node dissection and prosthetic breast reconstruction can be conducted via short incision used in aesthetic breast augmentation.

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Complications and Operation Methods of Reoperation Cases after Upper Lid Blepharoplasty

Presenter: Hiroko Ochiai, MD, PhD

Co-Authors: Aiko Oka, MD, Eri Hirata, MD, Yuichiro Uoya, MD, Chihiro Nakayama, MD

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Objectives: Some complications occurring after upper lid blepharoplasty produce an undesirable aesthetic result. Other complications may cause impairment of the eyelid closure mechanism, which will cause the eyes surface disorder. These complications

are of more immediate concern for correction. We assessed the data of re-operation in our hospital to know the real situation.

Methods: To assess outcomes of reoperation for the surgical correction of acquired upper lid ptosis, we evaluated the data and reasons of these operations which were done for in our hospital.

Results: 76 patients including 14 male and 62 female subjects with a mean age of 70.4 years were evaluated. The most common reoperation after the first operation was skin excision. Followed aponeurotic repair, upper lid crease creation, lateral canthoplasty, levator and Müller's muscle resection and frontalis suspention. The elements of the reason for correction are classified below. 1. Skin excess, 2. Over correction; asymmetry or symmetry, 3. Under correction; asymmetry or symmetry. There were three cases of severe lagophthalmos which were operated by the other surgeons. The medical examination of the ophthalmologist was carried out before and after an operation. For correction of these lagophthalmos after polysurgery, levator lengthening with tissue transfer (Conchal ear cartilage or fat tissue) was effective for esthetic and functional recovering.

Conclusion: It may be recommended to plan the operation by disintegrating in the elements mentioned above for complemental factors. And it will be important to explain to patients beforehand that the operation for correction may be necessary. Some patients have a combination of problems that can be treated concomitantly.

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Fat Grafting to Improve Parastomal Skin Contour for Ostomy Care

Presenter: Ihab Saab, MD

Co-Authors: Megumi Asai, MD, Tommy Ivanics, MD, Hassan Ahmad, MD, Daniel Yoho, MD, Andrew Penn Worden, MD, Katherine Zimnick, NP, Donna Tepper, MD, Aamir Siddiqui, MD

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Background: Stomas are common surgical procedures with predictable outcome. When the operation is done properly there can still be a spectrum of morbidities from poor appliance fitting to chronic skin breakdown. Irregularities in parastomal skin contour secondary to scarring, wound contraction, and change in weight and body habitus are major culprits. In cases were revising the stoma of relocating it are not options, other solutions are necessary. We report our experience with six patients who underwent recontouring of the parastomal soft tissue with fat grafting for improved skin contour and ostomy care.

Intervention: Patients were evaluated for contour deformities that were the primary cause for stoma appliance dysfunction. Deformities including skin folds, contracted scars, fat necrosis, tissue atrophy were identified for fat grafting. Areas of soft tissue prominence and fullness were highlighted for lipectomy via liposuction. In the operating room the appliances removed, topography and deformities marked in sitting and supine positions. Subcision, fat grafting and liposuction performed as necessary to the different areas of the abdomen. The goal of the surgery was a 3 cm wide uniform ring around the stoma in the superficial subcutaneous plane. Volumes for the fat grafting and lipectomy varied by patient. Photographs and interviewing performed before and after surgery. We frequently over-corrected the parastomal depressions to account for the 30% anticipated loss of the fat grafted over time. Medical records were reviewed to assess the improvement of postoperative stoma care.

Outcome: Six patients underwent parastomal fat grafting from February 2017 to June 2018. Three patients had an end-ileostomy, one had a loop ileostomy, one with a chronic enterocutaneous fistula with ostomy appliance, and one patient had a urostomy. An average of 192.5 mL lipoaspirate was harvested (range: 120 - 350 mL), and 108 mL of filtrated and washed fat was grafted (range: 58-230 mL). Lipectomy via liposuction to the target area was performed in 2 patients. Average fat aspiration was 85 mL (75 ml and 110 ml). One patient had near complete resolution of leaks after the surgery and no major issues were reported after one year from the procedure. Two patients had major improvement of appliance seal with short-term follow up. Three patients had partial improvement in seal when compared to continuous leakage preoperatively. No complications were related to the procedure.

Conclusions: Fat grafting is a novel and safe technique that could provide a solution for difficult stoma. Partial improvements can have a significant positive impact on lifestyle. The procedure can be repeated if necessary. This is especially useful when

patients have prohibitive risks to have further trans-abdominal procedures. Larger sample size and long-term follow up will be needed for further assessment of the outcomes.

Long-Term Results of Unilateral Cleft Lip Repair with Multiple Infantile Hemangiomas Including the Cleft Side of the Upper Lip

Presenter:	Yong Chan Bae, MD, PhD
Co-Authors:	Dae Kyun Jeong, MD, Yong Woo Lee, MD, Jae Woo Lee, MD, PhD, Soo Jong Choi, MD, PhD
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Purpose: Cleft lip and infantile hemangioma are relatively common congenital diseases. However, infantile hemangiomas on the cleft side, in the operative field of cleft lip, are extremely rare, and no clear guidelines have been established for their treatment. We experienced a case in which a patient with a cleft lip had infantile hemangioma on the cleft side. We performed cleft lip repair on a patient with infantile hemangioma on the cleft side of the cleft lip at 3 months after birth and have been following-up on the patient for the past 18 years. We report the results of 18 years follow-up after the surgery of this rare patient.

Methods: The male patient was diagnosed with a left unilateral complete cleft lip with alveolar cleft and a submucous cleft palate. There were multiple infantile hemangiomas throughout his body, with no notable abnormalities in the chromosomal analysis. In particular, the patient had infantile hemangiomas on the upper lip and lower lip, right ear helix, back, and left shoulder. The hemangioma on the upper lip was on the lateral segment of the cleft side. As per the general treatment guidelines, cleft repair was performed at 3 months after birth. Millard's rotation advancement technique was used for the repair, which uses the lower small triangular flap. The patient was followed up for 18 years after surgery.

Results: There was no excessive bleeding during the surgery and blood transfusion was not needed. The excised tissue was confirmed to be infantile hemangioma in the histopathologic examination. The patient did not show any abnormalities during recovery, and there was some residue of infantile hemangioma in the repair site in the upper lip vermilion. The residual infantile hemangioma in the repair site of the upper lip vermilion was involuted by the age of 5 years, and there was only a normal degree of scarring after cleft lip repair of the upper lip vermilion. At the same time, the infantile hemangiomas in the right ear helix, back, and left shoulder were completely

involuted without any scarring. The patient has been followed up until now, and at 18 years, he has no particular problems other than the red scar on the lower lip.

Conclusion: Infantile hemangiomas requiring lip repair for unilateral complete cleft lip are extremely rare, and there are no established surgical guidelines for this condition. In such cases, delaying lip repair until the infantile hemangioma is involuted may not be desirable for obtaining the best aesthetic outcome, and it is also not desirable because it may induce psychosocial impairment in patients and caregivers. Therefore, we believe that general cleft lip repair produces good outcomes even in cases involving hemangiomas on the cleft side.

Isolated Orbital Fractures Are Associated with Cranial and Cervical Spine Injuries

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Purpose: Fractures of the orbit often co-associate with a variety of cranial and cervical spine injuries. However, these cranial and cervical spine injuries are more often seen in the context of rim-involving orbital fractures. There is paucity of published data detailing the incidence or patterns of cranial and cervical spine injuries that occur in association with isolated (rim-sparing) orbital fractures. The objective of this study is to investigate whether specific locations of isolated (rim-sparing) orbital fractures are associated with cranial and cervical spine injuries.

Methods: Retrospective review of patients presenting with orbital fractures to a Level One Trauma Center from 2015 to 2017. We reviewed Craniomaxillofacial CT Scans for each patient to identify location and patterns of orbital fractures. We excluded fractures that involved the orbital rim(s), as well as bilateral orbital fractures and fractures sustained from penetrating injury. Associated injuries including cranial, skull base, or cervical spine fractures, intracranial bleed, cerebral contusion, and cervical spine soft tissue injuries were abstracted from the medical record.

Results: 568 orbital fractures were identified of which 217 (38%) had no rim involvement. 202 (93%) of these were unilateral rim-sparing fractures that qualified for inclusion in our analyses. The most prevalent mechanisms of injury were: assaults

(40%), falls (24%), and motor vehicle accidents (20%). The most common isolated orbital fractures were orbital floor blowouts (n=132, 65%), medial wall fractures (n=92, 46%) and two wall fractures involving both the floor and medial wall (n=40, 20%). Single wall orbital floor blows out fractures had the lowest rates of associated cranial or cervical spine injuries (5% with calvarial, skull base, or cervical spine fractures and 16% with intracranial bleed). Single wall orbital roof blow-in fractures and single wall lateral orbital wall fractures were uncommon (10% and 3%, respectively). However, these fractures were associated with significantly higher rates of calvarial, skull base, or cervical spine fractures (35%, p=0.0001 for roof blow-in; and 33%, p=0.0096 for lateral wall) as well as higher rates of intracranial bleed (55%, p=0.0003 and 50%, p=0.0390), versus single wall orbital floor fractures. Among the patients that sustained single wall orbital roof blow-in or lateral wall fractures, only 15% and 33% respectively had no associated cranial or cervical spine injuries.

Conclusions: Overall, these findings suggest that isolated roof and lateral wall fractures have statistically significant higher rates of associated cranial and cervical spine injuries. Surgeons that encounter orbital roof blow-in or lateral orbital wall fractures should have heightened suspicion for cranial and cervical spine injuries.

Long-Term Results of Mandibular Reconstruction Using Mandibular Reconstruction Plate after Resection of Mandibular Region Against Malignant Tumor

Presenter:	Arito Kurazono, MD
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Purpose: In the mandibular reconstruction after resection of the mandibular region against malignant tumor, there are cases where a method using a mandibular reconstruction plate is selected depending on the patient's general condition or stage. Problems of infection, manifestation, breakage of plate in the lower jaw This time, we investigated long-term outcome of surgery on mandibular reconstruction using reconstruction of lower jaw performed at our hospital, surgery more than 10 years ago. However, there are few reports of long-term results.

Methods: From January 1993 to December 2008, for patients who underwent reconstruction of the mandible using the mandibular reconstruction plate at the

National Cancer Center eastHospital after mandibular region resection, using a medical record and retrospectively.

Results: There were 52 patients who underwent mandibular reconstruction using the mandibular reconstruction plate during the same period, among which 38 patients were able to use medical record. In 38 cases, 26 men, 12 females, average age 78 ± 15 years old, all cases were cases of mandibular cancer. All of the cases were done with the mandibular reconstruction plate and the flap used was 28 freerectus abdominis flaps, 7 anterolateral thigh flaps and 3 forearm flaps. The follow-up period was 38.6 ± 7 months (1-169 months), 5 cases of wound departure, 5 infections, 2 cases of infection and 3 cases of plate exposure as postoperative complications.Thirty-three of 38 deaths occurred within 10 years, and five cases were observed after 10 years or more, among which 4 cases did not cause problems on the mandibular reconstruction plate.

Discussion: Mandibular cancer requiring reconstructive surgery often has advanced disease stage and has poor prognosis. In addition, patients are often older, and long-term follow-up was accompanied with difficulties. Long-term results were examined in the range that could be observed.

Free Dermal Fat Autografts for Complex Craniofacial Wounds: A Three-Decade, Retrospective Cohort Study

Presenter: Craig R. Dufresne, MD
Co-Author: Mikaela I Poling, BA
Affiliation: Dr Craig R Dufresne, MD, PC, Fairfax, VA

Purpose: Complex craniofacial wounds (CCW) are those refractories to initial treatment and may involve chronic infection, exposed hardware, irradiated tissue, and soft tissue volume loss. Typical reconstruction with microvascular flaps involves considerable morbidity. While free dermal fat autografting (DFA) is used extensively in many applications, its use treating CCW remains an unexplored but attractive possibility. Aims are to (1) determine if free DFAs are an appropriate adjunct to eradicate infection or provide coverage for exposed hardware in CCW and (2) evaluate if free DFAs are a stable volume and contour reconstructive option for CCW.

Methods and Materials/Experience: Data extracted from office charts of a retrospective cohort comprising 33 consecutive patients (13 male; 20 female and aged 2- and 79-years), who underwent free DFA between 1985 and 2018 for CCW by a

single plastic surgeon, were analyzed. Post-operative follow-up was 1-24 years (M=6.53, SD=7.91).

Results: Many patients had several concomitant wound complications. Most patients presented with a history of fracture caused by trauma. Primary pre-operative wound complications were dominated by infection (N 19), of which over 73% (N 14) were associated with non-autologous material. Seventeen had resolution of their pre-operative infection. Of the total (N 33), 78.79% were had stable grafts at follow-up [$X^2(3)=51.24$, $p<0.001$], with only 3 experiencing observable atrophy and 1 graft necrosis. In 4 patients, free DFAs were palpated during subsequent operative settings and found to to be grossly intact, soft, and bleeding. Most of the cohort was complication free [$X^2(1)=8.76$, $p=0.003$], with 75.76% experiencing no problems involving the graft. Twenty-eight (84.85%) of 33 patients had therapeutic success with free DFA [$X^2(1)=16.03$, $p<0.001$]. Mechanism of injury ($\beta=0.34$, $p=0.037$) and pre-operative wound status ($\beta=0.42$, $p=0.016$) predicted therapeutic success [$R^2=0.96$, $F(11,6)=12.6$, $p=0.003$]. While 5 (15.15%) did not have therapeutic success, no additional problems arose related to graft.

Conclusions: Free DFA appears to be beneficial for treatment of CCW and show low morbidity. Future studies must evaluate these findings. In this context, use of free DFAs should be considered for CCW treatment.

Previous Presentation: Friday, 3 May 2019, Christian Medical and Dental Association National Convention, Ridgecrest, NC.

A Two-Stage Approach to Craniofacial Reconstruction in an Infected Ovine Mandibular Defect Model

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Introduction: Reconstruction of infected mandibular defects is challenging due to the size and possible irregular shapes of defects, presence of pathogens, and the availability of suitable donor tissue. We have developed a two-stage tissue engineering approach in which: 1) an antibiotic-releasing space maintainer is inserted

in the mandibular defect to support the formation of a healthy soft tissue envelope and locally eliminate infection and 2) the implantation of a 3D-printed bioreactor in the ribs to grow a vascularized autologous bony tissue flap of customized geometry. In a second surgery, the space maintainer is removed and replaced with tissue from the bioreactor.

Objective: The objective of the current work is to evaluate the effects of treatment of an infected mandibular defect on 1) the presence of pathogens at the mandibular defect and 2) the quality of the bone formed in the bioreactors containing autograft (morselized sheep rib) or a commercially available bone allograft (Bio-Oss®, Geistlich). We hypothesized that the presence of an untreated mandibular infection will result in an increased number of clinical complications (i.e. mucosal dehiscence) and may negatively affect the quality of the tissues generated in the *in vivo* bioreactor. Additionally, we hypothesized that both graft materials would be capable of supporting mineralized tissues.

Methods: In the edentulous region of the mandible of six female sheep, a ~2cm defect was created superior to the mandibular canal. All animals were inoculated with 10^6 CFU of a bioluminescent strain of *Staphylococcus aureus*. A porous poly(methyl methacrylate)-based space maintainer loaded with vancomycin-containing poly(lactide-co-glycolide) microparticles (n=3 sheep) or blank microparticles (n=3 sheep) matching the geometry of the defect wasinserted and secured via plate. At the bioreactor site, alternating ribs were exposed, and a ~4cm segment of each rib was removed, leaving the underlying periosteum intact. Each animal received 2 3D-printed autograft and 2 allograft bioreactors matching the geometry of the mandibular defect. Blood and oral swabs were taken at 1-, 2-, 4-, and 9-weeks post-surgery. At 9 weeks, animals were euthanized, and the tissues (bioreactors and mandibles) were harvested. Blood was analyzed for complete blood count and systemic vancomycin concentration, swabs for bacteria present, and mandibles and bioreactors for bone quality via microCT. Histological evaluation and mechanical testing are ongoing.

Results and Conclusions: None of the 3 sheep that received vancomycin-loaded space maintainers demonstrated dehiscence, while all of the animals in the blank group had dehiscences of varied sizes ($p<0.05$). The untreated animals had a significant increase in white blood cell count at 1- and 2-weeks post-surgery. Oral swabs yielded bioluminescent bacterial colonies only in the animals with blank space maintainers. MicroCT revealed significantly increased bone volume/tissue volume ratio in the untreated autograft groups relative to treated autograft groups ($p<0.05$). This study demonstrated that the antibiotic-loaded space maintainer was capable of clearing the localized infection, and that the bioreactor strategy is capable of generating bone using either autograft or a commercially available synthetic allograft.

Intraoperative Frozen Section Analysis for the Excision of Non-Melanoma Skin Cancer: A Single-Center Experience

Presenter: Katherine C Benedict, MD
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Introduction: Recurrence rates for non-melanoma skin cancers (NMSCs) following Mohs' micrographic surgery (MMS) are consistently lower than standard surgical excision. However, variations in the availability of MMS, waiting times, and costs continue to affect patient preference between treatment modalities. Furthermore, MMS commonly requires delayed reconstruction leading to additional surgeries that increases the risk of adverse outcomes. In order to achieve curative resection while ensuring optimal cosmetic outcomes, plastic surgeons may utilize intraoperative frozen section-guided excision to forego extensive or delayed reconstruction.

Methods: Patients presenting with NMSCs undergoing wide local excision using intraoperative frozen section margin analysis (IFSA) at our institution from October 2008 to November 2016 were retrospectively reviewed. Analyzed data included IFSA results, final permanent section histopathology, number of resections required for clear margins, and recurrence rates. Excisions were performed by one of three plastic surgeons and analyzed by one of eight pathologists.

Results: A total of 171 patients and 204 lesions were included in the study. Mean patient age was 72 years. Operative reports demonstrated that 79.9% of margins were clear after one excision. The remaining 20.1% of cases with residual positive margins after primary excision were identified using IFSA and were re-excised until negative margins were achieved. Of the 20.1%, a total of 11.8% required a second excision and 8.3% required three or more excisions. Intraoperative frozen section results revealed 1 false positive case representing a rate of 0.49% and 5 false negative results leading to a rate of 2.45%. Fifteen patients had local recurrence: a rate of 7.35%. Frozen section sensitivity was 89.79% and specificity was 99.35%. The positive predictive value was 97.78% with a negative predictive value of 96.85%. Patients had a mean follow-up of 39 months.

Conclusion: The resection results and recurrence rate of non-melanoma skin cancers excised at our institution are comparable to national trends using standard surgical excision. The findings suggest that standard surgical excision using intraoperative

frozen section analysis is a safe and effective alternative to Mohs micrographic surgery.

Serial Sterilization of Silicone Breast Implant Sizers Contributes to a Change in Volume As Compared to Permanent Breast Implants

Presenter: Katherine H Carruthers, MD
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Background: Breast implant sizers are commonly employed as an aid for permanent implant selection during both reconstruction after mastectomy and cosmetic augmentation. Since implant size is one of the most important factors influencing implant selection, the ability of sizer devices to accurately reflect their permanent counterparts is essential. In most facilities, silicone breast implant sizers are reused for multiple surgeries, in accordance with manufacturer recommendations, which allow multiple re-sterilizations prior to disposal. However, the sterilization process was observed to introduce air pockets into the silicone sizers which are trapped and retained after repeated sterilization. We hypothesized that introduction of air volume inside sizers contributes to mismatch in permanent implant selection. Therefore, the goal of this study was to determine how serial sterilization changes the volume of breast implant sizers and whether this change results in a clinically significant difference in permanent implant size selection.

Materials and Methods: We selected representative devices across a range of volumes (200cc to 600cc moderate profile smooth round silicone breast implant sizers (Mentor Worldwide, LLC. Irvine, CA)) and measured their volumes after ten serial sterilizations. All devices were processed according to the manufacturer recommendations for sterilization. After each re-sterilization, the device was inspected for the presence of sequestered air and the sizer volume was measured using a water displacement technique. The volume after each re-sterilization was recorded and the difference between the new volume and the original volume was calculated to show each interval increase in implant volume over the device's lifetime. T-test analyses were used to determine if there was a statistically significant change in sizer volume.

Results: After ten sterilizations, a similar absolute increase in volume was found in each device, ranging from 23.88cc to 26.54cc. Interestingly, as a percent, this increase was much greater for the 200cc sizer (12.85%) than the 600cc sizer (3.98%).

Although the volume did gradually increase with each subsequent sterilization, the largest single increase in volume across all devices and sterilizations was 12.04cc which occurred as a result of the third sterilization of the 250cc device. Overall, the change in sizer volume became statistically significant after the fifth sterilization ($p=0.04$).

Conclusion: The manufacturer standard for serial sterilization of breast implant sizers results in an approximately 25cc increase in volume over the lifetime of the device, regardless of the initial volume of the sizer. As such, sterilization has a much greater impact on smaller volume sizers than on larger volume sizers. Furthermore, a statistically significant change in volume is seen after only five rounds of sterilization. This increase in volume may result in the selection of a permanent implant that is actually a size smaller than what was trialed intraoperatively. Therefore, accurate documentation protocols should be introduced to keep precise record of the number of sterilizations that each device has undergone from the time of manufacturing. Additionally, surgeons should adjust their permanent implant selection to account for a possible increase in sizer volume and exercise caution when re-sterilizing smaller volume silicone sizers.

The Open Payments Database and Financial Relationships between Plastic Surgeons and Industry

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Significance: The Physician Payments Sunshine Act (PPSA) was designed to increase transparency around financial relationships between doctors and industry by mandating industry to publically report payments to physicians. This study will analyze research and non-research payments to plastic surgeons in 2017 from the publically accessible CMS open payments database.

Methods: We computed the percentage of plastic surgeons receiving payment, the median/ mean payments per plastic surgeon, payment categories, regional trends and sponsors from the CMS open payments database. We calculated the total number of practicing plastic surgeons from the Association of American Medical Colleges State Physician Workforce data book, 2017. Statistical analysis was preformed using SPSS statistics program.

Results: There were approximately 6,161 plastic surgeons receiving 58,122 payments totaling $26,266,929. Approximately 87% of plastic surgeons nationwide received payment. The median payment per physician was $214. Payments to the top 10% of compensated plastic surgeons totaled $24,133,430 (92% total payments), and mean payment to these physicians was $39,177 (median=$7,793). Four-hundred and sixty physicians (7.47%) received payments in excess of $5,000. Food and beverage was the most common payment type (80% total). Royalties or licenses received greatest amount of payment ($9,651,062, 36.75%). The greatest amount of payments was made in relation to botox ($6,659,335, 25.35%). Allergan Inc. was the largest sponsor of non-research payments ($13,130,688, 50%). Forty-six plastic surgeons received payments related to research totaling $497,063 (median=$1,638). The largest sponsor of research payments was Musculoskeletal Transplant Foundation INC ($251,730, 51%).

Conclusion: The PPSA makes conflict of interest information more transparent and publically accessible. The majority of plastic surgeons received payment from industry. The most common forms of payment are food and beverage, but the largest overall payment is from royalties and licenses. Future studies associating physician behavior with conflict-of-interest data may whether industry financial relationships influence provider care.

The Study on the Effect of EGF and TGF-b1 in Intracellular Niche of Keloid Scar Fibroblast

Presenter:	Sun Jae Lee, M.D.
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Purpose: The treatment of keloid scars in not clearly established and causes many patients to suffer. Many studies have been conducted to differentiate keloids from normal skin. Previous studies have not directly addressed the effects of epidermal growth factor (EGF) and transforming growth factor-beta 1 (TGF-β1) on keloid fibroblasts in an intracellular environment. In this study, we have investigated the effects of EGF and TGF-β1 on keloid fibroblasts in an intracellular environment.

Material & Methods: The keloid tissues were collected from patients after surgical resection. Active and inactive keloids were differentiated based on clinical symptoms and keloid patterns. A total of 17 patients were enrolled, and 4 normal tissues, 8

inactive keloid tissues, and 5 active keloid tissues were obtained. From each tissue sample, fibroblasts were cultured without any stimulation and the expression of different biomarkers was estimated. The fibroblasts were then stimulated with 10 ng/mL of EGF and TGF-β1, and changes in the expression of the biomarkers was estimated using quantitative PCR.

Results: FSP-1, TGF-β1, α-SMA, and Col1A1 expression levels showed a difference of more than 2-fold and were highly expressed in active keloids. TGF-β1 expression was decreased in the active keloids after stimulation with EGF, and the TGF-β1 expression was increased in the inactive keloids. When stimulated with TGF-β1, the expression of α-SMA, COL1A1, and TGF-β1 was significantly increased in the active keloids, whereas the expression of TGF-β3 was decreased.

Discussion: The decreased expression of TGF-β1 and increased expression of TGF-β3 after TGF-β1 stimulation indicated a decrease in fibrotic factors and an increase in antifibrotic factors. Excessive stimulation of TGF-β1 is thought to stimulate the antifibrotic pathway. The addition of EGF led to the reduced expression of TGF-β1 and stimulation of the antifibrotic pathway.

Conclusion: Overall, our results show that EGF and TGF-β1 can influence the genetic markers in keloid tissue and stimulate the antifibrotic pathway within the intracellular environment.

Effectiveness, Indications, and Side Effects of Oral Propranolol Treatment for Infantile Hemangioma in Japanese Patients

Presenter:	Michika Fukui, MD
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Background: Infantile hemangioma (IH) is a common benign tumor, which arises in 1.7% of newborns in Japan. They are often treated at the field of plastic and reconstructive surgery. IH can cause disfigurement and/or lead to serious complications depending on their specific locations, for example disturbing vision, airway at perioral area. It has been reported that 12-24% of IH patients have any complications and require medical treatment. In our country, oral propranolol treatment for IH application has only been covered under the national health insurance system since 2016. However, there have been few reports about the efficacy of oral propranolol against IH in Japanese patients. In this study, we examined the

effectiveness and side effects of oral propranolol treatment for IH conducted at our hospital.

Method: This study examined 12 cases of IH that were diagnosed between January 2017 and August 2018. All 12 patients were treated with oral propranolol (due to ulceration, a functional disorder, or cosmetic issues or risks of tumor-related bleeding). Sex, age at the onset, the affected site, clinical type, age at the initial administration of propranolol, the reason for propranolol treatment, the hospitalization period for initiation of propranolol treatment, the duration of propranolol treatment, the treatment response (tumor reduction, color change, regression, or softening; rated as excellent, good, or fair), and side effects were evaluated.

Results: The 12 patients included 3 males and 9 females. The face and trunk were affected in 8 and 3 cases, respectively. 9 patients had superficial IH. The patients' mean age at the start of propranolol treatment was 3.7 months (range: 1–8 months), and the mean duration of hospitalization was 4.5 days (range: 4–7 days). Oral propranolol was continued for 12.4 months on average. All of the IH reduced in size after the propranolol treatment. 9, 2, and 1 case exhibited excellent, good, and fair responses, respectively. There were no side effects (0 of 12 cases). Six patients were treated with a dye laser. Two of them underwent dye laser treatment while being treated with propranolol because of the rapid growth of their IH. In three patients, a dye laser was used to alter the color of the IH after the propranolol treatment.

Conclusion: Oral propranolol treatment successfully reduced the size of the tumor in all cases. The success rate (excellent or good) was 91.7% (11 of 12 cases). In this study, no patients have side effects. However, serious side effects have been reported. Therefore, further accumulation of Japanese IH cases is expected. It is important to observe patients carefully after the initiation of propranolol treatment and to monitor their vital signs and blood sugar levels. Lastly oral propranolol treatment is recommended for IHs, especially which disturb the patient's vision, airway, eating at perioral sites, or expands rapidly, or which is not feasible in laser irradiation, for example IH at hairy area or IH with ulceration.

Silver-Impregnated Negative Pressure Wound Therapy for the Treatment of Open Wounds in Lower Extremity: A Prospective Randomized Clinical Study

Presenter: Dong Hwan Lee, MD
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Background: Over the last two decades, negative pressure wound therapy (NPWT) has been successfully applied to the treatment of various wounds. Recently, as a result of the development of a more-refined NPWT system, a silver-containing polyurethane open-cell foam has been introduced. The aim was to demonstrate the antibacterial efficacy of silver-impregnated NPWT compared to conventional NPWT when applied on open contaminated wounds of the lower extremities.We designed a prospective, double-blind, randomized controlled trial at two tertiary center institutions comparing the two types of NPWT in acute traumatic lower extremity ulcers with exposed soft tissue deeper than the deep dermis. Subjects were randomly allocated into either an experimental group treated with silver impregnated NPWT or a control group treated with conventional NPWT, then the study wounds were administered NPWT at initial presentation.

Method: Wound cultures for all patients were obtained serially for semi-quantitative analysis on a weekly basis during dressing changes. The cultures were serially obtained from four sites: wound surface (wound swab), deepest granulation tissue of the wound (tissue culture), end of the suction tube connected to sealed film, and a portion of polyurethane foam sponge surfacing on the wound.

Results: The primary outcomes of interest were bioburden reduction and rate of bacterial growth in the two groups, which were evaluated according to 'rate of culture positivity' each week. Another important measure was the identification and transition of four specific bacterial species that are most commonly encountered in clinical settings, *Staphylococcus aureus*, methicillin-resistant *S. aureus* (MRSA), *Pseudomonas*, and *Acinetobacter* species. Ultimately, 66 wounds in 66 patients were analyzed by this study. The mean duration of NPWT application was 29.9 ± 10.7 days. Of the 66 wounds, 31 wounds were allocated to the conventional NPWT group (31 patients, 23 men and eight women) and 35 wounds to the silver NPWT group (35 patients, 29 men and six women). In the conventional NPWT group, the mean age was 48.5 years, and the mean wound size was 260 ± 563 cm^2. The mean duration of NPWT application was 37.6 ± 7.6 days. In the silver NPWT group, the mean age was 46.5 years, and the mean wound size was 233 ± 346 cm^2. Throughout the study period, no significant complications or adverse events were observed. For MRSA, the silver-impregnated group showed a significant reduction with culture positivity rate on wound surface (at second week, p=0.010; at third week, p=0.031; and at final week, p=0.048) and tissue (at second week, p=0.030; at third week, p=0.058; and at final week, 0.076- marginal borderline at third and final week).

Conclusion: The MRSA-positive rate in the silver group showed a steady decline over time, with statistical significance. In addition, the MRSA colonization rate in the

silver group was lower than in the conventional NPWT group in all locations, with statistically significant differences in wound surface and tissue culture. This randomized study has indicated that silver impregnated NPWT is more effective for bacterial clearance, especially for MRSA, than conventional NPWT.

Use of the Fasciocutaneous Flap Harvested from Revascularized Limbs with Peripheral Arterial Disease

Presenter:	Dong Hwan Lee, MD
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Background: Free fasciocutaneous flap is used for soft tissue reconstruction, often in patient with peripheral arterial disease. The purpose of this study was to determine whether reconstructive outcomes and healing time were affected by peripheral arterial disease in flap reconstruction harvested from revascularized extremities.

Methods: We reviewed 97 consecutive cases of fasciocutaneous flap harvest for microsurgical lower extremity reconstruction with more than one year of follow-up. The cases were divided into two groups; one group with flaps harvested from lower extremity with angiographically-confirmed peripheral arterial disease and the other group with healthy arterial system. Clinical data including patient demographics, risk factors, details of reconstruction, flap outcomes, and completion of wound healing were collected. Multiple logistic regression model adjusted using inverse probability weighting was computed to determine the association between peripheral arterial disease and the outcomes of harvested flaps.

Results: Mean follow-up was 26 months. Flap harvests from revascularized extremities were performed for 27 cases and from non-diseased limbs for 70 cases. Fifty-four cases out of 97 cases developed flap-related complications, 8 cases of them were vascular compromise at immediate postoperative phase. One case of total flap necrosis developed in each group. The most common complication was partial flap necrosis, which required additional skin graft procedure. The presence of peripheral arterial disease was not associated with increased flap complication in non-adjusted statistical analysis. Donor site complication was not also significantly affected. However, complete healing of surgical wound was significantly delayed in diseased limb. Similar result was obtained after propensity score-adjusted analysis.

Conclusion: Although peripheral arterial occlusive disease is thought to influence wound healing significantly, the authors found no difference in reconstructive outcomes of harvested flap from between diseased and non-diseased limb. Using free fasciocutaneous flap after revascularization would presumably be a safe and effective reconstructive option for complex wounds.

Reduction Mammaplasty in Adolescents: A Comparison of Wise and Vertical Incision Patterns

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Background: Reduction mammaplasty was shown to ameliorate physical and psychological problems in adolescents suffering from macromastia. However, benefits of the Wise compared to the vertical incision pattern have not yet been established in this population. The aim of this study is to compare the outcomes of these two techniques in adolescents undergoing reduction mammaplasty.

Methods: A retrospective study of adolescents undergoing breast reduction by a single surgeon between 2011-2017 was conducted. Wise and vertical reduction techniques were compared based on demographics, clinical outcomes including surgical complications, patient satisfaction, and aesthetic outcomes. Patient satisfaction was determined using the validated BREAST-Q survey, and aesthetic outcomes using the validated ABNSW system.

Results: A total of 60 adolescents underwent reduction mammaplasty (Wise/inferior pedicle=80.0%, Wise/superior medial pedicle=1.7%, vertical/superior medial pedicle=18.3%). Patients who reported preoperative pain (Wise=95.9%, vertical=72.7%, p=0.039) were more likely to undergo Wise reduction. Patients with Wise reductions also were more likely to undergo bilateral reduction (Wise=93.9%; vertical=63.6%, p=0.017). The major and minor complication rates were 1.7% (Wise=2.0%, vertical=0%, p=NS) and 23.3% (Wise=20.4%, vertical=36.4%, p=NS), respectively. Adolescents undergoing Wise incision demonstrated statistically significant improvement in NAC contour (Wise=61%, vertical=47%, p=0.028) and overall aesthetic outcome (Wise=25%, vertical=17%, p=0.008) with scarring not being a negative factor (Wise=-16%; vertical=-35%, p=0.004). Patient satisfaction was comparable in both groups.

Conclusions: Reduction mammaplasty is a safe, effective treatment for adolescent macromastia. The similarity in complication and satisfaction rates between Wise and vertical patterns suggests that both techniques can be safely performed in the adolescent population, but the Wise pattern allows for better aesthetic outcomes.

Public Perceptions on Breast-Implant Associated Anaplastic Large Cell Lymphoma

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Background: Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) has entered the spotlight as high-profile media outlets and the Food and Drug Administration have begun to relay the evolving science to the public. This study aimed to gauge the baseline knowledge and concern regarding BIA-ALCL among adult laywomen within the United States. Additionally, we sought to understand the influence of variables including previous exposure to breast implants for both cosmetic and reconstructive purposes and the source of information on these outcomes

Methods: Amazon.com's Mechanical Turk and Qualtrics were used to survey 500 American women about the risk of BIA-ALCL. Respondents self-reported demographics and any prior experience with breast implants. Eleven questions were asked regarding respondents' concerns of BIA-ALCL and the source of their knowledge. Responses were reviewed for quality control before participants were paid for involvement. Responses were analyzed using descriptive statistics and Chi squared tests.

Results: The average age in our cohort (n=500) was 37.8 ± 11.7 years. The majority of respondents were Caucasian (71.4%) and had completed at least a two-year college degree (69.4%). Of respondents 12% had previously received breast implants, 73% knew at least one person with breast implants, and nearly 50% would consider receiving a breast implant. After providing information about the risk of BIA-ALCL, respondents showed a clear preference to smooth implants and 58.4% were still willing to receive a reconstructive implant and 45.8% a cosmetic implant. One-third reported they would be less likely to receive implants. Most respondents with implants or those who knew someone with implants were still willing to receive an implant ($p \leq 0.001$). Of respondents with breast implants 66.7% reported some degree

of concern regarding BIA-ALCL and 35.0% are strongly considering removing their implants. When presented with information on autologous reconstruction, 17.0% of all respondents preferred implants and 42.4% would consider both options. Fourteen percent had previously heard about BIA-ALCL, the majority from multiple sources - predominantly health professionals or media/healthcare blogs. The source of a respondent's information regarding BIA-ALCL was not associated with their degree of concern or desire to remove the implant. Respondents who had previously heard of BIA-ALCL or who had implants were more likely to understand the association between implants and BIA-ALCL ($p<0.001$). Of respondents 89.8% believe plastic surgeons should discuss BIA-ALCL with all patients considering prosthetic implants.

Conclusions: Patients undergoing breast reconstruction using implants for both cosmetic and reconstructive purposes receive their information primarily from healthcare professionals or media/healthcare blogs; however, only a minority have heard of BIA-ALCL and understand the strength of the association between BIA-ALCL and implants. When provided with the most up-to-date information, patients understand the rarity of the complication and the majority are unchanged in their decision to receive breast implants. As plastic surgeons, we can promote awareness among prospective patients and reassure the anxieties of those who have previously received breast implants. Our findings suggest that professional healthcare blogs and media outlets may be the most effective way to spread knowledge to those who are not in direct contact with healthcare professionals.

Reconstruction of Complex Hemipelvectomy Defects: A 17 Year Single Institutional Experience with Lower Extremity Free and Pedicled Fillet Flaps

Presenter:	Lucas Kreutz-Rodrigues, MD
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Purpose: Hemipelvectomy procedures result in massive soft tissue defects.[1,2] The standard reconstructive approach is to reconstruct the defect with anterior or posterior hemipelvectomy flaps, however, certain oncologic situations can preclude the use of local tissue flaps.[3,4] In such cases, a suitable alternative to provide sufficient soft tissue coverage is the use of fillet flaps, which are defined as pedicled or free flaps harvested from amputated parts.[5] The purpose of this study is to present our institution's experience with using both pedicled and free fillet flaps to reconstruct hemipelvectomy soft tissue defects.

Methods: The authors performed a retrospective chart review of patients who underwent hemipelvectomy followed by fillet flap reconstruction from 2001 to 2018. Patient demographics, clinical and surgical characteristics, postoperative outcomes and complications were reviewed.

Results: Ten patients were identified and included. Mean age was 51±SD 12.4 years. Six patients (60%) underwent standard external hemipelvectomy, 4 patients (40%) extended external hemipelvectomy. Seven (70%) lower extremity fillet flaps were performed as free tissue transfers, 3 (30%) were pedicled flaps. Mean flap size was 1153±SD 1137 cm^2. Mean followup was 5 months (range: 1 - 24 months). Five patients developed postoperative complications, none of them required operative intervention. There were no partial or total flap losses postoperatively.

Conclusion: Reconstruction with either pedicled or free lower extremity fillet flaps is a valuable reconstructive modality for managing acquired soft tissue defects following hemipelvectomy. This useful technique mitigates donor site morbidity, while simultaneously delivering adequate soft tissue coverage with an acceptable complication profile.

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The Financial Value of Plastic Surgeons to an Academic Medical Center As Operative Consultants

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Background: Plastic and reconstructive surgeons at academic centers assist a broad range of surgical services through joint cases. Since the reconstructive surgeon functions as a consulting physician, the financial impact of this contribution is systemically overlooked, and the revenue generated is attributed solely to the primary attending of record. We sought to quantify the productivity and profitability of plastic surgeons as essential operative consultants who facilitate the completion of highly complex procedures.

Methods: Hospital financial data was reviewed for all inpatient surgeries over a three-year fiscal period (2015-2017). Cases in which a plastic surgeon provided assistance to a surgeon from another department were identified using operative reports. Billing records were examined to determine revenue and costs per surgery. Contribution margin (CM), defined as hospital revenue minus variable cost based on actual resources used, was calculated for each case. Data analysis of consulting cases, primary plastic surgery cases, and all other cases was performed using R Statistical Software (Foundation for Statistical Computing, Vienna, Austria).

Results: During the study period, there were 696 cases with a primary non-plastic surgeon that required a consulting reconstructive surgeon. There were 993 primary plastic surgery cases, and 21,146 non-consult cases performed by other surgical specialties that were identified for comparison. The specialties most commonly requesting reconstructive assistance were orthopedic surgery (n=139), neurosurgery (n=124), breast/surgical oncology (n=86), and cardiothoracic surgery (n=71). Average net revenue per case was greatest for the consult group, $94,557 per case, versus $73,824 per case for primary plastic surgeries and $60,758 per case for the non-consult comparison group. Average contribution margin for plastic surgery consult cases was $39,326. This CM was significantly greater when compared to primary plastic surgery cases ($25,779; $p < 0.05$), and to all other non-consult cases ($24,789; $p < 0.05$).

Discussion: Plastic surgeons provide frequent and valuable operative assistance to other surgical services. Cases that require plastic surgery consultation generate more revenue than those performed by either the plastic surgery department alone or any other department. Furthermore, these cases demonstrate a significantly higher contribution margin, which is a measure of overall profit generation for the hospital. This financial impact is poorly captured by current hospital tracking systems, which categorize only by primary surgical specialty. The specific skill set of plastic surgeons is thus an undervalued resource for both patient care and hospital financial well-being. By understanding the economic contribution of reconstructive surgery at the

institutional level, resource allocation can be better tailored to support future growth of these departments.

Comparison between Near Infrared Spectroscopy and Laser Doppler Flowmetry in Free-Flap Adjunct Monitoring

Presenter: James C Yuen, MD
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Purpose: The goal of this study is to evaluate the differences and similarities between Near Infrared Spectroscopy (NIRS) with Laser Doppler Flowmetry (LDF) in adjunct monitoring of free flaps. Their efficacy, recorded data trend, and device characteristics will be compared.

Methods and Materials: After institutional review board approval at Banner MD Anderson Cancer Center, the charts of 60 consecutive free-flap patients over 2-year period were reviewed. There were 6 bilateral DIEP cases and 2 cases where each flap had 3 and 2 monitored components, respectively. The choice in using either adjunct monitor, ViOptix T.Ox (ViOptix Inc., Fremont, CA) or Laser Doppler (LD) Periflux 5000 (Perimed AB, Järfälla, Sweden), was not standardized, except that the ViOptix probe (larger) was never chosen for intraoral flaps. Total of 67 monitoring events occurred: 38 with LDF on 37 flaps of 35 patients (head/neck 29, breast 7, lower extremity 1); 29 with ViOptix on 25 patients (head/neck 12, breast 15, upper extremity 1, and lower extremity 1).

Results: Of the 37 free flaps monitored by LDF, there were 2 take backs because of diminishing values: LD numbers dropped from 17.4 to 4.4 in case of fibula hematoma and from 14.7 to 4.7 in case of venous thrombosis of serratus to leg. Of the 28 flaps monitored with ViOptix, there were 2 re-explorations: ViOptix numbers dropped from 46% to 20's for the DIEP pedicle stretches and from 32% to 28% for perforator compression hours after thoracodorsal-scapular-chimeric flap to cheek. All 4 flaps were salvaged. There were no false negatives or positives with either monitoring modality. Two ViOptix probes failed after 4 and 3.5 days of use, respectively. No LD probes failed during use. Unlike ViOptix, the LD probes are sterilizable. Of the 6 LD probes purchased, the average sterilization cycle per probe was 11, and only 1 broke after 14 cycles. Cost per flap for this LD probe was $154. Cost of each ViOptix probe (disposable) was $1000. Average number of recorded entries per flap was 92 for LDF and 88 for ViOptix. Flaps were monitored for 3-6 days and every hour for the first 2-5 days, then every 2 or 4 hours. For LDF,

mean perfusion value was 32.43 with standard deviation (SD) of 15.65 [coefficient of variation (CV) 38.1]. Mean ViOptix reading was 63.9% with SD of 6.26 (CV 10.6). Final LDF values (last 8 hours recorded, mean) increased an average of 118% compared to the beginning (initial 8 hours, mean), whereas ViOptix dropped by -7.5% (average).

Conclusion: LDF and NIRS are equally efficacious in free-flap monitoring. Cost associated with LD recyclable probes is significantly less than the single-use ViOptix probes. Periflux LDF recordings tend to increase significantly with time (more than double), while that of ViOptix drops slightly by the end of each monitoring session. Perfusion data from LDF have much greater coefficient of variation (38.1 vs 10.6) compared to ViOptix. NIRS produces more steady numbers throughout the monitoring period (less fluctuations) compared to LDF for uncomplicated flaps.

Penoscrotal Reconstruction with Superficial Circumflex Artery Perforator Propeller Flap

Presenter:	Ma Rhip Ahn, MD
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Purpose: Penoscrotal defects can occur for various reasons, mostly after debridement or wide excision in the treatment of Fournier's gangrene, skin cancer such as extramammary Paget's disease, or infections after foreign body injections. (1-3) For a successful reconstruction, it is important to not only properly resurface the defect but also to maintain the original shape of the penis and scrotum.

Methods and Materials: In this study, we have aimed to introduce the feasibility of the superficial circumflex iliac artery perforator (SCIP) propeller flap to effectively reconstruct penoscrotal defects. Eleven patients with penoscrotal defects reconstructed using the SCIP propeller flap were retrospectively evaluated.

Results: The causes of the penoscrotal defects were extramammary Paget's disease in 5, Fournier's gangrene in 4, and foreign body injection leading to complications such as vaselinoma in 2 patients. The average follow-up period was 18 months (range: 4–42 months), and the comorbidities were diabetes mellitus in 3, hypertension in 2, Bechet's disease in 1, and prostate cancer in 1 patient. SCIP flaps were elevated according to the well-known method, however the source vessel of the perforator was eccentrically located to obtain the long flap after rotation.

The average flap length was 19.7cm, and the average width was 7.7cm. The average size was 156.7cm^2, with the largest measuring up to 24 x 12cm^2. The medial superficial branch of the superficial circumflex iliac artery was used as the source vessel in all cases. The average rotation arc was 165° (150–180°). When a kinked pedicle or an inadequate flap size was discovered after a temporary propeller rotation, skeletonization of the pedicle was performed to gain additional mobility and release the torsion over the long pedicle. The direction of the flap rotation was determined to be toward the direction of a shorter radius, which was rechecked using Doppler ultrasound to ensure perfusion. When decrease of blood flow was expected, the rotation direction was changed. Two cases showed partial necrosis in the tip area of the flap, which were treated using conservative care or scrotal flap coverage. There were no cases of total flap loss or lymphorrhea.

Conclusion: Reconstruction of the penoscrotal area with the SCIP flap is one of the many effective methods. It is especially ideal considering loose, elastic, and thin nature of the penoscrotal tissue. Elevation is easily facilitated, and the thickness of the SCIP flap can be easily adjusted without microsurgery.

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The Natural History and Clinical Course of Bell's Palsy: Determining When to Intervene

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Introduction: Bell's Palsy (BP)—idiopathic dysfunction of the seventh cranial nerve—is the most common cause of peripheral facial weakness, accounting for 60-75% of unilateral facial paralyses.[1] The incidence in the United States is 20-43 cases per 100,000 person-years.[2,3] It is self-limiting in 71-86% of cases—although, which

patients are high risk for recovery failure is unclear.[1-3] Patients with persistent dysfunction or sequela are a common referral population to Plastic Surgery; however, it is difficult to know when to intervene. This study aimed to elucidate the natural history of BP and patient clinical course.

Methods: This study was a retrospective chart review for January 2011 to December 2017. An institutional database was queried for charts with ICD-9 351.0 or ICD-10 G51.0. All resulted charts were reviewed. Subjects required a new diagnosis of BP for inclusion and were excluded if: ICD code was inappropriate; ICD code was historical; or facial paralysis was secondary to another cause. Disease characteristics (laterality, severity, etc.), clinical course (presentation location, follow up, etc.), intervention/treatments, and disease course (resolution, etc.) were tracked. Tracking occurred until subjects met one of three criteria: 1. Lost to follow up; 2. Complete resolution without sequela; 3. Two years after diagnosis.

Results: A total of 3026 potential subjects resulted from the query. Of those, 2120 were excluded (268 inappropriate code; 1389 repeat code; 452 paralysis secondary to another cause) and 906 met inclusion criteria. For follow up visits, 437 had zero and 771 had ≤ 3. Average age was 48 ± 20 years at diagnosis with the majority Caucasian (673) and Non-Hispanic (835). Incidence increased with age: 461 subjects ≥ 50 years old. There was no difference in age or disease laterality. Most subjects presented to an emergency department (545). Per documentation, 550 subjects were stated to have complete facial paralysis but lacked documentation of total involvement. Forehead, eyelid, and mouth paralysis were most commonly noted. Changes in taste, sensation, or tearing were the most frequent associated symptoms. Treatment was generally steroid alone (444) or steroid plus antiviral (302). There were 174 complete resolutions and 523 subjects had partial improvement in paralysis. The remaining subjects were lost to follow up or documentation regarding progress was terminated without clear resolution. For those patients who showed improvement in symptoms or complete resolution, 90% occurred by 107 ± 100 days. Dyskinesis was noted in 4 subjects and synkinesis in 2.

Conclusions: The high rate of non-follow up and poor documentation make the natural history of BP difficult to fully elucidate. Nevertheless, it seems safe to begin intervention—with reasonable assurance of disease plateau—at 200 days post-diagnosis. Additionally, BP sequela seem either inconsistently recorded or improperly detected and consequently undertreated.

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The Ortho-Plastic Management of Paediatric Open Lower Limb Fractures: Experience of a UK Level I Major Trauma Centre

Presenter:	Ankur Khajuria, MD, MSc (Oxon.)
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Introduction: The evidence-base for management of paediatric open lower limb fractures is limited. Management of adult open lower limb fractures largely revolves around early administration of antibiotics, with fracture stabilization and establishing a soft-tissue envelope. However, this does not incorporate the significant differences in the paediatric population, notably the greater priority for limb salvage and differences in fracture healing. Alongside physical differences in bone structure (thick periosteum, better vascularity, shorter time to union due to better healing ability), paediatric patients also have an improved potential for remodeling. The aim of this study was to evaluate the ortho-plastic management of paediatric open lower limb fractures at a UK major trauma centre, reporting the risk of infection and rate of union.

Methods: A retrospective review was performed on children presenting at our institution with an open tibial fracture from 2011 - 2016. Patient demographics, mechanism of injury, method of fracture fixation and soft tissue coverage, union time and outcomes were recorded.

Results: 23 patients (16 male; 7 female) presented with an open tibial fracture. Road traffic accidents (RTAs) accounted for majority of the injuries (17/23, 73.9%). Methods of fracture fixation comprised: 11 (47.8%) external fixations, 6 (26.1%) plaster of paris, 4 (17.4%) intramedullary nails and 4 (17.4%) open reduction internal fixations (ORIF). Wound management comprised: 15 (65.2%) primary closures, 1 (4.4%) delayed primary closure, 2 (8.7%) split skin grafts (SSG), 2 (8.7%) local flaps and 2 (8.7%) free flaps. The mean union time was 15.2 weeks (SD = 11.4 weeks). There was 1 (4.4%) pin-track infection, in a complex fracture through the distal third

of the diaphysis of the right tibia and fibula; 1 (4.4%) superficial wound infection and no flap failure.

Conclusion: The study shows that unlike in adult open tibial fractures where flap coverage is considered gold standard, primary closure may suffice in selected paediatric patients. This would circumvent donor site morbidity and other flap-associated complications. Further work is required to evaluate long-term functional outcomes of this cohort.

Evaluation of Long-Term Complications and Recurrence Rates in Ventral Hernia Repair with Component Separation

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Purpose: Ventral hernia repair (VHR) with concomitant component separation (CS) achieves better structural support in large fascial defect abdominal wall reconstructions. Traditionally, CS is performed by plastic surgeons, but has recently become more popular in other specialties such as general surgery. Previous reports indicate that while CS reduces hernia recurrence, it is associated with an increased risk of complications. This study evaluates outcomes associated with VHR with CS (VHR+CS) compared to VHR-alone and a sub-analysis of VHR+CS outcomes stratified by plastic versus general surgeons.

Methods: A retrospective chart review of all VHRs between January 2009 and June 2017 at a single institution was performed. Demographic data, comorbidities, procedure details, length of stay (LOS), postoperative complications and recurrence rates were recorded. Patients with less than 6 months follow up or less than 30 cm^2 defect size were excluded. Follow up was defined as surgical follow up, abdominal CT or MRI, or surgical visits with well-documented abdominal exams.

Results: A total of 185 patients were identified: Group I (n=42) received VHR+CS and Group II (n=143) received VHR-alone. Differences in defect size (217.4 cm^2 vs 149.2 cm^2**, p = 0.02**) and concurrent procedures (1.4 vs. 0.9, **p = 0.02**) between groups I and II, respectively, reached significance. In addition, group I had significantly increased LOS (group I 15.0 days vs group II 4.6 days, **p = 0.0049**); however, no difference in post-operative complications (22.7% vs 21.6%, p = 0.89) or recurrence

rates (22.7% vs 14.1%, p = 0.052) between groups I and II, respectively, was appreciated.

Group I (n=42), who received VHR+CS, was further stratified by specialty; group IA (n=24) were VHR+CS performed by plastic surgeons and group IB (n=18) VHR+CS was performed by general surgeons. Differences in defect size (262.8 cm^2 vs 149.6 cm^2, **p = 0.046**) and concurrent procedures (1.7 vs 0.9, **p =0.047**) were noted in groups IA and IB, respectively. There were no differences in recurrence rate (20% vs 20%, p = 0.656), LOS (8.8 days vs 6.3 days, p = 0.33), or complication rate (29.1% vs 27.8%, p = 0.6) in groups IA and IB, respectively.

Conclusion: Despite the use of component separation in larger, more complex ventral hernia repairs in our overall patient population, VHR+CS provides comparable outcomes in abdominal wall reconstruction at our institution. In our sub-group analysis, VHR+CS performed by plastic surgeons showed no difference in LOS, complication rates and recurrence rates compared to general surgeons, despite larger defect sizes; more concurrent procedures; and more complex reconstructions performed in the plastic surgery cohort. Performance of VHR+CS is a viable approach to improving overall outcomes in patients with larger, complex hernias and may directly benefit from plastic surgery participation.

Prognostic Indicators for Upper and Lower Extremity Amputations in a Verified Burn Center

Presenter:	Danielle Anne Thornburg, MD
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Introduction: Reconstructive surgeons are often faced with the need to amputate when limb salvage is no longer a viable option. Burn Center patients present not only with burn injuries but also necrotizing infections, purpura fulminans, frostbite, toxic epidermal necrolysis, and crush/degloving trauma. With co-morbidities and extent of injury, all are at risk for amputation given the soft tissue destruction and systemic organ compromise that occurs. Since they are not well-defined in the literature, the purpose of this study was to determine prognostic factors which predispose patients to extremity amputations. With early identification, multiple and extensive preservation salvage efforts in “at risk” cases may be eliminated, facilitate earlier recovery, and conserve finite resources.

Methods: This retrospective registry review (2000-2017) compared patients who required amputations with those who were more suitable for reconstruction. Cases were further matched by age, sex, total percent body surface area (%TBSA), and type/location of injury, to control for possible confounding variables.

Results: During this study period, 110 patients with amputations were compared to 12,997 with upper or lower salvaged extremities. The main etiology was flame burn (25%) with a high percentage burn injury as the most common precipitating event (59%). Amputations were mainly digital (39%) and transtibial level (33%). Comparing amputees (AP) to non-amputees (NAP), there were significant differences in mean age [50 vs 34 years, $p < 0.001$], %TBSA [20 vs 8 %, $p=0.003$] and length of stay [33 vs 11 days, $p<0.001$]. Co-morbidities such as cardiovascular (Relative Risk 4.3, $p<0.001$), liver (RR 4.8, $p<0.001$), renal insufficiency (RR 19.1, $p<0.001$), diabetes (RR 5.0, $p <0.001$), and alcohol abuse (RR 4.3, 95% CI, $p<0.001$) increased the risk of amputation. In the matched control cohort, burn etiology comprised 25 (57%), of the injuries (11 amputees and 14 controls). Of those admitted for non-burn mechanisms, 4 AP and 5 NAP had infectious processes (20%); two in each group with frostbite (9%), two AP and one NAP with purpura fulminans (7%); and two AP with one NAP had other conditions. There were three deaths in the AP and two in the NAP groups. Two of the older patients died of Non-ST-elevation myocardial infarction (NSTEMI) complications during their hospitalization. Of 44 patients, 12 (27%) had upper and lower extremity amputations. Of 66 total amputations performed, 30 (46%) were upper extremity only, 24 (36%) were lower only, and 12 (18%) were in both. The age (48±22 vs 44±20 years, $p= 0.46$) and %TBSA (25±55 vs 22±25, $p= 0.67$) of the two groups were similar, however, the amputees had a longer length of stay (42±22 vs 21±21 days, $p<0.002$) compared to non-amputees. The AP developed more infections such as sepsis, urinary tract infections, pneumonia, and gangrene [16 (73%) vs 6 (27%), $p<0.002$], and subsequently required more antibiotics, [21 (68%) vs 10 (32%), $p < 0.0002$].

Conclusions: Prognosticating factors such as injury severity and stress, older age, co-morbidities, intensive therapy requirements, and infectious complications increase the risk for upper and lower extremity amputations.

Mechanical Stretch Preconditioned Adipose-Derived Stem Cells Improve Impaired Wound Healing By Inducing Macrophage M2 Polarization

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Background: Uncontrolled inflammatory response during wound healing leads to aberrant repair. Administration of cells/cell factors capable of screwing polarized macrophages towards the anti-inflammatory M2 has shown a favorable prospect to the treatment of inflammatory diseases[1]. Studies have reported that adipose-derived stem cells (ADSCs) have an immunoregulatory effect and improve cutaneous wound healing, but the therapeutic effect on impaired wound still needs to be enhanced. Previously, we found that mechanical stretch preconditioning could enhance the cellular viability and secretion function of ADSCs *in vitro*. However, it is unknown if mechanical stretch preconditioning could enhance the immunoregulatory effect of ADSCs on impaired wound healing. The aim of our study is to investigate whether mechanical stretch preconditioned ADSCs could regulate macrophage polarization and improve impaired wound healing.

Material and methods: Mouse ADSCs were obtained and divided into two groups: stretched ADSCs (ms-ADSCs) and non-stretched ADSCs (con-ADSCs). Cyclic mechanical stretch (10%, 12h, 0.5Hz) was applied by the Flexcell®FX-5000™ system. The ms-ADSCs or con-ADSCs were co-cultured with murine macrophage RAW264.7 cells with/without LPS or IL-4 stimulation for 24h respectively. Then M1 markers (iNOS, TNF-α, IL-6) and M2 markers (Arg-1, CD2016, IL-10) were determined by reverse transcription-quantitative polymerase chain reaction. 8 mm diameter full-thickness excision wounds were made on the dorsal skin of db/db diabetic mice as a delayed wound healing model. Intradermal injections of 5×10^6 ms-ADSCs or con-ADSCs around wound margins were conducted at two days post-injury. Histological studies were performed and the pro-inflammatory cytokines (TNF-α, IL-1β and IL-6) and pro-healing cytokines (IL-10, VEGF, IGF-1) were observed by immunohistochemistry. The M1/M2 polarization *in vivo* was further evaluated by iNOS/Arg-1 immunofluorescence via confocal microscopy.

Results: The iNOS, TNF-α, IL-6 mRNA levels of RAW264.7 cells were significantly reduced after co-culture with ms-ADSCs than con-ADSCs, while the Arg-1, CD2016, IL-10 mRNA levels reversed. In addition, histological studies and immunohistochemistry showed that ms-ADSCs treatment significantly accelerated impaired wound healing and reduced inflammatory response characterized with lower expression of TNF-α, IL-1β and IL-6 and higher expression of IL-10, VEGF and IGF-1 in the wound. Besides, ms-ADSCs treatment led to a decrease of M1/M2 ratio based on the iNOS/Arg-1 immunofluorescence.

Conclusion: Mechanical stretch preconditioning enhanced the ADSCs-guided macrophage polarization from M1 to M2, and mechanical stretch preconditioned ADSCs improved impaired wound healing.

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Nipple Sparing Mastectomy with Immediate Neurosensitization of the Nipple Areola Complex

Presenter:	Cindy Rodriguez, BS
Co-Authors:	Jaime Flores, MD, Manuel Torres-Salich, MD, Barbara Ponce, PA, Jodi Schaefer, RN, Ediledis Tarrio, ARNP
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Background: Nipple sparing mastectomy (NSM) has been proven to be an oncologically safe technique for treatment of breast cancer. Patients' primary dissatisfaction with the procedure is the loss of nipple areola complex (NAC) sensation. Experience in hand surgery have shown nerve allograft as a successful conduit for nerve repair and good sensory return. Recently nerve allografts have been employed to provide sensate autologous flaps in breast reconstruction to connect intercostal nerves to sensory nerves of autologous flaps. Expanded and novel use of nerve allografts has the potential to preserve NAC sensation after NSM.

Material and Method: At the time of NSM the 4th lateral cutaneous intercostal nerve is identified as it leaves the chest wall and into the breast tissue. At least 1cm of the nerve is dissected from the breast tissue and preserved. The nerve stump is connected to a 7cm nerve allograft using 8-0 nylon. In order to reach the NAC, a second 5-7cm graft is connected to distal end of the graft. Breast reconstruction then proceeds and once completed, prior to skin closure the nerve allograft is routed over vascularized tissue. The individual axons at the end the allograft splayed out and individual axons are sutured into the deep surface of the NAC using 8-0 nylon. Follow up sensation evaluation is done at 3 months, 6 months, 1 year, and 2 years. Semmes-Weinstein Monofilaments and the Acroval Neurosensory and Motor Testing System was used to evaluate patient sensation.

Results: A total of 47 patients underwent NSM and immediate breast reconstruction with direct connection of the NAC. Average age of patients was 47. 5 patients were unilateral mastectomy and 42 were bilateral for a total of 89 breasts with 55 breasts being prophylactic. 11 of the patients had neoadjuvant chemotherapy. 12 patients underwent autologous reconstruction and 35 underwent expander placement with ADM. No complications reported. At 3 month follow up for neurotized patients, SWMF 6.65 was felt 31.88% of the time at various breast locations, and SWMF 2.83 was felt 15.22% of the time. 6 month follow up indicates sensation is positively progressing for neurotized patients who showed early signs of sensory function.

Conclusion: Sensation preservation after NSM is a viable option and best performed at the time of mastectomy. Connecting the 4th lateral cutaneous intercostal nerve to the NAC would allow for return of sensation which is often lost. Coordination with breast surgeon is paramount for the identification and preservation of target nerves and success of the procedure. Use of allograft allows the nerve to be connected to the NAC without additional donor site morbidity. The procedure is technically difficult but feasible and does not add increased complication to breast reconstruction. 3 month and 6 month follow up results indicate breast sensation is more likely and significantly quicker in neurotized patients. 1 year follow up sensation testing will provide further evidence for the return of sensory function.

Effectiveness of Cryotherapy in the Treatment of Hypertrophic and Keloid Scars: A Systematic Review and Meta-Analysis

Presenter:	Hassan ElHawary, MD, MSc
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Purpose: Despite the wide plethora of treatment modalities for keloids and hypertrophic scars, treatment remains very challenging. Therefore, there is a constant demand for new treatment modalities. One treatment modality that has been extensively studied in the last several years is cryotherapy. Cryotherapy works by causing cellular injury and necrosis of the pathological scar tissue. Conventional cryotherapy consists of spraying the lesion/wound with cryo-material which can cause local side-effects such as hypo-pigmentation and erythema. The recent development of intralesional cryotherapy (ILC) allows for more specific targeting of the lesion leading to higher efficacy and lower risk of hypo-pigmentation[1]. Since ILC is a relatively new technique, there aren't many studies comparing it to other standard of

care treatment modalities. The goal of this study is to provide an updated review of the therapeutic effect of intralesional cryotherapy on hypertrophic scars and keloids.

Methods: A comprehensive systematic review and meta-analysis of effects of intralesional cryotherapy on hypertrophic scars and keloids was performed. Both PUBMED/MEDLINE and EMBASE library were searched using the following liberal search strategy ("cryosurgery OR cryotherapy") AND (intralesional) AND (keloids OR hypertrophic scar) from inception till Aug20th 2018. After strict inclusion and exclusion criteria, and removal of duplicates, 47 articles were fully read for which 15 articles were deemed relevant and reviewed in this paper.

Results: Out of the 15 studies reviewed, 10 studies are prospective, three RCTs, one retrospective and one pilot. 80 % of the papers exclusively assessed keloids while the remaining 20% studied both keloids and hypertrophic scars. The most common outcome measured was scar volume (73.3%) followed by pruritus (60%). Other outcomes included scar height (40%), redness (40%), scar hardness (33.3%), and elasticity (13.3%). Only one study assessed patient satisfaction and discomfort. Only five studies compared ILC with another treatment modality while the remaining had no control group. Three studies compared ILC with spray cryotherapy. They all showed superior therapeutic outcomes of ILC compared to spray cryotherapy. Furthermore, ILC was found to be superior to both 5-FU and corticosteroids. However, one study showed that ILC is inferior to surgical excision followed by steroids. Out of the 10 studies that had no control group, 9 showed positive therapeutic effects of ILC. The meta-analysis results will be presented.

Conclusion: Intralesional cryotherapy is a relatively new treatment modality that has very promising therapeutic effects on keloids and hypertrophic scars. The vast majority of studies show a positive therapeutic effect of ILC on keloids and hypertrophic scars. However due to the very low number of studies that compare ILC with other treatment modalities, we believe more studies should be conducted to further validate the therapeutic effect of ILC.

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Eyelash Reconstruction with Follicular Unit Extraction Technique Hair Transplantation By Using Choi Implanter

Presenter: Nuh Evin, MD
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Objectives: Hair loss in face results from trauma, genetic thinning, plucking, surgery, burns and others. Hairless defect in the facial aethetics units causes facial asymmetry, psychological and cosmetic problems. We present our result about eyelash reconstruction with follicular unit extraction (FUE) technique in this study.

Materials and Methods: Seven patients with unilateral eyelash defect were included in this study. Firstly, deficiency and direction were determined with reference to the opposite side eyelashes. Patient's medical records were rewived bidore surgery. All transplants were performed under local anesthesia. Donor hair were harvested by using micropunch from the post auriculer thin hairs. Then choi implanter was used for transplantation to the eyelash line. Survival of the graft and satisfaction degree of patients were evaluated with the Microsoft Paint program and the satisfaction evaluation scale at the 12th postoperative month, respectively.

Results: 4 patients were male, others were female. Mean age of them was 27 ± 14.2. The etiology was trauma in 4 patients and the eyelid tumor excision in the other 2 patients. There were no postoperative complications in the donor and recipient areas. All grafts viability was over 84% at the 12th postoperative month. All of the patients were very good deggre satisfied with the aesthetic appearances.

Conclusions: Reconstruction of eyelash is a challenging surgical problem for the hair transplant surgeon. The aim of eyelash restoration is to obtain as symmetric density, direction, and angle of growth, and the distribution of hairs as possible with opposite side. In our study, folicular units' technique was used to obtain for natural and very satisfied eyelash reconstruction.

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A 3-Dimensional Analysis of the Correlation between Soft Tissue and Bone of the Lower Face

Presenter:	Jeoung Hyun Nam, MD
Co-Authors:	Ho Seong Shin, M.D & PhD, SeokHwan Kim, MD, Yugil Park, MD, HeeYong Kang, Md, Gwang Hyun Ahn, M.D, Dong kyu Kim, MD
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Background: The prime aim of this study was to establish cephalometric linear and angular normative values of the lower face using a 3-dimensional analysis in Korean individuals and verify whether the linear and angular measurements on 3-dimensional laser scanning are comparable with measurements on 3-dimensional CT images.

Materials and Methods: In this current study, 40 Korean individuals aged between 18 to 60 years were enrolled. Using 3-dimensional CT scan and 3-dimensional facial laser scan, linear and angular values of the lower face were measured and recorded. Statistical analysis was carried out to verify the concordance and correlation between two 3-dimensional imaging modalities.

Results: The 40 samples consisted of 11 women with a mean age of 40.8 ± 14.5 years and 29 men with a mean age of 29.7 ± 15.0 years. The results demonstrated the difference between gender and the tendency of asymmetry on both sides. Among different methods of measuring angular values, the gonial angle between tragion'-gonion'-menton' from 3D facial laser scan and between articulate-gonion-menton from 3D CT scan demonstrated a good concordance and a high correlation.

Conclusion: The gonial angle measured between tragion'-gonion'-menton' using 3D facial laser scan was comparable with values from 3D CT scan. The reference points and the gonial angle we defined here, can be a reliable alternative method evaluating mandibular angles for assessing patients and surgical planning in plastic and orthognathic surgery.

The Use of Prophylactic Antibiotics for Preventing Surgical Site Infections in Facial Fractures

Presenter:	Lindsey Teal, BS
Affiliation:	The University of Texas at Austin Dell Medical School, Austin, TX

Background: There is low strength of recommendation regarding the guidelines for treating different types of facial fractures with antibiotics.[1] However, many surgeons elect to still prescribe antibiotics prophylactically with these injuries. The objective is to provide evidence-based research in regard to the usefulness of prophylactic antibiotic use in preventing surgical site infections in different types of facial fractures.

Methods: Data from the US National Trauma Data Bank (NTDB), 2015-2016, was retrospectively analyzed. All surgeries for open and closed orbital, midface, nasal, and other non-specified facial fractures were included. The use of prophylactic antibiotics in these patients was also recorded. Deep, superficial, and organ/space surgical site infections were used to measure the outcomes.

Results: Overall,13,307 patients met the inclusion criteria for the fracture diagnosis. Of these, 105 received prophylactic antibiotics, none of which had a surgical site infection. Of the patients who did not receive prophylactic antibiotics, 22 of these had a surgical site infection. Half of the surgical site infections were superficial surgical infections. Closed midface and nasal fractures had the highest percentage of infections. There was no statistically significant difference between those who had prophylactic antibiotic administration with any type of facial fracture and surgical site infections.

Conclusion: The information from this retrospective study suggests that the use of prophylactic antibiotics for facial fractures does not significantly reduce the prevalence of surgical site infections. Higher level studies with a larger treatment arm should be done to further guide clinical use of prophylactic antibiotics in different types of facial fractures.

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Topical Tranexamic Acid Decreases Post-Operative Ecchymosis in Rhytidectomy Patients

Presenter: Kayla Humenansky, DO
Co-Authors: Jude Opoku-Agyeman, DO, Scott Lindsay, DO
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Background: Excellent hemostasis is paramount in achieving the best surgical outcome. Many methods have been studied for optimal hemostasis. Regardless of these efforts, hematoma rates persistently range from 1% to 15%.[1] The antifibrinolytic drug, tranexamic acid (TXA) has proven to reduce blood loss and transfusion requirements in other fields of surgery and has recently begun gaining popularity in aesthetic procedures.[2] The safety and efficacy of TXA has been well studied.[3] Tranexamic acid is a synthetic lysine analogue which inhibits fibrinolysis thereby promoting clot stability. Some reports also suggest its role in reducing inflammation.[2] Historically administered intravenously, interest is growing in using TXA as a topical hemostatic agent. We share our experience in using tranexamic acid-soaked sponges to decrease post-operative ecchymosis and edema in rhytidectomy patients. We offer post-operative images of our rhytidectomy patients for a visual demonstration of the notable improvement in post-operative ecchymosis and edema.

Methods: We performed a review of nine patient charts who underwent full rhytidectomy with extended sub-superficial musculoaponeurotic system (SMAS) dissection and plication with platysmaplasty. After SMAS plication, hemostasis was achieved using electrocautery and gauze sponges soaked with 2% TXA topical solution were placed under the skin flap, while the contralateral rhytidectomy flap was raised. This was repeated on the contralateral side while the initial side was closed. No drains were placed. Post-operatively a compressive facelift dressing was applied and maintained for 24 hours. The mean age was 58.78. All patients were female. No post-operative hematomas were identified. One post-operative seroma was noted in a patient who underwent revision rhytidectomy with platysmaplasty, requiring two aspirations of 5-10 cc of serous fluid. There were no post-operative wound healing complications or infections. In addition, there were no systemic complications related to the use of topical TXA. The current additional cost of TXA application is 12.00 dollars per patient. Pre-operative and post-operative photographs were taken for patients at post-operative day 1 and 7.

Conclusions: Substantial blood loss is not common in aesthetic surgery procedures and therefore most investigations regarding tranexamic acid and hemostasis are published in other surgical specialties. Wide use of TXA in plastic surgery has been limited to craniomaxillofacial surgery. No standard dosing has been determined and various topical dosage concentrations have been described. We have seen dramatic improvements in post-operative edema and ecchymosis using a 2% solution and soaks times of 30-45 minutes. Tranexamic acid-soaked sponges improve early post-operative patient outcomes by decreasing ecchymosis and edema, thus allowing quicker return to daily social activities. Tranexamic acid is cost effective with

beneficial patient outcomes. These pre- and post-operative photographs of our rhytidectomy patients provide a visual demonstration of the benefit of using TXA.

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Disparities in Access to Reduction Mammaplasty

Presenter: Norma I. Cruz, MD
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Introduction: Breast reduction surgery is known to produce improvement of symptoms associated with macromastia, but the ability to obtain this surgery remains limited by socioeconomic and demographic factors. [1-2]

Method: A prospective cohort study was performed to evaluate the differences between women with macromastia who had government-funded vs. private insurance and their access to surgery. All women who presented to the Plastic Surgery Clinic with complaints of large and heavy breasts were invited to participate in the study. Data collection included demographic questions as well as bra cup size, body mass index (BMI), specimen weight, time interval for insurance approval or denial of coverage, and postoperative complications. The difference between groups was evaluated using Student's t-test or Chi-square test, whichever was appropriate, with p-value of less than 0.05 being considered significant. This study was approved by the Institutional Review Board.

Results: The study evaluated 203 women with symptomatic macromastia. Of the group 103 (51%) had government-funded insurance and 100 (49%) had private insurance. Women with government-funded insurance were older (mean age 35±11 vs. 28±9, $p<0.05$), had larger breasts (mean 40-DD vs 38-D, $p<0.05$), had more obesity (mean 34±4 vs. 29±3, $p<0.05$) and had larger surgical specimens (mean 1,200±350 vs. 760±255 grams, $p<0.05$). The time interval to approval of the surgery for the government-funded insurance was 6±3 months vs. 2±1 months for private insurance (statistically significant $p<0.05$). Of the claims submitted 71% of the

government-funded and 90% of the private insurance were approved ($p<0.05$). Patients with government-funded insurance had a 45% postoperative complications rate vs. 26% in the other group ($p<0.05$).

Conclusion: There are significant disparities in access to breast reduction surgery based on type of insurance. Patients who depend on government-funded insurance have a higher percentage of denial of surgery, longer waits and reach surgery older, more obese and with greater complication rates.

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Negative Pressure Wound Therapy with Continuous Irrigation for Pocket Preservation and Salvage of Breast Implant Reconstruction

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Co-Authors: Aamir Siddiqui, MD, Donna Tepper, MD
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BACKGROUND: Implant based reconstruction remains the most common used method for breast reconstruction post mastectomy in the United States. Implant based reconstruction is reported to have high major complication rates including infections, skin flap necrosis and implant explanation. Implant salvage have been reported in literature after appropriate debridement, capsulectomy and pocket change with variable success rates. We report our experience with four patients who underwent preservation of the breast pocket and implant salvage while using a negative pressure wound therapy with continuous irrigation (NPWTi) of high volume 0.25% acetic acid.

INTERVENTION: The patients who underwent NPWTi for breast implant salvage were identified with review of operative records. The procedure was performed under general endotracheal anesthesia. After explantation of the infected tissue expanders, the breast pockets were debrided and the pocket washed thoroughly, quantitative cultures where sent. NPWTi sponge was placed to fill the breast pocket and

continuous high volume irrigation of the breast pocket with diluted 0.25% acetic acid was initiated at a rate of 1 drop a second (180ml/hr). The treatment was continued for 3 to 5 days, and the patients were taken back to the operating room for exchange of the wound vac sponge with a permanent implant. Medical records were reviewed to assess for relapses in infection.

OUTCOME: Four patients underwent NPWTi from July 2018 to October 2018. Three patients had tissue expanders placed in prepectoral pocket wrapped in cadaveric acellular dermal matrix (Alloderm®) and one in a subpectoral pocket with cadaveric acellular dermal matrix sling. Infected seroma was noted upon tissue expander removal however no frank purulence was noted in any of the patients. All quantitave cultures came back negative. Median duration of NPWTi therapy was 4 days (range 3-5 days) while on intravenous antibiotics. Three patients had a successful implant-reconstruction salvage with exchange of the NPWTi sponge with a permanent implant. One patient was noted to have a persistent bipofilm after NPWTi therapy so reconstruction was aborted and the breast pocket was closed over drains. After a median follow up of 20 weeks (range 11-21 weeks) the three patients do not have recurrence of any signs or symptoms of infected implant.

CONCLUSIONS: NPWTi is a safe and novel technique which can be used to salvage implant-based breast reconstruction. NPWTi helps in preserving the breast pocket while continually washing it. It also gives the surgeon the opportunity to reassess the breast pocket few days post debridement before using a permanent implant. Despite short follow up period, using NPWTi is a promising technique to salvage breast implants. Further randomized controlled studies will further delineate its roll in implant salvage.

Identifying Preoperative Factors Associated with the Flap Volume in Patients Undergoing Breast Reconstruction with the Extended Latissimus Dorsi Musculocutaneous Flap Coverage

Presenter:	Eun-Young Rha, MD, PhD
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Abstract: Purpose: The latissimus dorsi (LD) flap is a versatile option for breast reconstruction.[1-3] However, the indications are limited because of a volume discrepancy between the breast and the flap.[1] We conducted this study to identify

preoperative factors associated with flap volume in patients who underwent breast reconstruction with the extended LD flap.

Materials and methods: A retrospective study was performed in 69 patients (69 breasts) who underwent breast reconstruction with the extended LD flap between March 2016 and March 2018. We evaluated body weight, body mass index (BMI), breast volume, flap volume, LD muscle thickness and soft tissue thickness [thickness between the top of the skin and the deep margin of the LD muscle].

Results: Mean age, body weight, BMI, breast volume, flap volume, LD muscle thickness and soft tissue thickness were 45.6 ± 7.1, 59 ± 8.1, 23.7 ± 3.2, 252.2 ± 107.1, 229.4 ± 95.6, 10.3 ± 2.5 and 27.2 ± 7.5, respectively. Pearson's correlation coefficient indicated a significant positive linear correlation between flap volume and body weight, flap volume and BMI, flap volume and LD muscle thickness and between flap volume and soft tissue thickness (correlation coefficients, 0.602, 0.569, 0.264 and 0.597, respectively). A predictive model was developed based on multiple regression analysis: flap volume (ml) = 4.992 × soft tissue thickness (mm) + 9.136 × BMI – 123.046.

Conclusions: Flap volume can be estimated using a predictive model in patients who have undergone breast reconstruction with the extended LD muscle flap. Considering the soft tissue thickness and BMI, the operative plan for the LD flap was either a single or combined procedure.

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Distraction Osteogenesis Anterior and Posterior Elongation on the Basis of Midcoronal Bridge in Bicoronal Synostosis

Presenter: Jaeyoon Kim, MD

Affiliation: Yonsei University, Seoul

Background: Distraction osteogenesis has the same effect as conventional surgery and effectively reduces cranial volume and intracranial pressure by distracting the flap with the same design as the conventional supraorbital rim and forehead advancement. The purpose of this study is to find the difference in cranial morphologic outcome, intracranial volume and neurologic development between the two distraction osteogenesis methods: Method of correcting only anterior bone flap and the method of correcting anterior & posterior cranium.

Methods: Bicoronal craniosynostosis of 22 patients (conventional method: 8, midcoronal bridge: 14) that underwent distraction osteogenesis using the distractor of the hospital from 2002 to 2016 was investigated. Each subject was divided into two groups according to the surgical technique according to the presence or absence of the midcoronal bridge design. Group 1 was the subjects who underwent fracture treatment on the adhered coronal suture and distracted only in the anterior direction. Group 2 was the subjects had completed distraction using a distractor with designed midcoronal bridge after 2012.

Results: Mean cranial index difference in both groups was 15.44 ± 1.6 in Group 1 and 4.20 ± 2.3 in Group 2. Both groups changed from hyperbrachycephalic head shape to mesocephalic shape, and the degree of change was larger in Group 1, that was statistically significant. (p=0.027)

The change in CVAI pre-and post-operation was 1.41 ± 1.75 in Group 1 and 1.22 ± 1.94 in Group 2, which was larger in Group 1. That is, asymmetry was corrected more in Group 1, but it was statistically insignificant. (P=0.223)

The amount of change of head circumferences before and after surgery was 33.77 ± 23.49 mm in Group 1 and 27.74 ± 22.01 mm in Group 2, which was larger than Group 1, but statistically insignificant.

The fronto-orbital convexity angle was measured and compared for an aesthetic evaluation of forehead contour. This index decreased from 114.21 ± 10.06 degrees to 103.69 ± 11.59 after operation in Group 1. It decreased from 115.71 ± 7.48 to 106.40 ± 7.28 by operation in Group 2. Angle variation was larger in Group 1 since mean Fronto-orbital **convexity angle difference was** 10.51±7.96 in **Group 1 and** 9.31±4.75 in Group 2, but it was statistically insignificant. (p=0.664)

Compared to the developmental indexes in normal population in the mental developmental index, the values within normal limits (± 1 SD, 85 to 114) decreased from 75.00% (n = 9) to 66.67% (n = 8), but increased in the psychomotor developmental index, 58.33% (n = 7) to 75.00 % (n = 9)

Conclusion: The effect of shape correction was maximized by designing a midcoronal bridge in patients with craniosynostosis in both coronal sutures, distracting in the anterior and posterior direction by mobilizing more cranial area than the conventional cranial vault remodeling method. Cranial index and cranial vault asymmetry index were better at anterior and posterior distraction than anterior distraction alone, and head circumference and intracranial volume were better in patients who had distraction to anterior and posterior direction. However, the neurodevelopment state decreases after surgery, so further investigation is necessary.

Barriers to Body Contour Surgery in Post-Bariatric Patients: Is Cost the Only Factor?

Presenter: Kailash Kapadia, MD
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Purpose: Massive weight loss after bariatric surgery has led to a growing population of post-bariatric patients with redundant skin resulting in physical and psychological symptoms. Although there is a desire for body contour surgery (BCS), the rate in the post-bariatric population remains low. We aim to identify major barriers preventing post-bariatric patients from receiving BCS through a review of the literature.

Methods: A literature review of PubMed using terms related to 'bariatric surgery' and 'body contour surgery' was conducted. Articles in English which discussed barriers to BCS in post-bariatric patients in the last five years (2014 – 2018) were included.

Results: Forty articles were analyzed. Barriers to BCS in post-bariatric patients was a measured outcome in 5 studies of which only 1 was performed in the US. Cost (i.e. cost to patient, insurance coverage, or surgeon reimbursement) was the major barrier cited in 50% of articles. Forty percent addressed patient-related factors: 10 discussed medical comorbidities, nutritional status, and prior surgical complications while 8 discussed psychological well-being, depressive symptoms, and body image. Sixty-five percent addressed health care system-related factors: 11 discussed the need for patient education, 10 discussed the lack of a referral pathway, and 17 discussed the need for further patient outcomes analysis. Although 60% of studies were conducted outside of the US where BCS may be covered by public insurance, there remain low rates of post-bariatric patients receiving BCS. This alludes to other factors such as societal or cultural perceptions about the need for BCS.

Fifteen articles highlighted improvements in QOL and 4 demonstrated health benefits in long-term weight loss maintenance. Recommendations to reducing barriers consisted of 9 articles proposing standardized pre-BCS surgical evaluation, 24 suggesting quantifying outcomes throughout the bariatric surgical pathway, and 12 recommending a referral pathway to improve access to plastic surgeons. Four publications specifically focused on standardizing the pre-BCS surgical evaluation and 5 studies used the BODY-Q as a way to quantify patient outcomes. Two publications from United Kingdom provided guidelines for development of a referral pathway but none was available specific to the US.

Conclusion: While cost and lack of insurance coverage may be the predominant barrier, there are other variables that are key critical factors. The literature suggests that while there are advancements in collecting patient-reported outcome measures in this population, further studies are needed to standardize the pre-BCS evaluation and improve access to BCS through patient education and referral pathways guidelines.

Initial Experience Using Closed Incision Negative Pressure Therapy Following Nipple-Areola Complex Reconstruction

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Purpose: Nipple-areola complex (NAC) reconstruction, including NAC sharing (ie, NAC grafting), is generally performed as the last stage of breast reconstruction. However, immediate nipple grafting has been reserved for select patients, and surgeons have also historically been reluctant to graft the nipple due to donor site morbidity and graft failure resulting in wound breakdown and breast implant loss.[1] Previous studies have reported favorable clinical results when using closed incision negative pressure therapy (ciNPT) following breast reconstruction;[2;3] however, none of these previous studies have focused on immediate NAC reconstruction with implant-based breast reconstruction. The purpose of this study is to describe our initial experience using ciNPT to help bolster appositional forces at the closed incisions following NAC grafting.

Methods: Eight patients with a median age of 49 years (range: 29-68) underwent a bilateral (n=7) or unilateral mastectomy (n=1) followed by immediate implant-based breast reconstruction between April 2018 and January 2019 at a facility in southern Florida. Four of the 8 patients underwent pre-pectoral direct-to-implant (DTI) breast

reconstruction surgeries, whereas 3 patients underwent submuscular DTI reconstruction - one patient had a submuscular tissue expander. Two patients were undergoing adjuvant chemotherapy at the time of surgery, and mastopexy was performed on the contralateral breast of one other patient to achieve better symmetry. Immediate NAC reconstruction in these 8 cases was comprised of a full thickness skin graft (FTSG) from NAC sharing. Briefly, an FTSG from the NAC was harvested from the contralateral breast of the patient undergoing mastopexy (n=1), while the remaining grafts were taken from an independent prophylactic mastectomy specimen. Skin from the recipient site was de-epithelialized before placing the defatted graft onto the reconstructed breast mound and suturing into place. The donor site from the mastopexy NAC (n=1) was also closed with sutures. Closed incision NPT was then applied over the closed recipient-site NAC incisions and the mastopexy donor site at -125 mmHg for 5-7 days.

Results: In 6 of the 8 cases, the reconstructed breast healed without complication or loss of the implant, although 1 case experienced delayed healing. The breast implant was lost in 1 case due to an infection and in another due to a hematoma and mastectomy flap necrosis. In 7 of the 8 cases, including the patient with a hematoma, there was a complete take of the NAC graft. There was an approximately 60% take of the recipient NAC graft for the patient that experienced a post-procedural infection. The 1 donor-site NAC also healed without complication.

Conclusions: Although further studies are needed, the results suggest that ciNPT may bolster appositional forces at the closed incisions following NAC grafting, thereby helping to manage NAC reconstructions following breast reconstruction surgery in cancer patients. This may allow for more frequent immediate NAC reconstructions and help to avoid subsequent staged surgeries.

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A Retrospective Analysis of Complex Abdominal Wall Reconstruction Using Repriza: A Novel Acellular Dermal Matrix

Presenter: Walter J. Joseph, III., MD

Co-Authors: Elizabeth M Kenny, BS, Aaron Foglio, BS, Francesco M Egro, MBChB, MSc, MRCS, Ernest K Manders, MD, Brian S. Zuckerbraun, MD, FACS
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PURPOSE: Large abdominal wall hernias remain a challenging problem involving patients with significant comorbidities and surgical treatments that are fraught with complications. Despite the advances in complex abdominal wall reconstruction (CAWR), the current synthetic and biologic meshes remain unsatisfactory. Recently, a novel acellular dermal matrix (ADM) called Repriza (Promethean LifeSciences, Inc.) was introduced, and this study sought to determine its safety, efficacy, and complication profile when utilized for CAWR.

METHODS: An IRB-approved retrospective cohort study was performed at the University of Pittsburgh between 2012 and 2017 reviewing patients undergoing CAWR using Repriza ADM inserted using underlay and bridging techniques exclusively. Patient demographics, co-morbidities, operative and post-operative details were collected. Multivariable logistic regression was utilized to predict hernia recurrence and other adverse clinical outcomes.

RESULTS: A total of 47 patients underwent CAWR with Repriza ADM. The majority of patients were females (70.2% female vs 29.8% male) with a mean age of 58±12 years. The significant pre-morbid state of our cohort was highlighted by a BMI of 32±7 and a high percentage of patients scoring ASA > 2 (70.2%) with significant cardiac (72.3%), respiratory (55.3%), diabetic (36.2%), and smoking histories (27.7%). The majority of patients had prior hernia repair (89.4%), with 34.0% having prior reinforcement of an abdominal wall defect. The majority of patient cases were designated as clean (76.6%) with only 12.8% needing enterotomy (clean-contaminated). Postoperative complications included seroma (12.8%), superficial wound infection (12.8%), dehiscence (12.8%), and DVT/PE (6.4%). Lastly, the hernia recurrence through Repriza was 10.6% and de novo hernia recurrence was 10.6%.

CONCLUSIONS: Repriza is a novel, safe and effective alternative for hernia repair and complex abdominal wall reconstruction, demonstrated by its lower hernia recurrence rate and comparable complication profile compared to other biologic mesh products.

Patient-Reported Quality of Life Outcomes after Breast Reduction

Presenter: Editt Nikoyan Taslakian, MS

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Purpose:
Women with macromastia often present with impaired quality of life due to chronic pain and reduced self-esteem. While many studies have assessed clinical and surgical outcomes of reduction mammaplasty, few have collected follow up information regarding psychosocial and functional outcomes from the patient perspective. Even fewer have explored the relationship between macromastia and sexual well-being, as well as changes after reduction.[1] This study examines patient-reported outcomes and quality of life following reduction mammoplasty at a single institution.

Methods: Female adult patients who underwent reduction mammoplasty from 2014 to 2018 at a single institution were recruited for this study. Patients agreed to participate in a telephone interview consisting of 22 questions adapted from the BREAST-Q Reduction Module Postoperative Version regarding psychosocial well-being, sexual well-being, and satisfaction with outcome. A retrospective chart review was conducted to collect demographic information, body mass index (BMI), preoperative breast size, breast reduction technique, and complications. A total of 50 patients agreed to participate in the telephone interview. This study was approved by our institutional review board.

Results: The mean age was 52 years (20-79) and mean BMI was 31.5 kg/m2 (24.8-44.4). Follow up time averaged 17 months (1.4-49). Pre-operative bra cup size was D or larger and 84% had ≥ grade 2 ptosis. Most cases (84%) were performed using the inferior pedicle technique. The mean amount of breast tissue removed was 682 grams (188-1710). The reported BREAST-Q scores were as follows: Satisfaction with Outcome 93, Psychosocial Well-Being 86, and Sexual Well-Being 68. Regarding specific outcomes, 96% of patients agreed that having surgery was the right decision for them, and 92% said they would encourage other women in their situation to have breast reduction. Patients who reported lower scores on satisfaction with outcomes commented on excessive scar tissue, residual pain, or wanting smaller-sized breasts.

Conclusion: Reduction mammoplasty for symptomatic macromastia results in improved psychosocial well-being and is associated with an overall high satisfaction rating by patients. However, the sexual well-being rating (68) fell within the reported normative preoperative score for women with macromastia.[2] Further prospective studies are necessary to elucidate the role of reduction mammoplasty in a patient's quality of life, specifically sexual well-being,[1] and to optimize meeting patient expectations and goals for the procedure.

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Benefits Beyond Salary: Reviewing Fringe Benefits in Integrated Plastic and Reconstructive Surgery Programs

Presenter: Laura Kathryn Wegener, BS
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BACKGROUND: Integrated Plastic and Reconstructive Surgery is one of the most competitive matches in the National Resident Matching Program (NRMP). Candidates often apply to every program across the country hoping to obtain a spot. A successful match involves many factors. Survey studies of successful candidates have sited location, resident satisfaction, preparation for future position and work/life balance as important non-monetary benefits in selecting a residency[1]. Each year there are more opportunities in the integrated match[2]. Standardization of residency program case and curriculum requirements from the Accreditation Council for Graduate Medical Education (ACGME) together with educational and research resources from the plastic surgery education network have streamlined educational experiences. The competition amongst applicants and among programs recruiting the most desirable applicants is separated by only a few nuances in program philosophy, location, and clinical/research opportunities. One factor that has not been examined previously is the difference in the benefits offered by programs to their residents. These benefits could represent an additional factor that programs use for recruitment and applicants use to narrow their rank lists.

METHODS: Residency program coordinators were contacted via phone and/or email and asked questions regarding their program's benefits.

PURPOSE: The authors of this study examined the fringe benefits offered by integrated plastic surgery programs using data from each program on the following benefits: PGY-1 salary, book/education fund, loupe stipend, food stipend, free parking and conference funding.

RESULTS: Forty-five of the 79 programs responded (57%). For the remaining 34 programs, we obtained information regarding salary, food stipend, parking and conference funding for 16 programs from their website, resulting in an adequate amount of data to analyze for 64 of the 79 programs (81%). The majority offers their residents conference funding (91%) and food stipends (81%), while fewer have separate non-discretionary education funds (61%), loupe stipends (56%), and free parking (53%). Even fewer programs (11%) cover United States Medical Licensing Examination (USMLE) Step 3 costs.

CONCLUSIONS: We determined that while some fringe benefits are commonly offered, there is a wide range of variability with respect to those benefits. However, this variability is independent of geographic location, status as an academic center, and program reputation. We found that there is a geographic correlation with regards to resident salary; salary is related to cost-of-living in the city or state where the program is located. Of the programs that also have independent residents, there is no significant difference in benefits offered than programs who do not have independent tracks.

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A Bibliometric Analysis of Research Productivity during Residency for 125 Hand Surgery Fellows

Presenter: Nicholas Siegel, BS
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Purpose: Research output is one element of a multifactorial process that fellowships consider when evaluating applicants. Hand fellowships present a unique circumstance in which applicants from various specialties – plastic surgery, orthopedic surgery, or general surgery – may apply. This project aims to assess and compare the research output among current hand surgery fellows who received their residency training in plastic surgery versus orthopedic surgery.

Methods: This project was a cross-sectional study of current hand surgery fellows for the 2018-2019 academic year affiliated with ACGME-accredited hand surgery fellowship programs in the United States. Fellows were identified using departmental websites, and their bibliometric profiles were found on SCOPUS. The study variables collected were bibliometric (total number of publications, total number of citations, total number of first-author publications, maximum number of citations for a single work, h-index) and demographic (gender, training background). Descriptive analyses were performed as well as logistic regressions.

Results: A total of 125/170 (74%) hand surgery fellows were identified across 83 programs. 19 fellows (15%) attend programs that are ACGME accredited in plastic surgery, 96 in orthopedic surgery (77%), 3 in combined plastic and orthopedic surgery (3%), and 7 in general surgery (5%). 35 fellows (28%) received their residency training in plastic surgery, 85 in orthopedic surgery (68%), and 5 in general surgery (4%). Fellows published a total of 436 peer-reviewed publications, which consisted of 307 articles (70%), 54 case reports (12%), and 75 systematic reviews (17%). The median h-index was 2 (1-3) for fellows with plastic surgery residency training and 1 (0-2) for fellows with orthopedic surgery residency training ($p = 0.003$). Bibliometric measures of total number of publications ($p = 0.01$), total citations ($p = 0.015$), and maximum citations for a single work ($p = 0.02$) were significantly higher among fellows with a plastic surgery background than those with an orthopedic surgery background. Total publications ($p = 0.004$), total citations ($p = 0.016$), max citations ($p = 0.03$), and h-index ($p = 0.002$) remained significant when controlling for gender and residency affiliation (academic vs community vs private). No difference in research productivity was observed across fellows stratified by their fellowship ACGME accreditation.

Conclusion:

The majority of current hand fellows attended orthopedic residencies. However, fellows from plastic surgery residencies have higher research productivity than their orthopedic surgery counterparts.

Apixaban Associated Post-Operative Hematomas Following Immediate Breast Reconstruction

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Introduction: Novel oral anticoagulants (NOACs), like apixaban, are becoming increasingly popular in medical practice; however, their use complicates procedural planning. Currently, there are published recommendations regarding cessation of these agents for elective surgeries based on the half-life of each medication, as well as restarting them post-operatively. Yet, various patient factors including the reason for anti-coagulation, procedure type and risk of bleeding must be considered when deciding on timing. We hypothesized that despite adherence to current recommendations on the cessation and resumption of apixaban peri-operatively, the use of this specific NOAC places patients at a higher risk of hematoma formation compared to those patients not using this form of anticoagulation. This study investigates post-operative hematoma rates after immediate breast reconstruction following mastectomy in patients on apixaban pre-operatively compared to those who are not.

Methods: A query of the electronic medical record was performed to yield all patients that underwent mastectomy followed by immediate reconstruction at our institution between February 2018 and January 2019. Patient charts were reviewed and multiple variables were examined, including any pre-operative anti-coagulation, type, as well as timing of discontinuation prior to surgery. Post-operative hematoma rate for all patients was tabulated. Patients were first stratified into two groups: pre-operative apixaban use and no pre-operative apixaban use. Then, all patients on any type of anti-coagulation or full anti-platelet (AC/AP) were arranged and stratified into two groups: those on apixaban and those on any other therapeutic AC/AP. A Fisher exact test was used for both group comparisons.

Results: A total 112 patients were identified, 2 in the pre-operative apixaban group and 110 in the no apixaban group. Of the patients on apixaban pre-operatively, 100% developed post-operative hematomas requiring return to the operating room for management. Of those not on apixaban, 9 developed post-operative hematomas (8.2%), 7 of which required operative management. When those on apixaban pre-operatively were compared to those not, there was a statistically significant difference in the rate of hematoma formation (100% apixaban vs. 8.2% no apixaban; p= 0.009). In total, 5 patients were on some form of therapeutic AC/AP: 2 on apixaban, and 3 on other types (1 clopidogrel, 1 rivaroxaban, and 1 therapeutic enoxaparin), all held appropriately per guidelines prior to surgery. When looking only at patients on AC/AP (n=5/112), apixaban use accounted for 100% of hematoma formation in this group (n=2/5). However, when compared, the difference in hematoma rate between these groups was not statistically significant (100% apixaban vs. 0% other; p=0.1).

Conclusion: Despite following all recommendations for management peri-operatively, all patients on pre-operative apixaban developed post-operative

hematomas requiring urgent return to the OR. Current guidelines recommend holding apixaban for 2-3 days preoperatively and restarting after 1-2 days for moderate bleeding risk procedures. The results of this study suggest that the current half-life-based recommendations on peri-operative management of apixaban may not be sufficient, compelling the need for further investigation and case-specific surgical caution.

Endoscopic Endonasal Reconstruction of a Persistent Skull Base Defect with a Vastus Lateralis Free Tissue Transfer

Presenter: Elizabeth M Kenny, BS
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Background: Cerebrospinal fluid (CSF) leak is the most common complication after skull base surgery.1-3 While CSF leak can be managed using primary closure of dura, grafting of autologous tissue or noncellular materials, local or pedicled flaps, or free flaps, the insetting of a vastus lateralis free flap using an endoscopic endonasal approach has not been described. We report a case where an endoscopic endonasal approach was used to inset a vastus lateralis free flap for definitive reconstruction of an anterior skull base with recurrent CSF leakage.

Case Report: A 38-year-old man with a highly extensive craniopharyngioma underwent multiple endoscopic resections. His postoperative course was complicated by craniopharyngioma recurrence, bilateral DVTs, right MCA stroke, fungal meningitis, renal insufficiency, pneumocephalus, and CSF leak recalcitrant to multiple repairs. Given his persistent CSF leak despite repairs with local flap and graft options, a vastus lateralis free flap was chosen for definitive reconstruction. Because of the patient's recent stroke, the free flap reconstruction could not be performed via craniotomy and the decision was made to perform the inset endonasally to gain adequate access to the recipient vessels. At 2-years post-reconstruction using a 6 x 5 cm right-sided vastus lateralis muscle-only free flap, the patient showed 100% flap viability with no CSF leak recurrence.

Conclusion: Careful consideration of defect size and location, as well as history of radiotherapy, surgery, or trauma is key in selecting the optimal anterior skull base reconstruction to prevent or manage CSF leak. Endoscopic endonasal insetting of a free vastus lateralis flap is a viable option for CSF leak management and cranial base reconstruction in select patients.

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Fronto-Orbital Advancement As a Treatment for Recurrent Ventriculoperitoneal Shunt Failure

Presenter:	Alyssa K. Brisbin, BS
Co-Authors:	Lucas A. Dvoracek, MD, Joseph E. Losee, MD, Stephanie Greene, MD, Jesse A. Goldstein, MD
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Purpose: Ventriculoperitoneal shunt (VPS) placement is the most common treatment for hydrocephalus. However, shunt failure often occurs, and can require multiple VPS revisions.[1] No other definitive interventions exist to mitigate this problem and prevent the need for revision. We share our experience with a 6-year-old girl with who underwent 12 VPS revisions before a fronto-orbital advancement cranial vault expansion was performed to improve ventricular compliance and eliminate the need for further VPS revisions.

Methods: A 4-year-old Caucasian girl with a history of Dandy-Walker Malformation, recurrent seizures, and numerous VPS revisions (averaging 3 per year) presented to our clinic for evaluation. The patient was overall normocephalic, with mild retrusion of the supraorbital rims bilaterally, and posterior occipital flattening. A fronto-orbital advancement cranial vault expansion was performed electively to prevent further shunt failure. A standard bicoronal approach to the supraorbital rims was performed, and the bandeau was advanced bilaterally. An EVD was also placed at this time.

Results: Postoperatively, unsuccessful weaning of the EVD mandated the placement of a left occipital VPS. Following this, the patient was discharged without evidence of neurological deficits. At 18 months follow-up, the patient had not required further surgical revisions of her shunt, which is the single longest amount of time she has gone without a revision.

Conclusion: While cranial vault expansion has been used to prevent further shunt failure and manage elevated ICP in pediatric patients, these cases involved either syndromic or iatrogenic craniosynostosis, not patients who were overall normocephalic.[2–4] In patients with a history of recurrent shunt failure, cranial vault expansion could be considered to improve compliance of the ventricles and reduce the need for VPS revision.

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The Role of Psychological Screening Tools in Aesthetic Surgery: What Have We Learnt?

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Introduction: It is accepted that systematic pre-operative psychosocial screening of patients seeking cosmetic surgery is essential for a satisfactory aesthetic outcome.[1-4] However, most aesthetic surgeons seem to receive limited training in the psychological assessment of these patients. To date, a number of psychological screening tools have been developed in order to improve patient selection in aesthetic

surgery however their use in the clinical setting is controversial.[1-4] The aim of this survey was to explore the view of United Kingdom's aesthetic surgeons on the use of psychological screening tools.

Methods: A 14-question survey was sent to BAAPS (British Association of Aesthetic Plastic Surgeons) members using the online platform Survey Monkey. The survey evaluated current practice and views of various screening tools.

Results: A total number of 73 responses were received.

74% of the responders believe that preoperative psychological screening plays an important role towards a favourable postoperative aesthetic outcome; however, only 50% of them regularly assess their patients pre-operatively.

89% stated that their practice is best described as "My clinical experience guides me to identify patients who might have an underlying psychological disorder".

78% are aware of the various available screening tools with most popular the FACE-Q (78%) and the BODY-Q (63%). Interestingly, only 24% of them regularly use a specific tool whereas 76% don't employ a specific tool as they believe that screening tools are time-consuming (52%), difficult to interpret (33%) and complicated (27%).

64% of the participants admit that they haven't received any training on the psychological assessment of aesthetic patients during their career and 75% are not aware of any available relevant training (either online or face-to-face).

70% don't have someone working within their practice who has additional training in psychological counselling but 68% admit that they collaborate with a clinical psychologist or a qualified therapist familiar with this patient group who can take referrals for assessment.

Conclusion: There is a lack of training amongst aesthetic surgeons on the psychological assessment of aesthetic patients. A scientifically sound , clinically significant but at the same time simple instrument is needed to properly assess cosmetic patients in order to identify those with psychological issues, inappropriate motivations, or unrealistic expectations who might be either unsuitable for surgery or at high risk for adverse psychosocial outcome post-operatively and who would, therefore, benefit from further psychological consultation.

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Pure Fat Grafting for Breast Reconstruction: An Alternative Autologous Breast Reconstruction

Presenter:	Pathik Aravind, MBBS
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Purpose: Plastic surgeons offer various options for breast reconstruction based on patient preference, underlying disease, and comorbidities. Despite multiple advancement in implant and autologous based breast reconstruction there remains some concerns regarding their use. Of continued concern is lymphoma associated with implant-based reconstruction and donor site morbidity with flap-based reconstruction. Within this context, an alternative form of breast reconstruction arose, which includes tissue expansion with tissue expander and subsequent fat grafting without the use of implant or flap. We sought to evaluate the technique of pure fat grafting for breast reconstruction and assess complications and quality of life outcomes.

Methods: We retrospectively reviewed our prospective database of breast cancer patients who underwent breast reconstruction at our institution. Patients who underwent pure fat grafting were identified. All patients underwent internal expansion with traditional saline expanders followed by reconstruction by pure fat grafting. Demographic information, complications, operative details, and BREAST-Q scores were abstracted from patients' records.

Experience: From 2009-2015, 10 patients underwent pure fat grafting for breast reconstruction at our institution. 4 patients underwent unilateral reconstruction and 6 underwent bilateral. Patients were followed-up to a minimum of 12 months.

BREAST-Qs were administered at 4 different time points – pre-operatively, 6 weeks after tissue expander insertion, 6 months after final reconstruction and 12 months after final reconstruction.

Results: In the four patients who underwent a unilateral mastectomy followed by pure fat graft a median of 4.5 sessions were required with a total median fat grafting volume of 380 cubic centimeters. In the six patients who underwent bilateral mastectomy followed by pure graft bilaterally, a median of 5.5 session were required. A median total of 974.5 cubic centimeters of fat was grafted in both breasts combined. The median fat graft volume per session was 158 cubic centimeters. Patients experienced no complications related to the fat grafting procedures. In addition, no breast cancer recurrences were noted with a follow-up of at least 12 months. Finally, Breast Q scores at the 12-month follow-up presented only minimal variation from the pre-operative values.

Conclusion: Pure fat grafting presents itself as a safe alternate option for breast reconstruction in the selected patients. It does not seem to be associated with any procedure related complications or major change in patients' quality of life. Therefore, we believe pure fat grafting is a viable option for breast reconstruction, especially in patients who do not desire or have contraindications to implant or flap-based reconstruction.

Novel Treatment of Lymphedema with Adjunct Nanofibrillar Collagen Scaffold Enhances Lymphatic Regeneration in Conjunction with Lymphaticovenous Anastomosis or Vascularized Lymph Node Transfer

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Background: Reported rates of volume reduction following lymphaticovenous anastomosis (LVA) and vascularized lymph node transfer (VLNT) in lymphedema patients typically do not exceed 50-60%. The purpose of this study was to investigate a hypothesized synergistic effect of adding a nanofibrillar collagen scaffold as an additional modality to improve outcomes in lymphedema patients.

Methods: A retrospective cohort study was performed of patients who underwent LVA or VLNT followed by collagen nanofibrillar scaffold (BioBridge; Fibralign Corporation, Union City, CA) implantation. Procedures were performed by a senior

surgeon from 2016 to 2018. Volumetric analysis was performed by comparing the relative amount of excess volume in milliliters (mL) between affected and healthy limbs before and after treatment with BioBridge (BB). Unpaired t-tests were used to compare the mean volume reduction between groups. Results were also compared with matched patients who underwent LVA/VLNT alone.

Results: Five patients underwent LVA/VLNT alone and five patients underwent LVA/VLNT with secondary BB implantation on average 9 months later. All patients were female and matched for demographics and stage of lymphedema. All had failed complex decongestive physiotherapy. The patients had an average age of 48.3 years. Three upper and two lower extremities were treated in each group. Compared to pre-procedure baseline, LVA/VLNT yielded a mean of 35% ± 22.2% edema reduction over an average of 9.2 months in the treated group prior to BB implantation. This was similarly observed in the patients being treated with LVA/VLNT alone (42% ± 17.5% edema reduction). Compared to LVA/VLNT alone, collagen scaffold implantation led to a statistically significant increase in mean edema reduction (81.8% ± 22.2%, p=0.0103) over the total study period (average 13.0 months). The addition of BB enhanced the average rate of edema reduction to 22.1% per month versus 3.6% per month (p=0.025). Postoperative lymphatic mapping with ICG-SPY confirmed the presence of dynamic ICG uptake along the BB.

Conclusions: Nanofobrillar collagen scaffold implantation enhances lymphatic regeneration and augments edema reduction compared to LVA/VLNT alone. A large, randomized study is necessary to prospectively evaluate the impact of this promising adjunct treatment.

Toward an Objective Outcome in Facial Rejuvenation Surgery: An Eyetracking Study

Presenter:	Thanapoom Boonipat, MD
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Purpose: The availability of an objective outcome measure for facial reconstructive surgery remains elusive. Evaluations submitted by external raters or by patient self-report may be influenced by expert knowledge, emotional antecedent, or implicit attitude. These types of subjective ratings, or objective measures such as anthropometric analysis, may unreliably convey how one is perceived by others. We

are interested in observers' instantaneous, reflexive responses to the human face, and how those instinctive responses relate to subjective judgment of a given face.

The goal of modern facelift and associated procedures for facial rejuvenation are to achieve subtle differences that lead to the perception of youth and attractiveness, yet the observer cannot pinpoint what exactly have been done to the patient's face.

We explored the visual markers that lead to differential perception of patients before and after facial rejuvenation surgery (high SMAS facelift, neck lift, fat grafting, brow lifts and blepharoplasty). By examining the early stages of visual processing that occur when an observer encounters images of affected individuals, we intended to investigate how observers perceives faces pre and post-surgical intervention, and how their opinions of the patients changes and correlates with their objective visual processing.

Methods: 40 images were obtained which portrayed pre and post operative photos of patients who underwent high SMAS facelift, fat grafting, and browlifts and blepharoplasty for facial rejuvenation. Photographs were obtained before and after surgical correction (>3 months postop).

Twenty look zone regions were mapped onto each facial image, reflecting aesthetic units of the face.

40 observers examined the images while an infrared eye-tracking camera continuously recorded their eye movements. The observers were then asked to rate the image for character attributes (attractiveness, trustworthiness, sociability, healthy, and capability, 1-7 scale, and estimate the age of the patient).

Factorial ANOVA and student t-test analysis was performed to determine significance of differences between groups.

Outcomes Measured: The total number of eye fixations within different lookzone regions was recorded.

Eye tracking data of pre- and post-operative images were analyzed and compared.

Results:

- The surgical intervention was found to decrease observers' attention to the cervical region but did not change how other areas are perceived significantly.
- The surgical intervention was found to significantly increase the character ratings for all five attributes compared to pre op controls: (sociable 3.53 to

4.18, trustworthy 3.85 to 4.20, attractive 3.34 to 3.3.90, health 4.07 to 4.61, capable 3.91 to 4.43.
- Average age estimate of the photos decreased significantly from 54 years (SD 6) to 48.6 years (SD 5.2), with true average age of 57.4 (7.6).

Conclusion: We provide data illustrating a novel and objective technique to evaluate the effect of reconstructive intervention for facial rejuvenation. Our data indicates that, consistent with the goals of subtle facial rejuvenation, the observers did not detect any areas of difference post operatively, but gain a more favorable impression of the person, and also perceived them as younger by a decade compared to their true age.

The Role of Academic Medicine Programs in Training Plastic Surgeons to Perform Gender Affirming Surgeries

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Background: The purpose of this web-based survey is to elucidate the current perspectives of plastic surgery residency program directors (PDs) on training residents to perform Gender-Affirming Surgery.

Methods: Web-based surveys were distributed to 79 plastic surgery PDs. Basic demographic information and perspectives on the training of gender-affirming surgery in plastic surgery residency were queried.

Results: Of 79 distributed surveys, there were 43 responses (54%). Overall, PDs reported that their trainees were prepared to address plastic surgery-related transgender concerns (67%), and believe plastic surgeons are the most appropriate specialty referral for each type of gender-affirming surgery (98% top/chest, 95% facial: 79% bottom/genital). 93% of PD's noted that transgender surgery is becoming more accepted and/or practiced in their referral area, with 26% reporting a dedicated clinic experience. There was a mixed response on the need for additional fellowship training for gender-affirming surgery. Residents are exposed to significantly more bottom ($p=0.0018$), top ($p=0.0013$), and facial surgeries ($p=0.00005$) if they rotate through a "gender" clinic.

Conclusion: The majority of PD's feel that their residents are currently well-trained in facial, top (chest), and bottom (genital) gender-affirming surgery. While most PDs agree that plastic surgeons are the most important referral for top, bottom, and facial surgeries, there is less consensus over the role of fellowship training. Most PDs reported a desire to devote additional CME time to the topic in the coming years.

Inappropriate Transfer of Burn Patients: A 5-Year Retrospective at a Single Center

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Introduction: The standardized *Burn Center Referral Criteria* published by the American Burn Association (ABA) serve to guide health centers in determining the appropriateness of patient transfer to a specialized center. With inappropriate transfer rates reaching as high as 77%, reliance on the ABA criteria is critical as the decision to transfer a patient can impose significant costs to both the patient and healthcare system. The aim of this study is to evaluate the appropriateness of all burn patient transfers to a single verified burn center over a 5-year period in order to optimize the assessment and care of this patient population.

Methods: A 5-year retrospective cohort study of all burn patients transferred or consulted for transfer to our burn center was conducted between January 2013-January 2017. Following application of inclusion (over the age of 18, transferred or consulted to our center for treatment of a burn injury) and exclusion (pregnant, children, incarcerated, non-burn injury, inpatients not transferred to our center) criteria, 767 cases were analyzed. In addition to basic clinical and demographic information, other outcome measures included reason for transfer, length of transfer time, transfer distance, mode of transfer, percent total body surface area burn (%TBSA), location and depth of burns, mechanism of injury, presence of inhalation injury, length of stay, survival status, and complications. Following data collection, 5-year descriptive trends were analyzed, and the ABA criteria were applied to each patient case in order to evaluate appropriateness of transfer. Patients transferred despite not meeting at least one of the ABA criteria were classified as inappropriately transferred. Geographic analysis was also performed using heat maps. Data were analyzed using t-test or chi squared analysis with $p < 0.05$ denoting significance.

Results: 612 patients (79.79%) were transferred over the 5-year study period with an annual transfer rate ranging from 75-90.2%. Of our transferred patient population, 25 patients (3.23%) were found to be inappropriate transfers to our burn center. Statistical analysis was performed to compare the appropriately transferred patients (N = 742) to the inappropriately transferred cohort. Inappropriately transferred patients were found to significantly differ from those appropriately transferred with a higher percentage of superficial partial thickness burns (76.00%, $p<0.05$) and a lower percentage that required surgery (4.00%, $p<0.05$). There was also a significant difference in anatomical location with inappropriate transfers more likely to have burns of a non-joint line portion of the upper or lower extremity (56.00%, $p<0.001$). There were no observed significant differences in length of transfer time ($p=0.67$), transfer distance ($p=0.87$), %TBSA ($p=0.85$), mechanism of injury ($p=0.63$), length of stay ($p=0.27$), or time of day of transfer ($p=0.14$).

Conclusion: The ABA criteria remain a robust guideline for burn patient referral to tertiary burn centers. Our study provides an increased awareness of the most commonly seen presentation of inappropriately transferred burn patients over a 5-year period. Given the advent of telemedicine, the ability to pinpoint a subset of patients vulnerable to inappropriate transfer has the potential to allow for streamlining of resources to benefit the entire health system.

In Vitro Evaluation of 3D Printed Hydroxyapatite, Beta-Tricalcium Phosphate, and Pore Architecture Gradients on Osteogenesis

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Introduction: 3D printing allows surgeons and engineers to recapitulate the complex structure of native tissue and precisely control the cellular environment [1]. While 3D printing is a rapidly advancing technique that has been widely adopted in medicine, it remains in its infancy [2]. In recent years, 3D printing has been leveraged to create complex graded constructs that can influence the differentiation of mesenchymal stem cells (MSCs) [3]. MSCs are a unique population of cells that harbor the capacity for self-reneal and differentiation into various cell types [4]. Thus, 3D printing and MSCs can be leveraged to improve upon current surgical techniques for tissue defects and aesthetic procedures in the field of plastic surgery.

Objective: The objective of the current work is to evaluate the effects of pore architecture and ceramic (Hydroxyapatite (HA)/β-tricalcium Phosphate (β-TCP)) composition gradients incorporated within 3D printed scaffolds, which recapitulate the native microarchitecture of cortical and trabecular bone, on the osteogenesis of seeded mesenchymal stem cells *in vitro*. We hypothesized that incorporation of HA with a gradient pore architecture would induce a spatially heterogenous MSC osteogenic maturity. Furthermore, the addition of a β-TCP gradient would support osteogenic differentiation in MSCs.

Methods: Allconstructs were printed using a commercially available 3D printing system (3D Bioplotter, EnvisionTec, Gladbeck, Germany) that is capable of printing a wide range of materials between 2-250 °C and 0-9 bar. Poly(ε-caprolactone) (PCL,M_w 50 kDa, Polysciences, Warrington, PA), HA (Sigma-Aldrich, St. Louis, MO), and b-TCP (Sigma-Aldrich, St. Louis, MO) were combined in three different weight ratios, loaded into separate print heads, and heated 160°C. The printing pressure and speed ranged between 2.0 – 4.2 bar and 0.5 – 3.5 mm/s in order to maintain a uniform fiber diameter. MSCs were harvested from the bone marrow of six 6-month-old New Zealand White rabbits and pooled to minimize individual variability. Cells were cultured in general media (DMEM, 10% FBS, PSF) until confluent. 3D printed scaffolds were then dynamically seeded for 24 hrs at a density of 6.0 x 10^5cells/scaffold. Cellattachment, distribution, and differentiation were then evaluated at 3, 14, and 28 days.

Results: MicroCT reconstructions demonstrated constructs had fiber size of 434 ± 51 μmand a uniform distribution of ceramic particles. Confocal microscopy revealed that cells were homogenously distributed in all groups after 24 hrs of dynamic seeding. After 14 days mineral deposits were analyzed by alizarin red for PCL and HA10/PCL constructs. Ongoing analysis is elucidating the effects of ceramic compositional and pore architect gradients on the osteogenic gene expression of seeded MSCs.

Conclusions: In the present work, 3D printing was leveraged to fabricate PCL based constructs with ceramic and porous gradients. Specifically, the effect of incorporating β-TCP gradients with pore gradients on the osteogenic phenotype of seeded stromal mesenchymal stem cells was investigated. This study demonstrated the ability to fabricate HA/β-TCP/PCL composites with tunable properties that can be altered to influence the osteogenic phenotype of MSCs.

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Plastic Surgery Goes Viral

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Background: The use of social media is growing tremendously along with its impact on the practice of plastic surgery, for better or for worse. Patients are increasingly using social media to obtain information about either the procedure or the surgeon

Study Aim: The aims of this study were to examine social media posting regarding plastic surgery and to analyze successful online communication methods of the plastic surgeons with the public.

Materials & Methods: A prospective analysis of three popular, global social media networks was performed, using the key phrases "plastic surgery" and "#plastic_surgery". Three hundred posts related to plastic surgery published on Instagram, YouTube and Facebook in November 2017 were assessed by the following parameters: author identity, subject, “social media currency” (likes, shares, comments, and views), and if special effects (videos, photos, etc.) or viral subjects such as reality stars or shaming were utilized. Results were compared to the results of another study which analyzed the use of those social media networks for breast cancer.

Results: Sixty-three percent of the posts on Instagram originated with plastic surgeons, compared to 18% on Facebook and only 13% on YouTube ($p<0.01$); together, the plastic surgeons’ posts comprise 31% of the total posts, while 49% of posts published by commercial companies ($p<0.01$). Most of the posts on Instagram were self-promotional (83%), in comparison to Facebook (29%) or YouTube (6%); $p<0.01$. YouTube posts are more personal in nature compared to Instagram and Facebook [39%, 7%, 9% respectively ($p<0.01$)]. Educational content in the posts accounts for only 16% of them, $p<0.01$.

Shaming is seen in 21% of the posts, especially in Facebook (39%), and mainly related to famous public figures (25%); $p<0.05$. Celebrity endorsed posts received more attention in every aspect of social media currency (likes, comments, shares, and views).

The use of images of women attracts attention and is widely used in social media posts of plastic surgery (68%). Posts that chose to include videos (22%) are generously rewarded. Online shaming also attracts attention, mostly found in Facebook (39%), and mainly of a public figure (25%).

Social use for plastic surgery in general was inherently different from the way it was utilized for breast cancer; mostly used by patients and for the patients: with less involvement of commercial companies ($p<0.05$), more positive posts and more personal stories ($p<0.05$).

Conclusion: social media have become an important tool for self-promotion, and a means to providing better customer service. This trend applies to the plastic surgeon as well. The study's main insights were to use Instagram, personal stories, educational post, videos and other unique inputs, and involve celebrities in the posts. The comparison of social media use in other close surgical fields, such as breast cancer surgery, may propose more strategies to educate the patients. In general, it would be wise to invest and understand these communication platforms, as they have become the path to dominate the field.

Anatomic Variability of the Anterolateral Thigh Flap: A Computed Tomography Angiography Study

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Purpose: The anterolateral thigh (ALT) flap is a versatile and commonly used flap with minimal donor site morbidity. Significant variations of its perforators' origin, location, and course have been described.This radiographic study further characterizes its cutaneous perforator anatomy.

Methods: The lower extremity CT angiography studies of patients undergoing ALT flap reconstructions were reviewed and information on ALT cutaneous perforator location, origin, and course was collected.

Results: Fifty-nine lateral circumflex femoral systems in 31 patients were included. Average patient age was 38.8 ± 15.9 years with mean BMI 27.2 ± 5.7. Most patients were male (22, 71.0 %). The lateral circumflex femoral artery (LCFA) most commonly originated from the profunda femoris artery (PFA; 87.5%), followed by the distal common femoral artery (8.9%). On average, there was 1.66 ± 0.69 perforators visualized per study. Perforators originated from the descending branch of the LCFA in 90.6% of studies. Other perforator origins included the PFA (4.2%), and the transverse (3.1%) and ascending (3.1%) branches of the LCFA. The average distance from the origin of the DLFCA to the point at which the perforator exits into the

subcutaneous fat is 12.6 ± 4.9 cm. Approximately 27.8% of perforators were <1mm in caliber. Average caliber of the remaining perforators measured 1.2 ± 0.4 mm. Mean distance from the most proximal perforator to the anterior superior iliac spine was 18.9 ± 4.1 cm. Perforators exhibited one of three courses: musculocutaneous (46.9%), septocutaneous (34.4%), or septomyocutaneous (18.8%). The majority of musculocutaneous (57.1%) and septomyocutaneous (84.6%) perforators were unilateral. In such cases, if sparing muscle was preferred, the preoperative CTA aided in donor thigh selection. The average intramuscular course within the vastus lateralis muscle of the musculocutanoues perforators was 5.3 ± 2.6 cm, with one perforator each traversing the rectus femoris and tensor fascia lataa muscles.

Conclusions: ALT flap cutaneous perforator anatomy can vary considerably. Using CTA, we report on rates of septocutaneous, myocutaneous, and septomyocutaneous perforators and underscore its utility in perforator selection.

Relationship between Plastic Surgery Procedure Incidence and Social Media Popularity

Presenter: Chloe Krasnoff, BS
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Relationship Between Plastic Surgery Procedure Incidence and Instagram Hashtag Usage

Background: Instagram has become a powerful tool for plastic surgeons for education, patient engagement, and self-promotion purposes. However, few academic publications have addressed Instagram or evaluated how it is currently being utilized regarding plastic surgery-related topics.

Objectives: Our goal was to analyze the social media engagement and popularity of the most common cosmetic plastic surgery procedures based on hashtag usage by answering the following questions: 1) what specific hashtags are being used; 2) how many posts are associated with each hashtag; and 3) how long is each hashtag?

Methods: Our study analyzed Instagram plastic surgery-related hashtags for the 25 most common plastic surgery procedures based on data from the 2017 American Society of Plastic Surgery (ASPS) Plastic Surgery Statistics Reports. For each procedure, Instagram was queried for the associated hashtag with the most user engagement as measured by number of posts.

Results: A total of 25 hashtags consisting of 11,353,914 posts were sampled. Amongst the most popular hashtags, there was a trend toward abbreviations and colloquial rather than medical terminology (e.g. #tummytuck vs #abdominoplasty, #radiesse vs #calciumhydroxylapatite). The median hashtag had 225,591 associated posts (range 2,750-4,208,970) and 12-character length (range 3-20). There was a strong positive correlation between hashtag posts and plastic surgery procedure incidence ($r = 0.926$) and a weak negative correlation between hashtag posts and hashtag length ($r = -0.417$).

Conclusions: The most common cosmetic plastic surgery procedures have a sizable presence on Instagram, each with thousands of posts associated with dozens of hashtags. Plastic surgeons utilizing Instagram should be selective in choosing which hashtags to use to reach the largest audience and elicit the most user engagement.

Trends in Academic Misrepresentation of Publications (Ghost Publications) in Plastic Surgery Residency Applications: A 3 Year Study

Presenter: Nelson A. Rodriguez-Unda, MD

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Introduction: Plastic surgery is an attractive specialty among medical students. Program directors and faculties of residency training programs have the luxury of selecting their trainees from the "cream of the crop" from United States medical schools. Using data from the National Resident Matching Program (NRMP), successful applicants to Plastic surgery tend to have above average USMLE steps 1 and 2 scores. More of the applicants are members of AOA and also have significant research experience. Extracurricular activities and services to the community are often impressive. Because of the steep competition for PGY-1 integrated program positions, the temptation exists for applicants to falsify parts of their applications, particularly those parts that are difficult to verify

Methods: A retrospective analysis of the Integrated Plastic Surgery applications from the years (2011-2014) was done. Demographic data was collected and stored in an encrypted-access database, including AAMC application, publications, number and type of research articles, first or second authorship. Two reviewers (NRU, NW) manually and independently hand-searched for each of the articles in the following databases (Medline, Scopus, Clinical trials, Google scholar) if the article could not be identified primarily a second filter with the assistance of a specialized Medical

Librarian was requested. A ghost article was defined as: the inability of finding the listed author in the authorship list of the claimed manuscript/abstract/chapter/other or the inability to find the submitted article. Misrepresentation was defined as the change in authorship order i.e. claiming to be first author when the author is third. For statistical continuous variables a 2-sided at the *alpha=0.05* significance level and *2-sided 95%* confidence interval will be used. Categorical variables were summarized by counts and by percentages of subjects in corresponding categories. In order to take into account repeated measures from the same applicant (e.g. more than one ghost article), data was analyzed with the use of generalized estimating equations (GEE), a multivariate analogue of linear regression for multiple publications. Analyses were carried out with the use of SAS software, version 9.4.

Results: All **392** applications from the consecutive years 2011 to 2014 were included, a total of **150** (2011-12), **123** (2012-13) and **119** (2013-14) applications respectively. The number of manually reviewed records was **2122**, their distribution consisted mostly of: Peer Reviewed journal Articles/abstracts 1187 [55.94%], followed by Peer reviewed online publication 822 [38.74%], Peer reviewed book chapter [2.92%] and lately Peer reviewed Journal Articles/Abstracts other than published [2.40%].

Academic dishonesty (AD) was found in 239 articles out of 2122 which constitutes [11.26%] of the pool, misrepresentation was found in 20 articles [0.94%]

The overall rate of AD at our institution during those 3 years was found in 134 applications [34.18%] and followed by misrepresentation in 5 cases [1.28%].

Using generalized estimating equations analysis associations were found for non-first author status and non-peer reviewed manuscript/abstract type, ***p-values*** are ***0.0003*** and <***0.0001*** separately

Conclusion: Academic dishonesty is present in Plastic Surgery applications, it is similar through the years, and negative predictive factors for ghost publications are first authorship and traditional peer-reviewed manuscript abstract

A Report on the Representation of Women in Academic Plastic Surgery Leadership

Presenter:	Wendy Chen, MD
Co-Authors:	Marissa E Baron, MPH, Debra A Bourne, MD, Justine S Kim, MD, Kia M Washington, MD, Carolyn De La Cruz, MD
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Purpose: 2017 marked the first-year women comprised a majority of United States medical school matriculants. While more women are pursuing surgical training, within plastic surgery, there is a steady attrition of women advancing in academics and leadership. We aim to report the current status of women in academic plastic surgery, from trainees to chairwomen and national leadership positions.

Methods: ERAS,SF match, NRMP, AAMC, ACAPS, PSEN, and professional websites for journals and national societies were accessed or contacted for demographic information for the last decade.

Results: At the trainee level, in the integrated applicant pathway, the number of female applicants has remained relatively stable, at around 30%, but the proportion of female residents has increased, from 30% to 40%. In the independent pathway, the proportion of female applicants and residents has remained relatively stable, with three men to every woman.

At the faculty level, from 2006 to 2016, there was an increase in female faculty members from 14.6% to 22.0%, an increase of <1% per year. Twelve percent of program directors are currently female, and 8.7% of department heads.

Nationally, major professional societies and administrative boards were evaluated, including ASPS, ABPS, and the residency accreditation committee. For all committees, the proportion of female members ranged from 19% to 55%, with an average of 27.6%. For committee leaders, the proportion of women ranged from 0% to 50%, with an average of 21.5%. Presidents of these societies were historically led by men, with only six having a history of female presidents.

Major journals were evaluated for composition of editorial boards. No journals had a female Editor-in-Chief. The proportion of female editorial board members ranged from 1% to 33%, with an average of 15.3%.

Conclusions: Recent literature has shown patients of female physicians to have better outcomes, and even a preference of female patients for female plastic surgeons. However, when it comes to academic leadership, women lag behind. As with other women in surgery, women in plastic surgery share a cumulative career disadvantage (personal, networking, clinical, academic, etc). Upward mobility is a challenge, as is recruitment and retention.

Our study shows a leak in the pipeline at all levels, from trainees to faculty, to leadership on the national stage. This report serves as a starting point for investigating reasons for this attrition of women in plastic surgery leadership.

Single-Cell RNA-Seq of Cultured Human Adipose-1 Derived Mesenchymal Stem Cells

Presenter: Yunzhu Li, MD
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Investigation into the heterogeneity of ADSCs using single cell RNA sequencing

Background: Adipose-derived mesenchymal stem cells (ADSCs) show considerable promise for clinical applications in regenerative medicine[1,2]. Cellular heterogeneity is a general feature of biological tissues and exists even within seemingly 'homogeneous' stem cell populations, which are influenced by extrinsic microenvironmental factors or intrinsic factors[3]. However, no study to date has dissected the heterogeneity of cultured ADSCs in a systematic manner. The lack of a thorough understanding of the cellular heterogeneity of ADSCs has hampered the development of an efficient and reproducible clinical application. The single-cell RNA-seq has shown itself to be a powerful tool to comprehensively dissect cellular heterogeneity in an unbiased manner with no need for any prior knowledge of the cell population[3].

Method: We performed a large-scale single-cell transcriptomic sequencing of 24,370 cultured ADSCs.

Results: We found that the subpopulations identified by clustering generally correspond to cells inferred to be at the same cell cycle phase: 91.6% in SubP1 were in the G1 phase; 84.7% in SubP3 were also in the G1 phase; 68.8% in SubP2 were at the S phase; 99.6% in SubP4 were identified as G2/M phase cells; and 59.1% in SubP5 were identified as S phase cells. Cells expressing characteristic genes of the same cell cycle phase tended to be clustered together, as exemplified by the expression intensity distribution of the S phase marker genes (*PCNA*, *MCM5*), G2/M phase marker genes (*CCNF*, *CENPF*), which all have peak expression at the specific phases based on the database Cyclebase21. These results suggest that cell cycle represents the dominant source of transcriptional heterogeneity in cultured ADSCs, and the hidden heterogeneity may be obscured.

Conclusion: We provided a high-quality dataset, which would be a valuable resource for dissecting the intrapopulation heterogeneity as well as interrogating lineage priming patterns for any interested lineages at single-cell resolution.

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Avoiding Dynamic Deformity in Subpectoral Breast Augmentation

Presenter: Oscar A. Zimman, MD, PhD, FACS
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Among the objections to subpectoral implantation of breast implants are the deformities caused by muscular contraction. Basically, the anatomy of the gland base is not coincident with the subpectoral space. Ever more plastic surgeons are considering avoiding this space in cases of breast reconstruction.

We are confronted with five different deformities, alone or combined, of implants:

- Riding-up when the patient contracts the muscle
- Flattening of the implant at the time of muscle contraction
- Notching of the detached border of the pectoralis major
- Bottoming out
- Lateral displacement in supine position

Dempsey and Latham(1) first described subpectoral breast implant placement in 1968. The crucial question is whether it is necessary to leave the lower insertion of the muscle free. The answer is no.

Robles et al.(2) published “A larger subpectoral pocket for breast implants” in 1978, proposing avoiding the full section of the muscle and creating, for the first time, a plinth for the lower pole of the implant. In 2007, Ventura et al.(3) described a submuscular-subfascial plane created for that purpose.

From a different point of view, Tebbetts(4) published, in 2001, the dual-plane technique with a full section of the lower insertion of the pectoralis major muscle and a variable section of the sternal insertions, according to each case, leaving the lower

pole without contention. A full section of the muscle may induce strong adherence to the capsule around the implant, producing the notch at the breast or allowing the bottoming out of the implant.

Taking care of the lower pole of the pocket is very important: for coverage and in order to take control of the pectoralis major muscle.

In some cases of redo surgery or breast reconstruction,ADM may be considered for use at the lower pole. ADM may be tacked to the inferior border of the pectoralis major above and to the Scarpa's fascia or deep fascia below.

The technique is easy to perform: submammary incision, dissection up the lateral edge of the pectoralis major, and then dissecting a submuscular-subfascial pocket without leaving the muscle free, maintaining a muscle-fascia unit. This will create a plinth to hold the implant. This subfascial plane acts as a shelf, giving firmness and stability to the new inframammary fold.

Summary: Managing the lower pole of the pocket in subpectoral implantation and creating an additional support for the implant, in primary and secondary implantation, and in some cases of breast reconstruction, the dynamic deformities are controlled. The key to this technique is not leaving free the inferior edge of the muscle.

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Low Complication Rates Using Closed Incision Negative Pressure Therapy for Panniculectomies: A Single Surgeon, Retrospective, Uncontrolled Case Series

Presenter:	Kailyn Wilcox, MD
Co-Authors:	Ashraf A. Patel, BS, Jasmine Bhinder, MD, Julia A. Reiser, MD, Prashant K. Upadhyaya, MD

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Introduction: Many obese and post-bariatric surgery patients develop a panniculus: redundant abdominal skin and subcutaneous tissue. It may serve as a source of discomfort, lower a patient's self-esteem, and be symptomatic. Panniculectomies are life-changing for such patients, but this procedure has been associated with complication rates as high as 70%.[1,2] Closed-incision negative-pressure therapy (ciNPT) has been shown to support wound healing and lower complication rates, however, there has been little research regarding ciNPT use with abdominal contouring procedures.[3] This study reports a single surgeon's use of ciNPT following panniculectomy and the incidence of complications.

Methods: This retrospective, uncontrolled case series analyzed 91 patients who underwent panniculectomies by a single surgeon from February 2014 – November 2018. PREVENA™ was the ciNPT used in all patients with a goal duration of 10 days. Patient demographics, comorbidities, history of bariatric procedures, hernia repairs, and perioperative data were collected. The duration of ciNPT was recorded and charts were reviewed up to one year postoperatively to determine complication rates. Complications were considered minor if they were managed conservatively and major if they required intervention. Statistical analysis included odds ratios with 95% confidence intervals and p-values.

Results: Mean follow-up was 225.1 days. Incidence of any major complication was 5.5% (n = 5), including major infections (4.4%, n = 4), major dehiscence (2.2%, n = 2), major seroma (4.4%, n = 4), and major hematoma (0%, n = 0). No patients required reoperation. The average duration of ciNPT use was 10.5 ± 2.0 days. Device malfunction occurred in 16 patients (17.6%); they were more likely to experience a complication (Odds Ratio = 3.9, p-value = 0.020). Obesity, diabetes, and active smoking were not found to be associated with complications (Odds Ratio=0.8, 1.0, 0.63 with p-values=0.701, 0.996, 0.709 respectively). Leaving ciNPT in place for longer than 10 days was not associated with infection (Odds Ratio=4.0, p-value 0.067).

Conclusions: High complication rates have been associated with panniculectomies, however, our results show low complication rates can be attained when ciNPT is utilized postoperatively. The lack of finding a significant association of complications in patients with obesity, diabetes, and smoking as well as the lack of infection with more than 10 days of ciNPT is likely because the study is underpowered. Randomized control trials evaluating different types of ciNPT will be useful in helping surgeons decide which ciNPT to use as a means to optimize patient outcomes and minimize

complications. Based on our experience, we suggest the use of PREVENA™ on all panniculectomy patients.

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Hidradenitis Suppurativa: A Comparison of Institutional Experience with the Tracking Outcomes in Plastic Surgery (TOPS) Registry

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Background & Purpose: Hidradenitis Suppurativa (HS) is a highly morbid disease. Surgical treatment is fraught with complications. As a divisional quality improvement initiative, we evaluated our experience in surgical management of HS and compared it to Tracking Outcomes in Plastic Surgery (TOPS) registry. The purpose of this study was two-fold: first, to both critically evaluate our practice compared to our peers nationally to discern best practices for the surgical treatment of HS, and second, to gain insight into whether TOPS truly reflects the experience of practicing board certified plastic surgeons.

Methods: A retrospective chart review of surgically treated HS was performed from January 2004 through January 2016 using ICD-9 code 705.83. Data collected included patient demographics, reconstructive methods, and complication rates. Reconstructive procedures included simple, intermediate, or complex closures, and adjacent soft tissue rearrangement. Overall complication rates were reported as percentages. A

Fisher's Exact test was used to determine associates between reconstruction and complications. These results were compared to TOPS data.

Results: 383 operative sites in 101 individual patients were reviewed. Complication rates were as follows: simple closure 80%, intermediate closure 68.3%, complex closure 59.6%, and adjacent tissue rearrangement 69.5%. Regional complication rates were evaluated and compared against TOPS and is reported as our institute/TOPS: complex closure for the axilla 50%/31.9%, for the inguinal region 25%/38.7%, and for the perineum 50%/56.5%. There was no statistical difference between complication rate and type of reconstruction. Statistical significance was identified between superficial wound dehiscence and adjacent soft tissue rearrangement having the highest occurrence ($p=0.0132$). TOPS data indicated lower complication rates were incurred when wounds were closed with Vacuum Assisted Closure (VAC), split thickness skin grafts (STSG), and muscle flaps.

Discussion and Conclusions: This study demonstrates the complicated nature of the surgical treatment of HS. The inguinal region had the highest overall complication rate (78.6%). Simple closure had the highest complication rate (80%) followed by adjacent soft tissue rearrangement (69.4%). Statistical significance was identified between superficial wound dehiscence and type of reconstruction, specifically for adjacent soft tissue rearrangement. When comparing our institutional data to the TOPS database, we identified modest discrepancies in absolute percentage, but very similar trends in complications between similar closure methods. However, TOPS data demonstrated lower complication rates with VAC, STSG, and muscle flaps. This data evaluation and comparison has driven us to reevaluate our surgical approach to HS. Secondary to the high correlation in outcomes between our experience and that reported in TOPS, it also supports the presumption that TOPS accurately reflects complications experienced by board certified plastic surgeons.

Does Lower Extremity Steal Phenomenon Really Exist? Limb Salvage Rates and Outcomes Using Free Tissue Transfer with End-to-Side Anastomosis for Extreme Limb Salvage in Single Vessel Extremities

Presenter:	Kyle Luvisa, MPH
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Purpose: Free tissue transfer (FTT) is a mainstay of limb salvage for patients with complex lower extremity wounds that would otherwise face amputation. FTT is

especially challenging in patients with only one vessel run-off to the foot because of limited vessel selection and theoretical risk of vascular “steal” whereby lower extremity blood flow is preferentially diverted to the more vascularized flap tissue. We present the flap success and limb salvage rates of FTT in a population of high risk, single vessel run-off patients.

Methods: A retrospective review was performed to identify patients who had a single vessel run off to the foot and FTT between April 2012 and August 2018. Run-off was assessed preoperatively by angiogram for all patients. All free flaps were performed using end to side anastomosis (ETSA) by a single surgeon. Outcomes of interest included post-operative complications, flap success, limb salvage rates, and ambulation data.

Results: Nine free flaps were identified that occurred in patients with single vessel run off to the foot. Patients were on average 62.2 years old with a BMI of 30.0 kg/m^2. Flap success rate was 88.9% (8/9). One patient required preoperative balloon angioplasty. Three of the patients (33.3%) required reoperation for complications. The overall limb salvage rate was 77.8% (7/9). The two patients who required below knee amputations required this procedure due to overwhelming infection of the limb. 77.8% (7/9) of all patients were ambulating without a prosthesis, and 8 (88.9%) total patients were ambulating with or without a prosthetic at an overall mean follow-up time of 1.53 years.

Conclusions: We present acceptable long-term limb salvage rates using FTT in patients with single vessel run off to the foot. Our results also do not show evidence of the vascular “steal” phenomenon, although still an important consideration for the microsurgeon during free flap planning. FTT success and limb salvage is still achievable in the setting of limited arterial blood supply.

Is There a Gap in Providers' Knowledge of the Women's Health and Cancer Rights Act (WHCRA)?

Presenter: Kristen Hardy, BS
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Introduction: The Women’s Health and Cancer Rights Act (WHCRA) ensures all insurance carriers cover post-mastectomy breast reconstruction, yet disparities in breast reconstruction persist. Though the reasons are multifactorial, lack of provider

knowledge regarding insurance coverage and differences in provider understanding of breast reconstruction rights may play a role in worsening disparities. Our objectives were to determine whether there is a need to increase WHCRA education for providers in rural areas, like West Virginia, and to assess providers' knowledge of WHCRA.

Methods: We collected data from health care providers participating in the Annual West Virginia Breast Cancer Conference in 2015, 2016 and 2018 using pre- and post-conference questionnaires designed to measure participants' knowledge of WHCRA following an education course. Each year, a single question was added to the Continuing Medical Education conference questionnaire that assessed if participants understand that WHCRA mandates coverage for all patients receiving post-mastectomy breast reconstruction. In the question, an insured patient asks to be referred to a plastic surgeon pre-mastectomy. Possible answers included excluding patients based on age, lack of insurance coverage for reconstruction, or the patient's disease process. The effectiveness of the course was analyzed by considering the pre- and post-course transitions between correct and incorrect answers. We then calculated an "effectiveness score": the proportion of providers who transitioned to correct post-course, minus those who transitioned from correct to incorrect, or remained incorrect.

Results: In the consecutive years that education was provided (2015, 2016), there was a statistically significant increase in the number of participants who answered correctly following WHCRA education ($p<0.001$). Following a year without education, there was not a statistically significant increase in correct answers following the course. In 2015, the effectiveness score was -13.5, with 61.7% of practitioners answering correctly post-course. In 2016, this score increased to 25.0, with 84.4% answering correctly post-course. Following a year without the lecture, the effectiveness score in 2018 again decreased to -13.0, with only 65.2% of providers answering correctly post-course.

Conclusions: Our study shows that there is a lack of WHCRA knowledge amongst some West Virginia providers. Studies suggest that patients and providers are influenced by financial considerations when considering breast reconstruction, which underscores the need for proper education on available insurance coverage[1] . Our study also suggests that yearly education increases provider awareness and understanding of WHCRA. The differences between 2016 and 2018 suggests that provider education needs to be a continuum. There are well reported disparities in rural and near-metro areas regarding access to breast-reconstruction counseling and education[2]. Our study illustrates that lack of provider knowledge on WHCRA may contribute to these disparities.

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Delayed, Two-Staged Autologous Breast Reconstruction: An Approach to Improving Delayed Reconstructive Outcomes

Presenter:	Ashraf A. Patel, BS
Co-Authors:	Lawrence Z. Cai, MD, Shawn Moshrefi, MD, Ian C. Sando, MD, Gordon K. Lee, MD, Rahim S. Nazerali, MD, MHS
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Background: Delayed breast reconstruction is typically associated with several challenges that are avoided in immediate or delayed-immediate breast reconstruction. Optimizing aesthetics is difficult for these patients, as there is not only a lack of breast volume but also lack of native breast skin.[1] Muscle-Sparing Transverse Rectus Abdominis Muscle or Deep Inferior Epigastric Perforator flaps are commonly used for patients desiring an autologous reconstruction, but the result is an unnatural appearing breast as non-breast skin is used to recreate the breast mound.[2] To improve aesthetics for these patients, we propose a modified delayed-immediate approach, which we term delayed, two-staged autologous breast reconstruction. This study reports the outcomes of five patients undergoing this method of reconstruction in an effort to better outcomes for patients undergoing delayed breast reconstruction.

Methods: A retrospective analysis was performed for all patients undergoing delayed breast reconstruction with prepectoral tissue expander placement over a twelve-year time period (2006 - 2018) at a single tertiary-care institution. Basic demographics, comorbidities, perioperative information, and complications incidence from both the first and second stage surgeries were collected for all patients that met the inclusion criteria. Charts were further reviewed for up to two years following autologous reconstruction to determine if patients experienced reconstruction related complications or if any revisionary procedures were done.

Results: A total of 5 patients (8 breast reconstructions) met inclusion criteria, and three patients had history of chest wall radiation or chemotherapy. Following

prepectoral tissue expander placement, there was one incidence of seroma (12.5%, n = 1), and no other complication occurred. Following autologous reconstruction, recipient site complication occurred in one breast (12.5%, n = 1). This breast experienced dehiscence (12.5%, n = 1) and fat necrosis (12.5%, n = 1). No flap losses or any other complications occurred for our series of patients. One reconstruction (12.5%) underwent breast scar revision. The average duration until the final postoperative follow-up visit was 185.8 days.

Conclusion: Delayed, two-staged autologous breast reconstruction requires an additional short, surgical procedure that results in a life-long improved breast aesthetic and better lower-pole ptosis. Complication rates remain low, which makes this a viable option to improve outcomes for patients seeking delayed autologous reconstruction. Our study utilizes prepectoral expander placement, which we believe will further enhance the quality of patient care.

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The Outcomes of Inhalation Injuries in Limited Cutaneous Burns

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Background: Thermal burn injuries are a major cause of morbidity and mortality, with over 1million burn injuries each year in the United States. Inhalation injury adds a negative effect on burn patients, and inhalation injury even without thermal skin injuries, can be associated with longstanding pulmonary dysfunction. Combined with cutaneous burns injuries, inhalation injury increases the requirements of fluid resuscitation and the incidence of pulmonary complications in the recuperative phase. Many of the consequences of inhalation injury result from an inflammatory response involving mediators following the interaction of irritant substances with

tracheobronchial mucosa and lung parenchyma, which leads to pulmonary edema, possible cast formation, airway reduction or even obstruction, loss of compensatory hypoxic pulmonary vasoconstriction, and ventilation/perfusion mismatch. It has widely been proposed that inhalation injury worsens outcomes, yet no national large-scale study has shown the exact relationship between inhalation injury and burn outcomes. Our study aim was to evaluate inhalation injuries as a risk factor in patients with limited burn injury, defined as ≤ 15% total body surface area (TBSA). Our hypothesis is that inhalation injury is associated with worse burn outcomes, even with limited burn injury.

Methods: A 10-year retrospective review of the American Burn Association Burn Registry from 2002 through 2011. We compared the outcomes of all the burn patients that meet our inclusion criteria of TBSA ≤ 15%. We stratified the patients into two groups: inhalation injury (group 1) vs. non-inhalation injuries (group 2). Demographic characteristics and outcome variables were collected and compared between each group. Outcome measures included in-hospital mortality rate, hospital length of stay, ICU length of stay, and ventilator days. Chi- Squared and t-test analyses were used with significance defined as p>0.05.

Results: A total of 93,781 burn patients meet our inclusion criteria. We had 4,204 patients (4.48% of total) with inhalation injury (group 1) and 89,577 patients (95.52% of total) with no inhalation injury (group 2). Group 1 had an average age of 44.8 years while the average age in group 2 was 31.2 years. There was no statistically significant difference between the two groups in terms of TBSA (3.5% vs 3.58%, p =0.24, t-test) as shown in Table 1. There was a significantly higher ICU length of stay at 8.55 days in group 1 compared to 6.27 in the group 2 (p=0.0001, t-test). There was a significantly higher hospital length of stay at 11.48 days in group 1 compared to 6.27 in the group 2 (p=0.0001, t-test). The ventilator days were also higher in group 1 at 6.07 vs. 0.67 in group 2 (p < 0.0001, t-test). The in-hospital mortality was also significantly higher in group 1 at 8.54% vs group 2 at 1.42% (p=0.0001, χ 2).

Conclusion: Inhalation injuries in limited cutaneous burns was associated with an increased ICU length of stay, in-hospital length of stay, average ventilator days, and in-hospital mortality. The presence of inhalation injury portends worse outcomes and increased need of resources.

Expanding the Indications for Negative-Pressure Therapy in Breast Surgery

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Introduction: Negative-pressure therapy (NPT) has contributed greatly to the optimization and healing of various wounds. Comprehensive applications of this technology in reconstructive and aesthetic breast surgery have not been well-described thus far. In addition to expedited healing of breast wounds from dehiscence and infection, a review of the literature demonstrates more novel existing practices of NPT in improving mastectomy skin flap perfusion[1], breast pocket salvage[2], and temporization in staged oncologic resection[3]. The purpose of this study was to examine personal experiences using negative pressure therapy in these more unconventional applications to demonstrate efficacy and offer an algorithmic approach to its use.

Methods: A review of cases managed by the senior author was performed to include reconstructive and aesthetic breast cases warranting NPT in the post-operative period. Pertinent factors in this case series included indications for its use, technical pearls, duration of therapy, and clinical outcome.

Results: This series can be classified into three categories including peri-prosthetic complication (infection, seroma, hematoma), post-mastectomy skin flap compromise, and staged oncologic resection. NPT in breast mound salvage following peri-prosthetic complication utilized the wound VAC sponge as a space-occupying dressing to maintain the pocket while preserving a clean wound environment. In our experience, from the time of initial washout, implant removal, and VAC placement, NPT maintained for 4 days post-operatively with IV antibiotics resulted in a clean wound. A new prosthetic was replaced at this time without any evidence of adverse sequelae. NPT was used in cases of post-mastectomy skin flap compromise if viability was indeterminate. The VAC was used once more to preserve the breast pocket while concurrently improving vascularity to the skin flaps. In these cases, the wound VAC was left in place for 4 days until the skin could declare. At this time, either definitive debridement or reconstruction was performed without any evidence of adverse sequelae or delayed skin necrosis not amenable to local wound care. NPT was used in cases of staged oncologic resection when the surgical margins were not definitively cleared. In these instances, the wound VAC simulated the excised tissue defect until final pathology returned at which time either further resection or definitive reconstruction was performed without having lost the breast mound.

Conclusion: NPT is a multi-dimensional asset in the setting of breast surgery as it promotes wound optimization and vascularity while able to be conformed to maintain structural integrity of tissues. These qualities should be maximized as we continue to define new applications for its use.

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Antibiotic Beads in the Management of Cardiothoracic Surgical Wounds: A Large, Single-Institution's Experience

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Introduction: Aortic prosthetic graft and cardiac implant infections are infrequent but can have devastating results. The conventional approach to management has required graft explantation with extra-anatomical bypass, long-term antibiotics, or valve replacement. The purpose of this study is to present our experience managing postoperative cardiothoracic surgical wounds using antibiotic impregnated polymethylmethacrylate (PMMA) beads followed by definitive wound closure.

Methods: A review identified patients with surgical wounds after an aortic graft and/or cardiac valve placement presenting between December 2012 and October 2017 at a single institution. Patient demographic information was retrieved along with patients' cardiothoracic surgical history, infectious course, surgical management, and complications.

Results: A total of 11 patients were treated for surgical wound infections; 10 sternal and 1 thoracotomy wound. The average patient age was 63.5 years; 6 males and 5 females. The average time from the initial surgery to infection presentation was 155 days (range 9 – 628 days). All wounds required IV antibiotics, operative exploration with irrigation and debridement of devitalized tissues and placement of antibiotic PMMA beads. Cultures were positive in 9 patients. Only 2 patients were readmitted for a continued infection or surgical complication; 1 patient required a bead exchange

following a hematoma evacuation with subsequent 2 additional hematoma evacuations after definitive wound closure, and 1 patient required a wound washout and sinus tract excision secondary to a mycobacterium avium infection. 2 patients required repair of a graft injury after removal of the antibiotic beads. All patients had successful wound closure with autologous tissues.

Conclusion: Surgical site infections following cardiothoracic surgery may be a sign of a dire prosthetic infection. Our experience has shown that patients may be successfully treated with operative wound washout and the placement of antibiotic beads, without a need for implant or device removal. After infection clearance, autologous tissue flaps allow for definitive wound closure.

Rates and Risk Factors for Loss to Follow up after Gender Affirming Surgery

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Purpose: Failure of post-surgical follow up after gender affirming surgery is an anecdotal challenge. Loss to follow up (LTFU) raises an additional obstacle in evaluating long term surgical, aesthetic, and quality of life outcomes after gender affirming surgery, as well as managing known risks such as capsular contracture and breast implant rupture. There currently is minimal literature investigating chronicity of transgender care pathways. To our knowledge, there are no surgical studies focusing primarily on LTFU in transgender patients. The goal of this study was to assess rates of short term LTFU and potential risk factors at a single institution.

Methods: A single-institution retrospective review from December 2014 to October 2018 was performed to identify transgender patients who underwent gender-affirming surgery. Patient demographics, medical comorbidities, operative information and outcomes, and clinic follow-up schedules were reviewed. Short-term LTFU was defined by missing routine post-operative appointments at the 1) one-month, or 2) three-to-six-month period, without additional later follow up. Pearson Chi-Square, Fisher's Exact Test, ANOVA, and binary logistic regression were used to identify risk factors associated with short term LTFU, with $p<0.05$ considered significant.

Results: 154 operations were performed in 128 patients, 88 male-to-female (MTF) and 40 female-to-male (FTM) or gender non-conforming. Short term LTFU was noted after 81 (52.5%) operations. Of these, the majority (n=74, 91.3%) were LTFU

at the three-six-month postop period. 60 (38.9%) operations were performed in patients who were employed, 52 (33.8%) in unemployed patients, 12 (7.8%) in patients on disability and 12 (7.8%) in students. 125 (81.2%) operations were performed in patients with government public insurance, and 26 (16.9%) operations were performed in patients with commercial insurance. Associated comorbidities included HIV positivity (n=49 operations, 31.8%), anxiety/depression (n=25 operations, 16.2%), and recreational drug use (n=39 operations, 25.3%).

Interestingly, employed patients were more likely to have short term LTFU. In addition, higher rates of short term LTFU were associated with longer operative time (p=0.028), although this was not identified as an independent risk factor on multivariate analysis. Type of surgery, gender identity, ethnicity, age, comorbidities, drug use, complications, and payer type did not affect rates of short term LTFU.

Conclusions: Successful gender affirming surgery has been shown to significantly improve quality of life in the transgender patient population.[1] As this field advances, it is critical to elucidate long term surgical outcomes. Unfortunately, in our experience long term result analysis is hindered by short term loss to follow up. In this study, over half of patients undergoing gender affirming surgery were lost to routine follow up after one month.

Intimate, longitudinal patient-physician relationships are integral to the success of gender affirming reconstructive surgery. This unfortunate dichotomy is likely to burden outcomes. As gender affirming surgery becomes increasingly performed with broader insurance coverage, it becomes ever critical to develop evidenced-based care pathways designed with safety-nets to maintain the patient-physician relationship.

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Grated Costal Cartilage: A Novel Technique for Dorsal Augmentation in Rhinoplasty

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The multiple existing methods for cartilage grafting in rhinoplasty present potential problems such as delayed distortion, visibility, and resorption. Diced cartilage grafting with or without fascial casing minimizes risk of these issues while providing comparable short- and long-term aesthetic and structural results at a low overall complication rate. However, cartilage dicing via surgical blade is often time-consuming and imprecise in creating uniformly sized cartilage pieces.

A novel method for cartilage processing in rhinoplasty is showcased by 36 patient cases over 36 months. To consistently produce homogenously sized cartilage pieces while simultaneously increasing efficiency, a commercial grater was incorporated into a single surgeon's practice beginning in October 2015. Grated cartilage implants were used in lieu of diced cartilage for dorsal augmentation.

Patients ranged in age from 14-61 and underwent primary, revision, or secondary rhinoplasty for both cosmetic and reconstructive goals. Autologous costal cartilage graft was used for all patients. Grated cartilage was introduced to desired areas of the nasal dorsum via three methods: wrapped in Surgicel®, as a Tisseel® construct, or injected directly via syringe.

Short-term results from dorsal augmentation via grated cartilage were satisfactory, and operating room cartilage processing time was <1 minute.

Grated cartilage, as opposed to traditional diced cartilage, allows for more precise grafting given the size of the shavings being fashioned into an implant. In addition, this alternative method offers shortened cartilage preparation time and compatibility with smaller autologous cartilage samples or those calcified due to advanced age. The simple technique utilizes an inexpensive, readily available reusable and sterilizable device rather than disposable surgical blades. Rhinoplasty surgeons ought to consider integrating a cartilage grating approach to cartilage preparation for dorsal rhinoplasty, rather than exclusively relying on the dicing method. Future studies will further elucidate advantages and disadvantages of this novel rhinoplasty technique.

Reconstruction of Oncologic Sternectomy Defects: A Systematic Review

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Introduction: Oncologic resections involving the sternum require some of the most challenging reconstructive efforts by the reconstructive surgeon; nonetheless, studies in the literature are limited. In such complex defects, pre-operative planning becomes paramount to achieve the optimal reconstructive outcomes. The purpose of this systematic review is to assess oncologic sternal reconstruction in literature; analyzing the reconstructive approach, type of flaps and prosthetic materials used, as well as outcomes and complications.

Methods: A systematic review was performed using the guidelines outlined in the Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA). The electronic literature search included Medline/Pubmed, Scopus and Cochrane Databases to identify oncological sternectomy reconstruction articles published to date. Data was extracted to evaluate tumor and defect characteristics, flap and prosthetic material used, and surgical outcomes. Complications evaluated included seromas, hematomas, wound dehiscences, skin or flap necrosis, surgical site infections, and unplanned return to the operating room.

Results: A total of 12 studies met the inclusion criteria, encompassing 522 patients. Most tumors were of primary origin, representing 51% of sternectomies, followed by metastatic tumors (43%). The mean pooled defect size was 135 cm^2. Prosthetic material was used for chest wall stabilization in 84% of the cases. The most common flap used for soft tissue reconstruction was the pectoralis major flap (183; 35%) followed by latissimus dorsi (79; 15%), and rectus abdominis muscle flap (42; 8%). The pooled surgical complications rate was 23.7%, with no differences when analyzed based on tumor type. Most common complications were infection (9.2%), wound dehiscence (3.7%) and seroma (2.1%). Pooled reoperation rate was (7.5%) with only 1% flap failure rate. Thirty days mortality was 1%.

Conclusion: Sternal defects following tumor resections can be successfully reconstructed despite their complex nature. Although reported surgical complications are high, the risk of flap failure is low. Multiple reconstructive options exist in the literature, the majority of which are local pedicled flaps; however, in some cases free flap were also described with high successful rates.

Plastic Surgery Residency Programs on Social Media: What Are the Trends?

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Purpose: According to recent estimates, over 77 % of US citizens have a social media profile. Despite the increase of social media usage by the general public, its use among medical students, residents and graduate medical education (GME) in plastic surgery has not been fully evaluated. Our objective is to determine the use and trends of social media among plastic surgery residency programs in the United States.

Methods: An electronic search was undertaken to identify accredited integrated plastic surgery residency programs on four social media platforms: Instagram, Facebook, Twitter and YouTube. We obtained the numbers of followers, likes, friends, numbers and content of posts. The metrics for each social media platform were calculated. Finally, Doximity residency navigator reports were compared to analyze the correlation of reputation rank with social media metrics.

Results: A total of 57 integrated plastic surgery residency programs were reviewed. Of which, 31 (54%) used at least one platform of social media, the most common being Instagram (41%), followed by Facebook (37%) and Twitter (25%). Only 2 (3.6%) programs used YouTube. Usage of social media continues to rise with 33.3% of programs in 2016, 38.9% in 2017, and 50% at the end of 2018. Independent of the residency program, the social media platform with the most extensive reach was Instagram, with a mean of 846 followers per account, followed by Twitter with a mean of 401 followers per account. A total of 8 programs used all 3 social media platforms with a total mean of 1749 followers (134-4849) per program. Residency programs that ranked in Doximity's first quartile in reputation scores were more likely to have ≥2 social media platforms (72% vs. 60%) and more followers (mean of 1187) than programs with lower ranks (mean of 850).

Conclusion: The use of social media by plastic surgery residency programs has increased over the last 3 years. The majority of residency programs currently use 2 social media platforms, with Instagram and Twitter being the most popular with the greatest outreach and following Programs with higher reputation ranking had more followers. The increase in social media usage among plastic surgery residency programs creates more opportunity to increase communication with the public via these technologies.

Comprehensive Systematic Review of Spontaneous Non-Traumatic Causes of Acute Compartment Syndrome of the Upper Extremity

Presenter: Jeremie D Oliver, BA, BS

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Background: While trauma to the upper extremity is known to cause acute compartment syndrome (ACS), non-traumatic causes of ACS of the upper extremity are rare. ACS of the upper extremity in a non-traumatic setting can lead to adverse results if not recognized early. There are limited reports of spontaneous ACS published in the literature. The aim of this comprehensive systematic review of non-traumatic compartment syndrome of the upper extremity is to increase awareness among plastic and hand surgeons of this acute event and provide an algorithmic approach to management in the acute setting through an illustrative case example.

Method: A comprehensive, systematic literature search was conducted in the Medline/PubMed database using the search terms, "compartment syndrome," "extremity," "spontaneous," "nontraumatic," and "atraumatic" in all combinations, without timeframe limitations. The search strategy adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for systematic review. All confirmed published cases of nontraumatic, spontaneous ACS in the upper extremity in humans with extractable patient data were included. A manual search of each study's references was performed to further identify published studies for inclusion. The extracted data included year of study, authors, journal name, localization of ACS in the upper extremity, suspected underlying etiology of the ACS event, and management strategy employed in each case (ie, fasciotomy vs conservative management). All age groups and sample sizes were included. The search was limited to studies in the English literature. Search query was conducted by two independent authors and verified by the senior author.

Results: The initial search query identified 185 publications. Publications in which the ACS was iatrogenic, due to trauma or revascularization, or located beyond the upper extremity were excluded. This yielded 16 reports of 19 cases of spontaneous nontraumatic ACS of the upper extremity published from 1993 to 2016. Fifteen of the publications were isolated case reports. Of the 19 instances of nontraumatic ACS, 6 were attributed to infection, 3 were due to a bleeding disorder, 3 were reported as unknown or idiopathic, 3 were secondary to anticoagulation medication, and 4 were due to systemic sclerosis, Ehlers-Danlos syndrome, coma blister in nontraumatic rhabdomyolysis, and McArdle disease. Only 2 cases were localized in the hand; the other 17 were in the forearm. Eighteen were managed by fasciotomy; 1 case of idiopathic etiology was successfully managed without surgical intervention. Thirteen cases reported accurate clinical diagnosis of the nontraumatic ACS in the upper

extremity without confirmation through diagnostic testing. The remaining 6 used manometry (4), magnetic resonance imaging (1), or venous duplex ultrasound (1)

Conclusion: Non-traumatic causes of ACS of the upper extremity include infection, anticoagulation therapy, and bleeding disorders. Even though trauma is the most common cause of ACS, clinicians should be aware of these other potential causes of ACS in the non-traumatic setting. Appropriate medical and surgical intervention should be done in order to avoid potential complications.

Hand Trauma in Older Adults: Epidemiology and Comparison to Younger Adult Cohort

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Hypothesis: Hand related trauma is common. We hypothesize that traumatic hand-related consultations differ in regard to mechanism, anatomic distribution of injury, injury severity and outcomes in adult (18-65) versus older adult (≥65) patients.

Methods: We conducted a retrospective analysis of all hand trauma consultations from 2015-2018 at a large, level I trauma center. All hand trauma consultations were reviewed for demographic information, mechanism of injury, tissue type injured (e.g. bone, soft tissue, tendon), anatomic region injured (e.g. digits, hand, wrist, forearm), interventions employed at time of consultation and outcomes. Subgroup analysis was performed, with adult patients (18-65 years) and older adult patients (≥ 65 years) being compared.

Results: A total of 842 patients were identified, with 731 patients being 18-65 years of age and 111 patients over 65 years old (range 65-97). Patients >65 years old were more likely to have multisystem injuries (p=0.0091), with concurrent intra-cranial injury being most common in older adults and lower extremity injury most commonly occurring in younger adults. Mechanism of injury was compared between groups, with falls significantly more likely in the older group (p=0.0014) and assault significantly more likely in the adult cohort (p=0.0019). Type of tissue injured was not significantly different between the adult and geriatric cohorts, with injury to bone being common in both groups. Anatomic region injured was most commonly metacarpal (n=131) in younger adults and distal phalanx (n=10) in older adults.

Conclusions: Traumatic hand injury consults are frequent in adults, with bone being most commonly injured. Older adult patients are more likely to have additional concurrent injuries. Due to these concurrent injuries, older adult patients are more likely to be hospitalized at the time of presentation. Given the higher prevalence of additional non-hand injuries in older adults, their rehabilitation needs may be different from younger adults. Future research is needed to evaluate the optimal rehabilitation for older adults with hand injuries.

Reconstruction of Digital Soft Tissue Defect with Thin Perforator Flaps: Optimal Options and Refinements

Presenter: Hyung-Sup Shim, MD, PhD
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Purpose: Reconstruction of soft tissue defect of digits can be challenging due to functional and aesthetic issues. Recently, in consideration of joint stiffness and need of a good wound bed in skin graft or inappropriate location for local flap, free tissue transfer is emerging as an attractive option. Nevertheless, there is no consensus about ideal option. In this study, we present cases of free SCIP(superficial circumflex iliac artery perforator) flap in reconstruction of multiple fingers including fingertip with discussion for appropriate options.

Methods: Eleven patients with soft tissue defects greater than $3cm^2$ of the single or two fingers with soft tissue defect with tendon exposure (Fig.1) were received free SCIP flap coverage. After detecting the superficial and deep branch of superficial circumflex artery, thin suprafascial flap was elevated in the groin region (Fig.2). Dominant perforator was selected and anastomosed with the recipient such as digital artery and dorsal vein (Fig.3).

Results: Flaps survived and there was no major complication including partial necrosis, flap failure. Three weeks after first operation, flap was divided in patients with the defect of two fingers (Fig.4). Contour was satisfactory aesthetically and total active motion was recovered over 80% postoperatively.

Conclusion: Reconstruction of the digital soft tissue defect requires thin and flexible tissue. Free tissue transfer is an appropriate option in prevention of joint contractures and limitation of ROM. However, bulky flap including an adipose tissue disrupts functional and aesthetic reconstruction. SCIP flap could provide one of the most thin

free flaps, especially in hand region. So, SCIP flap can be one of the optimal options for digital reconstruction supported by the supermicrosurgery technique of the surgeon.

Early Outcomes Using a Novel Bilaminar Dermal Regenerative Template for Treatment of Complex Upper Extremity Wounds

Presenter: Yuewei Wu-Fienberg, MD
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Introduction: The management of upper extremity soft tissue defects with full-thickness skin loss and exposed, denuded tendon and/or bone traditionally requires vascularized local, regional or free tissue reconstruction [1,2]. In this study, we retrospectively reviewed patient outcomes utilizing Novosorb BTM (PolyNovo, Wilmington DE), a novel bilaminar dermal regenerative template composed of a biodegradeable inner foam layer that is bonded to a transparent sealing membrane, followed by skin grafting, for reconstruction of complex upper extremity injuries with exposed tendon and/or bone.

Methods: In this retrospective study, all patients treated at our Level I trauma center with upper extremity trauma who had application of Novosorb BTM were included. At the time of surgery, all non-viable tissue was debrided, and the product was applied according to the manufacturer's instructions. A silver impregnated dressing was applied over the sealing layer, and patients were discharged on a five-day course of oral antibiotics. Wound checks to assess for infection, fluid collection, and revascularization of the neodermis were performed weekly. If required, split thickness skin grafting was performed once neodermis appeared perfused, or after the sealing layer delaminated spontaneously.

Results: Six patients (4M:2F) with an average age of 49.8 (35-60) with exposed tendon and/or bone were included in the study. The etiologies of the wounds were: hand injuries related to motor vehicle accidents (n=3), radial forearm free flap donor site (n=1), industrial press injury (n=1), and full thickness hand burns (n=1). Average defect size measured 97cm^2 (10-440). Average time to complete healing was 45 days (27-57). One patient underwent grafting as early as 13 days following application. Three patients reepithelialized spontaneously and did not require grafting; average defect size in these patients was 26cm^2 (10-42). There were no infections and no loss

of the dermal matrix or skin graft, when performed. All patients went on to heal without complication after grafting and did not require further surgical treatment.

Conclusions: Novosorb BTM is a dermal regenerative template that shows potential as an alternative option to flap reconstruction in select patients after upper extremity trauma and soft tissue defects with exposed tendon and/or bone. Further studies will be required to refine indications and evaluate outcomes.

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Comparing Single- and Dual-Portal Endoscopic Carpal Tunnel Release Using Patient-Reported Outcomes: A Systematic Review of the Literature

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PURPOSE: Several studies have demonstrated successful outcomes following endoscopic carpal tunnel release (CTR); however, no studies have directly compared patient-reported quality of life between single- and dual-portal endoscopic CTR. We performed a systematic review of the literature of single- and dual-portal endoscopic approaches in order to better elucidate their relative patient-reported outcomes (PROs).

METHODS: PubMed, MEDLINE, and Cochrane Library databases were queried according to PRISMA guidelines. Studies reporting on single- and dual-portal endoscopic CTR and patient-reported quality of life (QoL), symptomatic relief, functional status, overall satisfaction, and return to work and activities of daily living (ADLs) were included.

RESULTS: In total, 588 unique articles were screened, and 38 studies met inclusion criteria. The year of publication of selected studies ranged from 1993 to 2017.

Nineteen single-portal and 19 dual-portal endoscopic CTR studies were reviewed; mean study size for each group was 108 ± 104 patients (range: 40-486) and 95 ± 103 patients (range: 22-456), respectively ($p = 0.67$). Average follow-up was 14 ± 24 months for the single-portal group and 16 ± 17 months for the dual-portal group ($p = 0.84$). The most common study design was prospective, non-randomized cohort in the single-portal group (8/19, 42%); in contrast, the dual-portal group consisted of an equal number of both prospective, randomized-controlled trials (8/19, 42%) and prospective, non-randomized cohort studies (8/19, 42%). The most frequently utilized assessment tool was an unvalidated, custom survey, interview, or questionnaire (CSIQ) followed by the validated Boston Carpal Tunnel Questionnaire (BCTQ) for both groups (16/19 for both). Health-related QoL was formally assessed in 2/19 (11%) single-portal studies and 4/19 (21%) dual-portal studies using the validated 36-Item Short Form Survey, with the exception of 1 study in the single-portal group that utilized an unvalidated CSIQ. In both groups, 17 (89%) studies reported symptomatic relief, making it the most frequently measured outcome, followed by functional status (13/19 [68%] in both groups). However, in the single-portal group, only 35% (6/17) of the tools used to assess symptom relief were validated; in contrast, 47% (8/17) of the dual-portal studies used validated tools. Similarly, 54% (7/13) of assessments of functional ability were validated in the single-portal group, compared to 62% (8/13) in the dual-portal group. About half of the studies in each group reported satisfaction (single-portal: 9/19, dual-portal: 10/19), and a majority of studies in each group measured time to return to work or ADLs (single-portal: 11/19, dual-portal: 15/19); however, these outcomes were all reported using unvalidated CSIQs. Only 1 study from each group measured all five parameters, whereas a majority of studies from each group reported at least three PROs (single-portal: 13/19, dual-portal: 13/19).

CONCLUSIONS: The majority of studies in both single- and dual-portal CTR groups utilized unvalidated CSIQs to evaluate PROs. In general, dual-portal studies utilized validated assessment tools more frequently. Only a small minority of studies assessed health related QoL. Future work includes designing a randomized controlled trial of both endoscopic approaches while examining PROs using validated tools in order to arrive at a clinically significant consensus.

Thirty-Day Outcomes of Upper Extremity Replantation and Revascularization Procedures: An Analysis of the National Surgical Quality Improvement Program Database

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Introduction: Over the past half century, upper extremity replantation and revascularization has been advanced by improved instrumentation and microsurgical techniques. In reports of institutional series, despite the microsurgical challenge, studies have shown high survival rates and excellent functional and aesthetic results.[1] This study examines a nationally representative cohort of heterogenous patients and institutions to determine the 30-day postoperative outcomes following upper extremity replantation and revascularization procedures.

Materials and Methods: Utilizing the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database, we identified patients who underwent an upper extremity replantation or revascularization procedure between 2008 and 2016. Patients were identified using Current Procedural Terminology (CPT) codes corresponding to digit (index, middle, ring, little), thumb, hand, forearm, and arm replantation, along with blood vessel repair of the hand and upper extremity. Complications, reoperations, and related unplanned readmissions were queried from the database. Rates of 30-day postoperative complications were determined, and total reoperation rate (along with procedures performed) and unplanned readmissions related to the index procedure (corresponding indications) were identified.

Results: This study included a total of 326 patients undergoing replantation and revascularization procedures of the upper extremity. The patients had a mean age of 51 years (range, 18 to 89 years), and were 61.7% male and 38.3% female. 65.1% were white, 16.0% were black, and 18.8% were other. Replantation procedures included digit (non-thumb) replantation (3.7%), thumb replantation (3.1%), and hand replantation (0.3%). Revascularization procedures included upper extremity blood vessel repair with vein graft (65.5%) and direct blood vessel repair of the hand and fingers (27.4%). The 30-day complications included intraoperative transfusions (8.0%), failure to wean off of the ventilator for greater than 48 hours (2.1%), deep venous thrombosis (1.5%), pulmonary embolism (1.2%), and pneumonia (1.2%). The reoperation rate was 5.5%, with incision and drainage occurring most frequently (0.6%). The readmission rate was 3.7% and most commonly occurred for pulmonary embolism (0.6%).

Conclusions: The most common complication for upper extremity replantation is intraoperative transfusions. This is unsurprising, considering the 52% rate of transfusions during leech therapy for replantation previously reported by Rizis et al.[2] Upper extremity replantation with blood vessel repair can be performed with suitable rates of complications in the 30-day postoperative period. These rates are

consistent with what has been published by studies from single-center series or reports from several centers.[3]

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Quantifying the Severity of Metopic Craniosynostosis: A Pilot Study in Application of Advanced Machine Learning in Craniofacial Surgery

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Introduction: Metopic Craniosynostosis refers to early fusion of the metopic suture. It can cause head shape anomalies and symptoms of elevated intracranial pressure. While the current standard for diagnosing the condition utilizes CT imaging and physical exam, there is no standardized method for predicting disease severity. Previous studies using interfrontal angles have looked at differences in specific skull landmarks, however these measurements are difficult to readily ascertain in clinical practice and fail to assess the complete skull contour. This pilot project employs machine learning algorithms to combine statistical shape information with expert ratings to generate a user-friendly method of measuring the severity of metopic craniosynostosis.

Methods: Expert ratings of normal and metopic skull CT images were collected. Skull-shape analysis was conducted using *ShapeWorks* software. Advanced machine-learning was used to combine the expert ratings with our shape analysis model to predict the severity of metopic CS using CT images. Our model was then compared to the gold standard using interfrontal angles.

Results: 17 metopic and 65 non-affected skull CT images of patients 5-15 months old were assigned a severity by 18 craniofacial surgeons. Our model accurately correlated the level of skull deformity with severity ($p<0.10$) and predicted the severity of metopic CS more often than models using interfrontal angles ($\chi^2=5.46$, $p=0.019$).

Conclusions: This is the first study that combines shape information with expert ratings to generate an objective measure of severity for metopic craniosynostosis. This method will help clinicians easily quantify the severity and perform robust longitudinal assessments of the condition.

Health-Related Quality of Life Measures in Congenital Hand Differences: Comparison of Pubescent and Pre-Pubescent Children

Presenter: Meghan McCullough, MD
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Introduction: An increasing recognition of the discrepancy between objective measures and patient perception has motivated the inclusion of patient-reported outcomes of health-related quality of life (HRQoL) in the surgical literature. While functionality in congenital hand differences (CHD) has been extensively studied, HRQoL is less well understood. The aims of this cross-sectional study are therefore to explore HRQoL in children with a CHD by administering a multi-dimensional survey focusing on psychosocial well-being in addition to physical functionality. Our clinical impression is that children during puberty may be more socially affected by their CHD, whereas younger prepubertal patients are less affected.

Methods: An anonymous survey was distributed to patients between the ages of 5 and 18 years who had presented in our clinic with a congenital hand condition. Respondents were split into two groups based on their age, pre-pubescent group (5-10 years) or pubescent (11-18 years). Survey questions were comprised of a combination of previously validated instruments including the Neuro-QOL, the NIH domain-specific Life Satisfaction form and the PROMIS upper limb and mobility surveys. A 5-point Likert Scale was used to measure attitudes and perceptions of patients regarding anxiety, life satisfaction, social stigma, and physical function. Statistical analysis was performed using a Mann Whitney U Test to assess differences between the respondent groups. An alpha level of $p<.05$ was adopted for the study.

Results: A total of 27 survey responses were collected. Fourteen (51.9%) respondents were female and 13(48.1%) were male. The pre-pubescent group included 14 subjects, and the pubescent group contained 13. No statistically significant difference was observed between the pre-pubescent and pubescent groups when looking at anxiety ($z= 0.62$, $p=.52$), life satisfaction ($z= 1.88$, $p=.06$), social stigma ($z=0.69$, $p=.49$), or physical function ($z= 0.12$, $p=.90$).

Conclusions: Preliminary reports of HRQoL among pre-pubescent and pubescent children with CHD are favorable, with little difference between the groups despite the inherent social pressures associated with adolescence. Because patient-reported outcomes often represent the outcomes most important to patients, they can provide a broader assessment to longitudinally assess upper extremity adaptation and disability, both pre and postoperatively, and more rigorously compare between treatment outcomes. Presenting patient-reported outcomes to families may also help facilitate additional discussion during consultation and may improve the decision-making process.

Minimally Invasive Vertical Mini-Midface Lifting Using Polydioxanone (PDO) Cog Threads: An Observational Outcome Study

Presenter: Yujin Myung, MD, PhD
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Backgrounds: The conventional midface lift requires complicated surgical procedures, including a lower blepharoplasty incision, extensive subperiosteal dissection, and endothelium fixation. Herein, we show that a midface lift using polydioxanone cog threads can achieve satisfactory results with comparably less invasiveness, surgical time, and complexity.

Methods: A total of 64 patients (all female, age 33-60 years) underwent the 'Mini-Midface Lift' from January 2017 to January 2018. After a stab incision was applied through an 18-gauge needle over the lateral orbital rim, three 18G pre-cannulated PDO cog threads were inserted, targeting the deep medial fat pad and inner layer of the superficial muscular aponeurotic system. Surgical results were evaluated subjectively and objectively.

Results: No major complications (postoperative hematoma, infection, or temporary sensory/motor decreases) were observed. The mean procedural time was 15 minutes, and all patients underwent local anesthesia. Patient satisfaction was highest at 1 week

and 6 months postoperatively, decreasing at 1 year postoperatively. The scores on the objective assessment followed the same pattern.

Conclusion: Using PDO cog threads for midface lifting is simpler, quicker, and less invasive than conventional surgical methods, and at the same time, achieves satisfactory results for at least 6 months.

An 6-Year Retrospective Analysis of Migraine Surgery at the University of Wisconsin

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PURPOSE: While surgical management of migraine headaches is becoming more commonplace in the field of plastic surgery it is still met with some criticism in the greater medical community due to the subjective nature of patient-reported results.[1] Many studies have demonstrated that cranial nerve decompression is both safe and effective for the relief of migraine symptoms.[2,3,4] Several validated surveys such as the Headache (HIT-6, MIDAS and MSQ) of migraine symptoms and how they affect patient lives are most often used when assessing the success of migraine surgery but often only one of these measures are used at a time. While, as a group, these surveys ultimately address the larger picture of the way migraine headaches impact patient lives, each individual survey addresses its own unique perspective to a degree, leaving the potential for missed experiences from one survey to another. We sought to use the migraine surgery experience at The University of Wisconsin – Madison to validate the efficacy of migraine surgery and demonstrate the robust nature of results by having patients participate in three validated migraine surveys.

METHODS: A retrospective review of 197 patients who underwent migraine surgery at the University of Wisconsin – Madison was performed (2013-2017). Patients filled out HIT-6, MIDAS and MSQ surveys preoperatively and six months after surgery. Pre- and postoperative scores were compared, and percent improvement was calculated. Preoperative and postoperative Migraine Headache Index (MHI) scores were calculated from clinic notes. Pre- and postoperative scores were compared, and percent reduction was calculated.

RESULTS: Complication rate was 2.8%. Patients experienced a reduction in Migraine Headache Index from 193.7 preoperatively to 48.8 postoperatively (mean reduction, 74.8%, p<0.0001). Seventy-nine percent of patients experienced at least a 50% reduction in Migraine Headache Index (MHI). Migraine frequency (mean reduction, 59.2%, p=0.0003) and intensity (mean reduction, 47.3%, p=0.002) were significantly reduced postoperatively. Patients also experienced decreased migraine duration (mean reduction, 37.9%, p=0.11). Additionally, we have demonstrated that patients experienced significant improvement in scores on the HIT-6 (mean reduction, 15%, p<0.0001), MIDAS (mean reduction, 50.5%, p=0.0028), and MSQL (mean improvement, 57%, p<0.0001) surveys.

CONCLUSIONS: Analysis demonstrates that our experience at The University of Wisconsin supports the current literature[3] demonstrating that migraine surgery is both safe and effective. Additionally, we have demonstrated that the improvement in symptoms experienced following migraine surgery is robust as patients experience a significant improvement in MHI, HIT-6, MIDAS and MSQ scores.

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Re-Excision Rate after Partial Mastectomy in Oncoplastic Breast-Conserving Surgery: A Single Institutional Experience and Review of the Literature

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BACKGROUND: Applying oncoplastic techniques to breast conservation therapy is believed to improve cosmetic and oncologic outcomes, compared to standard breast conservation therapy alone. This study aimed to perform a comprehensive review of

the literature comparing outcomes of oncoplastic breast conservation therapy (BCT+R) to that of standard breast conservation therapy alone (BCT). A secondary objective was to compare these results to outcomes after oncoplastic breast conservation therapy performed at our institution (BCT+r).

METHODS: A literature search was performed in PubMed using key words, "oncoplastic," "partial breast reconstruction," and "breast conservation therapy." Case reports, case series and studies with less than 10 patients and studies that did not report re-excision rates were excluded. A retrospective chart review was performed from 2011 to 2017 of all cases of oncoplastic breast conservation therapy performed at our institution by a single two-surgeon team consisting of one breast surgeon and one plastic surgeon. Outcomes were assessed by comparing re-excision rates between the three comparison groups (BCT, BCT+R, BCT+r).

RESULTS: The BCT group was made of 5965 patients (22 papers) and the BCT+R group comprised 2564 patients (41 papers). Re-excision rates in the BCT+R group were lower (4.0%) than the BCT group (17.2%, p=0.0001). 172 patients comprised the BCT+r group and underwent oncoplastic breast conservation therapy during the study period at our institution. The re-excision rate in the BCT+r group was 1.7% and was significantly lower than the BCT group (p=0.0001) and lower but not significantly different from the BCT+R group (p=0.2113).

CONCLUSIONS: Oncoplastic breast conservation therapy leads to lower re-excision rates compared to standard breast conservation therapy. Oncoplastic breast conservation therapy may improve oncologic outcomes compared to standard breast conservation therapy by allowing for more extensive resection without compromising aesthetic results.

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Ischemic Complications after Nipple-Sparing Mastectomy: Predictors of Reconstructive Failure in Implant-Based Reconstruction and Implications for Decision-Making

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Purpose: The sequelae of mastectomy skin flap and nipple-areolar complex ischemia can be devastating complications in immediate reconstruction after nipple-sparing mastectomy (NSM). While risk factors for ischemic complications are well known, predictors of reconstructive failure with major skin envelope ischemia and implications for decision-making remain to be fully elucidated.

Methods: A retrospective review was performed of all cases of NSM and immediate implant-based reconstruction at a single institution from 2006 to June 2018. All cases with major ischemic complications, defined as either mastectomy flap necrosis or nipple-areolar complex (NAC) necrosis requirement debridement were included for analysis. Data on patient demographics, mastectomy and reconstruction characteristics, additional reconstructive complications and the nature and management of ischemic complications were collected and analyzed. Cases requiring explantation or implant exchange were compared.

Results: Out of 1,345 cases of NSM, 70 cases (5.2%) had major ischemic complications. The majority of cases were two-stage tissue expander reconstruction (74.3%) with ADM used in 50% of cases and mesh in 7.1%. Average mastectomy weight was 645.7 grams.

Sixty-three cases (90%) had major mastectomy flap necrosis, 18 (25.7%) had full NAC necrosis and 11 (15.7%) had both**.** Five cases (7.1%) underwent implant exchange at the time of debridement and 15 cases (21.4%) required explantation and delayed reconstruction with two-staged implant-based (9 cases), latissimus dorsi and implant (4 cases) and autologous (2 cases) reconstruction. Debridement of necrosis was performed at an average of 27.8 days after reconstruction with an average debridement size of 27.8 cm^2.

Cases that required explantation had a significantly lower BMI (22.3 versus 24.7, p=0.013) and larger debridement size (49.5 versus 17.6 cm^2, p=0.0168). Additionally, explantation cases had a much higher rate of ADM/mesh utilization (100% versus

45.5%, p<0.0001), prior radiation (20.0% versus 0%, p=0.0083), immediate implant reconstruction (46.7% versus 20.0%, p=0.0491), concomitant major infection (30.0% versus 1.8%, p=0.028) and both major mastectomy flap and NAC necrosis (33.3% versus 10.9%, p-0.0494). These cases were also more frequently performed in the operating room compared to the office setting (93.3% versus 27.3%, p<0.0001). There were no significant differences between cases requiring explant versus exchange.

Conclusions: NSM cases complicated by ischemia that require explantation have a significantly higher rate of preoperative radiation, immediate implant placement, use of ADM/mesh, concomitant major infection and debridement in an operating room. These variables should be taken into account when discussing risks with patients preoperatively and assessing the quality of mastectomy flaps and subsequent reconstructive choices intraoperatively.

Acute Intraoperative Microvascular Complications in Autologous Breast Reconstructions: The Effects of Resident Education and Training in Microsurgical Anastomosis

Presenter:	Avinash P. Jayaraman, BA
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Introduction: Academic medical centers with large volumes of autologous breast reconstruction afford residents an invaluable, hand-on educational experience in microsurgical techniques. We present our experience with flaps (DIEP, PAP, LAP, stacked, multi-flap) where a supervised resident or microsurgical fellow completed the microvascular anastomoses.

Methods: Retrospective chart review was performed on N=279 flaps (157 patients) which had microvascular anastomoses performed by a physician who is a PGY4 (n=45), PGY5 (n=30), PGY6 (n=54), MF (microsurgery fellow, n=27), or AP (attending physician, n=123). Comorbidities including age, BMI, hypertension, diabetes, autoimmunity, DVT/PE, and pre-operative chest wall radiation were tracked. Intraoperative anastomoses complications, revisions of original anastomoses, and flap losses were analyzed with ANOVA. Data was collected using a centralized REDCap database and analyses was performed using SPSS software.

Results: Age and all comorbidities were equivalent between groups. The percentage of flaps with at least one intraoperative anastomosis complication was equivalent

between groups: PGY4 (9%, 4/45), PGY5 (10%, 3/30), PGY6 (13%, 7/54), MF (7%, 2/27), and AP (13%, 16/123) *p=.931*. The percentage of flaps requiring at least one revision of the original anastomoses was equivalent between groups: PGY4 (20%, 9/45), PGY5 (10%, 3/30), PGY6 (9%, 5/54), MF (4%, 1/27), and AP (12%, 15/123), *p=.145*. Rates of flap loss were also equivalent between groups: PGY4 (0%, 0/45), PGY5 (3%, 1/30), PGY6 (2%, 1/54), MF (0%, 0/27), and AP (<1%, 1/123) *p=.581*. Overall flap loss between all groups was 3/279 (1.1%).

Discussion: With regard to flap loss, microsurgical vessel compromise, and revision of anastomoses, lower PGYs did not significantly worsen surgical outcomes for patients. Although there were slight fluctuations in flap loss between different groups, none of these differences proved to be significant. Hands-on supervised microsurgical education appears to be both safe for patients and also an effective way of building technical proficiency in plastic surgery residents.

Optimizing Computed Tomography Angiography (CTA) Guided Deep Inferior Epigastric Artery Perforator (DIEP) Flap Reconstruction: An Algorithmic Approach

Presenter: Katherine H Carruthers, MD
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Purpose: The deep inferior epigastric artery perforator (DIEP) flap is a well-established method for autologous breast reconstruction. Historically, preoperative Doppler ultrasonography was used to select perforating vessels for anastomosis, however, computed tomography angiography (CTA) has recently emerged as the predominant resource for flap design. Despite this trend, there is no universal process to guide the mapping and execution of DIEP flaps using CTA imaging. We herein present an algorithm for DIEP flap breast reconstruction using preoperative CTA imaging to guide both flap design and the sequence of operative events to optimize outcomes.

Methods and Materials: A retrospective review was conducted of all patients undergoing DIEP flap breast reconstruction over a 24-month period. All reconstructions were performed by two surgeons from a single practice. CT angiograms were obtained for all patients and used for preoperative planning based on an algorithm which guided the selection of perforating vessels for flap design and the orientation of flap placement on the chest wall.

Results: The algorithm was applied to a series of 196 patients who underwent DIEP flap reconstruction with a total of 301 individual flaps. Of these patients, 91 (46.4%) had unilateral reconstructions and 105 (53.6%) had bilateral reconstructions. With respect to timing, 111 flaps (36.9%) were delayed reconstructions and 190 flaps (63.1%) were immediate reconstructions. All of these patients had preoperative CTA imaging using a protocol optimized for visualization of the deep inferior epigastric vessels and their associated perforating vessels into the lower abdominal soft tissue. Prior to surgery, each CTA was reviewed and three specific items were noted: (1) total number of perforators per hemi-abdomen, (2) perforator size, and (3) perforator location. These items were recorded according to a numeric scale and combined to generate a "favorability score" for each flap, which was subsequently used to determine flap orientation on the chest wall and the sequence of operative events, paying attention to non-flap factors such as previous chest wall radiation and the suspected need for augmentation of venous outflow with superficial inferior epigastric vein (SIEV) anastomosis to guide the final operative plan. Using this CTA-guided, algorithmic approach to flap design and operative sequencing, the total flap loss was limited to two flaps (0.66%) in this series. Interestingly, venous outflow was augmented by the addition of SIEV anastomosis in 37 flaps (12.3%), emphasizing the importance of flap orientation in our algorithm.

Conclusions: Using an objective algorithmic approach, CT angiography can assist in the design and placement of perforator-based flaps. The proposed algorithm was applied to all DIEP flap breast reconstruction cases, regardless of individual surgeon preference, and was associated with a low overall flap loss rate. The results of this study suggest that a standardized approach to flap design and execution may lead to improved flap survival rates, particularly in the hands of less experienced microsurgeons or in cases when there are multiple possibilities for flap design and placement.

Prepectoral Breast Reconstruction with Wise-Pattern Mastectomy

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Background: Prepectoral implant breast reconstruction mitigates the problems with traditional subpectoral reconstruction such as animation, discomfort, and restriction in breast shape. Patients with large or ptotic breasts can benefit from Wise (inverted-T) pattern skin reduction mastectomy to achieve improved shape compared to other

mastectomy incision patterns. As described in patients with dual-plane prosthetic reconstruction, Wise pattern mastectomy has significant morbidity (1). The author compared the complication rates of Wise pattern mastectomy to other incision patterns following immediate prepectoral breast reconstruction with implant or expander.

Methods: Consecutive patients were recruited prospectively into the author's prepectoral breast reconstruction observational database. The database was used to compare postoperative complications and outcomes in prepectoral implant reconstruction patients undergoing Wise pattern mastectomy and those with other incision patterns.

Results: Ninety-six patients were recruited into the study with a mean follow-up of 9.3 months (range, 6.2-14.4 months). Twenty-two patients had Wise pattern mastectomy, while the remaining 74 patients had other mastectomy incisions (oblique, vertical, inframammary crease). Patient demographics (age, diabetes, smoking, and irradiation history) were similar, with the exception of body mass index (Wise, 33.2; control, 26.6; $p < 0.001$). Forty-seven patients underwent direct-to-implant (DTI) reconstruction, none of which were Wise pattern patients. Of all complications (hematoma, seroma, drain placement, infection, skin necrosis, implant/expander loss), only the incidence of partial-thickness skin necrosis (Wise, 31.8%; control, 1.4%; $p < 0.001$) and full-thickness skin necrosis (Wise, 13.6%; control, 0%, $p = 0.011$) were significant. Seroma in the Wise pattern group was 18.2% compared with 5.4% in the control group, but this was not statistically significant ($p = 0.078$). No patients with prior seroma or skin necrosis went on to develop infection or device removal. Zero patients in the Wise pattern group had device removal, while three patients in the control group had device removal, which was not statistically significant ($p = 1.00$). Multivariate regression revealed that, even after controlling for body mass index (BMI), Wise pattern mastectomy predicted partial skin necrosis. ($OR = 44.11$, 95% CI).

Conclusions: The authors have demonstrated that Wise pattern mastectomy with prepectoral implant/expander reconstruction can be performed safely and successfully. When compared to other mastectomy incisions, Wise pattern mastectomy with prepectoral reconstruction can lead to increased incidence of skin necrosis and tends toward increased seroma, but when treated conservatively, does not lead to increased infection or device removal.

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Back Rolls Management in the Massive Weight Loss Patient: The Lateral Approach

Presenter:	Taliah Schmitt, MD
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Background: As the Massive Weight Loss population increases, plastic surgeons are often confronted with body deformities that are difficult to treat. In certain areas scar placement is hard to accept for patients.

For the treatment of back rolls, the gold standard procedure has been the upper body lift or bra-line back lift, but this procedure necessitates two per-operative positions (prone, and supine) and leaves the scar in the middle of the back where scar constriction and hypertrophy are frequent.

Methods: After performing a pinch test along the mid-axillary line to assess whether the back skin excess can be eliminated with a lateral skin excision, we performed extended lateral torsoplasties on patients that presented back roll deformities. All extended lateral torsoplasty surgeries were performed at the same time as a brachioplalsty, requiring no change in per-operative positioning. No drain was placed.

A total of 32 patients have been treated with this technique between 2017 and 2019.

Results: Pain level was minimal, and no patient encountered a hematoma, seroma or infection. There was no lateralization of the breast in any patient.

Six patients presented with a hypertrophic scar at three months post-op. No scar revision was needed.

One patient presented with a moderate edema of the upper limb and required manual lymphatic drainage for six months post op.

Results: Extended torsoplasty in carefully selected patients is a great alternative to the upper body lift for the treatment of back rolls. It is a one-step surgery that can be combined with a brachioplasty and a lateral thigh lift surgery. The scar is hidden along the axillary midline and allows to correct back skin excess as well as some anterior skin excess even on the lower part of the back or abdomen. Complication rate is minimal, and the surgery can be performed safely as an outpatient.

Variations in Regional Nasal Anatomy to Guide Ethnic Rhinoplasty: A Systematic Review

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Purpose: While rhinoplasty was the third most common aesthetic procedure performed in 2017, only 25% were performed on non-Caucasian patients. Historically, rhinoplasty has been guided by Caucasian aesthetic norms, risking racial incongruity in various ethnic populations. There is increasing literature describing rhinoplasty in ethnic populations, but many reports remain broad and do not account for regional differences. Therefore, the purpose of this study is to identify regional variations among Asian, Indian, and African nasal anatomy to guide ethnic rhinoplasty.

Methods: A systematic review of Asian, Indian, and African rhinoplasty was performed using PRISMA guidelines using the medical indices PubMed, GoogleScholar, and Web of Science using predetermined MESH terms. Review articles, papers which did not detail nasal anatomy, and non-English language publications were excluded. Data extracted from the papers was subcategorized by region.

Results: Of the 147 papers meeting initial screening, 72 were included for full paper review. 51 papers including 9,202 patients detailed Asian rhinoplasty anatomy and techniques. The classic Asian nose demonstrates a broad, flat dorsum, low radix, underrotated tip, short nasal length, and weak alar cartilages with wide lobules. Notable exceptions are in the Japanese population, which tends to be narrow with adequate dorsal height, and in South Korea where dorsal convexity was described in 8 papers. 7 papers including 1,858 patients discussed Indian rhinoplasty. The classic Indian nose varied by region. Northern Indians demonstrated long noses with dorsal projection and narrowed intraalar distance. Southern Indians exhibit a wide dorsum, round tip, and flared ala. The latter findings were even more pronounced for Indians in the Himalayan region. Of the 14 papers found for African rhinoplasty, 11 described African Americans with triethnic heritage and were excluded. 3 papers including 196 patients detailed African rhinoplasty, but no regional variation was seen.

Conclusion: The goals of ethnic rhinoplasty have shifted from “Westernization” to optimizing the nasal aesthetic within ethnic norms. The present study demonstrates

that, even within various ethnic groups, regional differences exist. In some cases, patients may desire for these findings to remain intact to preserve cultural identity. There is increasing data describing variations within Asian and Indian populations, but findings are less clear for patients with African ancestry. The findings presented in this study may assist the plastic surgeon in evaluation of Asian and Indian populations for potential rhinoplasty.

Disparities in 2018 Health Care Access for Craniosynostosis Patients: The Influences of Private Insurance and Rural Residency

Presenter: Jeffrey A. Goldstein, MD
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PURPOSE: One of the goals of recent US healthcare reform is to increase access for all citizens. The aim of this study is to assess disparity in access for craniosynostosis surgery for a single Midwestern United States craniofacial center in 2018 with an emphasis upon patient insurance status and urban versus local residence.

METHODS: The charts of all patients who underwent primary craniosynostosis repair in 2018 at our institution were reviewed for demographic factors, age at time of consultation, and surgical technique (open versus endoscopic).

RESULTS: 54 patients, ages 2 to 22 months, underwent primary craniosynostosis surgery at our institution in 2018. 34 underwent an open procedure, while 20 underwent a strip craniectomy, followed by helmeting. 47 of these patients were non-syndromic. 28 patients had private insurance (52%); 24 patients had state-funded medicaid insurance (44%), and 2 were without insurance (4%). 29 patients lived in an urban environment (54%); 25 resided rurally (46%). Further results include:

1. While 52% of patients had private insurance; 75% of patients who underwent strip craniectomy were privately insured. 25% were Medicaid or not insured.
2. 44% of patients who underwent open vault reconstructions were privately insured. 56% were Medicaid or uninsured.
3. While 54% of patients were urban-based, 74% of patients who underwent strip craniectomy were urban-based. 26% were rural.
4. 45% of patients who underwent open vault procedures were urban-based. 55% were rural.

5. For strip craniectomy patients, those with private insurance were first seen in consultation at a mean of 42 days of life. With Medicaid or uninsured, it was 58 days of life.
6. For insured urban-based strip craniectomy patients, mean day of first consultation was 37 days. If rural based, the mean was 57 days.

CONCLUSIONS: Disparities in 2018 health care access for US craniosynostosis patients exist with delayed presentation in clinic for less insured and/or rural patients as well as fewer strip cranectomy/helmeting procedures in these patients.

Fat Grafting across the World: Analysis of Three Annual Major Plastic Surgery Meetings

Presenter:	Zachary S. Gala, MD
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Background: Fat grafting has seen a recent surge in both reconstructive and aesthetic endeavours. Clinical research has explored the applicability of adipose regenerative cells in all areas of the body. Despite rising international interest in the regenerative outcomes, no methodological and technical standardization exists. This study analyzes the literature on fat grafting techniques during the experimental and clinical stages to show that even with a rise in both clinical practice and basic science research, more funding and emphasis on fat-grafting can unlock its true potential in reconstructive and regenerative medicine.

Methods: Systematic review of the program presentations at the annual plastic surgery conferences from the (ISAPS, ASAPS, ASPS) for the years 2006 to 2016 was performed. The programs were obtained on the official websites or via hard copy archives. Independent reviewers manually classified each program itinerary listed, and filtered for relevant fat-grafting presentations. The data was further divided by congress, year, country of publication, subject, and results.

Results: The review yielded a total of 628 presentations, with 218 (34.7%) from ISAPS, 213 (33.9%) from ASAPS, and 197 (31.4%) from ASPS. Abstracts with corresponding podium presentations consisted of 29.9% of the total itinerary, while big session presentations consisted of 41.1%, and 28.8% were master classes. Basic science research projects made up 21.1%, while the rest were human studies (78.9%). Pre-operative assessment was studied in 6.4%, and the majority (61.9%) addressed

clinical outcomes. Complications, harvesting and processing techniques, and future uses made up the remaining investigations. Aesthetic presentations made up 59.7% while reconstructive were 5.6%, and the remaining projects addressed both aesthetic and reconstructive uses. For area of the body where fat-grafting was implemented, facial regions were the most common, closely followed by breast, and then gluteal region, body contouring, and then extremities.

Conclusion: To our knowledge, this is the first study of this magnitude to inclusively analyze prior trends in fat grafting, current research, and future implications. Once purely aesthetic, it is now performed worldwide for various plastic, reconstructive, and regenerative purposes. Fat grafting is expanding across surgical subspecialties and revolutionizing multidisciplinary research, becoming increasingly widespread in clinical practice. However, a lack of methodological standardization and an absence of basic science and clinical evidence in certain aspects of the procedure prevents the reveal of its vast potential. We hope that this review will provide some insight in the evolution of fat grafting, and emphasize the facets that can undergo further investigation

Reverse Frontal Facelift - Case Report

Presenter: Marcia de Queiroz Araujo Gomes, md
Co-Authors: Amanda Figueira Bussade, md, Gisela Hobson Pontes, md, Ronaldo Pontes, md
Affiliation: Servico de Pos Graduacao Professor Dr. Ronaldo Pontes, Niteroi

INTRODUCTION: This peculiar case report shows a patient with syndromic facies, presenting a strong cutaneous manifestation, especially on the frontal region, which makes it impossible to correct the defect by the usual facelift techniques, where the traction of the frontal flap is performed cranially. The reverse frontal facelift was the surgical technique idealized for this case. It is an innovative technique and there is no previous publication in the literature. Like all scientific activity, the evolutionary process is continuous. Techniques and tactics continue to emerge, highlighting the importance of rhytidoplasties for the scenario of plastic surgery.[1]

METHODS: Italian patient, male, 56 years old, presenting cutaneous manifestation syndrome, especially on the frontal region of the face, with inelastic skin with a coriaceous aspect, which caused aesthetic discomfort, and resulting in a syndromic stigma. The technique developed by Dr. Ronaldo Pontes for this case involves an incision that begins at the root of the helix, point A, contours the eyebrow in a sinuous line about half a centimeter from the implantation of the eyebrow hairs going to the

glabella region, curves towards the root of the nose and finds identical dimensions on the other side. From point A, a curved line also ascends towards the medial direction, with a distance of 2 cm in order to allow a safe base or nutrition of the entire flap. The intention of this technique is to decrease the distance between the target area and the incision area in order to obtain greater traction, thus allowing the correction of the aspect of the face in focus.

RESULTS: The caudal flap traction through supra-ciliary incision allows to correct the defect in the frontal region not altering the hairline implantation line or excessively rise the eyebrows. The treatment of the middle and lower thirds of the face added to the nasolabial follicular skin spindle resection allowed also the rejuvenation of the face in wide aspect and the smoothing of the nasogenian folds.

CONCLUSION: the technique of reverse frontal facelift was created for a specific case of cutaneous manifestation syndrome since the case requested an atypical incision. When well indicated, in exceptional cases, this technique can be used to achieve good results. Despite the greater cicatricial exposure, with a suture made by planes and skin carefully well coapted, it is possible to achieve a satisfactory result. However, preoperative counseling is essential for the patient to learn that scars will become more apparent but are necessary for a more effective outcome.

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Patient-Centered Satisfaction after Secondary Touch up Correction of the Cleft Lip and Nasal Defect

Presenter: Justin Loloi, BS
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Background/Purpose: Cleft lip patients and their families are often subjected to a range of emotional and psychological hurdles associated with the congenital abnormality and its treatment.[1] Following primary repair, the cleft lip patient is routinely offered a secondary revision procedure to address asymmetry or scar burden in order to further normalize the appearance of the lip and nose.[2] There is a paucity of studies illustrating satisfaction following revision procedures, particularly from the

unique perspective of the patient. We sought to evaluate patient-reported aesthetic and psychosocial outcomes of secondary cleft lip and nose revision procedures.

Methods: We conducted a single-center survey-based prospective study including 42 patients who underwent secondary revision procedures for the cleft lip and nasal defect. Patients were administered an 8-question survey, based loosely on the CLEFT-Q survey during a routine post-operative clinic visit (7-point scale with 1 = agree with statement, 7 = disagree with statement).

Results: Patients agreed that an improvement was seen in the appearance of their lip (mean: 1.93) and nose (mean: 1.98) following surgery. Overall patients felt satisfied with the results of their revision procedure (mean: 1.76). An improvement in confidence and decrease in feelings of self-consciousness was reported. Patients were teased less by their peers and were more likely to participate in social activities. Overall, for all 8 questions, the mean response was reported at less than 2.5, suggesting a strong agreement with the survey statements. The statement with the highest agreement was in regard to overall patient satisfaction with the touch up procedure. The statement with the lowest agreement was addressing if the patient was teased less regarding appearance following the procedure, although the mean score was still consistent with agreement with the statement.

Discussion/Conclusion: There is sparse literature delineating the effectiveness and utility of secondary revisions from the perspective of the patient. We show that these "touch up" procedures benefit the patient not only in terms of aesthetic outcome, but also in the psychosocial realm including improvements in confidence, self-esteem, interaction with peers, and willingness to engage in social activities. With a better understanding of the true impact of revision procedures from the perspective of the patient, we are able to advocate for the critical role secondary revisions play in this sensitive patient population and tailor management strategies to the preference of the patient.

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Rotation of the Orbital Bandeau Along the Horizontal Axis in Unilateral Coronal Synostosis

Presenter:	Ilana Margulies, MD, MS
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Introduction: Unilateral coronal synostosis (UCS) results in well-defined dysmorphic changes including sphenoid malposition yielding posterior displacement of the orbital bandeau. Although ipsilateral supraorbital bar rotation along the *horizontal* axis has been suggested, it has not been previously investigated. Thus, the authors sought to characterize the rotation of the ipsilateral supraorbital bar in UCS through craniometric analysis.

Methods: 35 non-syndromic UCS patients (0-18 months) with CT images obtained prior to operative intervention and 16 control patients (0-24 months, 32 orbits) were included and divided into age matched groups. Prior to analysis, the sagittal CT images depicting the largest area of each orbit were isolated and the angulation of each cranial base was standardized at 0˚ horizontal. Craniometric measurements were taken in ImageJ 1.52a, and statistical analysis comparing the ipsilateral supraorbital bar in UCS patients with both sides of control patients was performed in GraphPad Prism 8 using unpaired t-test ($p<0.05$). Interaction analysis was performed in SAS 9.4 (Cary, N.C.) using a two-way ANOVA model ($p<0.05$).

Results: The ipsilateral supraorbital bar was significantly rotated around the horizontal axis when measured in reference to the 0˚ vertical in UCS vs. control patients by an average difference of 7.1˚ to 10.9˚ across age groups ($p<0.05$). No significant effect modification was detected between age and UCS on ipsilateral supraorbital bar rotation ($p>0.05$). Additional angles with vertices around the superior orbital circumference were then measured to locate the likely apex of rotation, and revealed a significant decrease in the posterior orbital roof to 0˚ horizontal in UCS patients by an average of 8.4˚ to 22.5˚ across age groups ($p<0.05$)

Conclusion: Rotation of the ipsilateral supraorbital bar around the horizontal axis in UCS is confirmed and quantified, and the apex of this rotation likely lies at the posterior orbital roof. The novel characterization and quantification of this deformity will better inform the operative approach and enable a more accurate surgical correction.

A NSQIP Analysis of Pharyngolaryngectomy Defects: Outcomes of Free Versus Pedicled Flap Reconstruction in 837 Patients

Presenter:	Darya D Kazei, MD
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Purpose: Head and neck (H&N) neoplasms are a significant source of morbidity and mortality within the United States. When localized to the laryngopharynx, surgical resection produces considerable defects which frequently require definitive tissue coverage. Reconstructive options include regional pedicled flaps and microvascular free flaps. The objective of this study was to assess 30-day postoperative outcomes of immediate autologous reconstruction in patients undergoing laryngectomy and pharyngolaryngectomy for H&N neoplasia.

Methods: The 2005-2017 American College of Surgeons National Surgical Quality Improvement Program (NSQIP) was filtered by International Statistical Classification of Disease (ICD) codes for patients with H&N neoplasms. Current Procedural Terminology (CPT) codes were then utilized to extract patients undergoing laryngectomy and/or pharyngolaryngectomy. The subsequent cohort was further isolated by CPT codes for those patients receiving pedicled and free flap reconstructions (n=912). Patients who concurrently received both a free flap and a pedicled flap (n=75) were excluded. Rates of postoperative wound, mild systemic, and severe systemic complications were evaluated between the two cohorts. Multivariable regression analysis controlling for age, in addition to baseline differences in body mass index, cohort frailty, smoking status, and operative time, was performed to generate adjusted odds ratios.

Results: A total of 837 patients with H&N neoplasia underwent laryngectomy or pharyngolaryngectomy with immediate autologous reconstruction. Among the cohort, 359 patients (42.9%) underwent a free flap (FF) reconstruction, while 478 patients (57.1%) received a pedicled flap (PF) reconstruction. Overall, 52.7% of patients experienced at least one all-cause complication. The only statistically significant difference between postoperative complications was observed for rates of mild systemic complications with 38.6% of the PF cohort and 52.4% of the FF cohort experiencing at least one mild systemic complication ($p<0.001$). However, multivariate regression analysis demonstrated that, compared to PFs, receiving a FF reconstruction was not a statistically significant predictor for the development of a wound (OR 0.927; 95%CI: 0.639-1.344; p=0.688), mild systemic (OR 1.361; 95%CI:

0.983-1.883; p=0.063), severe systemic (OR 0.894; 95%CI: 0.484-1.650; p=0.720), or all-cause (OR 1.159; 95%CI: 0.836-1.607; p=0.375) complication.

Conclusion: This study identified that laryngopharyngeal exenteration with concurrent reconstruction is associated with considerable rates of postoperative complication. Controlling for baseline differences among the cohorts, free flap reconstruction was not a statistically significant predictor of complications when compared to pedicled flaps.

Female Genital Surgery for Asian Patients: From the Experience of 5,901 Cases

Presenter: Minako Fukuzawa, MD
Affiliation: Shonan Beauty Clinic, Matsudo city, Chiba

PURPOSE: Despite the worldwide increase in the numbers of procedures of female genital surgery, there is a dearth of research with Asian patients. As the largest chain aesthetic clinic in Japan, a cumulative total of female genital surgery in our entire organization was 5,901 and I performed 968 procedures from 1 January to 31 December 2018. I investigated the breakdown of procedures, patients' motivation, satisfaction, efficacy and safety of our technique.

MATERIAL and METHODS: A retrospective study of the patients treated in our clinic was performed. The detailed breakdown of procedures was extracted from our electronic chart. Patients' motivation and satisfaction were from the questionnaire survey.

RESULTS: The breakdown of procedures performed in our clinic was as follows: labiaplasty (53.0%), clitoral hood reduction (32.9%), vaginal rejuvenation (3.6%), labia majoraplasty (1.4%). The major motivations for the treatment of my patients were big appearance (83%), pigmentation (55%), rubbing (52%). Satisfaction scores of my patients graded on a five-point scale were overall 4.7, clinical course 4.2, physical outcome 4.5, psychological well-being 4.6, surgeon 4.9. Postsurgical complications of my patients were infection: 6 cases, hematoma: 1 case, seroma: 1 case.

CONCLUSION: The majority of patients had good results and satisfaction with their treatments. I hope that reports such as this will bring light to the growing field of female genital surgery for Asian patients.

A Low Cost Closed Injection System for Fat Grafting

Presenter: Alvaro Luiz Cansancao, MD
Co-Author: Alexandra Conde-Green, MD, FICS.
Affiliation: Universidade Iguacu, Rio de Janeiro

Background: The demand for aesthetic procedures in order to improve the appearance of the buttocks is impressively increasing. Fat grafting is surely the technique that has aroused the greatest interest among surgeons and patients around the world[1].

Materials and methods: In order to minimize fat manipulation, we created a totally closed injection system, that consists of four parts: A sterile canister, a 60 ml syringe, a 3-way surgical hose and a cannula. The system is assembled by connecting one of the 3-way hose's pathways to the cannula, one to the syringe and another to the canister.

Discussion: The creation of this injection system allowed us to harvest fat, process it by decantation or washing and perform fat grafting without any manipulation or exposure of the fat to the environment[2]. It is a simple system to acquire, since it does not require any innovative material, especially if we take into account that from the 4 pieces necessary for its assembly, 3 of them are often used in all fat grafting methods: Canister, syringe and cannula. We only needing to acquire a 3-way surgical hose. In many hospitals this type of hose is already available because it is widely used in other procedures such as arthroscopies and prostatectomies.

The main advantage of this system as already mentioned is to avoid fat manipulation and its exposure to the environment, thus reducing the chance of exogenous contamination of the material to be injected and consequently the chance of infection, which is, after the fat embolism, the most feared complication in gluteal fat grafting[3].

Another advantage is that the surgeon has his attention totally turned to the fat injection, leaving the control of the volume and the speed of injection in charge of the auxiliary.

This system is similar to that used by an infusion pump, but it has some advantages, such as the lower cost, the easy control of the amount of fat that is being injected in each area of the buttocks.

Conclusion: With this system we are able to perform fat grafting in a very safe and dynamic way, allowing a good control over the injection speed and the amount of fat injected in each area with a lower cost than similar devices as infusion pump. It also allows the surgeon to have his attention 100% focused on fat grafting, leaving the injection on behalf of the auxiliary. Another advantage would be the.

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Safety and Efficacy of Renuvion in Facial Resurfacing and Subdermal Tightening

Presenter: Keith Ramsey Sweitzer, BS
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Purpose: Current skin rejuvenation methods, while effective, often are associated with significant side effects including hypopigmentation, scarring, and erythema, as well as been costly, and difficult to use due to proper selection of the chromophore, as well as spread of CO2 related skin damage. Helium plasma and propriety radiofrequency energy (Renuvion) is a new device that affords improved precision, decreased cost, and improved both skin resurfacing and subdermal tightening.

Methods: Consecutive patients seeking facial skin resurfacing or subdermal skin tightening were evaluated. Patient underwent pre-operative skin preparation and Visia analysis. Subjective and objective outcomes through standard medical photography and Visia analysis was performed.

Results: The amount of deep wrinkle effacement as well as cutaneous tightening is dramatic and more impressive than aggressive CO2 laser or the deepest chemical

(modified phenol) peels with improved safety. Significant skin tightening is seen without signs of thermal damage typically seen with laser devices. The skin improvement is most likely a result of subdermal and deep dermal remodeling and its unique effects on the deeper adipose tissue layers. Prolonged erythema is the most common seen complication.

*Comparison pictures are unable to be uploaded through this submission website.

Conclusions: Renuvion has promise as a safe and effective method for skin rejuvenation, and deep soft tissue contraction. It offers improved subjective and objective skin quality and tightening with decreased thermal damage and its associated complications. It currently offers lower cost than similar modalities. Further analysis with long term follow-up is ongoing to determine the best ways to prevent any prolonged erythema and determine factors leading to favorable outcomes.

Flap Plus Sub-Flap Irrigation and Negative Pressure Therapy for Infected Lower Extremity Wounds

Presenter:	David Eliott Kurlander, MD
Co-Authors:	Marco Swanson, MD, Corinne Wee, MD, Rebecca Knackstedt, MD, PhD, James Gatherwright, MD
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PURPOSE: Reconstruction of infected lower extremity wounds is associated with risk for persistent infection and flap loss. Taking advantage of topical sodium hypochlorite's efficacy in decreasing bioburden in chronically infected wounds, we introduce a novel paradigm for treatment of infected lower extremity wounds that includes muscle or fasciocutaneous flap plus sub-flap sodium hypochlorite irrigation and negative pressure therapy (NPT).

METHODS: All patients who underwent lower extremity wound reconstruction with flap plus sub-flap irrigation and NPT were identified and outcomes assessed. The technique requires thorough debridement prior to reconstruction. After flap inset, irrigation tubing is placed under the flap and black foam sponge placed superficial to the flap edges, with NPT set to -100mmHg. Fifty milliliters of 0.5% sodium hypochlorite solution is instilled every 4 hours with 15 minutes of soak time. The sub-flap irrigation with NPT is discontinued post-operative day #4 or #5.

RESULTS: Eight patients with mean 3 months follow-up were identified, including 7 patients with wounds of the leg, ankle, or foot and 1 patient with a groin wound. Wound etiology included motor vehicle collision (4), gunshot wound (1), necrotizing fasciitis (1), septic ankle (1), and infected vascular bypass (1). Four patients had

infected hardware or PTFE graft at the time of flap reconstruction. Bacterial growth included Pseudomonas, Acinetobacter, and MRSA among other species. Six patients grew multi-drug resistance organisms and six patients had polymicrobial infections. Flaps included ALT (3), radial forearm (2), muscle sparing latissimus dorsi (2), and rectus femoris (1). Two patients had delayed wound healing, one requiring skin graft and the other requiring flap advancement. At last follow up, all wounds were healed and all infections cleared. No amputations were required.

CONCLUSION: In this series we demonstrate the successful treatment of high-risk infected lower extremity wounds with flap plus sub-flap irrigation and NPT. This may mitigate risk of persistent infection and flap loss. Larger studies and comparative studies will be required to elucidate the indications and assess relative benefits of this treatment paradigm.

Use of Cadaveric Costal Cartilage Graft in Cleft Rhinoplasty

Presenter: Hillary E Jenny, MD
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Purpose: Autologous cartilage (AC) grafting is considered the gold standard for rhinoplasty for cleft nasal deformity as it is associated with a low risk of infection and extrusion. However, harvesting AC such as rib involves donor site morbidity and increased time under anesthesia. As irradiated homologous costal cartilage grafts (IHCC) may have a similar complication profile as autologous cartilage but without the donor site morbidity, they may be an effective alternative in patients with cleft nasal deformity.

Methods: A retrospective study was performed on pediatric and adult patients with a history of cleft lip who underwent rhinoplasty for cleft nasal deformity at Johns Hopkins Hospital between 2009 and 2018. Patients were excluded if their rhinoplasty did not involve placement of an AC or IHCC graft.

Results: A total of 165 cleft rhinoplasties (age 2-72 years, 73% age <18 years, 52% female) were performed, using a mean of three cartilage grafts. 30% of these procedures were revision surgeries. Mean follow-up time was 407 days. Ninety-six (58%) procedures used IHCC, with the remaining utilizing AC. Complications resulted from eighteen (11%) procedures, seven (10%) involving AC and eleven (12%) involving IHCC grafts. Six of seven AC complications (86%) required

operative intervention, compared to seven out of 11 (64%) for IHCC. The most common complications for IHCC and AC respectively were infection (n=5) and collapse (n=2). One AC procedure resulted in hypertrophic donor site scarring, one graft resorbed and one warped; one IHCC graft extruded, none resorbed, and two warped. There was no difference between groups regarding complication rate or complications requiring operative intervention (p=0.3, p=0.5).

Conclusions: IHCC grafts are equally safe and effective as AC for use in rhinoplasty for cleft nasal deformity. These grafts are readily available and eliminate donor site morbidity.

Unilateral Microform Cleft Lip Repair through Intraoral and Intranasal Mucosal Incisions in Adult Patients

Presenter: Yongqian Wang, MD
Affiliation: Plastic Surgery Hospital, Peking Union Medical College, Beijing

Background: In microform cleft lip repair, it is elaborate work to restore the normal shape of the lip and nose without incision on the lip skin. We describe a new technique of unilateral microform cleft lip repair through intraoral and intranasal in adult patients.

Methods: According to the shape of Cupid's bow, a different small incision is used without creating an obvious cutaneous scar. A vertical incision is made on the mucosa in the oral cavity against the infused gap of the muscle. Another vertical incision was made on the nasal floor. The anatomical structure could be exposed clearly through the intraoral and intranasal incisions. First, the nasolabial muscle around the nasal floor is reconstructed and then the orbicularis oris muscle around the philtrum is reconstructed.

Results: From March 2011 to March 2017, the technique was used in 35 unilateral microform cleft lip repairs. All the patients were followed up for 12 to 36 months. The appearance of the nose, philtrum, and Cupid's bow peak improved. 32 patients had a satisfactory appearance. The nasal alar relapsed in 3 patients.

Conclusion: The orbicularis muscle of mouth could be reconstructed through intraoral and intranasal incisions. The shape of the nose, Cupid's bow and philtrum could be restored without traditional skin incision.

Keywords: microform cleft lip; nasolabial muscle complex; intraoral incision; intranasal incision

Early Cleft Repair Vs NAM: Comparing Pre-Operative Severity and Post-Operative Results Utilizing a Computer Engineered AI System

Presenter:	Pedram Goel, MD
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Background: Early cleft lip repair (ECLR) can be performed safely and effectively. One persistent question is whether ECLR may be offered to wide unilateral complete clefts who historically would have received nasoalveolar molding (NAM). This study aims to compare the pre-operative cleft severity of ECLR patients to those who underwent NAM pretreatment and compare postoperative outcomes.

Methods: Unilateral CL patients (1/1/2005-9/11/2018) were retrospectively reviewed and divided into two groups: ECLR (age <3 months) and presurgical NAM with CL repair (ages 3-6 months). Pre-treatment CL severity was assessed using an AI computer engineered system that calculated cleft width ratios (CWR, pre-treatment cleft width divided by commissure width). For further analysis, a second subset of wide complete cleft lip patients undergoing ECLR (excluding incomplete clefts) was created to compare to the NAM group.

Results: 74 ECLR patients and 25 NAM patients (average age at repair 32.24 days and 117.56 days, respectively) met inclusion criteria. Mean CWR was 0.456 for ECLR patients and 0.501 for NAM patients ($p= 0.165$). The ECLR subgroup considering only patients with complete cleft lips had a mean CWR of 0.520, suggesting this group had more severe clefts. The ECLR subgroup's average lip length, frontal nasal breadth, commissure length, nostril breadth, nostril width, and nasal angle symmetry ratios were compared to the NAM groups postoperatively. The average lip length, frontal nasal breadth, and commissure length symmetry ratios for the ECLR subgroup of 27 complete clefts was 0.88, 1.05, and 0.92 respectively compared to 0.93, 1.08, and 0.89 for the NAM group ($p = 0.181$, $p = 0.526$, $p = 0.378$). The average nostril breadth, nostril width, and nasal angle ratios among the ECLR subgroup were 1.09, 1.17, and 1.12 respectively compared to 1.12, 1.19, and 1.14 in the NAM group ($p = 0.480$, $p = 0.613$, $p = 0.640$).

Conclusion: ECLR provides patients with severe cleft lips an alternative option to NAM with at least equivalent results. With increased experience, long-term data, and increased awareness, we feel that ECLR has the potential to be a paradigm shift in the treatment of the cleft lip/nasal deformity.

The Association of Liposomal Bupivacaine on Opioid Consumption in the Pediatric Alveolar Cleft Population

Presenter:	Jiwon Sarah Crowley, MD
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Introduction: Liposomal bupivacaine (LB) is a long-acting local anesthetic that has become a valuable tool in multimodal pain therapy for many adult surgical specialties. However, it has only recently been used in the pediatric population. Recent studies have shown that administration of LB in pediatric patients is safe and efficacious, particularly in the craniofacial population. Despite this, there has not been a study focusing on its use in alveolar cleft patients. We proposed that the use of surgical site infiltration with LB in this population would be associated with a decrease in post-operative opioid requirements following alveolar bone grafting.

Materials and Methods: A retrospective cohort study was conducted that included patients who underwent alveolar bone grafting from November 2016 to December 2018 by two craniofacial surgeons at a tertiary craniofacial center. Data collected included technique of harvest (H-osteotomy, trap door osteotomy and coring drill), laterality (left, right or bilateral), demographics, and use of LB. We then calculated the total opioid use through the end of post-operative day (POD) 1. All opioid amounts were corrected for patient weight and converted to an oral morphine equivalent (OME) for standardization. We then performed a multivariable linear regression modeling OME as a function of LB use while controlling for operative technique, laterality, age, sex, and weight.

Results: Forty-four patients who underwent alveolar bone grafting (29 female and 17 male, ages 8-17 years with median age 11 years) were included in our study. Two of the 44 patients underwent separate right and left ABG operations for a total of 46 charted hospital admissions. The H osteotomy harvesting technique was used 23 times (53.3%), trap door osteotomy technique 13 times (29.5%) and the coring drill technique 10 times (22.7%). Eighteen (39.1%) patients used intravenous narcotics,

eighteen (39.1%) patients used oral narcotics and ten (21.8%) used no narcotics at all. Twenty-five (54.3%) patients received LB. Average hospital length of stay (LOS) was 1.6 days (standard deviation [SD] ±0.63), over which patients received on average 13.0 mg OME (SD ±13.1 mg) up until the end of POD 1.

On multivariable analysis, patients who received LB required 14.4 mg less of OME up until POD1 (p=0.007). There was no difference in hospital LOS (1.76 vs 1.4 days, p=0.83) or number of post-operative visits within 30 days following surgery (2.1 vs 1.8 p=0.09) between cohorts. Patients who underwent bilateral bone grafting had a longer LOS (1.5 vs 0.9, p=0.0183). The LB cohort had reduced proportions of patients requiring intravenous narcotics (28% vs 52.4%) and oral narcotics (36% vs 42.8%) and had a higher proportion of patients who received no narcotics (36% vs 4.8%) (p=.027). LB use was not associated with overall hospital costs ($35,211 vs $36,622; p=0.68).

Conclusions: Intraoperative surgical site infiltration of LB was associated with decreased post-operative opioid requirements following alveolar bone grafting. It can be an effective part of multimodal pain therapy in the pediatric population. Further studies will need to be conducted focusing on the association of LB on length of stay and decreasing hospital cost.

Perioperative Morbidity of Repeat Posterior Cranial Vault Distraction Osteogenesis: A Single Center Experience

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Introduction: Posterior cranial vault distraction osteogenesis (PVDO) has become the preferred modality in many centers for cranial expansion in syndromic and multisuture craniosynostosis patients. The low morbidity profile and large degree of volumetric expansion have propelled its use. The purpose of this study was to evaluate the perioperative morbidity of repeat PVDO in pediatric patients.

Methods: A retrospective review of all patients who underwent PVDO was performed from 2015 to 2018. Individual demographics, perioperative data, distraction parameters, and complications were reviewed and repeat PVDO patients were identified.

Results: A total of 16 patients underwent primary PVDO (16.48+/-15.44 months old at the time of surgery) in the selected time period. Five of these patients had repeat PVDO performed (30.49+/-15.32 months old at the time of surgery), with one patient requiring a third distraction. Indications for repeat distraction were symptomatic intracranial pressure (ICP) elevation and halted cranial growth. When comparing primary PVDO to repeat PVDO, operative time (168+/-55 vs. 207+/-47 minutes, p=0.14), reported EBL (16.7+/-9.0 vs. 11.3+/-6.6 mL/kg, p=0.20), RBC transfusion (25.9+/-15.1 vs. 25.2+/-10.6 mL/kg, p=0.91), length of ICU stay (3.3+/-4.3 vs. 4.0+/4.4 days, p=0.72), and length of hospital stay (8.4+/-9.5 vs. 5.8+/-4.0 days, p=0.53) were not significantly different. Additionally, there was no increased incidence of post-operative complications (37.5% vs. 33.3%, p=0.86).

Conclusions: Repeat PVDO is comparable in perioperative morbidity to primary PVDO in patients with syndromic or multisuture craniosynostosis. Use of PVDO provides excellent cranial expansion and relief of elevated ICP while delaying the use of frontal advancement or monobloc procedures.

Primary Cleft Rhinoplasty: 22-Year Retrospective Review of a Single Technique

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Purpose: Repair of the cleft lip nasal deformity at the time of the initial cheiloplasty has become widely accepted owing to evidence of both improved outcomes and need for fewer revisions.[1] Patients may require additional rhinoplasties prior to beginning school, if severe, and again in adolescence. Several primary rhinoplasty techniques exist, and few surgeons have long-term series of a single cleft rhinoplasty repair method. The senior author has over 20 years of experience performing the same primary cleft rhinoplasty repair based on a technique described by Salyer.[2] The purpose of this study is to examine long-term outcomes of this technique.

Methods: An IRB-approved, retrospective review was conducted on all patients who underwent a cleft rhinoplasty by the senior author at the time of their primary cleft lip repair between January 1996 and January 2018. Patients above the age of 3 at the time of the repair were excluded.

Results: Of the 60 patients who met the inclusion criteria, cleft type was as follows: 22 UCL-L (36.7%), 10 UCL-R (16.7%), 12 UCL/P-R (20.0%), and 16 UCL/P-L

(26.7). 37 (61.7%) were male and 23 (38.3%) were female. 17 (28.3%) presented with other congenital comorbidities, most commonly cardiac. The median age at surgery was 3 months. Degree of lip clefting was noted for 57 patients, of which 31 (54.4%) were complete and 26 (45.6%) were incomplete. No patient had short-term complications related to their initial cleft lip and rhinoplasty repair, such as bleeding or airway compromise. 52 (86.7%) patients had follow-up appointments in the medical record, with an average follow-up of 6.27±5.56 years (0.01-19.3). Average age at last follow-up appointment was 6.60±5.55 years (0.2-20.0). 33 (63.5%) and 27 (51.9%) were above the ages of 3 and 5 years old, respectively, at last follow-up. None of the school-aged patients required additional surgical correction of the cleft nose deformity prior to beginning school. Eight (15.4%) patients had follow-up beyond 16 years, with ages ranging from 16 to 20. Two of these had definitive rhinoplasties as adolescents. Of the remaining 6 patients beyond 16 years of age, none was seeking an additional rhinoplasty at last follow-up, and thus never required an additional nasal procedure beyond the rhinoplasty performed at the time of initial cleft lip repair.

Conclusions: This is one of the longest-running, single-surgeon cleft rhinoplasty review series. Our patient demographics are consistent with the literature. The cleft rhinoplasty technique described by Salyer results in no additional incisions, is performed at the time of the initial cleft lip repair, and has yielded excellent long-term results in this series. The senior author has not needed to perform elementary school age rhinoplasties on any patients, and the majority of patients with follow up beyond 16 years (6 of 8, or 75%) have also not required a rhinoplasty in adolescence.

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Internal Cranial Expansion for Treatment of Refractory Intracranial Hypertension in an Adult Population

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Background: Idiopathic intracranial hypertension (IIH) is a disease process attributed to increased intracranial pressure that often presents with headaches, visual deterioration, and papilledema. Severe cases are often refractory to medical treatment, lumbar punctures, and CSF shunts. Internal cranial expansion (ICE) is a relatively novel technique that involves removing and shaving down the skull's inner calvarial table and cancellous bone to increase intracranial volume and reduce intracranial pressure. Previous studies have shown success in pediatric patients. The present study describes the effectiveness of ICE in adult patients with IIH.

Methods: A retrospective review was conducted of 9 patients from the ages of 18-61 years who underwent ICE for the treatment of IIH. Preoperative and postoperative clinical parameters including patient symptoms, presence of papilledema, and available ICP or CSF opening pressures were compared. Procedural details and complications were noted. Intracranial volume increases were calculated using available pre- and postoperative CT scans.

Results: Mean follow-up for the 9 patients in this series was 8 months. Technically successful ICE was performed in all patients within the cohort without any surgical complications. At the time of last follow-up, 4 (44%) of 9 patients were either symptomatically improved or asymptomatic. Three (33%) of 9 patients with headache had a reduction in or complete resolution of this symptom. Papilledema was resolved in all patients (4 of 4) with this sign. Postoperative intracranial volume expansion ranged between 6.9% and 18%.

Conclusions: Internal cranial expansion is a safe procedure that can provide symptomatic improvement for some adult patients and thus has a role in treatment of refractory IIH outside of the pediatric population. This surgery expands the intracranial volume and thus promotes ICP normalization, which may lead to the reduction or complete resolution of the signs and symptoms of IIH. Internal cranial expansion may be used as part of a multidisciplinary management approach in the treatment of refractory IIH.

Speech and Audiology Outcomes Following Single-Stage Vs. Early Two-Stage Cleft Palate Repair

Presenter:	Jiwon Sarah Crowley, MD
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Purpose: Management of patients with unilateral or bilateral complete cleft lip and palate using early soft palate closure at the time of cleft lip repair followed by hard palate closure at 10-18 months of age has been advocated for improving speech and audiology outcomes, though this has not been previously investigated. This study performs a comparative review of speech and audiology outcomes for single-stage and two-stage palate repairs for patients with complete cleft lip and associated cleft palate.

Materials and Methods: A retrospective chart review identified patients with diagnosis of cleft lip with associated complete cleft palate who underwent either single or two-stage repair from 2006-2012. Data collected included age at each surgery, necessity of further speech surgery for velopharyngeal insufficiency, frequency of tympanostomy tube placement, and most recent audiology and speech assessment data including hypernasality and intelligibility, which were graded per the validated Americleft speech scale. Subset statistical analysis was performed comparing single-stage and two-stage groups for unilateral and bilateral patients.

Results: A total of 91 patients were identified and subdivided into groups of unilateral single stage, bilateral single stage, unilateral two stage and bilateral two-stage repairs. Mean age at the time of single-stage palate repair was 13.3 months. For the two-stage group, mean ages were 4.2 and 11.8 months for the soft palate and hard palate repairs, respectively. Mean age at most recent speech assessment was 4.72 years for all patients. Speech surgeries were required for 5.9% (n=2/32) of single-stage patients and 2% (n=1/47) of two-stage patients although this difference was not significant. The two-stage unilateral group showed significant improvement in intelligibility versus the single-stage group (0.59 vs 1.37; $p < 0.05$), but no significant discrepancy with hypernasality. The two-stage bilateral group showed significant improvement in intelligibility versus the single-stage group (0.79 vs 2.17; $p <0.05$), but no significant discrepancy with hypernasality. Mean age at last audiologic assessment was 6.17 years. No significant difference was noted between groups with respect to hearing loss or tympanostomy rates.

Conclusion: Early two-stage palatal closure is a viable method for improving early speech development in patients undergoing repair of unilateral and bilateral cleft lip and cleft palate. No significant benefit was achieved with respect to audiologic outcomes or tympanostomy rates.

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Volumetric Velopharyngeal Port Modification in Cleft Palate Patients Undergoing Le Fort 1 Maxillary Advancement

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Background & Purpose: The effects of maxillary advancement (MA) on velopharyngeal anatomy have been previously studied by means of cephalometric analysis (1). The purpose of this study is to compare the pre and post-operative velopharyngeal port configuration modifications as measured on computerized tomographic (CT) scans. Changes in velopharyngeal function (VPF) as evaluated by perceptual speech assessments are also discussed.

Methods: This was a retrospective cohort study of 44 patients with and without Cleft Lip and Palate (CLP) who were treated with MA for midface hypoplasia and secondary malocclusion at skeletal maturity. Pre and post-operative CT images were compared with respect to pre-established landmarks by 2 independent evaluators. Perceptual speech assessments were completed pre and post-operatively.

Results: Of the linear distances computed, the differences in the pre and post-operative measures of the narrowest part of the nasopharynx, the narrowest part of the retropalatal airway space and the retropalatal anteroposterior distance were statistically significant ($p<0.05$). The retropalatal cross-sectional areas (pre: 129.82 +/- 102.12 mm^2 vs post: 145.65 +/- 99.90 mm^2), the nasopharyngeal cross-sectional areas (pre: 375.16 +/- 120.58 mm^2 vs post: 370.38 +/- 142.61 mm^2) and the volumetric assessment of the nasopharyngeal space (pre: 4.06 +/- 2.26 cm^3 vs post: 4.34 +/- 2.35 cm^3) showed no statistically significant difference ($p<0.05$). There was no change in VPF following MA as reported by perceptual speech assessment.

Conclusion: Our results support the belief that although some structural modifications of the pharyngeal port are inherent to MA in CLP patients, its surface area and its volume do not seem to change significantly. These modifications do not appear to impact VPF.

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Surgical Workforce, Socioeconomic Status, and the Global Burden of Orofacial Clefts

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PURPOSE:
Orofacial clefts are one of the most common congenital anomalies, but this disease burden is unevenly distributed worldwide. Our hypothesis is that most of this burden falls on the countries with the smallest surgical workforce or lowest socio-demographic indices, rather than the countries with the highest prevalence of disease.

METHODS: The Global Burden of Disease methodology was used to estimate prevalence and morbidity of orofacial clefting in 195 countries from 1990 to 2017. Disability adjusted life years (DALYs) and prevalence were compared over time, geographically, and against the Socio-Demographic Index (SDI) and size of the national surgical workforce. Linear and logarithmic regressions were performed. Our international authorship hypothesizes on multiple factors contributing to this change based on their region's perspective.

RESULTS: From 1990 to 2017, the number of clefts worldwide decreased by 4.9% to 10.8 million and the burden of this disease significantly decreased by 70.2% to 652,084 DALYs. In 2017, low- and middle-income countries experienced 83.5% of the DALY burden. The largest decreases in DALY were seen in East Asia and the Pacific (83.6% decrease) and Sub-Saharan Africa (73.1% decrease), while North America (14.2% decrease) and high-income countries (20.5% decrease) remained neutral.

Prevalence was weakly positively associated with increasing SDI ($r=0.43$, $r^2=0.18$) while DALYs were negatively associated with SDI ($r=-0.79$, $r^2=0.48$). There was a logarithmic association between the estimated surgical workforce and the disease burden, with significantly fewer DALYs in countries that had a surgical workforce of more than six providers per 100,000 population.

CONCLUSION: The burden of orofacial clefts has decreased significantly despite steady prevalence over the past 28 years. Most of the burden of orofacial clefting is carried by low- and middle-income countries, and the prevalence of orofacial clefting is not strongly correlated with the socio-demographic index. Strengthening the surgical workforce may aid in decreasing the life-long disease burden of orofacial clefting for any given country.

Adult Cranioplasty Reconstruction with Customized Cranial Implants: Does Radiation Therapy Affect Outcomes?

Presenter:	Kerry-Ann S. Mitchell, MD, Phd
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Purpose: Reconstruction of complex cranial defects presents numerous challenges, especially when combined with radiation therapy (RT). As such, the goal of this study was to investigate whether pre- or postoperative RT increases the risk of complications in the setting of cranioplasty (CP) with customized cranial implants.

Materials & Methods: A retrospective cohort study was performed on our IRB-approved database spanning January 2012 to March 2018.[i] All CPs performed by the senior author (CG) were included. Variables abstracted from patient records include demographic data, medical/surgical history, intra-operative data, and post-operative history. Further analyses were performed on "primary" CPs (defined as no prior CP attempts to correct their index cranial defects). "Revision" CPs (defined as having prior CP reconstruction performed by the senior author/different surgeon) were excluded. The primary outcome was complication incidence in patients who underwent pre- or post-op RT. Complications were categorized as major or minor. "Major" required reoperation, while "minor" were self-limiting. Recurrences of the indication for index craniotomy/craniectomy were not considered CP-related complications. Complication rates were further assessed by implant material. Standard descriptive analyses were performed. Chi-squared tests were used to examine for significant differences across categorical variables, with significance set at $p<0.05$.

Results: 227 primary CPs were performed between January 2012 and March 2018. 18 patients underwent pre-RT and 11 underwent post-RT. Mean age was 50 years (SD±16.3, range 17-92 years). Of the 199 patients who did not undergo radiation, 23 (12%) had major complications. Of the 18 pre-RT patients, 3 (17%) had major complications. Two patients had tumor recurrence requiring further surgery. None of

the 10 post-RT patients had complication; 2 had tumor recurrence requiring additional surgery. There was no statistically significant difference among the groups ($p > 0.05$). Across all groups, most patients underwent CP reconstruction with solid, prefabricated polymethyl methacrylate (PMMA; no liquid mixing intra-op). The use of autologous bone compared to synthetic implants did not result in statistically significant differences in complications in any of the groups.

Conclusions: In this study, neither pre-RT nor post-RT significantly increase the risk of major complications in primary CP. We hypothesize that our patient-specific algorithm for choosing solid implants over titanium mesh, combined with various neuroplastic surgery techniques such as scalp augmentation with fascia,[ii] contribute to these findings. Further studies are needed to determine whether this holds true in revision surgeries.

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Quantitative Effects of Cleft Lip and Nose Adhesion on Nostril and Alveolar Discrepancy

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Background: While there is considerable data quantifying the effects of nasoalveolar molding (NAM) on definitive lip repair, less is known about the effect of cleft lip and nose adhesion (CLNA) on the alveolar segments and nostril shape in patients that are unable to undergo craniofacial orthodontics. CLNA approximates the lip segments, resulting in the conversion of a complete cleft lip to an incomplete cleft lip while sparing the tissues and landmarks for eventual definitive lip repair. In resource-constrained environments or situations where patients cannot undergo craniofacial orthodontics, CLNA has been shown to qualitatively improve nostril shape prior to

definitive reconstruction in wide cleft. However, less is known about the effects of CLNA alone on the nostril and alveolar cleft segments dimensions.

Material & Methods: After obtaining IRB approval, a single-center retrospective review of unilateral cleft lip patients undergoing CLNA was performed. Measurements were taken at the time of CLNA and at formal repair. The following data points were extracted for the cleft and non-cleft side: nostril height (NH), nostril width (NW), alveolar height (AH) and alveolar width (AW). Dimensional changes from the time of CLNA and time of formal repair were statistically analyzed using a paired students t-test.

Results: A total of 1053 surgical cases were reviewed. Eight patients met criteria for inclusion. Average nostril height prior to CLNA was 2.3mm on the cleft side and 5.6mm on the non-cleft side ($p=0.020$). After CLNA, the nostril height on the cleft vs. non-cleft side was 4.5mm and 5.0mm, respectively ($p=0.553$). Average nostril width prior to CLNA was 14.8mm on the cleft side, compared to 7.3mm on the non-cleft side ($p=0.003$). After CLNA, the average nostril width on the cleft side was 11.2mm, compared to 7.1mm on the non-cleft side ($p=0.007$). CLNA resulted in a significant reduction in nostril width on the cleft side ($p=0.002$). The average alveolar width discrepancy, measured as the gap between alveolar segments, was 9.9mm prior to CLNA and significantly decreased to 1.5mm before definitive repair ($p=0.002$). Alveolar height discrepancy decreased from 11.4mm to 6.5mm ($p=0.060$).

Conclusion: This study reports quantitative changes with CLNA, a powerful tool for reshaping the nostril and approximating the alveolar segments in cases where NAM is not an option. This study demonstrates that CLNA alone achieves a cleft nostril height which approaches the non-cleft side, improved alveolar height and width discrepancy by closure of the the gap between alveolar segments, and significant reduction in nostril width.

One-Stage Repair of the Cleft Lip, Nose, Alveolus and Palate: Technique and Morbidity - a Retrospective Review

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Introduction: Repair of the cleft lip, nose, alveolus and palate is frequently performed in various combinations of staged procedures based largely on the concern

of facial growth restriction, with the ideal timing of repairs remaining controversial[1]. This leads to multiple recovery periods, increased school absences, and increased exposure to general anesthesia. In addition, concerns regarding the dangers of general anesthetics and their potential effects on neurocognitive development are prevalent, posing a possible risk during periods of rapid brain growth[2, 3]. Multiple procedures also impose a significant socioeconomic burden on the family[4]. Ideally, these would be combined into a single stage procedure, offering significant benefits to both the patient and the family, while still being safe and effective.

Objective: The purpose of this study is to demonstrate the safety, efficacy, and initial outcomes of a single-stage repair of the total cleft deformity.

Methods: A retrospective chart review of a sequential series of patients from January 2007 to December 2017 who underwent a new single stage repair of the cleft lip, nose, alveolus and palate performed by one surgeon was completed. Demographic data, surgical and anesthetic time, length of hospital stay, and complications were the primary outcomes assessed.

Results: One hundred patients, with an average age of 7.0+/- 4.2 months old underwent a single stage repair of the total cleft deformity. Average anesthesia time was 283 +/- 51 minutes; the average procedure time was 243 +/- 50 minutes; the average estimated blood loss from the procedure was 18.4 +/- 7.7 mL; and the mean hospital stay was 1.8 +/- 1.1 days. The average follow-up duration was 35 months, with the longest still following up after 10.5 years. There were no reported anesthetic complications, oronasal fistulas, infections, need for blood transfusions or re-admissions. One patient required a second procedure due to a traumatic dehiscence. Two patients developed velopharyngeal insufficiency. One patient required an upper lip revision with excess skin removal and eight required upper lip scar revisions.

Conclusions: This study demonstrates the safety and efficacy of a single stage repair of the total cleft deformity. Operative times, hospital stays, and anesthetic morbidity compares favorably to staged repairs. With the concerns over the impact of general anesthesia on development, a single stage repair represents a viable option for limiting exposures while still maintaining acceptable post-operative outcomes.

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Alternative Transpalpebral "Eyelid" Approach for Supraorbital Frontal Craniotomy and Access to the Anterior Cranial Fossa

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Purpose: The transpalpebral "eyelid" approach is a novel alternative to the traditional incisions for supraorbital frontal craniotomy and access to the anterior cranial fossa. Using the natural skin folds of the eyelid, the transpalpebral incision mitigates visible scars to improve post-operative aesthetic outcomes. While this type of approach has been described in the neurosurgery literature, this is the first report of such a surgical technique in the plastic and reconstructive surgery literature for accessing the anterior cranial fossa. Herein, we elucidate our unique surgical technique and results for this approach to the anterior cranial fossa.

Methods: A retrospective review was performed of patients who underwent supraorbital frontal craniotomy using an anterior skull base approach with transpalpebral exposure over seven years by a single plastic surgeon (D.A.S.). Surgical techniques, medical co-morbidities, intra-operative complications, and long-term complications were assessed. Pre- and post-operative imaging were evaluated.

Results: Nineteen patients (mean age 52±12 years, 52% male, 48% female) underwent supraorbital frontal craniotomy using an anterior skull base approach with upper transpalpebral exposure. In terms of operative indications, 80% (15) had anterior communicating aneurysms with a mean aneurysm size of 5.36±1.91 mm, 10% (2) had meningiomas, 5% (1) had a dural fistula, and 5% (1) had an orbital hemangioma. Notably, 58% (11) had a smoking history. No intra-operative complications were encountered, and no cases were converted to traditional open approaches. Mean length of hospital stay was 3.3±1.5 days. Post-operative imaging revealed no residual or recurrent aneurysms, meningiomas, fistulas, or hemangiomas. Mean follow up time was 47.1±28.4 months. Long-term complications were limited to two patients requiring re-operation for aesthetic considerations related to palpable

hardware with no further sequelae. Specifically, one patient had removal of right cranial hardware and cranioplasty with bone paste as well as temporalis muscle flap advancement, and one patient had removal of left cranial hardware and cranioplasty with bone cement. No long-term neurological complications or infections occurred.

Conclusion: In conclusion, this transpalpebral technique is an excellent, minimally invasive, and innovative alternative to approach lesions of the anterior cranial fossa. This transpalpebral approach provides dissection in well-defined anatomical planes, affords preservation of the frontalis muscle, avoids injury to the facial nerve branches, and yields superior aesthetic outcomes to traditional craniotomy incisions. Furthermore, this novel approach does not limit neurosurgical access or results and led to no neurosurgical complications.

An Analysis of 53 Craniofacial Center Websites: Craniosynostosis Families Are Being Provided Inaccurate, Variable, and Incomplete Information

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Purpose: Craniofacial center websites are an early and significant source of education for parents. The aims of this presentation are to analyze the answers given by these websites to selected questions about craniosynostosis, and to assess the variability and accuracy of these answers.

Methods: The internet search-phrases “craniosynostosis,” “craniofacial center,” and “craniosynostosis center” were employed. The first 30 teams for each search were chosen, leading to 53 center websites after accounting for duplications. The websites were reviewed. Answers to select questions were recorded and assessed.

Results: Answers to questions were highly variable between websites with disparate statements noted, including:

1. 13% of websites state that surgery is required for all craniosynostoses.

2. 14% of websites state that if untreated, craniosynostosis mostly or always leads to developmental delay.

3. 95% of websites state there’s a combined plastic surgical-neurosurgical team approach. 5% are neurosurgeons working alone.

4. 22% of websites only mention open surgical correction. No sites exclusively mention endoscopic techniques.

5. The maximum age for endoscopic surgery is less than 3 months for 50% of sites, 3–6 months by 44%, and *8 months by 6% of websites*.

6. 76% of websites do not address if blood transfusion is required. 4% of centers claim transfusion is only required for an open approach, although their published data contradict this.

7. Multiple inaccurate claims exist where centers describe themselves or their achievements with superlatives claiming to be unrivaled or unparalleled by other centers.

Conclusion: The most search-engine-optimized craniofacial center websites often are not comprehensive and provide inaccurate and variable information to families.

Ten Surgical Hacks Based on Anatomy to Dramatically Reduce Your Face and Neck Lift Time

Presenter: Jordan D. Frey, MD
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Myriad techniques for management of the skin, subcutaneous, and fascial components of the face and neck have been described. During surgery, a natural flow of slower and speedier components can be designated. Concern for injury to facial motor or sensory nerve branches often leads to inefficiency and increased operative time. Prolonged surgical time creates more swelling, leading to delayed healing and longer recovery time. The time taken to perform this procedure seems proportional to the length of time with post-operative edema. We introduce and demonstrate ten reproducible surgical hacks based on anatomy, which span aspects of the entire face and neck lift procedure:

1. Pre-operative markings including a superior, transverse “cross-bar” located 2 centimeters above the superior tragus, a step-cut to preserve the tragal incisura, and a varied, wavy postauricular incision for easier trim without dog ear formation. The benefits of these markings will be outlined.
2. Modified curved Metzenbaum dissecting scissors with the tips adjusted to cut with pushing for rapid push skin undermining

3. Oblique sub-SMAS scissor spreading to elevate the SMAS flap without nerve injury
4. “Digital measuring sticks” by knowing the distance of key areas on the surgeon’s hand, used to measure critical distances, saving time to guide incision positions and anatomic dissection including safe sub-SMAS release and placement of SMAS flap suspension sutures
5. Modified scoops (small, sharpened measuring devices) for rapid pre-platysmal fat removal
6. Using the lowest point of the anti-tragus as a guide for initial splitting and in setting of the skin flap followed by skin flap trimming using the skim trim hack
7. Pre-tragal divot to prevent tragal distortion with flap thinning, hair reduction, and a single suture
8. “No-inset” method for the lobule to save time and prevent pixie ear deformity
9. One minute dressing with a silicone pad prevents fluid accumulation
10. Block and tackle the face for local-only face and neck lifts or painless hematoma drainage

Implementation of these surgical hacks in face and neck lift procedures allow the surgeon to decrease operative time dramatically and minimize post-operative edema while attaining aesthetic and natural results. Certain surgeons may already use some of these “tricks” and can use this as a resource to further “tidy up” their procedure; for others, these surgical hacks will be novel and can be implemented to refine their current techniques.

Face and neck lift surgery mandates the marriage of anatomical knowledge and surgical economy of skills and instruments. Using simple and reproducible surgical hacks, including instrument modifications, technical adjustments, and block methods, the surgeon can maximize efficacy and efficiency with face and neck lifts, improving patients’ ultimate recovery with less post-operative swelling as well as outcomes.

Buccal Mucosa Grafts for Reconstruction in Patients with Female Genital Mutilation

Presenter: Catherine Calvert, MD
Co-Authors: Takintope Akinbiyi, MD, Shelby Nathan, MD, Ivona Percec, MD, PhD
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Aim: Reconstruction after female genital mutilation (FGM) is a relatively new concept in the U.S. aimed to improve pain and sexual function and to restore a normal

physical appearance. The buccal mucosa has been described as a donor site option for reconstruction of eyelids, cheeks, larynx, urethra, and more recently the vagina. Here we present the novel use of buccal mucosal grafts in the reconstruction of external female genitalia after FGM.

Method:

1. Mouth is irrigated with Peridex solution and throat pack is placed.
2. Rectangular piece of thin buccal mucosa is harvested using a #15 blade with care to avoid important structures such as buccal fat pads, buccinator muscle, and Stensen's duct. Incisions are closed in a single running layer with 4-0 chromic suture.
3. Anterior abdomen fat harvesting is performed using standard Coleman technique. Fat is processed via Telfa rolling on back table.
4. Clitoral scar is incised or excised with careful attention to avoid injury to deeper nerves.
5. A flap harvested from the superior aspect of clitoral skin is rotated inferiorly to cover the superior aspect of the clitoral hood. The remainder of the hood is resurfaced using shaped portions of the buccal mucosa sutured with 4-0 chromic.
6. Flaps from the labia majora are rotated laterally and imbricated to the periosteum with interrupted 4-0 chromic. Medial flaps designed to become the new labia minora are subsequently covered with buccal mucosal grafts on their lateral aspects.
7. Buccal mucosal grafts were dressed in xeroform and antibiotic bolsters.
8. Fat subsequently grafted into bilateral labia majora inferiorly and superiorly into the vulvar region to encourage regeneration of the surgical site.

Results: The authors have observed excellent cosmetic outcomes at 6 months postoperatively with well incorporated tissue. Patients report significantly improved functional outcomes with postoperative clitoral retraining therapy.

Conclusions: Benefits of using the buccal mucosa as a donor site are similar to those reported previously. Namely, these include an inconspicuous donor site scar, primary closure of the donor site, and a decreased need for local tissue rearrangement and distortion of anatomy due to a distant donor site.[1,2] As with any new technique, further investigation is needed to examine the long term functional and cosmetic outcomes, including patient satisfaction and sexual function. Exposure of this technique to plastic surgeons will enable the therapeutic benefits to this greatly underserved population.

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Do You Know Your ABCDEs? The Surgeon's Guide to the Psychological Screening of Aesthetic Patients

Presenter: Maria Chasapi, MD
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Introduction: Most surgeons receive inadequate training in the psychological assessment of patients pursuing cosmetic surgery. It is accepted that systematic pre-operative psychoanalytical approach is crucial for a favourable aesthetic outcome.[1-4] However, few comprehensive screening tools are described in the literature to guide the aesthetic surgeon through the vital domains of psychological evaluation. [2-4]

Hereby, we propose an innovative ready reckoner based on the "ABCDE" approach as a simple and effective tool to screen cosmetic patients prior to treatment with the aim of identifying those individuals who may be either unsuitable for cosmetic surgery or at high risk for poor psychological outcome after elective aesthetic procedures and would therefore benefit from additional support and /or psychological referral.

Methods: Literature search was performed to identify all screening tools used in the pre-operative psychological assessment of patients undergoing aesthetic surgery.[1-5] In addition, a parallel review was undertaken to filter out identifiable predictors of an unsatisfactory post-operative psychological and psychosocial outcome despite a technically satisfactory surgical result.[1,3,4,5]

Results: Data compiled from available evidence were categorized into five key domains that constituted the basis of the "ABCDE" approach (A: Aims, B: Background and Body language, C: Consciousness, D: Developmental Influences, E: Expectations). This was then summarized in the innovative form of a ready-reckoner that can be readily used in the clinical setting to guide the aesthetic surgeon through

the essential areas of psychological assessment.[1-5]Its components are summarised in the following table:

	A	B	C	D	E
A	**A**ims	**A**ppearance	**B**oost	**C**onfidence	**D**rive **E**xternally
	Asymmetry			**D**eficits	driven
	Aestheticality			**D**efects	
B	**B**ackground&	**A**ppearance	**B**ehaviours	**C**omorbid	**D**iscrepancy **E**ffect on you/
	Body language	**A**ge	**B**DD(Body	psy conditions	intuition
	Aesthetic history	Dysmorphic	**C**ontact		**E**go strength
		Disorder)			
C	**C**onsciousness	**A**wareness	**B**ody image	**C**ritical	**D**istraction **E**xcessive
	Avoidance of	**B**ashfulness	Judgement	**D**egree of	preoccupation
	social activities		**C**oncealing	distress	
D	**D**evelopmental	**A**cute onset	**B**ackground	**C**ultural	**D**ramatic **E**vents
	Influences	**A**ttitude of family	-social-		changes

E **E**xpectations

Conclusion: The "ABCDE" approach provides a simple and comprehensive aide memoire for aesthetic surgeons to explore systematically their patients' psychological and psychosocial background and flag up any potential problems that can negatively affect postoperative results.

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Transnasal Tension Suture of External Nasal Splints: A Reliable, Novel Technique

Presenter: Lucas Kreutz-Rodrigues, MD
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Purpose: External nasal splints are frequently applied for postoperative protection after closed nasal reduction or rhinoplasty, usually secured with tape dressings or surgical glue.[1-4] We routinely apply external nasal splints in these situations and secure the splint by transnasal suturing. We seek to describe our technique and review our experience with transnasal tension suture of the external nasal splint.

Methods: A retrospective chart review was performed, to review 100 consecutive patients who had an external nasal splint secured using this method. The technique consists of steristrips applied across the dorsum and nasal bones in a transverse

orientation, followed by a vertical “U” shaped sling of steristrips. A piece of Aquaplast is cut to shape to allow coverage of the entire nasal tip, sidewalls, and dorsum up to the level of the radix, with care not to impinge on the lower lids or medial canthal region. The Aquaplast material is molded to the nose. While the splint is still in its malleable state, a 2-0 polypropylene suture on a straightened tapered needle or a Keith needle is passed through the splint, the nasal sidewalls and septum, through the splint on the contralateral side, and back again in a horizontal mattress fashion. The suture is tied down and gently cinched to maintain the desired shape of the splint and prevent splaying or flattening. For this maneuver to be successful, it should be completed before the splint completely hardens. The splint is left in place until the first postoperative followup (10-14 days), at which time it is removed by simply cutting the single suture.

Results: Mean patient age was 31.5 years, 82 male and 18 female patients were reviewed, 67% of splints were placed for closed reduction of acute nasal trauma, and 33% placed after elective rhinoplasty for late correction of functional and cosmetic traumatic deformity. No splints were inadvertently removed by patients prior to followup. Splints were removed an average of 12 days postoperatively and mean late followup was 27 weeks. There were no complications related to transnasal suturing of the splint, specifically no incidence of skin ulceration, pressure necrosis, identifiable scarring related to the suture entry points or breathing difficulty attributable to internal nasal valve narrowing.

Conclusion: Transnasal tension suture is a safe and reliable method for securing a thermoplastic external nasal splint. This method overcomes many of the disadvantages associated with adhesive tape fixation of splints and is not associated with any added morbidity.

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Endoscopic D-Knife Decompression Technique (DDT) to Treat Frontal Migraines

Presenter: Mikaela Kislevitz, MD
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Purpose: Both endoscopic and transpalpebral decompression of the supraorbital nerve (SON) have been used for the treatment of frontal migraines and more recently New Daily Persistent Headaches (NDPH). Utilizing a transpalpebral or endoscopic approach, the nerve is decompressed by means of a corrugator excision, fascial release, vascular lysis, supraorbital band release and an occasional boney foraminotomy. The transpalpebral approach may not allow for visualization of all small accessory nerves. However, the endoscopic approach provides superior visualization but can be challenging to perform in patients with long foreheads (> 8cm) or frontal bossing. An endoscopic-assisted SON decompression with a D-knife is described with intraoperative photos and videos in patients with long foreheads and/or frontal bossing. In addition, cadaver and clinical data is presented.

Methods: Six cadaver heads, with twelve total supraorbital foramens were decompressed using the D-Knife decompression (DDT technique). This D-Knife has a blunt end that faces the bony part of the notch and a sharp end that cuts the fibrous band. In addition, patient charts were retrospectively reviewed to evaluate post-operative events after SON decompression surgery.

Results: In all twelve cadavers, six with frontal bossing, SON canal decompression was completed using the D-Knife technique with no injuries to the SON or globe. Twenty-three patients received the DKD technique for SON decompression. All patients were free from injury to the nerve or globe. Patients reported mild transient nerve irritation (34.7%) and numbness (4.3%).

Conclusion: Patients with frontal migraine headaches and NDPH with frontal bossing/longer foreheads can safely have SON decompression endoscopically utilizing the DDT technique.

Medical Malpractice Claims after Nonsurgical Cosmetic Procedures

Presenter: William K Snapp, MD

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BACKGROUND: Nonsurgical procedures account for more than 40% of the 15 billion dollars spent on cosmetic procedures nationally each year. These procedures are being performed by physicians across a multitude of both surgical and non-surgical specialties, as well as by physician extenders. Although nonsurgical procedures are often viewed as a low-risk alternative to cosmetic surgery, they are not without their own complications. Consequently, physicians assume the risk of malpractice litigation when performing or supervising such procedures. There is a paucity of literature regarding malpractice claims associated with nonsurgical cosmetic procedures. The goal of this study is to use multiple national legal databases to characterize such malpractice claims.

METHODS: Retrospective analyses of both the Westlaw legal database and VerdictSearch legal database were performed on all legal cases from 1985 to present that resulted in a verdict or settlement related to nonsurgical cosmetic procedures. The 10 most common nonsurgical cosmetic procedures were included in the search query. Malpractice cases were reviewed individually to ensure that they were directly related to nonsurgical cosmetic procedures and then the databases cross-referenced to eliminate any duplicates. The final combined database was then analyzed based on the procedure, primary malpractice claim, defendant qualifications and specialty, the case outcome and the amount of award in case of plaintiff decision/settlement.

RESULTS: A total of 68 individual cases were collected and analyzed. The most common procedure was laser resurfacing (n=20), followed by chemical peel (n=17) and laser hair removal (n=16). Despite being the most and second most common procedures performed over the last two decades, botulinum toxin injection and dermal filler injection only accounted for 1 and 8 malpractice claims, respectively. The most common cause for litigation for laser resurfacing (90%), chemical peel (94%) and laser hair removal (94%) was burns/scarring due to alleged inappropriate administration, while the most common cause for litigation after dermal filler injection was nodule/cyst formation (50%). 38% of all cases resulted in a decision in favor of the plaintiff (against the physician) and 6% of cases were settled out of court. The remaining resulted in favor of the defending physician. The average award after a decision in favor of the plaintiff was for $440,323.27± $419,404.77. The average settlement was for $393,625.00± $240,355.77. The majority of providers with identified specialties were board-certified plastic surgeons (n=20), followed by dermatologists (n=14) and ophthalmologist/oculoplastic surgeons (n=6). There was a disproportionate number of general practitioners (internists, family practitioners and

pediatricians) (n=7) given the small volume of cosmetic procedures they perform relative to other specialties. There was no significant difference between the procedure, the cause for litigation or the defendant specialty and the outcome of the lawsuit or the final monetary award.

CONCLUSIONS: Medical malpractice litigation is a significant cost burden to physicians across all specialties, including those performing nonsurgical cosmetic procedures in the office. Given the rapidly increasing popularity of nonsurgical procedures, it is important that plastic surgeons are aware of the medicolegal landscape to avoid potential malpractice claims associated with such procedures.

A Matter of Time: Ear Molding for Auricular Defects

Presenter: Manas Nigam, MD
Co-Authors: Vikas S. Kotha, BS, Emily S. Lai, BS, Stephen B. Baker, MD
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Purpose: Nonoperative ear molding has become an attractive option for traditional management of congenital auricular deformities. Deformities like cryptotias may self-correct over time and clinicians may be inclined to observe rather than intervene. However, the best timing for ear molding remains a point of debate.[1,2] In his own experience, the senior author (S.B.B) has developed several modifications to the ear molding process. The purpose of this study was to evaluate the lead author's outcomes after congenital ear-molding and investigate the influence of treatment timing.

Methods: A single-surgeon, single-institutional retrospective review from July 2013 to November 2018 was performed of pediatric auricular deformities which received ear molding. Patient, treatment, and outcome information including family satisfaction were analyzed. Patients were stratified into group I if treated within two weeks of birth or group II if treated after two weeks of birth.

Results: 158 ears in 100 patients (57 boys and 43 girls) were identified. The average post-treatment follow-up time was 0.5 months. Presentations included Stahl's ear (n=9), lidding/lop ear (n=20), helical rim abnormalities (n=17), prominent/cup ear (n=16), conchal crus (n=1), and mixed ear deformities (n=38). Average age was 10.6 days in group I (n=45) and 28.5 days in group II (n=55) (p=0.0001). Treatment times were similar between groups (31.6 days vs. 32.3 days, p=0.76). Group I experienced 43 fallout incidences compared to 56 incidences in group II (p=0.93). 107 devices

were used in group I compared to 124 in group II (p=0.79). 5 adverse events occurred in group I and 11 occurred in group II (p=0.16). Reapplication was needed in only 1 patient, and no patients required follow-up surgery. The average number of visits was similar between groups (4.6 vs 4.5, p=0.86). Satisfaction after molding was reported by all but two families (p=1).

Conclusions: Ear molding not only spares operative morbidity, but also allows for much earlier correction compared to surgical options, which usually address deformities only after the auricle has reached its adult size. Furthermore, surgical revision is often necessary and only prolongs the time until deformity resolution is achieved, even in the best outcomes. Because ear molding disrupts the ear when cartilage pliability is enhanced secondary to circulating maternally derived estrogen within the neonatal circulation, progressive organic restructuring occurs and outcomes are superior to surgery.[3] Our study did not find any difference in outcomes respective to treatment time, indicating that for select, comfortable clinicians, there may be utility in observing the natural progression of deformities. As our experience with ear molding continues to grow, the lead author has modified his technique. Future work will investigate these modifications.

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Facial Harmonization with Dermal Fillers

Presenter: Denis Souto Valente, MD, PhD
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Introduction: Volumetric rejuvenation and embellishment with dermal fillers (DF) is a minimally invasive technique with predictable life spans (1,2). Facial features can be reshaped with great control using DF. In this manuscript, the authors discuss the

applications of calcium hydroxylapatite (CaHA), hyaluronic acid (HA), polymethylmetacrylate (PMMA), and poly-L-lactic acid (PLLA) for facial reshaping.

Methods: 953 non-randomized subjects seeking treatment for facial volume balance received deep injection of DF in 3–5 facial areas including the temples, eyelids, zygomatic arch, cheeks, chin, prejowl sulcus, and jawline. Patients returned for follow-up at 2, 4 and 25 weeks, with the option of touch-up injections at 4 weeks if required. DF result was assessed using a 10 cm Visual Analog Scales (VAS) and patient satisfaction using the Global Impression of Change Scale (GICS) (5). Complications were recorded.

Results: Mean VAS scores at baseline were 3,7. At 4 weeks the mean VAS score had improved to 8.5. At week 25, mean scores had further improved to 8.7. At both follow-up visits, mean GICS scores were higher than the initial, indicating that facial appearance was 'much improved' compared with the baseline mean. A complication rate of 2.4% were observed. No subject discontinued the study due to adverse events.

Conclusion: Adequate DF placement at different regions of concern with a combinatorial and pan facial approach is important to achieve natural results. DF can be used successfully to correct volume loss and enhance facial features.

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The "Patent-Lumen" Vein Graft Harvesting Technique in Free Flap Reconstruction

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Background: Vein grafts are commonly used in microvascular reconstruction to augment pedicle length when adequate recipient vessels are lacking in proximity to the wound bed (1). However, their use may result in increased microvascular complications (2). The “Patent-Lumen” technique used at our institution consists of immediately irrigating and injecting the graft with a heparinized solution until maximal vein dilation is achieved. The graft is then clamped at both ends, maintaining its patency throughout the micro-anastomoses up until final unclamping. The purpose of this case series is to describe and evaluate the outcomes of the “Patent-Lumen” vein graft harvesting technique.

Methods: A retrospective chart review of all free flaps between 2007-2018 was performed. Adult patients undergoing microvascular reconstruction requiring a vein graft were included. Data collected included patient demographics, surgery specific variables and post-operative intra-hospital details. The primary outcome of interest was microvascular complications.

Results: A total of 10 patients aged 59 (+/-11) were included in the study. Eight saphenous and 2 superficial forearm veins harvested using the “Patent-Lumen” technique were used to bridge 9 arterial and 6 venous vascular deficits. Eleven grafts were interposed, and the AV loop approach was used in 2 cases resulting in an additional 4 grafts. Defect etiology was oncologic, traumatic and infectious in 50, 30 and 20% of cases respectively. The lower extremity was the most commonly reconstructed site (50%). The flap success rate was of 100% without any incidents of microvascular complications requiring re-operation.

Conclusion: The “Patent-Lumen” vein graft harvesting technique has resulted in no thrombosis, kinking or flap failure, in free tissue transfer reconstruction at our institution. It is a safe and effective technique for vein graft harvest and confers its advantage by maintaining lumen patency until restoration of flow, by preventing kinking and by immediate identification of leaks along the vessel.

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Less Is More: Microvascular Thrombophylaxis with Factor-Xa Inhibitor Monotherapy

Presenter:	Vikas S. Kotha, MD
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Purpose: From surgery length and postoperative activity restrictions alone, free tissue transfer (FTT)-based breast reconstruction patients have en elevated risk of developing postoperative venous thromboembolism based on their Caprini score.[1] However, because microanastomotic patency is critical, microsurgeons are keen on minimizing thromobophilic and vasoactive conditions. Additionally, compliance with traditional subcutaneous-based prophylaxis regimens is poor.[2] Consequently, traditional dogma regarding appropriate free tissue transfer (FTT) thrombophylaxis remains split and conclusive evidence is lacking. The purpose of this study was to examine the antithrombotic utility of Factor Xa-inhibitors after FTT.

Methods: A single-surgeon, single-institution retrospective review was performed from January 2016 to January 2019 of patients undergoing FTT who received postoperative prophylactic anticoagulation with subcutaneous lovenox during their hospital stay and then postoperatively with an oral Factor Xa-inhibitor: rivaroxaban 10mg daily for 10-14 days. Patients also received aspirin 81mg for thirty days postoperatively. Preoperative hematology testing to identify thrombophilias was performed and these patients received intravenous heparin 500units/hour for five days postoperatively, followed by Xarelto or home anticoagulation. The frequencies of postoperative deep venous thrombosis/venous thromboembolism (DVT/VTE) and outpatient hematoma were compared between patients with diagnosed thrombophilia and those without known risk factors.

Results: 163 FTTs performed in 105 patients were included. The average follow-up was 11 months. No patient developed postoperative DVT, VTE, or outpatient hematoma. Postoperatively, 99.3% (162/163) of patients received rivaroxaban and 1.2% (2/163) remained on home (preoperative) apixaban regiments. 98.8% (161/163) flap success was achieved. 3.7% (n=6) of patients were affected by thrombophilia: plasminogen-activator inhibitor-1 (PAI-1) (n=1), malignancy (n=2),

hyperhomocystinemia (n=1), factor II deficiency (n=1), or severe lower extremity trauma (n=1). Reoperation on POD1-2 was required in 3% (5/163) of flaps for hematoma evacuation (4) and microanastomotic venous congestion (1). 80% (4/5) of flaps were salvaged. One flap lap loss occurred in a patient with hyperhomocystinemia.

Conclusions: While recent efforts are growing, consensus microsurgical guidelines for prophylactic anticoagulation are lacking and studies are limited. One promising effort comes from the Enhanced Recovery after Surgery (ERAS) Society.[3] The limited plastic surgery evidence suggests it useful to assess practices of other disciplines, including orthopedics. We achieved FTT outcomes free of post-discharge VTEs and hematomas by routinely prescribing oral Factor Xa-inhibitors. Novel to microsurgery, this regiment has been strongly validated in orthopedic surgery. Large multicenter orthopedic studies like the RECORD and XAMOS studies and ORTHO-TEP registry have proven less mortality and bleeding risks with rivaroxaban compared to LMWH, enoxaparin, and fondaparinux. Our study indicates a potential similar efficacy for FTT patients, and further studies should be done to validate these findings.

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Free Nipple-Areolar Grafting at the Time of Skin-Sparing Mastectomy As an Alternative Nipple-Areolar Complex Sparing Strategy

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Background: The nipple sparing mastectomy (NSM) technique allows patients to keep their native nipple areolar complex, affording them a more natural reconstructive result (1). NSM techniques have been retrospectively shown to have similar oncologic outcomes in terms of local recurrence, disease free survival, and overall survival when compared to skin-sparing mastectomy in which the nipple-areolar complex (NAC) is sacrificed (2, 3). Though the indications for NAC preservation continue to evolve based on outcomes data, many patients remain poor candidates for standard NSM secondary to patient anatomic factors, as well as based upon breast surgeon preference and/or experience with standard NSM techniques. For such patients, an alternative NAC-sparing strategy can be considered to provide the cosmetic and quality of life benefits of NAC preservation. This alternative NAC-sparing strategy is the concept of free nipple-areolar grafting at the time of skin-sparing mastectomy.

Methods: A case series of four patients with an average age of 42.7 years who underwent free NAC grafting at time of skin-sparing mastectomy were included. All patients carried a high-risk genetic mutation (BRCA1 or BCRA2) for hereditary breast cancer syndrome. Patients were considered for free nipple-areolar grafting if their tumor met National Comprehensive Cancer Network (NCCN) criteria for NSM but the patient's breast was considered to be too ptotic or large for a standard NSM.

Results: We discuss our operative technique for free NAC grafting at the time of skin-sparing mastectomy. Based on our institution's experience with free NAC grafting at the time of skin-sparing mastectomy in breast reconstruction patients, we propose a treatment algorithm to incorporate free NAC grafting into clinical practice based on oncologic and anatomic evaluation both for type of mastectomy and reconstruction.

Conclusion: For patients undergoing mastectomy who would be eligible for NSM from an oncologic standpoint but are not candidates based on anatomic factors or surgeon preference, we propose offering patients the skin-sparing mastectomy approach with free NAC grafting as a very realistic NAC-sparing alternative to standard NSM. Our free NAC grafting technique at the time of skin-sparing mastectomy follows oncologically sound principles and affords patients the opportunity for similar aesthetic and quality of life benefits of retaining one's native NAC. This free NAC grafting technique at the time of skin-sparing mastectomy can be combined with both implant-based and autologous reconstructive techniques.

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Same-Stage Fine Tuning of Immediate DIEP Flaps: The Wise-Pattern Mastectomy

Presenter:	Arij El Khatib, MD
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Purpose: Elliptical non-nipple sparing mastectomy in patients with large or ptotic breasts usually leaves loose mastectomy skin flaps over the DIEP which need to be either resected or gathered. This results in flat breast shape or DIEP flaps that slip laterally in the pocket towards the axilla, causing patient discomfort, and needing subsequent revision. We believe that the use of a wise-pattern mastectomy will allow for immediate treatment of these concerns.

Method: Retrospective analysis of our institution's experience in immediate DIEP flaps performed on breasts mastectomized using a wise pattern instead of the common elliptical mastectomy in the last 3 years.

Results: Out of a total of 40 breasts in 33 patients reconstructed with a DIEP flap immediately post wise-pattern mastectomy, we report 6 cases of partial mastectomy-flap necrosis not needing revision, 4 cases of significant mastectomy flap necrosis needing reoperation, and 2 cases of inability to adequately close the wise pattern intraoperatively after DIEP placement, necessitating retention of DIEP skin in the inferior pole. One DIEP flap had significant fat necrosis due to arterial insufficiency.

Conclusions: In patients with large or ptotic breasts, the wise-pattern mastectomy before an immediate DIEP reconstruction allows the immediate shaping of the breast by controlling the breast pocket, footprint, and excess skin. It results in a more natural-shaped breast and precludes the need for second-stage reshaping. Potential pitfalls of the technique are partial mastectomy flap necrosis due to the increased

number of incisions, and inability to close the vertical components of the wise pattern over the DIEP.

Learning Objectives: Participants will learn the technique and results of using wise-pattern mastectomies with immediate DIEP flap reconstructions. They will also learn about potential complications and ways to avoid them.

The Clinical Performance of a Skin Barrier Device As Part of a Standardized Infection Reduction Study of 218 Implant Based Breast Reconstructions

Presenter: David C Lobb, MBChB
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Purpose: Due to the critical impact of breast implant infection on quality of life of breast cancer patients, we have published the performance characteristics of an evidence-based protocol that significantly reduced but did not eliminate gram positive infection after mastectomy. To provide a skin barrier against bacterial contamination from the skin flora, we added the Alexis wound manager (AWM) to the evidence-based protocol at the time of immediate expander placement.

Methods: An evidence-based protocol was developed including pre-operative decolonization with intranasal Bactroban, and chlorhexidine body wash for 5 days, intra-operative double-gloving with glove change, chest re-prep before expander placement, triple and povidone iodine washes of implant and pocket and post-operative gram-positive oral antibiotic prophylaxis until drain removal. In an effort to further decrease skin flora implant infections an AWM was added to the protocol after our first 86 patients. All patients underwent immediate acellular dermal matrix-assisted, partially submuscular tissue expander placement with a single drain placed except when axillary lymph node dissection was performed resulting in 2 drains for that breast. A retrospective review of a prospectively maintained database of consecutive immediate breast tissue expander reconstructions was performed comparing demographics, treatment characteristics, and infection-related clinical outcomes of all patients completing the protocol with and without the AWM.

Results: 135 breasts among 86 patients were reconstructed under the protocol alone and 83 breasts among 46 patients were reconstructed under the same protocol with AWM. The two groups of patients were statistically similar in age, BMI, comorbid conditions, percentage of smokers, and rates of postoperative radiation. Overall

(8.1%), major (2.9%) and minor (5.2%) infection rates were greater with the protocol alone than with the addition of the AWM (overall 7.2%, major 2.4% and minor 4.8%) yet these differences were not significant. Explantation rates were higher as well in the protocol only group (2.9%) than with the AWM (1.2%) (P=0.35). Drain duration was statistically significantly shorter with the AWM (12.6 days) than the protocol alone group (17.6 days, $p<0.01$).

Conclusions: The use of a skin barrier as an addition to an evidence-based infection reduction protocol was associated with a modest improvement in infection outcomes and explantation rates and resulted in a significantly shorter drain duration.

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Residency Is Breaking My Back: Development of Musculoskeletal Symptoms in Plastic Surgery Residency

Presenter:	Aaron Foglio, BS
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BACKGROUND: The importance of assessing resident well-being has been recognized by the ACGME and is now a program requirement. There are psychological, emotional, as well as physical components that play a role in resident well-being. A common physical complaint among Plastic Surgery attendings is work-related musculoskeletal symptoms. The aim of this study is to identify when these musculoskeletal symptoms develop, common causes, how to prevent them from occurring, and how to inhibit the symptoms progressing.

METHODS: A survey was created and approved by our IRB to gather information on participant demographics, operating history, development of musculoskeletal symptoms, potential causes of these symptoms, and interventions that can be employed to mitigate these symptoms. This was then distributed to all U.S. Plastic Surgery residents.

RESULTS: There were a total of 68 respondents. The majority of residents (73.9%) reported musculoskeletal symptoms developed while in residency, with only 12.7% reporting entering residency already having symptoms. Of the residents who developed symptoms during training, it was most prevalent after three years of residency with 80% reporting onset of symptoms during this period, which correlated to operating on a more consistent basis during their training. The most common symptoms were pain (72%), stiffness (57.3%), and fatigue (47%). Symptoms were most frequently of the neck (66.2%) and lower back (58.8%). Development of these symptoms was attributed to prolonged neck flexion and retracting. Methods to alleviate discomfort or mal positioning by adjusting the OR table height, was rarely requested, with only 13% of residents feeling "very comfortable" asking for in the presence of the attending. No residents reported having formal curriculum on basic knowledge of body positioning and conditioning.

CONCLUSIONS: Plastic Surgery residents are at high risk for developing musculoskeletal symptoms during residency training, which can substantially impact their following careers. Identifying causes and mitigating risk is essential and should be addressed prior to the third year of residency when symptoms most often begin. Understanding that surgeons are "small joint athletes" points to the necessity of formal education and mindfulness of ergonomics with immediate benefits to lowering both musculoskeletal symptoms as well as stress.

Which Procedure Provides the Most Lift? a Cadaveric Study Comparing the Skin Only, Smasectomy and Extended SMAS Face Lift Techniques in 10 Hemi-Faces

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Purpose: The face lift is a critical aesthetic surgical intervention to rejuvenate the aging and sagging face. Various face lift techniques have been developed and described with goals to produce the greatest lift, to assure a lasting effect, and to limit

complications[1]. There have been no studies able to demonstrate superiority when comparing one procedure to another[2]. More so, there have been no cadaveric studies within the literature with the prime focus of quantifying the effective lift of these specific face lift techniques with subsequent comparisons. This study analyzes three major face lift techniques (skin only, SMASectomy, and extended SMAS), characterizing the effective lifts, in order to provide a quantitative head-to-head comparison in 10 cadaveric hemi-faces.

Methods: The study was conducted on two separate anatomic dissection days on 5 cadaver heads (2 females and 3 males). Each cadaver head was divided into left and right, accounting for 10 hemi-faces. Each hemi-face was divided into 4 separate baseline horizontal vectors. These segments were (1) lateral canthus to helical root, (2) nasolabial fold to conchal bowl, (3) nasal ala to tragus, and (4) oral commissure to ear lobule. The primary outcome studied was change along these vectors from baseline to post-procedure. On each hemi-face, the senior author (A.W.) performed a skin only, SMAS plication (to mimic the SMASectomy), and extended SMAS procedure in subsequent fashion. Change along these vectors were recorded and analyzed using Kruskal-Wallis one-way analysis of variance to detect statistical significance.

Results: After each procedure, all 5 cadaveric heads exhibited a positive lift along each horizontal vector. The mean aggregate lift for the skin only was 2.68 cm, for the SMAS plication (SMASectomy) was 2.88 cm, and the extended SMAS was 3.30 cm. When compared to the baseline measurements, each procedure demonstrated a statistically significant change along these horizontal vectors (skin only $p<0.05$, SMAS plication $p<0.05$, and extended SMAS $p<0.05$). Among procedures, there was no demonstrative statistical difference between each face lift technique. In a subgroup analysis of each procedure's effect on the lower face, the extended SMAS versus the skin only and SMAS plication (SMASectomy) demonstrated a large substantive effect size of 1.5 cm and 1.6 cm, respectively.

Conclusions: The skin only, SMASectomy, and extended SMAS technique each exhibit statistical and clinical significant lifts along the measured horizontal vectors. There appears to be no significant difference among procedures when analyzing overall initial lift in 10 cadaveric hemi-faces. For a subset of patients that may require a more extensive lower facial lift, the extended SMAS may be the preferred technique as it exhibits the most substantive quantitative effect on the lower facial vectors in our study.

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Discovering the True Resolution of Postoperative Swelling after Rhinoplasty Using 3-Dimensional Photographic Assessment

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Purpose: While prolonged nasal edema is a well-known sequela after rhinoplasty, the anticipated time-to-resolution and anatomical distribution of edema remain largely anecdotal. Nasal swelling obscures the delicate contours and definition of the nose, and it is particularly noticeable in the nasal tip. Edema and lack of definition in the nasal tip may affect patient satisfaction and prolongs the assessment of the final aesthetic result. The following study set out to quantify the dynamics and anatomic distribution of postoperative edema after rhinoplasty.

Methods: Consecutive patients undergoing primary open rhinoplasty in 2018 were included in this study. Retrospective analysis of post operative three-dimensional photographs was performed using Canfield Vectra VAM software. Three dimensional changes to the nose were analyzed only for patients who had 3D pictures at either 7- or 14-days post operatively and at least 2 additional pictures at the following time points 45, 90, 180, and >250 days post operatively (N=18). Three-dimensional metrics including volume, anterior-posterior projection, horizontal width and were calculated at each interval for the upper nasal two thirds and lower third, defined as nasal tip. Edema was defined as the change in nasal volume at post operative intervals relative to the baseline image. The distribution of edema was calculated as the percent of total nasal volume in the upper two thirds versus the lower third (nasal tip). Topographic color maps and mesh overlays were created for each interval to visualize changes to the nasal contour at post operative intervals.

Results: Maximum nasal volume occurs at 7-14 days post-operatively. The mean volume loss from 7 days post operatively to >250 days post operatively was (2.8+/-

.7cc). The distribution of edema changed over time; however and was consistently greater in upper two thirds than the nasal tip. The anterior projection of the nasal tip was greatest at 1 week, while the width was minimum at one week. The projection decreased and width increased progressively from 7 to 90 days, with near resolution at >250 days.

Conclusions: Three-dimensional analysis reveals that nasal tip edema greater in the upper two thirds of the nose compared to the tip after rhinoplasty. Interestingly, the relative distribution of edema in the nasal tip increases over time. In this region where definition and delicate contours are obscured by minimal edema, nasal tip edema is more noticeable but less in overall volume than the upper two thirds. The behavior of overall nasal edema was comparable to prior published data. This study objectively quantifies the amount and duration of edema in the nasal tip after rhinoplasty that can guide patient and surgeon expectations. Evidence of persistent nasal tip edema serves as a therapeutic target for improving the patient post-operative course with new technology, including specialized splinting that includes support to the nasal tip as a modification to the traditional nasal splint. Further investigation into methods for improving post-operative nasal tip edema are ongoing.

Blindness after Filler Injections: The Role of Extravascular Hyaluronidase on Intravascular Hyaluronic Acid Embolism in the Rabbit Experimental Model

Presenter: Lei Zhang, MD
Co-Author: Sufan Wu, MD, PhD
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Background: Blindness caused by ophthalmic artery embolism is the most catastrophic complication of facial Hyaluronic acid (HA) injections. Extravascular (retrobulbar) injection of hyaluronidase has been suggested as a salvage in this calamitous situation. However, it still lacks consensus regarding the effectiveness of this treatment.

Objectives: The aim of this study is to investigate the role of extravascular hyaluronidase in dissolving intravascular HA occlusion.

Methods: Two different experiments were performed:1) Isolated rabbit abdominal aorta segments filled with hyaluronic acid were treated with extravascular immersion of highly concentrated hyaluronidase, followed by gross observation, microscopic examination, particle size analysis and immunohistochemical stainingfor 90 minutes.

2) The live rabbit auricular artery was occluded by hyaluronic acid and treated with extravascular injection of hyaluronidase and then was evaluated by gross observation, microscopic examination and perfusion studies for 90 minutes.

Results: No changes of HA within the abdominal aortae were observed after treatment of extravascular hyaluronidase. Hyaluronidase could only be detected in adventitia of the aortae, instead of vascular smooth muscle and vascular lumen. The occluded auricular artery showed no reperfusion after extravascular injection of hyaluronidase.

Conclusion: In this rabbit model consisting of two parts, the extravascular hyaluronidase was unable to penetrate the arterial lumen of the isolated abdominal aorta within 90 minutes nor the live auricular artery of the rabbit to dissolve intravascular HA within 90 minutes, thus casting doubt on whether extravascular (retrobulbar) hyaluronidase injection has a role in treating ophthalmic artery embolism due to HA injections.

Nonsurgical Rhinoplasty with Dermal Fillers

Presenter: Denis Souto Valente, MD, PhD
Co-Authors: Gustavo pereira Filho, MD, MSC, Sibelie S Valente, MSc, Rafaela K Zanella, MD
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Millions of minimally invasive cosmetic procedures using dermal fillers (DF) along the face are performed each year. Nonsurgical rhinoplasty (NSR) refers to the adoption of injectable DF used to augment select regions of the nose trying to achieve improved function or appearance in select individuals. Recent developments in DF use along the nose have led to transform this technique in an attractive alternative for patients searching nasal improvement without surgery.

The author executed a retrospective cohort study derived from patients who underwent NSR at a private practice setting. The minimum follow-up was 10 months.

951 consecutive, non-randomized patients met the inclusion criteria to enter the study. The overall complication rate was 8%, whereas the revision rate was 17%. About 92% of the patients polled after this procedure asserted, they definitely accepted to have NSR only because it was not a surgery.

DF NSR cannot be a surgery substitute, but when slight nasal deformities are present this technique can be applied. The use of DF for technical refinement during primary

rhinoplasty or for camouflage trying to correct post rhinoplasty deformities represents an interesting therapy which allows to avoid, or sometimes to delay, surgery, because invasive procedures are often dreaded by the patients.

DF NSR is better indicated to postoperatively simulate structural grafts typically used in rhinoplasty such as strut graft, umbrella graft, and spreader graft. In patients without previous rhinoplasty its indications are limited to tip definition and correction of small dorsal humps.

Several substances can be employed to perform NSR, amongst the most used are: hyaluronic acid (HA), polymethylmethacrylate (PMMA), polydimethylsiloxane (PDMS), poly l-lactic acid (PLLA) or calcium hydroxyapatite (CaHa).

The risks of procedure repetition associated with the short maintenance of results did not permit the initial popularization of NSR with HA. With the advent of newer temporary DF with greater longevity and less immunogenicity such as PLLA and CaHa, NSR has become a viable and safe option to surgery.

There are different cleavage planes in the nose. The ideal plane for DF injection is superficial to the periosteum and perichondrium, at the deep fatty layer, because it is loose and wide and there are virtually no vascular structures that could be injured. In this plane is possible to avert the most devastating complication: vascular compromise causing tissue necrosis. Cannula use instead of needles can also help to prevent damage to the blood vessels. Restricting the use of DF to the sidewalls and nasal dorsum can minimize collateral effects because more complications occur after treatments along the nasal tip.

Promote initially hypocorrection, prefer repeated sections with small incremental boluses, and constant reassessment are the best option to avoid overcorrection, asymmetries, and irregularities. To perform NSR with DF the injector must perform a proper diagnostic before the procedure, apply the correct technique, recognize developing problems, and have a practical workflow for immediate reversal and treatment of potential complications.

This review provides elements to help physicians using DF NSR to better understand clinical indications, limitations and cautions necessary to perform this procedure successfully.

Turning Back the Clock: Artificial Intelligence Recognizes Perceived Age Reduction after Facelift Surgery

Presenter:	Ben H Zhang, BA
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INTRODUCTION: The primary reason for cosmetic facelift surgery is to look younger, more refreshed, and attractive. Since there are few objective methods to assess the success of facelift surgery, we utilized convolutional neural network algorithms (facial recognition software) and FACE-Q patient-reported outcomes to evaluate perceived age reduction and patient satisfaction following facelift surgery.

AIM: Determine the reduction in perceived age for facelift patients using artificial intelligence and correlate the results with FACE-Q patient satisfaction outcomes.

METHODS: First, standardized preoperative and postoperative (1 year) images of 50 consecutive patients who underwent facelift procedures (plastymaplasty, SMAS-ectomy, cheek MACS-lift) were analyzed, along with 25 control images. Patient images were excluded if they underwent other facial procedures. Four large public neural networks (FacePlusPlus, Amazon, Microsoft and IBM) trained to identify patient ages based on facial features provided a mean estimated age (MEA). In addition, FACE-Q surveys were used to measure patient-reported facial aesthetic perioperative/1-year postoperative outcomes.

RESULTS: Neural networks estimated ages of control images within 14 months (± 3 months). Following facelift procedures, patient images were estimated to be significantly younger ($p < 0.0001$), with a mean estimated age reduction of 4.6 years (95% confidence interval, 1.7 to 4.9: range, -3.3 to 8.4). FACE Q scales showed high level of satisfaction with facial appearance overall (82.7+18.2), (including cheeks, nasolabial folds, lower face, neck). In addition, the degree of satisfaction with decision to undergo surgery correlated with the age reduction determined by neural networks; a reduction of greater than 5 years corresponded to a satisfaction score of 94.5±8.2, while a reduction of less than 3 years corresponded to a score of 71.8±10.1.

CONCLUSION: Artificial intelligence (trained convolutional neural networks) can reliably estimate the reduction in apparent age after facelift surgery, which correlate with patient satisfaction. These neural network algorithms can be used by plastic surgeons to calculate average age reduction following various facelift techniques.

Buccal Fat Pad Partial Lipectomy for Facial Slimmer

Presenter: Denis Souto Valente, MD, PhD
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In the history of surgical facial rejuvenation, the focus has always been in skin resection. Recent findings about the facial fat compartments have led to the development of surgical techniques aimed to treat the aging effects on the fat of the face. It is common knowledge that the Buccal fat pad (BFP) plays a major role in facial aesthetics.

BFP partial lipectomy is a procedure that can be performed in patients with chubby cheeks. When this procedure is carried out on the right patient it can produce significant improvement in facial contour. Since its description, there has been a rapid rise in the use of this technique.

From November 2013 to January 2018, a longitudinal prospective study was conducted on 498 patients undergoing BFP partial lipectomy. All patients went into a private consultation with the senior author and have been operated by the same surgical staff.

Patient demographics were collected. All patients had postoperative visit at 3 months to determine satisfaction rates in a 10 cm visual scale ranging from 0 (complete dissatisfaction) to 10 (complete satisfaction). Measured data included postoperative complications.

There was 38 lost to follow up among the subjects participating in this research. The satisfaction rate was 8. The complication rate was 1.6% and included 1 case of seroma requiring ambulatorial drainage, 2 cases of temporary numbness at the nasogenian area and 1 case of excessive resection needing postoperative fat graft along the cheeks.

Knowledge of the anatomy of the BFP is crucial to perform the surgery, and we believe that this is the main cause of the lower rates of complications in our research. BFP is accessible from the oral cavity and its total estimated volume is 10 cc. The Parotid duct is an adjacent anatomic structure, so it is easily encountered when extracting BFP. Thus, surgeons should take care not to damage this apparatus. In our study we did not find any signs of ducts laceration, because in the seroma patient search for amylase in the fluid was negative.

BFP reduction is a great procedure in the properly selected patient. Fullness in the lower cheeks can be treated this way. Liposuction or skin tightening technologies will

not be the right choice when buccal fullness is apparent. The buccal fat pad sits deeper in the cheek under muscle, and this is different from skin fat that can be removed with liposuction. The resection must leave some fat behind so that the cheeks do not look gaunt as the person ages. BFP removal, in the right person, can really slim down the face. The results of the procedure are not completely predictable. It must be performed on suitable individuals, or it can produce irreversible hollowing of the cheeks.

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Dermal Fillers - How Readable Are the Online Resources for the Most Common Plastic Surgery Procedure?

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Purpose: Soft tissue filler injections are one of the most common non-surgical procedures performed annually by plastic surgeons. Hyaluronic acid based products have demonstrated a dramatic rise in popularity over the past decade with over 2.7 million procedures performed in 2017[1]. Increasingly, patients are relying on internet resources as a primary source of medical information, including information regarding surgical and non-surgical aesthetic procedures[2]. Assessing the quality and readability of the information patients engage with on the internet is essential for patient education and expectation management purposes. The purpose of this study is to assess the readability of the most popular online patient resources for aesthetic dermal filler injections.

Methods: A web search was conducted on February 19, 2019, for the term “dermal fillers” using the largest available public search engine, Google. Cookies and location services were disabled in order to reduce bias in search results. Results which were promoted as sponsored advertisements were excluded. The remaining search results found on the first page were included in our evaluation. Readability was analyzed using ReadablePro[3], an online application.

Results: Ten first-page search results were identified and included for evaluation in our study. All patient directed information pertaining to dermal filler injections within one click of each home page was collected. A total of 50 articles pertaining to aesthetic dermal fillers were downloaded from the 10 included sites. On average, these resources were written at an eleventh grade reading level (Flesch Kincaid 9.7 +/- 1.2, Gunning Fog Score 11.4 +/- 1.3, Coleman Liau Index 11.8 +/- 1.1, SMOG Index 11.8 +/- 1.0, FORCAST Grade Level 11.4 +/- 0.6). The mean Flesch Reading Ease score was 51.1 +/- 7.2 which is considered "fairly difficult" and indicates a 10-12th grade reading level. None of the individual web pages met the recommended 6th grade reading level for patient information.

Conclusions: The American Medical Association and National Institute of Health recommend that all patient education materials be written at a fifth or sixth grade reading level[2,4]. This study finds that the average reading level of the most popular online patient resources far exceeds this recommendation. Many patients continue to utilize the internet as a primary source of medical and surgical information. It is imperative that these resources are continuously analyzed and appropriately written in order to establish realistic expectations and ensure adequate patient education.

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Correction of the Deepened Labiomental Groove with Silicone Implant in Advancement Genioplasty

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Purpose: Advancement genioplasty is performed to aesthetically improve the lower third facial profile. Aesthetic profile is determined by various factors including the

location of the chin, chin soft tissue, mentalis tension and lip position. Excessive chin advancement alone may lead to deepen the labiomental sulcus and deform the aesthetic result[1]. Inverted V-shape osteotomy reduce the labiomental sulcus compared to horizontal osteotomy, however, teeth root positions limit the advancement of the chin. Thus, advancement of the chin is recommended to be conducted with vertical lengthening at the same time which deemphasize the labiomental sulcus. Avoiding the mentalis repair tightly and postoperatively injecting botulinum toxin to the mentalis could also prevent the deepened labiomental sulcus. However, these additional procedures may have limited effect for relieving the labiomental groove and difficulty in gaining aesthetic facial profiles. The purpose of this study presents the easy and effective way to efface the labiomental groove deepening with silicone implant in advancement genioplasty.

Subjects and methodology: Three hundred seventy-six patients (216 advancement alone or combined with vertical augmentation or reduction, 160 setback, vertical augmentation alone or vertical reduction alone) underwent genioplasty between January 2014 and October 2017. Surgical procedures for advancement genioplasty were conducted through the labial incision. The mandibular bone was exposed below the mental foramen along the inferior mandibular border. Inverted V-shape osteotomy was done with advancing the distal bone segment. Vertical augmentation or reduction procedure could be combined according to the preoperative plan. Fixation with plates and screws was done. Considering the chin soft tissue, mentalis tension, step off deformity and facial profile, the patients who required 4 mm or more advancement were determined to insert silicone implant block. The authors carved chin silicone implant whose thickness was usually 2 mm less than chin advancement. After inserting the block, it was tied with the plates fixed at the bone. At the 6-month follow-up assessment, the patients' satisfaction with their surgery was very satisfactory, satisfactory, fair, and unsatisfactory.

Results: Among 216 cases of advancement genioplasty, 79 cases (62 women and 17 men) of advancement procedures used silicone implant. Among 79 cases using silicone implant, 17 were advancement alone, 36 were advancement with vertical augmentation and 26 were advancement with vertical reduction. The mean age of the silicone implant cases was 27.2 years (range, 19–52 years) and follow-up period was 12.3 months (range, 6–31 months). Among the 79 patients, 71 were satisfied with the outcome. Four revision operations were performed. Two were for surgical site infection and two were for wound dehiscence.

C**onclusion:** Advancement genioplasty may cause deepened labiomental sulcus which may lead to aesthetically unpleasing result. Inserting silicone implant at the sulcus could easily efface the deepened groove. This procedure could be an easy and reliable method for aesthetic result in excessive advancement genioplasty.

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A Novel Approach for Simultaneous Plastysmaplasty and Genioplasty Using an Intraoral, Transmucosal Incision

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Purpose: Patients presenting with facial aging have blunted neck/jawline definition. Often, bony chin insufficiency is overshadowed by soft tissue ptosis and is only realized when a platysmaplasty/facelift alone creates suboptimal results. Furthermore, the central platysma is best accessed via the submental incision but create a visible submental scar. The authors propose a simultaneous platysmaplasty and genioplasty via the intraoral incision with or without facelift to address both soft tissue and bony deficiencies in the cervicomental area.

Methods: The case sequence involves an initial platysmaplasty via the intraoral incision, followed by an osseous genioplasty, and finishes with the facelift. The first step is to create a lower lip vestibular incision below the attached gingiva, as would be conventional for an intraoral genioplasty. At the inferior border of the mentalis, the periosteum is divided to come more superficial on top of the platysma. The subcutaneous neck skin flap is raised over the platysma and the anterosuperior platysma edge is tacked with two sutures for mobilization and manipulation. The intraoral exposure then allows full platysmal visualization and manipulation, including defatting and plication. Following the platysmal plication, the genioplasty bone segment is cut, manipulated, and secured with rigid fixation. The platysma is draped forward and fastened to the genioplasty segment and plate. This further tightens the platysma and defines the cervicomental region. The mentalis muscle is re-draped and secured. As the last step, the facelift is performed to fine tune the soft tissue drape of the face and neck.

Results: Cases are presented to showcase proper candidate selection and results. A 58-year-old female presented with jowling, skin excess, and convex profile with lack of chin projection. Following genioplasty, plastymaplasty, and facelift, she was observed to have significantly increased chin-throat distance, sharper cervicomental

angle, and reduced jowling. No post-operative complications were reported at 320 days follow-up.

Another 66-year-old female exhibited significant platysmal banding and skin excess. Concurrent chin recession created a flat cervicomental angle. Following genioplasty, platysmaplasty, and facelift, she enjoyed improved chin projection, chin-throat distance, and cervicomental angle with soft tissue rejuvination and elimination of platysmal banding. No post-operative complications were reported at 270 days follow-up.

Conclusion: The concurrent platysmaplasty and genioplasty via the intraoral incision, with finishing facelift is a powerful technique that addresses the unrecognized lack of chin support while creating a crisper cervicomental angle. Pre-operative assessment for patients complaining of face/neck aging should include evaluation of chin projection. Candidates for the simultaneous genioplasty benefit dramatically from all three procedures done together.

Short Nose Correction in Chinese: Septal Cartilage Combined with Ethmoid Bone Graft

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Background: There are many techniques for correcting short nose deformities and septal extension graft is the first choice for Chinese patients. However, the volume of septal cartilage in many Chinese patients is not sufficient to be used alone as an effective septal extension graft. Therefore, we designed a novel technique, which combining septal cartilage with ethmoid bone graft to overcome this issue in Chinese short nose patients.

Methods: Thirty-five women with short noses underwent septal extension grafting from February 2015 to March 2017. We use endoscopic technique to harvest ethmoid bone to enhance the L-strut structure. An L-strut, comprising 0.8 cm segments of the caudal and dorsal cartilaginous septum, is left altered in order to harvest more cartilages for septal extension. The harvested septal cartilage, approximately 1.0mm in thickness and 16 to 20 mm in length, was grafted on one side of the caudal septum. Then the alar cartilage was fixed at the end of the septal cartilage graft. The nasal lengths, nasal tip projections and nasolabial angles were measured pre- and postoperatively.

Results: The septal cartilage combined with ethmoid bone graft presented an adequate nose lengthening and a decreased nostril show, even in cases with very little septal cartilage.

Conclusions: The authors present a novel technique for the correction of short nose deformity in Chinese patients. Combining the septal cartilage with ethmoid bone graft provides ideal results with minimal complications; and overall patient satisfaction was very high.

Complications and Their Management after Non-Incisional Blepharoptosis Repair

Presenter: Jungkyu Han, MD

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Purpose: Surgical correction of blepharoptosis is one of the most challenging operations to plastic surgeons. Since it was first introduced in 2010[1], the non-incisional correction method has been widely used in patients with mild to moderate blepharoptosis. This study aims to analyze postoperative complications after non-incisional blepharoptosis repair surgery and to share our clinical experience of how they were treated.

Methods: From March 2017 to February 2018, 384 patients underwent non-incisional blepharoptosis correction in our clinic. The operation was carried out according to the method in our previous paper.[2] Although this method is also used in a variety of secondary surgeries[3], patients with prior history of ptosis surgery were excluded from this study. Mean follow-up period was 317 days. Through the retrospective chart review, we analyzed the complications that occurred after the operation and how they were managed.

Results: Of the 384 patients who underwent surgery, 154 had no discomfort after the surgery. The remaining 230 patients complained of minor postoperative discomfort. We applied protective soft contact lens in all patients with any degree of discomfort. Most of the patients felt more comfortable with their lenses on. A total of 29 secondary surgeries were performed on 28 patients. Under correction of blepharoptosis was present in 13 patients. Loosening of double eyelid fold was noted in 7 patients. Six patients underwent revisional surgery to correct their eyelid folds for cosmetic purposes. In the other 2 patients, there was constant pain and discomfort, and we released the Muller-tucking stitches. Of the 29 secondary surgeries, 24 cases were

done with non-incisional approach again and the other 5 cases were done using incisional approach. Hematoma was found in 1 patient who had concurrent pre-aponeurotic fat removal.

Conclusion: Except for mild discomfort, which is usually self-limited, overall complication rate after non-incisional blepharoptosis repair surgery was 6.0(23/384) percent in our case series. And most of the patients with complications were again managed with less invasive technique. Wearing protective soft lenses helped relieve discomfort in the eyes after surgery. It was solved by loosening the Muller-tucking stitches in cases of persistent pain and headache. In patients with mild to moderate blepharoptosis, this technique is considered as a useful method with low complications.

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Changes of Eyebrow Height and Position with Aging: A Systematic Review and Meta-Analysis

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Purpose: There is no consensus in the literature regarding the aging changes to eyebrow height. The purpose of this study is to systematically review the current literature describing the changes to eyebrow position with aging.

Methods: Applying the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidelines, a comprehensive search of Embase, Ovid MEDLINE,

and Cochrane databases from 1980 to January 2019 was conducted for articles reporting changes to eyebrow height with aging. The resulting publications' abstracts were screened by two independent reviewers, and studies that evaluated eyebrow height or position across different age groups were included. Studies that specifically reported measurements of medial, mid and lateral eyebrow position between two subjects' groups - younger than 50 years old, and over 50 years old were included for a meta-analysis. Results were summarized by mean differences (MD).

Results: A total of 346 articles were initially identified, of which 19 met our inclusion criteria. Of 3634 patients that were identified, 2237 (64%) were females and 1274 (36%) were males. Only three studies compared the same individuals over time while other studies compared individuals from different age groups. No standard measurement was used to assess eyebrow height or position. Only two studies evaluated eyebrow height at the lateral brow ends and both showed significant lateral brow descent with aging. When comparing subjects older than 50 years old to subjects younger than 50 years old, eyebrow height showed significant increase with aging at the level of medial canthus (mean difference 1.4mm; 95%CI: 0.22-2.59, p=0.02), and mid-pupil (mean difference 1.17 mm, 95%CI (0.54-1.8), p=0.0002). However, no significant difference was found between the two age groups regarding eyebrow height at the level of the lateral canthus (mean difference 0.19 mm, 95%CI (-0.87-1.25), p=0.72).

Conclusion: Based on the available literature reviewed, aging is associated with significant increase in eyebrow height and position along the medial canthus and mid-pupil; however, no significant change in eyebrow height was found along the lateral canthus.

Medical Malpractice Claims after Rhinoplasty

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HYPOTHESIS: Rhinoplasty has long been considered one of the most difficult plastic surgery procedures to master, because of both the technical difficulties of the operation as well as the often-impossible expectations of the patient. Consequently, rhinoplasty is a frequent target of malpractice litigation. There is a paucity of literature regarding malpractice claims relating to rhinoplasty. The goal of this study is to use

multiple national legal databases to characterize malpractice claims related to rhinoplasty.

METHODS: Retrospective analyses of both the Westlaw legal database and Verdict Search legal database were performed on all legal cases from 1985 to present that resulted in a verdict or settlement related to rhinoplasty. Cases were reviewed individually to ensure that they were directly related to alleged malpractice against the treating surgeon and then the databases cross-referenced to eliminate any duplicates. The final combined database was then analyzed based on the cause for litigation, defendant specialty, the case outcome, and the amount of award in case of plaintiff decision/settlement.

RESULTS: A total of 55 individual cases were collected and analyzed. 49/55 (89%) of the plaintiffs were female. The average age of the patient was 39±13 years. 12/55 (22%) cases resulted in a decision in favor of the plaintiff (against the physician) and 2/55 (4%) cases were settled out of court. The remaining resulted in favor of the defending physician. The average award after a decision in favor of the plaintiff was for $334323.08 ± $639080.43. The average settlement was for $40,000. The most common malpractice claim after rhinoplasty was due to displeasure with cosmesis (n=28) followed by airway obstruction (n=27) and informed consent (n=8). Of the physicians named in the malpractice claim, 34 were board-certified plastic surgeons, 16 were ENT/facial plastic surgery trained and 2 were oral and maxillofacial surgery trained. There was no significant difference between the specific malpractice claim or the defendant specialty and the outcome of the lawsuit or award amount.

SUMMARY: Medical malpractice litigation is a significant cost burden to physicians across all specialties, including plastic surgeons. Rhinoplasty in particular is susceptible to legal scrutiny in the setting of dissatisfied patients or substandard results. It is important that plastic surgeons are aware of the medicolegal landscape to avoid potential malpractice claims associated with such procedures.

Laser Blepharoplasty with 980nmDiodo

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We applied the laser technique in double eyelid and transconjunctival blepharoplasty operations. A diode 980nm laser at an average power of 10 W in the pulse mode, It gives a peak power of 125 W, which is equivalent to 12 mJ of laser was used as a cutting tool and also as a hemostatic tool during procedures. Our interest stemmed

from the fact that our patient population was becoming younger, and many patients require decrease in postoperative dry eye symptoms and that the eyelids retained a very natural appearance. Thus, we began to extend the operation to patients who not only had excess orbital fat but also to patients with fine wrinkles, skin excess, and orbicularis muscle relaxation or redundancy. Eighty cases of laser double-eyelid operations were compared with the conventional method. The results were analyzed during the operation, immediately post operation, and 4, 7,10 and 14 days and I and 3 months after the operation. The laser technique showed advantages such as shortening of the operation time and minimal bleeding. The operation was safe and efficient, and the healing process was as fast as with the conventional scalpel method. Protective eye shields are utilized. Their application is preceded by ophthalmologic anesthetic solution and antibiotic ophthalmologic ointment. The shields are removed immediately after the procedure is completed to prevent corneal edema. Skin, muscle, and fat may all be resected with the laser without having to cross-clamp or crush these structures. Blood loss of 0-5 cc frequently is reported for all four lids. The laser is able to produce an incision with excellent hemostasis and skin retraction. The patients in this series demonstrated markedly diminished blood loss during surgery and reduced bruising, swelling, pain, and discomfort postoperatively. Contralateral procedures were done with conventional surgery. The incision margins were healed after 4 days.

As Baker described that laser blepharoplasty incision is easier to perform, especially in the aged patient. But, according to my experience, younger persons can also be good candidates for eyelid surgery. Mele et al. reported in their study that there were no complications from the use of the laser, and no new complications were found as a result of using the laser during eyelid surgery.

In conclusion the laser in eyelid operations shortened the operation time and reduced complications. It reduced bleeding intra and postoperatively, thus reducing postoperative swelling, pain, and ecchymosis, demonstrated greater benefit on the laser. Surgery was safe and efficient 980 nm diode laser shows in blepharoplasty. The hemostasis incision allows the surgeon a dry field and excellent visibility, less bruising, swelling, pain and discomfort. shortened operating time and minimal bleeding. Patients had markedly decreased blood loss demonstrated during surgery. Margins the incision were healed after 4 days and never caused hypertrophic scars. Laser 980 nm diodo in eyelid surgery shortened the operation time with no complications. Reduced bleeding intra and postoperatively, demonstrated a greater benefit on the laser side as shown in the follow-up images of cases.

Finite Elemental Biomechanical Simulated Analysis of the Nasolabial Fold

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Background: This study aimed to confirm the dynamic biomechanical relationships between different kinds of nasolabial folds and the facial mimetic muscles by finite element analysis.

Methods: Based on the existing general anatomical data, the 3D CAD model of the skin-muscle-maxillofacial bone in the nasolabial fold region was established by using the engineering design module of the Catia software. After establishing the CAD model of the nasolabial fold with the Catia software, the CAD model was then imported into the Hypermesh software. The unit type was set up. The grid division was performed. And the material properties were then assigned. Finally, the 3D FEA model of the skin-muscle-maxillofacial bone in the nasolabial fold region was generated, and then introduced into the Abaqus software with HM format for mechanical force loading and biomechanical analysis.

Results: Based on the existing general anatomical data, a FEA model of the skin-muscle-maxillofacial bone in the nasolabial fold area was established successfully, combined with the softwares of Mimics, Geomagic Studio, Catia, Hypermesh and Abaqus together. This FEA model had a good geometric similarity and good biomechanical properties, which provided an ideal biomechanical model for the deformation and biomechanical study of the nasolabial fold.

Conclusions: The dynamic biomechanical relationships between different kinds of the nasolabial folds and the facial mimetic muscles were roughly confirmed by FEA.

Clinical Observation and Anatomical Analysis of Vision Loss after Facial Hyaluronic Acid Injections

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Background: Vision loss caused byophthalmic arteryembolism is the most disastrous complication of facial hyaluronic acid (HA)injections. In this study, 3 clinical cases with different extent of vision loss and relevant cadaver anatomy analysis were employed to investigate vision loss due to HA injections.

Methods: Three patients of vision loss after HA injections were studied. Two patients suffered all field of vision loss and one patient suffered part field of vision loss. Ocular angiography and ophthalmic testing of patients were examined to investigate the embolism site of ophthalmic artery. Thirty-six hemifaces of fresh Asian cadavers were dissected to investigate the anatomy of the ophthalmic artery and branches including facial branches and the central retina artery. The minimum dose of HA for central retinal artery embolism was calculated through the measurements of the artery volumes from facial branches to the trunk of ophthalmic artery.

Results: Clinical cases showed that the symptom of vision loss was different and the central retina artery occlusion and compound of intraocular branches occlusion were severe than posterior ciliary artery occlusion. During follow up, the symptom of vision loss had no improvement after treatment including retrobulbar injection of hyaluronidase. Cadaver anatomy study showed facial branches including supratrochlear artery, supraorbital artery directly originated from ophthalmic artery. The artery volumes of supraorbital artery and supratrochlear artery from orbital margin to the branch point of central retinal artery to ophthalmic artery were 0.083 cm^3 and 0.089 cm^3. The ophthalmic artery system was specific and isolated in order to nourish the eyeball.

Conclusion: The various extent of vision loss depends on the different types of embolism site at intraocular branches of ophthalmic artery, and no cases got obvious improvement of vision after treatment. Less than 0.1 ml HA can cause the central retinal artery embolism from facial branches injections. limiting volume per injection is a simple technique to prevent this complication.

Clinical Trial to Evaluate the Efficacy of Botulinum Toxin Type A Injection for Reducing Scars in Patients with Forehead Laceration – A Pilot Study

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Skin damage by either trauma or surgical intervention inevitably results in scar formation. Facial scars can be cosmetically disfiguring and may cause functional impairment and psychosocial withdrawal. Botulinum toxin type A(BoNTA) is known to prevent fibroblast proliferation and expression of TGF-B1. It also induces temporary muscle paralysis and decreases tension vectors. Fibroblasts induce scar contracture and hypertrophy by producing collagen fibers in wound healing processes.

In theory, botulinum toxin can play a vital role in scar prevention by reducing contracture and relaxing the adjacent muscles.

Several studies have suggested the possibility of injecting botulinum toxin into nearby musculature around the traumatic or incisional wounds. However, sound clinical evidence has been missing. The aim of this study is to investigate the subjective and objective evidence of the effect that botulinum toxin has on scar formation in human.

This prospective, split-scar, double-blinded, randomized controlled study. From February 2012 to December 2015, patients who presented forehead lacerations were recruited from the emergency room. 45 patients with forehead laceration were enrolled in this study and randomized into two groups with or without injection of BoNTA. When the patients presented to the clinic to remove the stitches, BoNTA was injected to the BoNTA group with 24 patients and saline was injected to the control group with 21 patients. The BoNTA was injected on dermal layer with 5U/cm within a 0.5 cm distance on BoNTA group. Placebo drug was prepared as a vial containing 0.9% saline which is similar to BoNTA. After that, follow-up was done in 1 month, 3 months, and 6 months. The scars were analyzed with the Patient and observer scar assessment scale (POSAS), Stony Brook Scar Evaluation Scales (SBSES) and Visual analogue scale(VAS) and analyzed with independent t-test, along with clinical photographs, cutometer and biopsies.

There were 21 patients in the control group and 24 patients in the BoNTA group. There were no significant adverse events in all patients. In all scar scales, the scores changed into favorable direction in both groups and the changes were larger in BoNTA group compared with the control group. However, when the number of changes of the scar scales was investigated, there were more favorable changes in BoNTA group, which was proved statistically in SBSES (P=0.047) and VAS(P=0.046). Even without statistical significance, there were more favorable changes in BoNTA group in Patient Scar Assessment Scale (PSAS) (P=0.110) and Observer Scar Assessment Scale (OSAS) (P=0.169)

Skin biopsy showed less collagen deposition on dermal layer in BoNTA group. In hematoxylin, eosin stain and masson-trichrome stain, there was a denser deposition of collagen fibers of the specimen belonging to the control group compared to the BoNTA group.

Based on the findings above, BoNTA can improve scar properties in various aspects, especially in decreasing collagen synthesis. The gross findings also showed favorable changes. This study provides useful indication of application of BoNTA in scar prevention with promising results

Comparison of the Pedicled Latissimus Dorsi Flap with Immediate Fat Transfer (LIFT) versus Abdominal-Based Free Flaps for Breast Reconstruction

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Purpose: Abdominally based free flaps and the latissimus dorsi and immediate fat transfer (LIFT) procedure are both fully autologous options for breast reconstruction. The former is specialized and requires comfort with microsurgical technique while the LIFT combines a common set of techniques familiar with all plastic surgeons. Comparison of the two methods for clinical effectiveness and complications for equivalency in outcomes may help elucidate and enhance patient decision making.

Methods: A retrospective review was performed to analyze outcomes of both patients who underwent the LIFT procedure and patients who underwent abdominal-based flaps between March 2017 to July 2018 by the senior surgeon. Data was analyzed per breast. Outcomes of interest included post-operative complications, flap success, and follow up revision and fat grafting procedures. Continuous variables between the two groups were compared using the two-sample t-test. Categorical variables were compared using Pearson's Chi Square and Fischer's Exact test as appropriate.

Results: 65 breasts were identified as having undergone abdominal-based flap procedures and 31 breasts underwent the LIFT procedure. Average follow up time was 8(±4.6) months for the abdominal-based flap patients and 7.9 (± 4.2) months for the LIFT patients ($p>0.05$). Demographics were not statistically different between the two flap cohorts ($p>0.05$). This includes age, BMI (abdominal-based flaps 29.9 ± 4.76, LIFT 28.2 ± 6.2 kg/m^2), diabetes, hypertension, connective tissue disease, and current tobacco use. Additionally, the use of neoadjuvant chemotherapy and adjuvant radiation was not statistically different between the two groups ($p>0.05$). The LIFT procedure cohort had a shorter length of operation time (375 ± 136 min) as compared to the abdominal-based flap cohort (514 ± 136 min) ($p<0.001$). Similarly, the LIFT cohort had a shorter length of hospital stay (1.65 ± 0.85) than the abdominal-based flap cohort (3.83 ± 1.65) ($p<0.001$). However, the average abdominal-based flap procedure had a shorter time until drain removal (13.3 ± 4.3 days) as compared to the LIFT (24.0 ± 11.2 days). The number of overall, major (requiring operation), and minor complications including infection/cellulitis, seroma, dehiscence, hematoma, and flap issues and/or failure were also not statistically different (abdominal-based flaps: major 20.0%, minor 27.7%; LIFT: major 12.9%, minor 19.35%). Similarly, the need for reoperations for revisions (abdominal-based flaps 0.80 ± 0.71 vs. LIFT 0.87

± 0.71) and fat grafting (abdominal-based flaps 41.54% vs. LIFT 58.8%) was not statistically different.

Conclusions: Both the LIFT vs. abdominally based free flaps have similar outcomes and complication rates. However, the LIFT may be preferred in patients that require shorter operation times due to comorbid medical conditions or with severe obesity which may result in abdominal donor site problems. Furthermore, the LIFT may be the fully autologous breast reconstruction choice for non-microsurgeons.

Implant-Based Breast Reconstruction after Nipple Sparing Mastectomy: A Comparison between One and Two Stages

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Background: Nipple sparing mastectomy (NSM) is reserved for patients that meet specific criteria in order to optimize considerations in the oncologic domain and reduce complications [1]. Trend towards the development of more broader reconstructive indications for NSM are directly related to patient demand and the possibility to achieve a better aesthetic outcomes [2]. Several studies have demonstrated the safety of this procedure in patients with increased risk factors [3, 4]. Well-selected high-risk patients can safely undergo NSM and implant reconstruction in 1 stage or 2 stages.

Purpose: Compare risk factors and complications in patients after nipple sparing mastectomy (NSM) and implant-based breast reconstruction.

Methods: A retrospective chart review was performed in a tertiary institution from 2016 to 2018. All patients that underwent NSM followed by 2 stages or direct to implant (DTI) reconstruction had their information collected per reconstructed breast. Patient demographics, previous surgeries, smoking status, radiotherapy history, surgical information and post-operative complications (delayed wound healing, dehiscence, mastectomy flap necrosis, and infection) were collected.

Results: A total of 217 breasts were analyzed, 110 (50.69%) underwent direct to implant and 107 (49.30%) two stages reconstructions. DTI group had patients with slightly older age: 48.88±12.78 vs 45.31±10.8 (p=0.02), higher BMI: 27.35±5.97 vs 24.89±4.95 (p=0.001), higher mastectomy weight: 455.62±229.05g vs

372.213±213.06g (p=0.006), and higher ptosis grades (p=0.010). The groups were similar for smoking status, history of radiation, prophylactic mastectomy. DTI group had more pre-pectoral reconstructions than TE group: 65 (59.09%) vs 22 (20.56%); and used acellular dermal grafts more frequently: 110 (100%) vs 83 (77.6%) (p<0.001). There were no significant differences in complication rates between the groups: 28.97% vs 33.63% (p=0.47), and reoperation rates: 12.14% vs 15.45% (p=0.56). Number of revision surgery was similar between both groups (p=0.17). The number of surgeries required on the entire reconstruction process was bigger on the two stages group 2.48±1 vs 1.4±0.75 (p<0.001). Successful implant-based reconstructions were achieved in 90.81% on TE group and 96.36% on DTI group (p=0.121).

Conclusion: Implant-based breast reconstruction after nipple sparing mastectomy can be successfully achieved in one or two stages with similar rates of complication, reoperation, and revision. The patients that underwent direct to implant reconstructions had similar rates of successful reconstructions, despite the higher BMI, older age, higher mastectomy specimens' weights, and higher preoperative ptosis grades.

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Breast Sensation Recovery after Neurotized Deep Inferior Epigastric Perforator Reconstruction

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Background: It has been proven that breast reconstruction and the improvement of the breast sensation for post-mastectomy patients can improve both satisfaction and quality of life for patients [1]. Spontaneous sensory recovery after DIEP flap has been showed due to ingrowth of peripheral cutaneous nerves from the wound edges or from deeper structures but usually is poor and variable. Neurotization has been used in breast reconstruction since 1992 and the limitation of only using the intercostal nerves for coaptation is the need of a greater chest dissection to have an appropriate nerve length that generates scar formation and tension on the suture line [2, 3] [4]. Using a nerve conduit with a nerve graft will reduce excess nerve dissection that will jeopardize nerve regeneration and can help to overcome the size mismatch between the intercostal nerve and the DIEP intercostal nerve [4] [3].

Purpose: To evaluate breast sensation outcomes after combined nerve conduit and allograft in deep inferior epigastric perforator (DIEP) reconstructions.

Methods: Dynamic and static sensation recovery tests were performed in all breast quadrants of consecutive patients that underwent deep inferior epigastric perforator reconstructionin with neurotizatized (group 1) and non-neurotized DIEP reconstructions (group 2). Demographics information, surgical details, and post-operative complications were collected.

Results: A total of 74 patients (96 breasts) underwent this technique since June/2016: 46 breasts from group 1, and 15 from group 2. The groups had similar age, BMI, smoking status, history of radiation therapy and timing of reconstruction. No difference was found for complications and reoperation between groups. The mean time interval between the surgery, first, and second tests were similar in groups 1 and 2. Thresholds on the first and second recovery tests were statistically similar. Compared to group 2, group 1 had 56% of the total areas evaluated (static and dynamic) with better sensation thresholds. On the second round of sensation tests, the clinical difference between the groups was more evident with all areas with better sensation thresholds in the neurotized group.

Conclusion: There is a positive trend for breast sensation recovery after reconstruction with neurotized deep inferior epigastric perforator flaps. Nerve regeneration takes time to be achieved and a longer follow up is necessary to evaluate the final sensation recovery.

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An Algorithmic Approach to the SIEA System Reduces Fat Necrosis in Autologous Breast Reconstruction

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Purpose: The deep inferior epigastric perforator (DIEP) flap has become the most commonly performed method of autologous breast reconstruction in the United States. However, occasionally poor perforator anatomy or quality in the deep system can lead to inadequate perfusion, ultimately resulting in fat necrosis and an unsatisfactory reconstruction. In this setting, the superficial inferior epigastric artery (SIEA) flap can be an attractive alternative due to speed of harvest and ability to avoid the abdominal morbidity of harvesting muscle, but vessel mismatch and fat necrosis can be common complications. In aims to reduce these complications and avoid muscle harvest, we present a novel algorithm in which two modifications were utilized involving the SIEA system in the setting of poor DIEP flap perforator anatomy. These include 1) a "dual-plane" flap by turbocharging the SIEA with intraflap anastomoses to cranial extent or branch of the DIE pedicle and 2) the use of the DIEA and vein as a composite interposition graft to increase pedicle length and size mismatch between the SIEA/V and the recipient chest vessels.

Methods: Retrospective review of a prospectively maintained, 866 free-flap database was performed for patients undergoing breast reconstruction at one institution with two surgeons from 2010-2017. Standard SIEA flaps were performed until 2015 in the setting of poor deep system perforators.

From 2016-2017 a novel algorithm was utilized: If there were poor DIEP perforators and superficial vessels were present, the SIE pedicle was anastomosed to the terminal branch or superior extension of the DIE pedicle. The DIE pedicle was then anastomosed to the antegrade internal mammary (IM) vessels. If no DIEA perforators were found and the SIEA was adequate, a flap based on those vessels was performed and the DIEA/V were utilized as a composite arterial/venous interposition graft to the chest vessels.

Outcomes of fat necrosis and flap loss were recorded for all flaps and comparative statistics were conducted with two-tailed Fisher's exact test.

Results: There were 30 standard SIEA flaps, 14 "dual-plane" flaps with a turbocharged SIEA system, 11 SIEA flaps with an interposition composite graft from the DIE pedicle, and 409 standard single pedicle hemi-abdominal DIEP flaps included in analysis. 15 standard SIEA flaps (50%) had fat necrosis which was significantly higher than the 59 standard DIEP flaps (14.4%) with fat necrosis (p=.0001). After utilization of the proposed algorithm, 2 modified SIEA flaps (8%) had fat necrosis, the reduction of which was statically significant (p=.001). Flap loss rates were not different between each cohort.

Conclusion: This retrospective cohort study suggests that utilization of a novel algorithm with two modifications of the superficial inferior epigastric system allowed a significant reduction in fat necrosis rates when compared to standard SIEA flaps from the same 2 surgeons. These results show that future patients, for whom we would have previously indicated for standard SIEA flaps, may have equal fat necrosis rates as standard DIEP flaps if this algorithm is utilized.

Evaluating the Risk of Breast Implant Related Complications after Cardio-Thoracic Surgery

Presenter:	Ayesha Punjabi, MD
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Purpose: Breast implants are utilized extensively for cosmetic and reconstructive purposes. This combined with the prevalence of surgical cardiothoracic disease results in a population of patients with breast implants requiring sternotomy or thoracotomy. We hypothesized that patients were at greatest risk for breast implant-related complications during anterior or medial cardio-thoracic approaches. The aim

of this study is to evaluate breast implant risks and complications during subsequent cardio-thoracic surgery using a meta-analysis of the existing literature specific to this unique and understudied population.

Materials and Methods: A meta-analysis using PubMed/MEDLINE, EMBASE, and SCOPUS was performed using "breast implant thoracotomy" (23 results), "breast implant sternotomy" (14 results), "iatrogenic breast implant rupture" (9 results), and "cardiac surgery breast implant" (356 results) as search terms. Titles were evaluated for relevance and duplicates were consolidated resulting in eighteen articles, years of publication 1993-2018. The methodological quality of included studies was independently assessed using the Methodological Index for Non-Randomized Studies guidelines. Average number of MINORS criteria was 3 out of 7. These were reviewed for patient characteristics, surgical approaches, and complications. Statistical analyses were completed with SPSS version 25.

Results: Twenty-seven (27) patients with an average age of 58.37 years (23-84) were identified. Average time from breast implant placement to thoracic surgery was 14.9 years (33% reconstructive implants, 67%, aesthetic implants). Cardiac valvular surgery (Mitral Valve) was the most common surgery (14/27 patients: 51.8%). The most common approach was a minimal access mini thoracotomy (18/27 patients; 67%).

Implant preservation occurred in 13 patients (48.1%); same implant removal and replacement at the time of the cardiac operation in 7 patients (25.9%); and implant exchange for new prostheses in 5 patients (18.5%). 11 patients (40.7%) had post-operative complications: implant rupture (9 patients), intra-thoracic implant migration (6 patients), free silicone in the thorax (7 patients), and delayed hematoma in the implant capsule (1 patient). The average time from surgery to complication was 17.05 (10/27 reported) months. Average follow-up was 11.5 (10/27 reported) months.

The implant preservation group had a complication rate of 78.6% vs. a 21.4% complication rate for patients who had implant removal and/or replacement ($p<.0001$). Significant predictors of complications were reconstructive vs aesthetic implant (87.5% vs.12.5% respectively), pulmonary lesion (100% vs. 20% for other indications, $p<0.0001$), and VATS (100% versus 20% for patients with other approaches, $p=0.02$). Mitral valve repair (14.3% vs. 69.2% for other indications, $p=0.004$) and minimal access approach (16.7% vs. 85.7% for other approaches) correlated negatively with complications. These individual primary predictors were not significant when combined using a regression model.

Conclusions: Our study demonstrated that implant preservation was associated with increased risk of breast implant related complications during cardiothoracic surgery.

Patients with reconstruction-related breast implants undergoing VATS for pulmonary indications were at greatest risk for an implant-related complication. Further study evaluating prospective treatment algorithms may demonstrate decreased complications using a breast implant removal and replacement strategy in high-risk patients.

Patient Safety Indicators Following Breast Reconstruction: Opportunities to Improve Patient Safety

Presenter: Danielle H Rochlin, MD
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Purpose: Despite the growing spotlight on value-based care and patient safety, little is known about the influence of patient-, reconstruction-, and facility-based factors on safety events following free autologous or prosthetic breast reconstruction. Our objective is to characterize hospital complications in light of modifiable risk factors.

Methods: Patients who underwent free flap and tissue expander (TE)-based breast reconstruction from 2012-2014 were identified from the Nationwide Inpatient Sample (NIS). Predictor variables included patient-level (age, race, income quartile, radiation history, and Elixhauser comorbidity score), reconstruction-level (free flap vs. prosthetic, and immediate vs. delayed), and facility-level (annual hospital volume of breast reconstruction, urban/teaching status, and length of stay) characteristics. Patient safety indicators (PSIs) were based on the Agency for Healthcare Research and Quality's designation of preventable hospital complications: venous thromboembolism, bleeding, wound complications, pneumonia, and sepsis. Logistic models were used to analyze outcomes, with sampling weights applied per Healthcare Cost and Utilization Project recommendations.

Results: The weighted sample included 103,301 women, of which 27,695 (26.8%) underwent free flap reconstruction at a mean age of 50.9 years (standard deviation [SD] 9.4) and 75,615 (73.2%) underwent TE-based reconstruction at a mean age of 51.1 years (SD 10.7). 3.6% of patients experienced at least one PSI (5.6% [free flap] vs. 2.8% [TE], $p<0.001$), with wound complications being most common (4.9% [free flap] vs. 2.5% [TE], $p<0.001$). Significant predictors of PSIs following free flap reconstruction were Elixhauser score of 4 or greater (odds ratio [OR] 1.95, $p=0.002$) and rural setting (OR 3.77, $p=0.024$). In contrast, wealthiest income quartile (OR 0.74 compared to poorest quartile, $p=0.047$) and immediate reconstruction (OR 0.64,

p<0.001) were protective parameters in prosthetic reconstruction. Length of stay was a significantly associated in both groups (OR 1.29 [free flap] vs. 1.49 [TE], p<0.001), with each additional day being associated with an increase in PSIs of 1.5% and 1.6% following free flap and prosthetic reconstruction, respectively.

Conclusions: The overall rate of PSIs was generally low following breast reconstruction, though PSIs were more common following free flap reconstruction. Reconstructive surgery volume and hospital size were not associated with the frequency of PSIs for either method of reconstruction. However, medical comorbidities and rural hospital setting were associated with increased PSIs following free flap reconstruction. Immediate reconstruction was protective against PSIs for TE cases. Longer length of stay was associated with higher risk of hospital complications for both groups. Though additional studies are needed to determine causality, duration of hospital stay may represent the greatest opportunity for modifiable risk reduction in surgical care delivery following breast reconstruction.

Lateral Intercostal Artery Perforator Flap: A Single Surgeon Experience and Review of the Literature for Partial Breast Reconstruction

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Background: In 1979 Kerrigan et al described the anatomical locations and potential reconstructive use of the different perforating branches of the intercostal artery. Later, in 1986 Holmstrom et al reported a flap based off the lateral perforating branch of the intercostal artery – the lateral intercostal artery perforator flap (LICAP flap) – as an option for superiolateral breast reconstruction. Since that time the LICAP flap has been described in cases reports, retrospective reviews, and even a prospective trial. However, a review of the literature has yet to be published. The purpose of this study was to review our institution's experience and perform a review of the literature.

Methods: A retrospective review was conducted of a single surgeon's experience a major university center. Patients who underwent lateral intercostal artery perforator flaps between the years of 2007 and 2018 were included. Pre- and post-operative photos were reviewed, patient demographics were analyzed, and complications rates were determined. A review of the literature was performed on Pubmed with search terms "lateral intercostal artery perforator flap" and "lateral thoracodorsal flap," selecting for articles describing use of this flap for partial breast reconstruction.

Results: 11 total patients underwent lateral perforator flaps for reconstruction of segmental mastectomy. Average age was 55 years old. Diagnosis at time of breast conserving surgery included ductal carcinoma in situ and invasive carcinoma, and chronic wound subsequent to radiation therapy. Total excision volume ranged from to 3x4x2 cm to 6x6x5 cm, from the superolateral breast. The majority of reconstructions were performed in a delayed fashion. No seromas, no delayed healing, nor any need for operative revision were reported.

From our literature search, 137 total articles were initially identified. Of these, 39 included information on 1445 patients who underwent 1518 laterally based perforator flaps for partial breast reconstruction. Patient age ranged from 23 to 83 years old, with an average reported specimen weight of 160g and flap dimensions of 15.7x6.9cm. Overall complication rate was low with most complications classified as minor and not requiring surgical intervention. Major complication leading to surgical revision was seen in only 2.57% of flaps. Donor site complications were not common, with seroma the most frequent seen in 3.5% of cases. Diabetes mellitus, thyroid disease, pulmonary and cardiovascular disorders, flap length over 17cm, smoking, high BMI, and history of radiation, were significantly associated with complications. Additionally, several studies reported good to excellent aesthetic outcomes using verified surveys such as SF-36 and the Breast-Q, as well as independent review by other plastic surgeons.

Conclusion: The LICAP flap presents a robust option for reconstruction of superolateral partial mastectomy defects. It may be performed in a delayed fashion to ensure negative margins at time of reconstruction and achieves good aesthetic outcomes with low risk of complications.

Can Your Patient Recognize Flap Failure after Autologous Breast Reconstruction? Identifying and Designing the Ideal Patient Educational Materials with Crowdsourcing and A/B Testing

Presenter:	Cara K. Black, MD
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Background: Health literacy is the capacity in which individuals may obtain, process, and understand basic health information and services needed to make appropriate health decisions. Poor health literacy is an epidemic in the United States, associated with higher mortality rates and poor postoperative care. Autologous breast

reconstruction is highly complex, and identification of complications is difficult even for some practitioners. We sought to further explore the problem of health literacy in this context and identify the ideal postoperative guide for patients.

Methods: Available online postoperative educational materials for autologous breast reconstruction were assessed using 11 different readability scores. To develop the ideal postoperative autologous breast reconstruction patient education materials (PEMs), we crowdsourced quizzes with varying amount of text, images, and readability levels with A/B testing. A/B testing is a method to examine the outcome of two versions of a single variable. All crowdsourcing respondents were female and on average Caucasian (81%), between the ages of 25-44 (66.4%), with children (74.0%) with an associate or bachelor's degree (50%), and making between $30,000 to $74,999 per year (49%). Lastly, we implemented our findings of the ideal PEMs during autologous breast reconstruction patient education and compared performance on postoperative quizzes with and without oral reinforcement. Ten patients served as the treatment group and were provided with an oral presentation about flap complications with visual aids to reinforce a written information booklet. Another ten patients served as the control group and were provided with only the written information booklet.

Results: Of the 12 postoperative flap complication patient education materials found through an internet search, the average grade level readability level was 9.9. 50% of the materials were written above an 8th grade level. Only one of the twelve (8.3%) of the education materials discussed specific details of flap compromise such as tissue discoloration and temperature change. Additionally, this single source did not address the next steps to take if these symptoms were seen. Two of the twelve provided education on proper flap positioning to avoid pressure on flaps after the procedure (2/12; 16.7%). The A/B tests results revealed that instructions of approximately 400-800 words written in a 6th grade level led to the best identification of flap compromise determined through a quiz. When combining written patient education materials modeled after these findings with oral reinforcement of the materials, patients scored significantly higher on the postoperative quiz (93.8% with materials vs. 69.4% without materials, $p = 0.0059$) with high levels of retention one week out (90% vs 76.0%). Factors such as education level, race, financial status, and parental status were not statistically different between the two groups ($p>0.05$).

Conclusions: Current available patient education materials are at a high reading level and lack specific information on identification of flap compromise. We propose a guideline for the most effective patient education materials to be approximately 400-800 words written in a grade 6th level with images and oral reinforcement.

Comparing Prepectoral Versus Subpectoral Tissue Expander Placement in Delayed-Immediate Autologous Breast Reconstruction

Presenter:	Ashraf A. Patel, BS
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Background: Tissue expanders (TE) have historically been placed below the pectoralis muscle in delayed-immediate breast reconstruction. Subpectoral (SP) placement requires extensive dissection and damage to the patient's muscular tissue which increases the risk for complications, including animation deformities.[1] With the advent of Acellular Dermal Matrix, prepectoral (PP) TE placement has become increasingly popular, as it obviates the extensive manipulation of the pectoralis muscle required in subpectoral reconstruction. This study compares the outcomes and complication rates between prepectoral and subpectoral TE placement in autologous delayed-immediate breast reconstruction at a single institution.

Methods: A retrospective chart review of all patients undergoing autologous, delayed-immediate breast reconstruction at our institution between June 2009 and December 2018 was performed. Demographics, comorbidities, and perioperative information from both first and second stage surgeries were collected for all patients. Relevant patient encounters were reviewed for up to twelve months following autologous reconstruction to determine complication rate. Complications were modeled using univariable and multivariable binary logistic regressions.

Results: A total of 89 patients met the inclusion criteria and data from 125 breast reconstructions was evaluated. Complication rates following TE placement (stage 1) trended lower in the prepectoral cohort (PP: 28.8% *vs*. SP: 37%, P = 0.34), and seroma was the most common complication amongst all patients (12.8%). Overall complication rates following autologous reconstruction (stage 2) were significantly lower for PP reconstructions (PP: 7.7% *vs*. SP: 23.3%, P = 0.02), and wound dehiscence was the most prevalent complication in all patients (9.6%). Multivariable regression showed TE position (P = 0.01) and history of radiotherapy (P = 0.01) were the most significant predictors of ≥1 complication following autologous reconstruction. Time delay between first and second stage surgeries was significantly greater for subpectoral reconstructions (PP: 199.7 *vs*. SP: 324.9 days, P < 0.001), and multivariable analyses controlling for age, gender, TE fill volume, and post-mastectomy radiotherapy showed subpectoral TE positioning to be an independent predictor of this delay (P = 0.003). Following autologous reconstruction, breast drains were removed for all patients once drainage was below 30 milliliters per day for two

days consecutively. Time until drain removal was shorter in the prepectoral cohort (PP: 8.6 *vs*. SP: 12.0 days, $P < 0.001$). Mean follow-up time was not significantly different between groups (PP: 278.4 *vs*. SP: 340.2 days, $P = 0.27$).

Conclusion: Prepectoral reconstruction in the delayed-immediate autologous reconstruction patient leads to better outcomes through significantly lower complication rates, shorter duration between first and second stage surgeries, and fewer days that breast drains remain when compared to subpectoral reconstructions. We believe this is made possible through less manipulation of the muscular tissue, better preservation of the skin envelope vasculature, and better control over the breast pocket. This study finds prepectoral reconstruction to be a safe option in improving delayed-immediate breast reconstruction.

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How Do We Raise the Bar in Autologous Breast Reconstruction? the Use of Progressive Tension Sutures for Donor Site Closure

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Background: The abdomen is the most common location from which tissue is harvested for autologous breast reconstruction.[1] The evolution from musculocutaneous flaps to muscle-sparring perforators flaps has decreased donor site complications such abdominal bulge and hernia, however complications remain. The development of progressive tension suture placement for donor site closure has the potential to decrease complications and increase the aesthetics of the abdomen after breast reconstruction.[2]

Purpose: To present our institutional experience using progressive tension sutures for a tensionless closure of the donor site to improve outcomes and optimize abdominal donor site aesthetics.

Methods: A retrospective cohort study was conducted over a two-year period. Sixty-six consecutive patients that underwent abdominally based autologous breast reconstruction were divided into an experimental group (36 patients), in which the donor site was closed using progressive tension sutures, and a control group (31 patients), in which the donor site was closed without the use of this technique. A comparison between both groups was conducted in terms of demographic characteristics, perioperative variables, and donor site-related postoperative complications.

Results: No significant differences were found between the two groups in terms of demographic characteristics including age, body mass index, smoking status, comorbidities, and previous abdominal surgery ($p>0.05$). No significant differences were noted with respect to unilateral vs bilateral donor sites, operative times and length of hospital stay ($p>0.05$). With regards to donor site complications, the wound dehiscence rate was significantly higher for the control group (27.8% vs 6.5, $p=0.023$). No differences were noted in terms of infection, seroma formation, hematoma formation, abdominal bulge or abdominal hernia rates between the two groups.

Conclusion: In the cohorts of patients analyzed, the use of a tensionless technique for the closure of the donor site after an abdominally based autologous breast reconstruction decreased the rates of donor site wound dehiscence. Seroma and hematoma formation rates remained the same across both groups.

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Safety and Efficacy of Fat Grafting during Second Stage Breast Reconstruction

Presenter:	Ashraf A. Patel, BS
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Introduction: Breast reconstruction is a crucial aspect of healing for breast cancer survivors and maximizing satisfaction while minimizing the number of surgical procedures is a multifactorial challenge. Advances in reconstructive surgery have made the aesthetic result a key driver in patient satisfaction and patients often pursue revisionary surgery to achieve their desired result. Fat grafting has become an increasingly popular option for patients and is known to improve psychosocial and sexual well-being.[1] In two-stage implant-based breast reconstructions (IBR), fat grafting can be performed at the time of permanent implant placement or at a future date as a revisionary surgery. To explore the best time to fat graft in IBR, this study compares the total time to breast reconstruction completion and outcomes between patients who received fat grafting during implant placement and patients who pursued fat grafting at a later date.

Methods: This study retrospectively reviewed charts for all patients undergoing IBR and fat grafting between January 2012 and December 2017. Delayed reconstructions and prior flap-based reconstructions were excluded. Basic patient demographics, comorbidities, history of chemoradiotherapy, and mastectomy information was recorded. Perioperative information collected at the time of implant placement included whether fat grafting occurred and the amount of fat that was injected. Charts were reviewed for up to two years postoperatively to determine whether any complication had occurred and if further revisionary procedures were performed. Statistical analysis included the unpaired t-test and the chi squared test.

Results: A total of 157 patients met inclusion criteria, and data from 269 breast reconstructions was included. Overall complication rates were lower when fat grafting was performed at the second stage surgery (Second Stage (SS): 3.6% vs. Later Stage (LS): 13.6%, p-value (p) < 0.001). 33.8% of patients in the SS cohort pursued additional fat grafting as a revisionary surgery. Patients in the LS cohort pursued on average more than one additional revision when compared to patients in the SS cohort (SS: 0.44 vs. LS: 1.9, $p < 0.001$). The mean total volume of fat grafted across all fat grafting procedures trended lower in the SS cohort (SS: 91.4 mL vs. LS: 106.1 mL, $p = 0.374$), and patients in the SS cohort completed their revisions in a shorter time frame (SS: 132.7 days vs LS: 545.4 days, $p < 0.001$).

Conclusions: Fat grafting is known to improve aesthetic outcomes in breast reconstruction. Both surgeons and patients are faced with the option of fat grafting during the second stage of reconstruction or at a later date, as a revisionary surgery. In IBR, we find that fat grafting during implant placement results in lower overall complication rates, fewer additional surgeries and enables patients to reach their desired aesthetic appearance in a shorter time frame. Fewer total surgeries not only translate to a more economical option, but also obviates the risk of complication that come with additional surgeries.

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Is Ptosis Inadequate As Selection Criteria: The Mid-Clavicle-to-Inframammary Fold Distance Predicts Ischemic Complications in the Inframammary Approach to Nipple Sparing Mastectomy

Presenter:	Kyle Luvisa, MPH
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Introduction: Anatomical exclusion criteria for nipple sparing mastectomy was defined as "not excessively large or ptotic breasts". However, morphologic criteria such as ptosis and sternal notch to nipple, have not been shown to predict ischemic outcome. In this presentation, we introduce a novel mid-clavicular-to-inframammary fold (MCI) measurement for NSM performed through an inframammary approach and demonstrate it to be predictive of mastectomy weight and ischemic outcomes.

Methods: Retrospective review was performed on all NSM through an inframammary approach. Exclusion criteria include other mastectomy incisions, staged mastectomy, previous breast operation, and autologous reconstruction. Preoperative anatomical measurements for each breast, clinical course, and specimen weight were obtained.

Results: One hundred forty breasts in seventy-nine patients were reviewed. Mastectomy weight was strongly correlated with MCI measurement on linear regression (R^2=0.651, p<0.001) but neither ptosis or sternal notch-to-nipple (SNN) distance were. Twenty-five breasts (17.8%) had ischemic complications: 16(11.4%) were nonoperative and 9(6.4%) were operative. The average mastectomy specimen weight in patients with major ischemic complications was 498g, significantly higher than mastectomy specimens without major complications (315g, p=0.001). Those with mastectomy weights ≥500g were 9 times more likely to have operative ischemic complications than those with mastectomy weights <500g(p=0.0048). The average MCI measurement among breasts with major ischemic complications was 30.2cm, significantly different from breasts without major ischemic complications (27.9cm, p=0.032). Those with MCI ≥30cm had a 3.8

times increased incidence of any ischemic complication(p=0.00547) and 9.2 times increase incidence of operative ischemic complications(p=0.00376) compared with those <30cm. The majority of patients with and without major ischemic complications had grade I ptosis(p>0.05).

Conclusion: Breasts undergoing NSM with inframammary approach with MCI measurement ≥30cm are at high risk for having ischemic complications. Previous anatomical measurements, such as SNN and ptosis, were not correlated with ischemic complications. While our absolute contraindication to NSM remains MCI >34cm, consideration for a staged approach or lateral incision is warranted in those ≥30cm.

Pectoral Placement of Tissue Expanders Affects Inpatient Opioid Use

Presenter: Halley Darrach, BS
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Purpose: Prepectoral breast reconstruction promises to minimize breast animation deformity and decrease the pain associated with subpectoral dissection and tissue expansion. This latter benefit is particularly timely given the ongoing opioid epidemic; however, this theoretical benefit remains to be demonstrated clinically. As such, this study aimed to compare inpatient opiate use and prescription practices following prepectoral and subpectoral expander-based breast reconstruction.

Methods: A retrospective review was performed of patients at a single institution undergoing immediate tissue expander placement between January 2017 to April 2018. Medical records were reviewed for surgical details, 24-hour inpatient PRN opioid usage (oral morphine equivalents [OME]), and discharge prescriptions. Comparisons were made using chi-squared and student's t-tests, where appropriate.

Results: 231 patients were identified (mean age 48.8 years), of whom 137 (60%) underwent prepectoral and 94 (40%) subpectoral tissue expander placement. All but two prepectoral patients and two subpectoral patients were opiate naïve. The prevalence of psychiatric comorbidities or chronic pain disorders was not significantly different between either cohort (p=0.746, p=0.680 respectively). Neither the rate of bilateral procedures (p=0.490) nor axillary dissections (p=0.821) differed between cohorts. Overall, 92% of patients were discharged within 24 hours, and length of stay did not differ between cohorts (1.07 days prepectoral vs. 1.17 days

subpectoral, p=0.0891). Two subpectoral and two prepectoral patients required prolonged admission due to post-operative pain.

All patients were ordered standing acetaminophen, celecoxib, and gabapentin, and – for subpectoral patients – cyclobenzaprine. Inpatient opioids were offered on an "as needed" (PRN) basis. Opiate usage within the first 24-hours was halved in the prepectoral cohort (22.2 vs. 44.5 OME, p=0.0003). However, patients with a chronic pain disorder (n=13) had significantly increased opioid usage (p<0.00001). The presence of anxiety (p=0.9636) or depression (p=0.5822) did not have a significant association with opioid use. In addition, the number of opiates prescribed on discharge (308.42 OME prepectoral vs. 336.99 subpectoral, p=0.3197) and the rates of opioid refills (19% prepectoral vs. 29% subpectoral, p=0.084) were not significantly different between cohorts.

Conclusion: Prepectoral tissue expander placement appears to be associated with a 50% reduction in inpatient opiate usage post-operatively compared to subpectoral placement. This may represent an opportunity to improve patient safety and satisfaction by decreasing outpatient opiate prescriptions.

The Safety of Retrograde Flow of Internal Mammary Vein: A Cadaveric Study and an Anatomical Evidence

Presenter: Hyun Ho Han, MD, Phd
Affiliation: Asan Medical Center, Seoul

Purpose: Internal mammary artery (IMA) and vein (IMV) are one of the most widely used recipient vessels for performing the free autologous tissue-based breast reconstruction. In some cases, however, additional vessels may be required to handle multiple flaps for volume addition, to boost a blood flow for supercharging purposes, or to use the other vessels when an anterograde flow of IMV is obstructed. In these situations, the opposite direction of the internal mammary vessel can be used as a retrograde flow (1, 2). However, there are doubts and concerns about the safety of using this flow.

Methods and Materials: Forty sides of the chest from 20 fresh cadavers with intact thoracic cage and internal mammary vein were used for the study. The numbers and location of the IMV valves were checked, and the location of starting vein bifurcation was also confirmed. Infusion of indocyanine green in the retrograde direction was followed by fluorescent angiography to confirm the direction of flow. Additional flow

using saline infusion was checked to verify the flow in the opposite vein over the sternum.

Results: Twenty-eight valves were identified in 40 sides of the chest, and an average of 0.7 valves per each side of the chest was identified. 23(82.1%) valves out of 28 were located above the 2nd intercostal space (ICS). The bifurcation the IMV most commonly occurred at 3rd intercostal space (18/41, 43.9%), followed by 2nd (9/41, 22%), 4th (8/41, 19.5) and 1st (4/41, 9.8%) intercostal space. The average number of communicating veins between the two veins after branching was 1.76 numbers. Indocyanine green, fluorescent angiography proved that the retrograde flow was shown to the caudal direction through the bypass. A large amount of the retrograde flow was drained to each level of the intercostal veins and the opposite IMV cross over the caudal border of the sternum around the xiphoid.

Conclusion: IMV valves are located concentrically above 2nd costal cartilage level even though 0.7 IMV valves of each side of the chests were confirmed. Based on these results, it is highly unlikely the retrograde flow to be disturbed by the valve because the level of the retrograde anastomosis would be used below the 2nd ICS. Furthermore, vein starts to make the bifurcation below the 2nd or 3rd ICS which having the 1.76 average number of communicating veins. It will allow keeping the flow if the valve interferes. The bypass flows into the intercostal vein, and the sternal vein through crossing the xiphoid is also possible. In conclusion, IMV retrograde flow is considered safe.

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Direct to Implant Prepectoral Breast Reconstruction: Patient Reported and Aesthetic Outcomes

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Background: Direct to implant (DTI) prepectoral breast reconstruction has recently resurged due to its several advantages including reduced post-operative pain and animation deformity.[1] Furthermore, prepectoral reconstruction is associated with decreased hospital stay, faster return to work, and an earlier return to activity compared to subpectoral procedures.[2] Breast-Q, a well-validated patient-reported outcomes (PRO) tool, assesses patient satisfaction and quality of life. Studying PROs have shown to improve patient quality of care by guiding surgical methodology and development.[3] Furthermore, with increased patient autonomy and decision making, patients often use PROs to help guide their decisions regarding future surgeries.[4] To that end, the goal of this study was to assess patients reported and aesthetic outcomes following DTI prepectoral breast reconstruction at six months and one year follow up.

Method: 65 consented adult patients undergoing DTI prepectoral breast reconstruction post mastectomy completed Breast-Q questionnaires preoperatively, and at six, and 12 months postoperatively. The primary outcome was Breast Q scores mainly satisfaction with breasts, psychosocial well-being, sexual wellbeing and physical well-being. In addition, 201 patients were assessed for aesthetic outcomes including the need for revision surgeries, implant-related issues, deformities, and capsular contracture. Repeat measure ANOVAs, dependant T-tests were performed on the primary outcomes. Moreover, a bivariate analysis using a Fisher exact test as well as a regression model correcting for covariates were performed.

Results: Mean satisfaction of breast decreased from 59.2 preoperatively to 58.3 at 12 months ($p>0.05$, $n=41$). Psychosocial wellbeing improved from 69.1 preoperatively to 73.5 at 12-month follow-up ($p>0.05$, $n=41$). Physical wellbeing of the chest did not significantly change from 76.1 preoperatively to 75.2 at 12 months follow up ($p>0.05$, $n=41$). Likewise, sexual wellbeing did not significantly change from 61.5 preoperatively to 60.9 at 12 months. There was no significant effect of acellular dermal matrix or post-mastectomy radiation therapy on any of the PROs studied domains. The aesthetic profiles of the patients' results are also presented.

Conclusion: Patients who underwent DTI prepectoral breast reconstruction were overall satisfied with outcomes. They were as physically satisfied with their implanted breast as they were with their pre-mastectomy natural breasts. Moreover, the results show that patients' sexual wellbeing and psychosocial state weren't affected by the surgery as evident at 6 months and 1-year follow-ups.

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Breast Reconstruction Utilizing Buried Dermatocutaneous Skin Flaps and Immediate Adipocyte Transfer: A Minimally Invasive Autologous Breast Reconstruction Technique

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Background: Autologous breast reconstruction historically required flaps that were invasive, required prolonged operative times and recoveries, and resulted in varying degrees of donor site morbidity. As the incidence of bilateral mastectomy increases,[1] patients and Plastic Surgeons alike are seeking a minimally invasive autologous breast reconstruction technique. Dermato-cutaneous flaps have been used for breast reconstruction in the past.[2] We present a minimally invasive autologous breast reconstruction technique utilizing buried folded over dermato-cutaneous Wise pattern flaps and immediate fat grafting. This is a single Plastic Surgeon, consecutive case series, with up to 2 years follow up.

Methods: Patients desiring autologous breast reconstruction that had sufficient breast ptosis and fat donor tissue were offered breast reconstruction with buried folded over **D**ermato-**C**utaneous flaps with **A**dipocyte **T**ransfer (**DCAT**). A Wise pattern mastectomy was performed, and fat transferred into an inferiorly based, folded over buried dermato-cutaneous flap. Fat was also immediately grafted into the pectoral, sub

pectoral, and rectus and serratus sub-fascial planes. Patients underwent an average of two (range 0-3) additional fat graft sessions at 3-month intervals to complete the reconstruction.

Results: 25 consecutive patients (43 breasts) underwent the DCAT procedure. Eight patients (8 breasts) had prior breast radiation, and two patients (2 breasts) required post mastectomy radiation. Fat grafted at initial mastectomy was 70 ml per breast (range 50-103 ml). Nineteen patients underwent additional outpatient fat grafting. Two additional outpatient fat graft sessions (range 0-3) at 3-month intervals completed the reconstruction. Average fat grafted at second stage was 217 ml (range 50-320 ml). Average follow up was 20 months from mastectomy and first fat graft, and 12 months from last fat graft. No patient suffered loss of her reconstruction. One patient had a post-operative seroma, which resolved with serial aspirations. Three patients had partial skin flap necrosis of one breast each that healed with local wound care. In all three of these cases, the area of necrosis involved the vertical limb near the "T" portion of the Wise pattern closure. Two of the three cases occurred early in the series, and the third occurred in a patient with a prior history of breast radiation. While eight patients (8 breasts) in this consecutive case series had prior breast radiation, the authors do not recommend that Surgeons new to the DCAT procedure offer it to this subset of patients. Radiated patients present additional challenges due to varying degrees of mastectomy skin contracture.

Conclusions: The authors present a minimally invasive and novel autologous breast reconstruction technique that does not require microsurgery, external expanders, or prolonged operative times. All patients in this series were highly satisfied with their results. This single Plastic Surgeon consecutive case series is the largest reported series to date utilizing this novel technique.

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Selecting Patients for Autologous Free Flap Breast Reconstruction in BMI>35: Stratifying Surgical Risk Factors for Patient Inclusion or Exclusion

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Introduction: Morbid obesity presents numerous challenges in autologous breast reconstruction. Along with considering other medical comorbidities, BMI alone can serve as an overall denominator in the decision-making process to offer or decline reconstruction.

Methods: Retrospective chart review was performed on N=350 patients who underwent bilateral breast reconstruction using DIEP flaps (n=654 flaps). Patients were divided into two groups: patients with BMI < 35 (Group1, N_1=273 patients, n_1=508 flaps), and patients with BMI ≥ 35(Group2, N_2=77 patients, n_2=146 flaps). Comorbidities including age, BMI, hypertension, diabetes, autoimmunity, smoking status, previous DVT/PE, and previous abdominal surgery were tracked. Donor site complications including wounds, infection, seroma, hematoma, and DVT/PE, and abdominal bulge were tracked. Flap losses and hospital stays were accounted. All data was collected using a centralized REDCap database. Analysis was performed with SPSS: continuous variables were analyzed with t-tests, and binary variables were analyzed with Chi-Square (χ^2), or Fischer's exact test for subgroups with n<5.

Results: Age, comorbidities, and past medical histories were equivalent between groups, except for diabetes: Group2 (21%) had a significantly higher rate of diabetes than Group1 (7%), *p<0.01*. Rates of infections requiring IV antibiotics (*p=0.056*), seroma requiring operation (*p=0.750*), hematoma requiring operation (*p=.356*), and DVT/PE (*p=0.512*) were equivalent between groups. Rate of wound complications requiring operative repair was higher in Group2 (16%) than in Group1 (7%), *p=0. 013.Surgical* ICU stay after flap procedure was equivalent between groups (group1= 2.22 days, group2= 2.32 days, *p=0.180*). Total hospital stay was equivalent between groups (group1= 4.00 days, group2= 4.21 days, *p=0.091*). Rates of abdominal bulge were equivalent between groups (group1= 4%, group2= 6%, *p=0.361*) Umbilicus was sacrificed significantly more in group2 (46%) than in group1 (10%), *p<0.01*. Flap loss was significantly higher in group2 (4/146, 3%) than in group1 (3/508, 0.6%), *p=0.026*. Overall combined flap loss was 1%.

Discussion: In our study, offering DIEP flaps to patients with BMI >35 appears to have a five-fold increase in flap loss. Despite attempting to decrease wound complications in higher BMI patients by sacrificing umbilicus, operative intervention for postoperative wound complications is still more than twice that of lesser BMI patients. This could be accounted by three times higher diabetes encountered in our

higher BMI group. Based on individual practice patterns, patients with BMI >35 can be educated of their higher risks in consideration as a candidate for free flap breast reconstruction.

Correction of Implant Malposition in Breast Reconstruction: Risk Factors and Outcomes

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Purpose: Implant malposition is a common reason for revisionary surgery in prosthetic breast reconstruction. A multitude of techniques have been described for correction of implant malposition, but few studies have examined risk factors for malposition and no studies to date have directly compared the use of acellular dermal matrix (ADM) and synthetic mesh for correction of implant malposition. We endeavored to identify risk factors for malposition location and compare outcomes by repair technique.

Methods: Retrospective review of a single surgeon series of implant reconstruction was performed. Variables of interest included age, BMI, radiation history, implant size, implant malposition with need for capsulorraphy procedure, location of malposition (inferior or lateral) and technique (suture, ADM or mesh). Binary logistic regression analysis was performed to identify risk factors for implant malposition. ANOVA testing was performed to compare success rates by capsulorrhaphy location and technique.

Results: Of 836 breasts, 82 (9.8%) exhibited implant malposition. Risk factors for any malposition were older age (OR 1.05, 95% CI 1.02-1.07), BMI<25 (OR 1.64, 95% CI 1.00-2.70) and bilateral reconstruction (OR 13.41, 95% CI 8.50-21.16). Risk factors for inferior malposition were similarly older age (OR 1.04, 95% CI 1.01-1.06), BMI<25 (OR 3.43, 95% CI 1.88-6.26) and bilateral reconstructions (OR 11.50, 95% CI 6.79-19.49) while risk factors for lateral malposition were only older age (OR 1.05, 95% CI 1.02-1.08) and bilateral reconstructions (OR 7.08, 95% CI 4.09-12.26). Post-mastectomy radiation was protective against lateral malposition (0.30, 95% CI 0.10-0.88). Implant malposition rates were highest at the extremes of implant volume to BMI ratios (both high implant volume to BMI and low implant volume to BMI). A zone of intermediate implant volume to BMI ratios was identified with significantly lower risk of malposition (1.3% versus 11.2%, p=0.007). Fifty-eight breasts

underwent capsulorraphy with ADM (n=28) or synthetic mesh (n=35). Sixteen breasts (27.9%) required re-do capsulorraphy. Capsulorraphy failure was more common in ADM compared to mesh repairs (50.0% versus 5.7%, $p<0.001$). Older age and ADM use were risk factors for capsulorraphy failure (OR 1.21, 95% CI 1.03-1.43 and OR 62.2, 95% CI 3.24-1193.84, respectively).

Conclusion: This study identifies risk factors for implant malposition after prosthetic breast reconstruction and represents the first direct comparison of ADM versus synthetic mesh for capsulorraphy. Risk factors for implant malposition vary by malposition location. Lower BMI increases risk for inferior malposition while radiation is protective against lateral malposition. Regarding repair technique, ADM has higher failure rates compared to synthetic mesh when used for correction of implant malposition in prosthetic breast reconstruction.

Current Practices in Orthognathic Surgery Postoperative Care

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Purpose: Great variation in post-surgical management after orthognathic surgery currently exists. The optimal management in cranio-maxillofacial surgery regarding orthognathic surgical postoperative care remains under studied. We hypothesized that training bias in either plastic surgery vs oral-maxillofacial training would affect post-surgery treatment protocols. The aim of this study was to better characterize the variation in patient care by surveying cranio-maxillofacial surgeons regarding treatment regimens following orthognathic procedures.

Methods: An online survey was sent to 219 active and affiliate members of the American Society of Maxillofacial Surgeons. The survey was comprised of 39 multiple choice and short answer questions regarding demographics, training, case volume, and postoperative practices commonly employed after orthognathic operations. Descriptive statistics were reported alongside hypothesis-driven analysis performed using Chi square tests ($p<0.05$).

Results: Survey responses were received from 40 surgeons. 34 respondents were plastic surgery trained, 4 indicated additional training in oral surgery, and 2 indicated additional training in otolaryngology. Of the plastic surgery trained respondents, 27 had additional craniofacial training, and of the 10 with dental degrees, 3 had

additional fellowship training. 70% of respondents performed between 10-59 orthognathic operations per year, with those trained in oral surgery more likely to perform more than 20 per year (p=0.02).

The most performed operations were Le Fort I (100%), bilateral sagittal split osteotomy (97.5%), and Le Fort II (52.5%). The most common methods for maxillomandibular stabilization were Erich arch bars (62.5%), bonded dental lugs (60%), and fixation screws (52.5%). The most common immediate postoperative occlusal management for lower jaw operations included guiding elastics (65%) and elastic MMF (55%) with 62% using guiding elastics for 3-6 weeks and 55% using elastic MMF for 1-2 weeks postoperatively. Likewise, the most common immediate postoperative occlusal management for combined upper-lower jaw operations included guiding elastics (62.5%) and elastic MMF (55%) with 64% using guiding elastics for 3-6 weeks and 45% using elastic MMF for 1-2 weeks postoperatively. Respondents use surgeon bent fixation plates (87.5%), pre-bent plates (50%), and 3D printed patient specific plates (40%).

The minority of respondents (30%) use tranexamic acid intraoperatively, 62.5% administer intraoperative and postoperative steroids, and 75% induce intraoperative hypotension (systolic blood pressure $\leq$ 100). While 65% of respondents start patients on a clear diet, a large variation of practices exists regarding when to resume regular diets, with 30% after 3-4 weeks, 30% after 5-6 weeks, and 22.5% after 6 weeks. For pain management, respondents most commonly recommend opioids (82.5%) and acetaminophen (82.5%) with 55% prescribing opioids for 3-6 days. 65% performed postoperative imaging, which was more commonly employed by surgeons who performed 20 or more operations per year (p=0.04).

Conclusion: Our study demonstrated wide variation of postoperative practices after orthognathic operations irrespective of training bias. Surgeons with oral surgery training were more likely to perform higher numbers of procedures compared to plastic surgery trained surgeons. Surgeons with a higher case volume were more likely to obtain post-surgery imaging. Future study into the efficacy of different postoperative practices with the goal of improving patient outcomes will be conducted.

Does the Bandeau Grow: Quantifying Post-Operative Changes in the Bandeau over Time after Fronto-Orbital Advancement?

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Introduction: Temporal hollowing is a known late sequelae of fronto-orbital advancement (FOA) surgeries, and much work has highlighted the effect of soft-tissue manipulation as a cause. However, bony manipulation including devascularization and under-correction may also contribute to temporal hollowing. Currently no long-term quantitative assessments exist which evaluate the bony changes after FOA. We sought to objectively assess how such bony morphology changes overtime.

Methods: A multi-center, IRB-approved retrospective study identified craniosynostosis (CS) patients treated with FOA between 2008-2018 at Children's Hospital of Pittsburgh or Children's Hospital of Philadelphia. Syndromic and non-syndromic patients with both early post- operative and late follow-up (>12 mos) head CT scans were included. Scans were reconstructed, oriented in a standardized fashion, and manually segmented into surgical fragments that delineated the osteotomies of interest for a given. Two craniofacial surgeons confirmed all segmentations and data points of interest. 32 data points and 56 discreet metrics were collected from each patient and evaluated for changes over time.

Results: Twenty patients matched inclusion criteria (12 female:8 male). CS subtypes included metopic (7), unilateral coronal (6 right, 3 left), multisutural (2), sagittal (1) and sagittal and metopic (1). Mean age at surgery and time to follow-up scan was 1.4 years and 2.8 years respectively. Average growth of the inter-eurion distance and glab.-opistho. distance was 3.3% and 9.6% respectively. The bandeau AP length increased 17.4%. While average bitemporal width increased 9.0%, anterior bandeau width decreased by 4.1%, leading to a transverse deficiency in the anterior temporal region. The average initial zygomatico-frontal (ZF) osteotomy offset was 3.9mm laterally and 6.5mm anteriorly; these remodeled, eliminating the gap. The average initial bandeau orbital width was 3.8mm wider than the midface orbital width and decreased over time (~39% loss of overcorrection). Data was significant to $p<0.05$ by pairedt-test.

Conclusion: The long-term shape and position of the bandeau determines surgical success of FOA. We found that the skull continues to widen bitemporally after surgery, however widening at the anterior temporal region is negligible. This is the first comparative demonstration of the bony contribution toward temporal hollowing in early and late post-operative patients.

Correcting Orbital Hypertelorism with Supraorbital Bipartition Osteotomy: Technique and Advantages

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Introduction: Orbital hypertelorism can exist in a variety of craniofacial anomalies such as midline anterior encephaloceles, frontonasal dysplasia, and syndromic bicoronal craniosynostoses. Facial bipartition corrects hypertelorism and benefits patients with a narrow, V-shaped maxilla. However, in young children with hypertelorism there is a higher risk of injury to dental follicles. The supraorbital bipartition allows for correction hypertelorism in this younger population of patients undergoing frontal craniotomy without the need for osteotomies extending into tooth-bearing segments of the maxilla.

Material and methods: The supraorbital bipartition technique was performed in 15 patients with hypertelorism. Of these, 3 patients had associated meningoencephaloceles, 5 patients had facial clefting, and 7 patients had hypertelorism associated with Crouzon or Apert syndrome. All patients underwent preoperative evaluation by neurosurgery, ophthalmology and pediatrics. Neuropsychiatric testing and preoperative CT scans were performed. The technique, advantages and complications are described.

Results: The patient age ranged from 8 months to 8 years old, with a mean of 40 months. Seven patients were female and eight were male. All cases were uneventful. The interorbital distance was normalized for age in 11 cases. The remainder 4 cases had dramatic improvement in interorbital distance. Blood loss ranged from 250 to 600 cc, with mean EBL of 350 cc. Blood transfusion was required in 12 patients. No major complications occurred. In 4 cases, unilateral detachment of the medial canthal ligament occurred. In one case, bilateral detachment of the medial canthal ligament occurred. In all cases, these detachments were repaired intraoperatively. Two cases had minor wound dehiscence that healed with local wound care.

Conclusions: The classical techniques for management of hypertelorism entails either complete bilateral orbital osteotomies and translocation, or facial bipartition. These techniques are not suitable for younger patients given the presence of tooth buds before the eruption of permanent dentition. In the proposed technique, the infraorbital osteotomy was avoided, thus sparing the developing tooth buds. The rate of complication of the present technique is lower than in the other techniques, with no

major complications. The improvement in interorbital distance is comparable to that obtained with classical techniques.

Intracranial Volume in Patients with Shunt-Related Craniosynostosis

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Purpose: Shunt-related craniosynotosis (SRC) occurs well after birth when loss of suture patency has less impact on cranial shape and volume than in-utero fusions. It is unclear if this process adversely affects cranial growth and reduces ICV expansion. Thus, encountering this complication represents a treatment challenge. In this study we evaluate the association between ICV and the presence of SRC in patients requiring cerebrospinal fluid shunting.

Methods: We identified 44 patients from 2006 to 2012 who underwent ventricular shunt placement for increased intracranial pressure, secondary to congenital conditions including: Dandy Walker, Spina bifida, Chiari malformation and congenital hydrocephalus. The patients were classified into two groups: Patients with SRC (Group 1, N=26) and without SRC (Group 2, N=18). Post-operative computed tomography (CT) scan was done at a mean of 2.18 ± 0.63 years, for Group 1, and 2.67 ± 1.16 years for Group 2 (p-value=0.13) after surgery. Cranial suture fusion and ICV measurement were evaluated. ICV was compared to an established normative database from over 600 healthy individuals. Given that ICV values did not show a normal distribution, we divided each group of patients into three categories: ICV within ± 2 standard deviations (SD); ICV between ± 2SD and ± 3SD; and ICV over ± 3 SD of the mean. Fisher's exact test and t-tests were carried out to measure categorical variables and the association between continuous variables, respectively.

Results: Significant difference for the age of shunt placement (121 ± 83.75 days; 65.33 ± 81.78 days; for Group 1 and Group 2, retrospectively; p-value=0.04) was found. Nonetheless, post-operative CT scan age (2.52 ± 0.65 years; 2.85 ± 1.07 years; for Group 1 and Group 2, retrospectively; p-value = 0.26) and ICV measurements (1314.69 ± 216.72 cc; 1292.45 ± 244.4 cc; for Group 1 and Group 2, retrospectively; p-value = 0.76) had no significant difference between the two groups. Fisher's exact

test revealed no difference between the ICV of patients with and without SRC for each category (p-value=0.67).

Conclusion: This study demonstrates no significant difference in the ICV between the two groups. In spite of this, since the onset of craniosynostosis is unknown, this single ICV measurement does not exhibit a complete picture of the impact on skull growth. Serial ICV measurements may provide better understanding of the long-term impact on skull growth in patients who developed SRC.

Pressure-Related Craniosynostosis: Treatment of Hydrocephalus with Ventriculo-Peritoneal Shunt Associated with Premature Cranial Suture Fusion

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Purpose: Hydrocephalus during infancy is a relatively common condition, most frequently treated by cerebrospinal fluid (CSF) diversion with ventriculoperitoneal (VP) shunting. Secondary craniosynostosis is the premature fusion of one or more cranial sutures following VP shunt placement for hydrocephalus and has been reported with varying incidence in the literature. The effect of external forces on the etiology of craniosynostosis has been postulated, and decompressive forces resulting from alterations in CSF pressure may precipitate premature sutural fusion. We examined the incidence of secondary craniosynostosis after VP shunt placement for infantile hydrocephalus in order to investigate the underlying pathophysiology of shunt-related craniosynostosis (SRC).

Methods: The authors performed a retrospective chart review and direct examination of serial CT images for 127 patients at a single institution who underwent VP shunt for hydrocephalus in infancy. Demographic information, syndromic diagnoses, comorbidities, hydrocephalus etiology, timing of shunt placement, and necessity of shunt revisions were evaluated for each patient. Pre and post-operative computed tomography scans were evaluated for sutural fusion, ventricular size, and degree of ventricular decompression. This data was then analyzed to determine any association between these independent variables and the development of craniosynostosis after shunt placement.

Results: Sixty-three patients (49.6%) developed radiographic evidence of SRC within a median of 26 months after VP shunt placement in our study. A total of 5 patients had a syndromic diagnosis, with only one (Pfeiffer syndrome) being associated with primary craniosynostosis. Older age at shunt placement and greater number of shunt revisions were found to be associated with the development of SRC. Gender, gestational age, syndromic diagnosis, degree of ventricle decompression, and etiology of hydrocephalus did not differ between the fused and non-fused groups. 30 patients had radiographic evidence of single suture fusion, while the remaining 33 had multi-suture fusion. Among patients with single suture craniosynostosis, the sagittal suture was most commonly involved (86.7%), while in multi-suture synostosis,>50% demonstrated fusion of the sagittal and bilateral coronal sutures. Of note, the presence of SRC was not documented in virtually all official CT reports.

Conclusion: The results of this study demonstrate that nearly 50% of patients who underwent VP shunt placement for a diagnosis of hydrocephalus in infancy developed SRC. This secondary fusion is often overlooked on routine CT interpretation and accurate diagnosis requires a high level of suspicion. Our findings support the important role that proper dural stimulation and expansion plays in maintaining cranial sutural patency. Disruption of these normal processes may be a significant factor in the development of nonsyndromic craniosynostosis, with the sagittal suture being most vulnerable to early secondary fusion.

Intracranial Effects of Unicoronal Craniosynostosis on Posterior Quadrants

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Purpose: Craniosynostosis results from premature fusion of the cranial sutures and leads to distortion of normal calvarial anatomy. It has long been understood that this distortion is a direct result of growth restriction adjacent to the synostotic suture with compensatory growth of adjacent structures; however, there has been a paucity of data regarding volumetric assessment, by quadrant, of calvarial asymmetry. This study aims to characterize cranial vault asymmetry in patients with unicoronal craniosynostosis focusing on posterior cranial vault volumetric changes. Additionally, we will quantify the effect of distraction osteogenesis (DO) on established cranial asymmetry.

Materials and Methods: Retrospective chart review at Rady Children's Hospital identified 17 patients with unilateral craniosynostosis who underwent cranial vault reconstruction (CVR) by internal DO. Pre- and post-distraction CT scans were analyzed using ITK-SNAP volume segmentation software. These 3D reconstructions were bisected into hemispheres by a midsagittal plane from nasion to occipital crest, and into anterior and posterior quadrants based on a coronal plane between the anterior take off of the petrosal ridges. Quadrant and hemispheric volumes were compared pre and post-DO using paired student's t-tests.

Results: 17 patients were analyzed (4 males, 13 females, age 6-32 months) over a 5-year period. Prior to DO, the synostotic posterior quadrant (SPQ) contained 1.9% less volume as (a proportion of total intracranial volume) compared to the non-synostotic PQ (NSPQ) (27.3% vs 29.2%, p=0.039). Likewise, the synostotic anterior quadrant (SAQ) contained 4.3% less volume than the non-synostotic AQ (NSAQ) (19.6% vs. 23.9%, p=0.0019). There was no significant difference in the proportion of hemispheric volumes before or after surgery (synostotic - 48.5% vs 51.4%, p=0.2; non-synostotic - 43.5% vs. 51.5%, p=0.1).

Following cranial distraction, total intracranial volume (ICV) increased by 27.5% (95% CI: 14.9%, 34.6%) with an absolute mean volume increase of 216.5 cm^3 (848.5 vs. 1065cm^3). ICV change after distraction was more significant in the SAQ (mean 34.8%) and SPQ (27.6%) compared to the contralateral quadrants (NSAQ 18.3%, and NSPQ 19.4%). Despite this fact, when assessing the change in volume as a proportion of total ICV there was no significant difference between pre and post DO volumes in the SPQ (27.3% vs 26.6%, p=0.57), NSAQ (23.9% vs 23.6%, p=0.81) or NSPQ (29.2% vs 27.9%, p=0.21). The SAQ did show a statistically significant increase of 1.2% (19.6% vs 21.8%) following DO with a relative increase of 11.2% (p=0.036). Post-distraction, the SAQ and SPQ contained 1.8% (48.5% vs. 51.4%, p=0.2), and 1.3% (48.5% vs 51.5%, p=0.1) less volume than the NSAQ and NSPQ respectively.

Conclusions: Unilateral coronal craniosynostosis leads to ICV restriction in the ipsilateral posterior quadrant in addition to the expected restriction in the synostotic anterior quadrant, resulting in ICV asymmetry of both the anterior and posterior cranial vault. After DO, there is an increase and redistribution of ICV that is most notable in the quadrants ipsilateral to the fused coronal suture. This redistribution results in an overall improvement in cranial vault symmetry; however, minor restriction in growth of the SAQ and SPQ persists as compared to their contralateral counterparts

Intracranial Hypertension and Cortical Thickness in Syndromic Craniosynostosis

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Introduction: Intracranial hypertension (ICH) is a frequent indication for surgical intervention in syndromic craniosynostosis. Various clinical risk factors have been described, but potential effects on underlying brain morphology have not been investigated. This study seeks to evaluate the impact of ICH risk factors on cerebral cortex thickness in syndromic craniosynostosis.

Methods: Patient records and imaging were reviewed for ICH risk factors and demographic data including papilledema, hydrocephalus, moderate to severe obstructive sleep apnea, cerebellar tonsillar position, occipitofrontal circumference curve deflection, age at the time of scan, and sex in 107 syndromic (Apert, Crouzon, Pfeiffer, Muenke, Saethre-Chotzen) craniosynostosis patients. 171 MRI scans of these patients were then analyzed. Average cortical thickness estimates were obtained via an auto-segmentation/ auto-parcellation image processing software (FreeSurfer) and exported for statistical analysis. A linear mixed effect model accounting for repeated measurements, age, gender, and syndrome influences was developed to determine impact of ICH risk factors on cerebral cortex thickness changes (significance $p < .05$).

Results: Average cortical thickness in this cohort was 2.78 ± 0.17 mm with an average age of 8.88 years (range 1.15 – 34.03) at the time of scan. Cortical thickness did not vary significantly by sex ($p = 0.534$) or syndrome ($p = 0.896$) as independent predictors. A history of papilledema ($p = .036$) or hydrocephalus ($p = .007$) prior to scan date was associated with thinner cortices than those without. Average cortical thickness was also shown to significantly vary with the age of the patient at the time of MRI ($p < 0.001$), with older patients having thinner cortices. History of moderate to severe obstructive sleep apnea (oAHI > 5) ($p = .464$), cerebellar tonsil position ($p = .682$), or history of occipitofrontal circumference curve deflection ($p = .375$) prior to scan date did not result in significant cortical thickness changes.

Conclusions: Our results indicate that a history of hydrocephalus or papilledema results in a thinner cerebral cortex on average in syndromic craniosynostosis patients. This suggests structural consequences from the development of intracranial hypertension and may support early intervention to avoid such effects. Further

investigation is needed to evaluate the link between these findings, timing of intervention, and neuropsychological development.

Individual Influence of Bicoronal Synostosis, Apert Syndrome and Crouzon Syndromes on Cranial Morphology

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Purpose: Apert and Crouzon syndromes are likely associated with bicoronal synostosis. However, the characteristic facial features of Apert and Crouzon syndromes do not occur in nonsyndromic bicoronal synostosis. Therefore, in this study, comparisons were made in nonsyndromic bicoronal synostosis, Apert and Crouzon syndrome (with only bicoronal synostosis associated) and normal individuals, to analyze the respective roles of cranium sutures synostosis and syndromes in cranial and subcranial morphology.

Methods: Sixty-nine preoperative CT scans were included (nonsyndromic bicoronal synostosis, n=13; Apert syndrome with bicoronal synostosis, n=17; Crouzon syndrome with bicoronal synostosis, n=5; controls, n=34). Craniofacial cephalometric measurements and cranial fossa volumes were analyzed using Mimics and 3-matics software. Statistical analysis was performed using the t-test and Pearson correlation test. The comparisons were made between each situation with normals.

Results: Nonsyndromic bicoronal synostosis patients developed a shortened cranial base length, with a significantly shortened distance between nasion and sella ($p=0.031$). The distance between nasion and ethmosphenoid synchondrosis ($p<0.001$) contributes most to this shortening. The cranial base angles of nonsyndromic bicoronal synostosis in both the cranial side (N-S-BA) and facial side (N-SO-BA) significantly increased, by 19.86 degrees ($p<0.001$) and 13.76 degrees ($p=0.002$), respectively. However, both the N-S-BA and N-SO-BA angles of Apert syndrome and Crouzon syndrome were narrowed more than that of nonsyndromic bicoronal synostosis (by 17.27°, $p=0.002$; 18.00°, $p=0.002$ in Apert syndrome, and by 22.43°, $p=0.004$; 25.24°, $p=0.017$ in Crouzon syndrome). Contrary to the normal subcranial space of nonsyndromic bicoronal synostosis, both Apert and Crouzon syndromes developed a reduced subcranial space.

The regional anterior and middle cranial fossae volumes of nonsyndromic bicoronal synostosis are characterized by significant increases of 40% ($p=0.008$) and 68% ($p=0.005$), respectively, with a normal posterior cranial fossa volume. The cranial fossae depths of nonsyndromic bicoronal synostosis were increased, by 48% ($p<0.001$), 49% ($p<0.001$) and 25% ($p=0.003$) for anterior, middle and posterior cranial fossae, respectively, accompanying the shortened cranial fossae lengths. The volume and morphology of all cranial fossae in Apert syndrome nearly paralleled nonsyndromic bicoronal synostosis. However, in Crouzon syndrome, with reduced depths of cranial fossae, volumes are more restricted than in both Apert syndrome and nonsyndromic bicoronal synostosis.

Conclusion: Isolated bicoronal synostosis resulted in platybasia, while Apert syndrome (bicoronal subtype) developed normal cranial base angle, and Crouzon syndrome (bicoronal subtype) grew a kyphotic cranial base. The syndromic skulls had additionally significantly reduced subcranial space. Cranial vault synostosis is more influential on cranial fossae development than these associated craniofacial syndromes. Apert syndrome tends to extend the anterior cranial fossa length in infants, while Crouzon syndrome has reduced cranial fossa depth, revealing adaptability of cranial fossae to vault synostosis.

Increasing Incidence of Craniosynostosis in the United States: Is Folic Acid Supplementation Responsible?

Presenter:	Erika Simmerman Mabes, DO
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Purpose: Craniosynostosis, the premature fusion of cranial sutures, has increased in both prevalence and incidence as reported by international studies.[1,2] To our knowledge, no recent studies have evaluated increasing incidence in the United States, therefore we sought to evaluate if there was a significant increase in our national incidence of craniosynostosis. Methotrexate, a folic acid antagonist, has been associated with an increase in craniosynostosis.[3] There has been a decrease in the incidence of cleft anomalies following the implementation of the folic acid supplementation program in 1998 within the US. Both of these anomalies appear affected by folate. We hypothesize that there is a reciprocal relationship between cleft and craniosynostosis and seek to investigate the theory that as folate supplementation

penetrates the population, we see a gradual increase in the incidence of craniosynostosis.

Methods and Materials: The National Inpatient Sample Database was consulted to identify infants born with craniosynostosis between 2004 and 2013. Data were collected from the United States Center for Disease Control and Prevention, including incidence of influenza virus infection according to year and month. Using multivariable logistic regression, we examined the relationship between craniosynostosis and the independent variables month and year.. We then utilized mixed-effects logistic regression to estimate the odds ratio of occurrence of craniosynostosis in relation to previous months' flu incidence. E-values were calculated to evaluate for unmeasured confounders.

Results: In 2004 there were 4,110 infants born with craniosynostosis, which increased to 6,155 infants in 2013. A statistically significant increase in the incidence of craniosynostosis within the United States was found (odds ratio of 1.57 in 2013; p value <0.001). Mixed-effects logistic regression revealed a lower incidence of craniosynostosis associated an increased incidence of influenza infection. E-values for national incidence of craniosynostosis and association with influenza incidence were 2.51 and 11.6 respectively.

Conclusions: To our knowledge, this is the first study demonstrating a significant increase in the national incidence of craniosynostosis in the United States, which we believe may be a result of folic acid supplementation penetrating the population. We also report for the first time a decreased incidence of craniosynostosis in association with influenza incidence, which support our hypothesis of a possible inverse relationship with cleft, as maternal influenza during pregnancy demonstrates increased incidence of cleft anomalies.[4] We are further investigating the relationship between cleft and craniosynostosis at this time to uncover a mechanism that might explain this relationship.

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Three-Dimensional Treatment Outcomes of a Virtual Helmet Design Protocol for Sagittal Strip Craniectomy

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Background & Objective: Postoperative helmet therapy is commonly used after sagittal strip craniectomy. Helmet design must be customized to the surgical procedure and patient's anatomy. This study compares three-dimensional head shape outcomes obtained from a novel virtual helmet design protocol and a traditional helmet design protocol.

Methods: This is an IRB-approved, retrospective review of 24 patients who underwent extended sagittal strip craniectomy with wedge ostectomies performed by one surgeon and postoperative helmets produced by one orthotist. Traditional helmet design is based on STARscanner (Orthomerica, USA) laser images with treatment goals indicated verbally by the surgeon. The virtual helmet design protocol utilizes images from a low-radiation protocol CT scan and 3D photo (3dMD, USA) obtained 1 week after surgery. An overlay of the 3D CT and 3D photo is produced. Standardized views of the overlay were used to demonstrate the location of bone cuts in relation to the soft tissue landmarks and provide specific instructions from the surgeon to the orthotist. Eleven patients comprise the traditional helmet group (THG) and 13 patients comprise the virtual helmet group (VHG). Three-dimensional images were obtained preoperatively, and at 1 week and 3, 6, 9, and 12 months postoperatively. Helmet therapy ended 12 months after surgery. Three-dimensional images of 24 age-matched healthy subjects were used as a control. The head was oriented on the Frankfurt horizontal plane, and cephalic index (CI) and vertical height (VH) measurements were recorded. 3D whole head composite images were generated for the VHG, THG, and control groups to compare global head shape outcomes to age-matched controls.

Results: The mean CI before and after treatment were 72.39 (± 4.37) and 81.07 (± 3.37) for THG and 73.71 (± 3.06) and 83.70 (± 2.33) for VHG. The mean CI was 83.53 (± 2.40) for controls. The difference in CI between THG and controls was

significant ($p<0.05$). The mean vertical height (VH) at the end of treatment was 122.88 mm (± 4.78) for THG and 119.03 mm (± 4.73) for VHG. Mean VH for controls was 118.27 mm (± 4.26). The difference in VH between controls and VHG was not statistically significant, while the difference between THG and controls was statistically significant ($p<0.05$). 3D analysis demonstrated normal biparietal and vertical dimensions in VHG compared to controls. THG exhibited narrower biparietal dimension and a greater vertical dimension compared to controls.

Conclusion: The virtual helmet group had a greater increase in CI and greater final CI compared to traditional helmet design. The three-dimensional analysis demonstrated that global head shape outcomes of VHG had greater biparietal expansion and less vertical growth. VHG 3D head shape was comparable to normal controls whereas THG head shape was slightly taller and narrower.

Craniofacial Fellowship Trained Surgeons: Where Are They Now?

Presenter: Ashley L. Howarth, MD
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INTRODUCTION: There are currently 29 craniofacial surgery fellowship training programs in the United States and Canada endorsed by the American Society of Craniofacial Surgeons and participating in the San Francisco Match. This number has increased over the last decade despite limited demand. The authors sought to evaluate the practice types and patterns of craniofacial fellowship trained surgeons.

METHODS: After IRB approval, a 20-question survey was designed to evaluate craniofacial surgeons and their practice patterns. The survey was sent to surgeons who completed accredited craniofacial fellowships in the United States or Canada from 2010-2018. The survey was created and distributed electronically through a private survey research center.

RESULTS: There were 61 respondents (26.5% response rate), 68.8% male, and 85.2% aged 36-45 years old. 54.1% trained in integrated plastic surgery residency prior to fellowship, and 39.1% trained in general surgery followed by plastic surgery fellowship. Some had previously completed fellowships: 8 (13.1%) pediatric plastic surgery, 5 (8.2%) microsurgery, 4 (6.6%) aesthetic surgery, 3 (4.9%) hand surgery, 2 (3.3%) burn surgery. 45 surgeons (75%) have been in practice ≤5 years. Practice profiles were academic (49.2%), private (23.0%), and hospital employed (9.8%) with

18% in various hybrid practices. Percentage of practice dedicated to craniofacial surgery was <25% for 21 (34.4%), 25-50% for 10 (16.4%), 51-75% for 13 (21.3%) and >76% for 17 surgeons (27.9%) with 63.8% desiring an increase in craniofacial case volume. Surgeons' patient populations are 14.8% pediatric only, 6.6% adult only, and 78.7% combined. They perform craniofacial trauma reconstruction (88.5%), general plastic surgery reconstruction (83.6%), cleft lip and palate repair (75.4%), craniosynostosis reconstruction (68.9%), breast surgery (54.1%), microtia reconstruction (50.8%), orthognathic surgery (50.8%), cosmetic surgery (50.8%), microsurgery (45.9%), hand surgery (36.1%) and facial reanimation (32.7%). 46 (75.4%) work as members of a craniofacial team. 26 (42.6%) do not have any craniofacial trained partners. 12 surgeons (19.7%) had jobs secured prior to beginning craniofacial fellowship and 44 (72.1%) were able to find jobs in their desired geographical area. 41 (67.2%) would recommend completing a craniofacial fellowship.

CONCLUSION: Craniofacial surgeons trained within the last decade are primarily in academic practice, operate on adults and children, and perform a variety of procedures. Limitations include low response rate and likelihood that surgeons who do not perform craniofacial surgery did not respond. Respondents were able to find employment in their desired location, work on a craniofacial team, and would recommend a craniofacial fellowship.

A Comparison of Intracranial Volumes in Patients with Isolated Metopic Ridge, Metopic Craniosynostosis and Normal Children

Presenter: Ryan M. McKee, BS
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Purpose: Premature closure of the metopic suture can result in a broad clinical and morphologic presentation ranging from metopic craniosynostosis with severe trigonocephaly to isolated metopic ridge. Isolated metopic ridge is detectable by inspection and palpation, but unlike metopic craniosynostosis, does not have hypotelorism or pterional constriction and does not usually require surgical correction. Previous research has shown patients with metopic craniosynostosis have significantly reduced intracranial volumes (ICV) compared to normal children. However, no studies have compared metopic ridge patients to metopic craniosynostosis patients or normal healthy children with respect to ICV. As a result, we aimed to determine if

patients with isolated metopic ridge have significantly different ICVs than normal children and patients with metopic craniosynostosis.

Methods: A retrospective review of patients with metopic ridge and metopic craniosynostosis was performed. Preoperative ICVs were calculated from manually segmented CT scans. Structural MRI data for normal children were acquired from the NIH Pediatric MRI Data Repository. ICVs were calculated in FreeSurfer.

Multivariate linear regression was performed to determine the impact of metopic ridge on intracranial volume controlling for age and gender.

Results: Data were available for 15 metopic ridge patients (8 males, 7 females; age 5-24 months), 74 metopic craniosynostosis patients (53 males, 21 females; age 1-23 months), and 213 normal patients (106 males, 107 females; age 1-24 months).

Mean metopic ridge ICV was greater than mean metopic craniosynostosis ICV at 3-6 months (3 metopic ridge patients, mean ICV 779.82cc vs 14 metopic craniosynostosis patients, mean ICV 646.59cc; p=0.028) and 6-9 months (4 metopic ridge patients, mean ICV 942.04cc vs 26 metopic craniosynostosis patients, mean ICV 737.92cc; p=0.005). Controlling for age and gender, the difference in ICV associated with metopic ridging was 139.76cc and 231.81cc at 3-6 and 6-9 months, respectively. There was no significant difference in ICV from 9-12 months (3 metopic ridge patients, mean ICV 860.36cc vs 19 metopic craniosynostosis patients, mean ICV 848.01cc; p=0.755) or 12-24 months (5 metopic ridge patients, mean ICV 1009.91cc vs 9 metopic craniosynostosis patients, mean ICV 1048.29cc; p=0.393) of life.

Mean metopic ridge ICV was not significantly different from normal ICV at any age range within our sample (p=0.389).

Conclusion: Metopic ridge and metopic craniosynostosis both result from premature fusion of the metopic suture; however, the ICVs of patients with metopic ridge are larger than those of patients with metopic craniosynostosis and not significantly different from those of normal children. Our study provides volumetric data to support the hypothesis that isolated metopic ridge is an intermediate phenotype between metopic craniosynostosis and normal cranial anatomy, with the principal problem being disrupted aesthetic rather than restricted calvarial growth. We hope that characterizing the spectrum of disease involving premature closure of the metopic suture with regard to ICV will aid physicians in their management of patients with isolated metopic ridge.

Premature Aging in Craniofacial Dysostoses Caused by FGFR2 Gene Mutations

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Introduction: The treatment algorithm for pediatric patients with craniofacial dysostoses entails a posterior distraction or expansion and fronto-orbital advancement at 6 months, a monobloc or facial bipartition at age 6 or 7, and in most cases a Le Fort I at age 17 or 18. What happens next in the treatment algorithm is unknown territory. Guidelines for surgical management of craniofacial dysostoses in aging patients have not been delineated, although the genetic basis of these diseases suggests problems associated with the aging process. Mutations in the fibroblast growth factor receptor 2 (FGFR2) gene have been identified in craniofacial dysostoses such as Apert, Crouzon and Pfeiffer syndromes, which are conditions causing premature fusion of the cranial sutures (craniosynostosis). Mutations in the FGFR2 gene have also been associated with cellular senescence. Increased cellular senescence is associated with prematurely aging tissues. Premature aging manifests as deterioration of the skin and skeletal problems in aging patients with craniofacial dysostoses. While the current craniofacial treatment algorithm gives good results in adolescents, this may not translate to good results in adults due to the effects of premature aging, and aesthetic procedures may be indicated at an early age.

Methods: Patients (n = 30) who underwent surgical correction of craniofacial dysostoses caused by mutations in the FGFR2 gene between January 1, 1975 and January 1, 2019 were identified. Retrospective chart review was conducted in order to determine eligibility into the study. Inclusion criteria included a diagnosis of Apert, Crouzon, or Pfeiffer syndrome. A cohort of patients with long-term follow-up results was identified and outcome measures such as skin quality (presence of facial rhytides or cutaneous abnormalities) and follow-up aesthetic procedures were evaluated.

Results: Evaluation of the long-term results revealed that premature aging is a problem in patients with craniofacial dysostoses caused by FGFR2 gene mutations. Adult patients with good results in adolescence developed features of premature aging including loss of skin elasticity, loss of facial volume and facial rhytides. Patients with craniofacial dysostoses who exhibited signs of premature aging benefitted from standard aesthetic surgical procedures such as facelifts in their twenties.

Conclusions: This study evaluates patient characteristics and long-term post-operative outcomes relating to premature aging in patients with craniofacial dysostoses caused by FGFR2 gene mutations and provides conclusions on the surgical

management of adult craniofacial dysostoses on the basis of the senior author's 44-year experience. Standard aesthetic procedures such as face lifts, brow lifts, nasal bone grafts, and genioplasties are indicated in order to correct deterioration of the face and maintain good results in adult patients.

Consolidation Time and Relapse: A Systematic Review Evaluating Outcomes between Internal and External Midface Distraction for Syndromic Craniosynostosis Patients

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Co-Authors:	Kelsey J Lipman, BS, James P. Bradley, MD, FACS, Jacob Reidhead, PhD, Justine C. Lee, MD, PhD, FACS
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Background: The choice between internal versus external distraction osteogenesis for midface advancement in patients with syndromic craniosynostosis is primarily based on surgeon preference and expertise. However, differences in outcomes between the two techniques have been sparingly compared. In this work, we performed a systematic review to compare outcomes between internal versus external midface distraction.

Methods: A systematic review was performed of studies published between 1998 and 2018 (61 studies included n=689 patients). Operative characteristics, early reoperations, complications, and relapse rates were extracted. Bias evaluation was performed using the Newcastle-Ottawa instrument. Statistical analyses were performed with independent samples t tests and linear regression analyses ($p<0.05$ considered significant).

Results: We found that external distraction was associated with more Le Fort III osteotomies and hardware adjustments ($p=0.023$), whereas internal distraction was associated with more monobloc osteotomies and longer consolidation times ($p=0.008$). No significant differences in the distance of midface advancement, reoperations, complications, or relapse rates were noted between internal versus external distraction, although external distraction trended towards a slightly higher relapse rate. Regardless of distraction protocol, consolidation time was found to be a strong negative predictor for relapse (beta=-0.792, $p=0.02$).

Conclusions: Internal and external distraction for midface advancement do not demonstrate significant differences in advancement distance, reoperative rates, complication rates, or relapse rates. Regardless of distraction type, consolidation time

was strongly inversely associated with relapse rates. The trend towards higher relapse in external distraction is potentially explained by the significantly lower consolidation times.

Assessing the Key Predictors of an Academic Career after Craniofacial Surgery Fellowship

Presenter: Kavitha Ranganathan, MD
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Purpose: Craniofacial surgery fellowship positions continue to outnumber the availability of academic craniofacial jobs. Therefore, it is important to understand the factors that affect the likelihood of securing an academic position. This information is not only valuable for applicants who aspire to be academic surgeons, but also for fellowship programs and educators who can utilize this data to identify applicants with a propensity for academics. The purpose of this study was to evaluate the impact of bibliometric indices and other trainee demographics on the ability to obtain a full-time academic plastic surgery position upon completion of craniofacial surgery fellowship.

Methods: Craniofacial fellowship graduates between 2009-2018 (n=182) were identified. Job placement out of fellowship, training information, and demographic data was collected. Bibliometric indices, total publications, and total citations were calculated up to and including the year of fellowship completion. Groups were stratified according to the trainee's initial job placement as academic or non-academic. Chi-square and/or Fisher's exact tests, and multinomial logistic regression were used to evaluate the relationship between job placement and selected factors.

Results: Of the 45.1% of fellows that secured academic positions, 43.9% trained at six fellowship institutions. Completing residency at a top tier ($p<0.001$) and integrated ($p=0.001$) plastic surgery program was associated with academic placement. The odds of academic job placement increased with each unit increase in h-index (OR=1.17; 95% CI: 1.10-1.29); $p<0.001$), g-index (OR=1.07; 95% CI: 1.03-1.11; $p<0.001$), $h_i$norm (OR=1.33; 95% CI: 1.17-1.51; $p<0.001$), total manuscripts (OR=1.04; 95% CI: 1.02-1.07; $p<0.001$), and total citations (OR=3.29; 95% CI: 1.78-6.08; $p<0.001$). Of the craniofacial fellows entering academics, 24 (29.3%) were female, 10 (12.2%) had other fellowship training, and 20 (24.4%) earned advanced degrees; these factors were not associated with job placement. Geography was significantly associated with

placement (p=0.018), as 63.6% of trainees in the Northeast secured academic positions. 20.3% (n=37) of craniofacial fellows completed dedicated postgraduate research time. Among these, 70.3% (n=26) went into academics; dedicated postgraduate research time was associated with academic placement (p=0.001).

Conclusions: The findings of this study are important for plastic surgery faculty, training surgeons, and medical students alike. We conclude that residency training institution, type of residency training program, fellowship geographic location, and dedicated post-graduate research time can significantly impact one's ability to secure an academic position upon craniofacial fellowship completion. Additionally, this study identifies bibliometric indices as objective measures of academic productivity and predictors of an academic job after completion of craniofacial surgery fellowship. It is our hope that these findings may serve to guide program directors in selecting applicants with higher likelihood of future academic practice, as well as plastic surgery residents, fellows, and medical students who aspire to be craniofacial surgeons at an academic center.

The Synostosis Research Group (SynRG) Outcomes Study: Preliminary Results from a Multi-Center, Prospective Consortium for the Study of Craniosynostosis Diagnosis and Treatment

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Introduction: Craniosynostosis (CS) treatment is complex and varies widely. Large-scale outcome studies are difficult given the practice variation, low incidence of disease, and long time between intervention and final outcome. Established in 2016, the Synostosis Research Group (SynNRG) is the largest multi-center consortium focused on prospectively evaluating the diagnosis and management of patients with CS. Here we present a preliminary analysis of these data.

Methods: Institutional review board at each SynRG institution approved this study prior to data collection. Patients diagnosed with CS who presented to any of 5 institutions from 2017 to present were enrolled in this study. Clinical data in 276 categories including history, diagnosis, radiographic imaging, intra-operative details,

hospital course, and follow-up were recorded prospectively and stored in a REDCap database.

Results: Of 298 patients registered, 62.7% were male. Average age at registration was 10.4 months. Single suture CS accounted for 80% of patients and multisutural 20%; 3% of patients were syndromic. Mean age at surgery was 11.3 months. 46% underwent open vault reconstruction, 43% underwent strip craniectomy, and 11% underwent other types of reconstructions. Of those who underwent open reconstructions, 50.1% were fronto-orbital advancements. Of those who underwent strip craniectomy, 66.2% were sagittal, 16.9% metopic, and 13.6% coronal.

Drains were used in 40% of patients. Antibiotics were given before incision in 98% of patients and continued post-op in 25% for a mean of 25 hours post-op. Tranexamic acid was used in 46% of patients and steroids in 60.5%. Intraoperative transfusion occurred in 42% of patients (80% in vault reconstructions and 11% in strip craniectomies). Postoperative hematocrit was on average 27.0, and 4.6% of patients required post-op transfusion.

In-hospital complications were hematoma in 2.3%, early wound breakdown in 0.5%, seizure in 0.5%. No CSF leaks, infections, or deaths were reported. Early reoperations were necessary in 1.9% of patients. Mean length of stay was 2.7 days. Narcotics were prescribed at discharge for 73% of patients.

Conclusion: Large, prospective, multicenter studies of CS treatment have the potential to identify opportunities to optimize care and improve outcomes. This preliminary analysis of the SynRG data reveals clear trends in treatment of CS and will be useful in improving outcomes moving forward as the consortium continues.

High Wing Le Fort Osteotomy: Correcting Malocclusion and Malar Deficiency in Patients with Cleft and Craniofacial Anomalies

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BACKGROUND: Patients with cleft or other craniofacial anomalies often develop severe maxillary retrusion with a skeletal class III malocclusion. Current treatment of skeletal class III malocclusion in this population includes orthodontic decompensation and Le Fort I osteotomy to correct the maxillomandibular relationship and occlusion.

However, the traditional Le Fort I advancement does not fully address the esthetic component and lack of skeletal volume in the entire midface. Many surgeons recognize this, and to restore midfacial contour and a convex profile, either utilize malar implants or combination Le Fort III and I osteotomies.

Instead, we perform a high wing Le Fort I osteotomy for simultaneous correction of midface deficiency and malocclusion. The high wing Le Fort I osteotomy includes all components of a traditional Le Fort I osteotomy plus anterolateral extensions onto the lateral buttresses to allow a portion of the zygoma to advance and provide malar soft tissue support.

The high wing Le Fort I avoids the use of alloplastic materials in this young population. Our technique also enjoys more stability than a combination Le Fort III and I and avoids the increase in orbital volume inherent in that technique in a patient population that seldom demonstates exorbitism.

The specific aim of this study was to determine if the senior author's method improves esthetic outcomes and demonstrates a salutary effect in cleft and craniofacial patients with skeletal malocclusion, maxillary hypoplasia, and midface deficiency.

METHODS: Cleft and craniofacial patients that underwent maxillary advancement with a high wing Le Fort I osteotomy between 2002 and 2018 were reviewed. All patients underwent the high wing Le Fort I osteotomy technique performed by the senior author. Only patients who had at least 12 months of follow-up were included for review of outcomes. Complications and relapse were reviewed.
Relapse was defined as recurrence of malocclusion or midface retrusion requiring surgical correction.

RESULTS: The charts of 85 patients were reviewed. Seventy-seven patients met inclusion criteria. Mean age at the time of surgery was 19 years. Mean follow-up was 15 months. During this time, no patients exhibited relapse requiring camouflage procedures or repeat orthognathic surgery. Complications will be discussed.

CONCLUSION: High wing Le Fort I advancement addresses esthetic component and lack of skeletal volume commonly seen in the retruded midface of cleft and craniofacial patients. The increase in malar volume creates a more esthetically pleasing convex profile, while improving the maxillomandibular relationship and correcting malocclusion, without the use of alloplastic implants, additional surgical procedures or increasing the orbital volume.

MAIN OBJECTIVES OF PRESENTATION: Each learner will be able to summarize the high wing Le Fort I advancement technique for the correction of class III malocclusion and midface retrusion in the cleft and craniofacial population.

Long-Term Orthognathic Considerations in the Pierre Robin Sequence Patient

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Background: Pierre Robin Sequence (PRS) is manifested by the constellation of micrognathia, glossoptosis, and airway obstruction. While syndromic children may require multiple procedures to address airway obstruction and malocclusion, one of the controversies in non-syndromic PRS is the potential for "catch-up" mandibular growth equivalent to children without craniofacial diagnoses. In this work, we evaluated the long-term requirements of orthognathic surgery at skeletal maturity in children diagnosed with PRS.

Methods: 115 children diagnosed with PRS were retrospectively evaluated from two craniofacial centers. Children ≥ 13 years of age were included and patients who underwent any type of mandibular distraction or surgery prior to skeletal maturity were excluded. Demographics, surgical, and orthodontic histories were reviewed. Descriptive statistics were reported. Chi-square was used to compare groups.

Results: 43 patients with PRS without mandibular surgery prior to skeletal maturity were identified (57% female; mean age: 20 ± 3.3 years). Mean length of follow up was 14.2 ± 5.2 years. 18 patients (41%) were diagnosed as syndromic, the majority of which was Stickler Syndrome. 41 patients (95%) had a history of a cleft palate and of those patients, 18 (44%) had velopharyngeal insufficiency necessitating surgery. Data was available for 42 patients in regards to orthodontic and orthognathic care. Orthodontic evaluation revealed that 41 patients (98%) had a history of orthodontic treatment and 20 (48%), 17 (40%), and 5 (12%) were classified as Angle Class I, II, and III, respectively. Subset analysis revealed that 13 and 4 patients with a syndromic diagnosis were Class I and class II, respectively, while 1 was class III ($p<0.05$). A total of 17 (39.5%) patients underwent or were recommended to undergo orthognathic surgery due to Class II (n=11/17, 65%) or Class III (n=3/17, 18%) malocclusion. When PRS children with surgical Class II malocclusion were separated into

nonsyndromic versus syndromic subgroups, 9/11 (80%) were nonsyndromic and 2/11 (18%) were syndromic. Overall, 9/25 (36%) of nonsyndromic and 2/18 (11%) of syndromic PRS children required orthognathic surgery to specifically address maxillomandibular and occlusal abnormalities (p=0.09).

Conclusion: Our current report suggests deficient long-term mandibular growth of nonsyndromic PRS children is relatively similar to that of children with syndromic PRS. These findings lie in contrast to the concept of mandibular "catch-up" growth and suggest that the maxillomandibular relationship in PRS may not resolve without intervention.

The Zygomaticosphenoidal Angle: A Reference for Surgical Navigation in Zygomaticomaxillary Complex Fracture Repair

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Background: Alignment of the zygomaticosphenoid (ZS) suture is fundamental to reduction of zygomaticomaxillary complex (ZMC) fractures.[1-3] Lateral displacement and anteroposterior impaction of the anterior segment must be corrected. Furthermore, to prevent a rotational deformity, the correct angle of the zygoma relative to the cranial base must be restored. Clinically, this can be a challenge, especially when there is comminution of the zygomaticosphenoid suture. The purpose of this study was to define normative values for a zygomaticosphenoidal angle. This data may be used as a reference in conjunction with stereotactic navigation to achieve anatomic orientation of the anterior fracture segment in ZMC fracture reduction. Normative data of this angle could be used in bilateral fractures and, if constant across laterality, patient-specific data could be used as a guide in unilateral injuries.

Methods and Materials: A single-center retrospective analysis of one-hundred patients was designed to determine normative zygomaticosphenoidal angle values. Computed tomography (CT) data of patients with isolated mandibular fractures was used to select for a craniofacial trauma demographic with available computed tomography and intact midface skeletal anatomy. An angle subtended by the midline and a best fit line through the ZS on axial CT was measured bilaterally. The mean value of this measurement for three vertically adjacent cuts was calculated with the position of central cut determined by the equator of the globe and trigone of the sphenoid. Measurements and assessment of cuts were performed and verified by two

investigators to ensure consensus. Demographic data including age, sex, and ethnicity was collected for comparison.

Results: The mean zygomaticosphenoid angle was 47º (range 39º -55º). 97% of angles were within two standard deviations (8º) of the mean. Subgroup analysis demonstrated no significant difference of ZS angle across age (p=0.74) or sex (p=0.89). White patients (45.60º) were found to have more acute ZS angles than Black (47.73º; p=0.02) or Hispanic (47.45º; p=0.04) patients. For each angle the variation across the three sample cuts was ≤4.5º in all cases. Patients demonstrated high fidelity of zygomaticosphenoidal angle bilaterally with a mean difference of 3º.

Conclusions: The zygomaticosphenoidal angle is a useful reference, in conjunction with stereotactic navigation, for anatomic reduction of ZMC fractures. Contralaterally obtained patient-specific data may be used to guide unilateral repair. Normative values may serve as reference in bilateral injury.

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Recent Smoking History Is Not Associated with Adverse 30-Day Outcomes Following Replantation or Revascularization Procedures of the Upper Extremity

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Introduction: Cigarette smoking has been associated with complications in general wound healing, but recent studies have reported varied conclusions regarding the impact of smoking on replantation or revascularization outcomes.[1,2] Upper extremity replantation and revascularization are complex procedures which rely upon proper wound healing for optimal success.[3] This study investigated the effects of smoking on

30-day postoperative outcomes following upper extremity replantation/revascularization.

Methods: The American College of Surgeons National Surgical Quality Improvement Program database was queried to identify all patients who underwent upper extremity replantation or revascularization between 2008 and 2016. Patients were identified using Current Procedural Terminology codes that corresponded to replantation procedures of the digit, thumb, hand, forearm, and arm or blood vessel repair of the finger, hand, or upper extremity. Patients with a history of cigarette smoking within one year prior to admission for surgery (Smokers, n=89) were compared to those without this smoking history (Non-Smokers, n=237). Univariate analysis was employed to identify possible individual risk factors for 30-day postoperative major and minor complications, readmissions, and reoperations. Multivariate regression models were utilized to calculate odds ratios (OR) and 95% confidence intervals (95%CI) to evaluate the impact of risk factors on 30-day outcomes.

Results: Smokers were younger (45 vs. 53 years, p=0.003), with no differences in sex, race, or body mass index. Non-smokers had a higher prevalence of diabetes mellitus (27.4% vs. 16.9%, p=0.048) and were more often on dialysis (32.1% vs. 19.1%, p=0.020). Preoperative lab values were comparable, as were wound class, American Society of Anesthesiologists (ASA) score, operative time, and length of stay. Major (2.2% vs. 7.2%) and total complications (16.9% vs. 14.3%) were also comparable between Smokers and Non-Smokers; however, Smokers required intraoperative transfusions more frequently (14.6% vs. 5.5%, p=0.006). Smokers and Non-Smokers also experienced similar reoperation (2.1% vs. 6.7%) and readmission rates (3.4% vs. 3.8%).

Regression analysis revealed that among replantation/revascularization patients, preoperative diabetes was a strong predictor for 30-day reoperations (OR=5.8, 95%CI, 1.1-30.4) and Caucasian race was a significant predictor of 30-day major complications (OR=3.3, 95%CI, 1.1-10.2), all $p \leq 0.038$. Preoperative smoking history of ≤1 year was not found to be a predictor of any adverse 30-day outcomes.

Conclusions: Smoking as a comorbidity is frequently seen in upper extremity replantation/revascularization patients. Non-smokers more frequently had comorbid diabetes mellitus and were on dialysis. Smoking history was not associated with increased major or minor complication, readmission, or reoperation rates in the 30-day postoperative period following upper extremity replantation/revascularization. Among replantation/revascularization patients, diabetes was a strong predictor for 30-day reoperations. The impact of diabetic control on outcomes in this population is worth further investigation.

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Patient Transfer for Hand and Upper Extremity Injuries: Diagnostic Accuracy at the Time of Referral

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Purpose: Local healthcare facilities are often unequipped to treat complex hand and upper extremity injuries, and patients are therefore transferred to designated level I trauma centers. The aim of this study was to describe the characteristics of patients transferred to a level I trauma center for hand and upper extremity injuries and to investigate the accuracy of the provided diagnosis at the time of referral.

Methods: All adult patients transferred from outside facilities to our level I trauma center for care of hand and upper extremity injuries were prospectively included in this study. Patient and injury-related information was collected at the time of referral prior to patient transfer, and again following diagnostic evaluation by a hand surgeon at our institution.

Results: Sixty-three patients were transferred to our hand surgery service from outside facilities. Most patients were referred by emergency medicine physicians (76%, n=47), followed by mid-level emergency department providers (PA or NP) (19%, n=12) or hand surgeons (5%, n=3). The median distance from a referring hospital to our center was 31 miles. Twenty-three (37%) of transferred patients were closer in proximity to another level I trauma center. Six patients were transferred directly from a level I trauma center.

Twenty-one (33%) of transferred patients had an inaccurate diagnosis at the time of referral. Factors associated with an inaccurate diagnosis included trauma level of the referring hospital and diagnoses of infection or dysvascularity.

Seventy-five percent (n=48) of patients underwent surgical intervention. Of these, 90% (n=43) underwent operative treatment during their initial hospital stay and 10% (n=5) patients underwent elective surgery at a later date. Twenty-seven percent (n=17) of all patients underwent microsurgical procedures. Seventy-five percent (10/15) of patients who did not undergo surgery had a bedside procedure performed as definitive treatment.

Conclusions: Diagnosis of hand pathology at the time of patient transfer was inaccurate in 33% of patients referred to our institution for hand surgery evaluation. Twenty-five percent of patients transferred to our institution did not ultimately undergo surgical intervention. Improvement of diagnostic accuracy prior to patient transfer may save healthcare costs and facilitate more expeditious, definitive care for patients with hand injuries and other pathology.

Free Fascial Flaps Vs. Bilaminate Synthetic Dermal Matrix - a Cost-Effectiveness Comparison for Full-Thickness Hand Reconstruction

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Background: Soft tissue injuries of the hand with exposure of bone and tendon require durable soft tissue coverage to preserve tendon gliding and hand motion. Two common means of reconstructing these defects include free fascial flaps and bilaminate synthetic dermal matrices (Integra, Integra LifeSciences, Plainsboro, New Jersey). In the era of value-based care, payers, providers, and patients desire the reconstructive option with the best outcome at the lowest cost. We aim to investigate the cost-effectiveness of hand resurfacing comparing free fascial flap reconstruction vs. bilaminate synthetic dermal matrices. We hypothesize that microsurgical reconstruction will be cost-effective at standard willingness to pay thresholds.

Methods: A decision tree was constructed comparing free fascial flaps to Integra using the rollback method. Probabilities for successful reconstruction were based on a systematic literature review identifying outcomes in free fascial flaps and Integra for hand reconstruction. The base case included a full-thickness hand wound 40 cm^2. Flap

based reconstruction occurred in a single hospitalization, whereas Integra reconstruction occurred in a staged fashion using negative pressure wound therapy between initial placement and skin grafting. Total active range of motion was modeled as the common outcome variable. Costing was performed from a payer perspective using national Medicare reimbursement rates based Current Procedural Terminology codes and Medical Severity Diagnosis Related Group codes for facility fees. The willingness to pay threshold was determined by Worker's Compensation payout for hand disability. Probabilistic sensitivity analysis was conducted for range of motion outcomes and costs using 10,000 Monte Carlo simulations. Modeling was performed using 2019 US currency.

Results: The average cost of free fascial flap reconstruction was $14,201.24 compared to $13,674.20 for Integra, yielding an incremental cost difference of $527.04. Incremental range of motion improvement was 18.0 degrees with free fascial flaps, yielding an incremental cost effectiveness ratio of $29.3/degree of motion. Assuming willingness to pay thresholds of $557.00/degree of motion based on current Worker's Compensation disability payouts, free-fascial flaps were highly cost effective. On probabilistic sensitivity analysis, free fascial flaps were dominant (i.e. improved outcomes and lower cost) in 25.5% of simulations, and cost-effective in 32.1% of simulations. Thus, microsurgical reconstruction was the economically sound technique in 57.5% of scenarios.

Conclusions: Free fascial flap reconstruction of complex hand wounds was marginally more expensive than Integra and yielded incrementally better outcomes. Microsurgical techniques were cost-effective in the base case, and this was confirmed with robust sensitivity analysis. Patients should not be discouraged to undergo microsurgical reconstruction for concerns of cost.

Misvaluation of Hospital-Based Upper Extremity Surgery across Payment, Relative Value Units, and Operative Time

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Purpose: To determine whether differences in estimated operative times between the Centers for Medicare & Medicaid Services (CMS) and the National Surgical Quality

Improvement Program (NSQIP) contribute to payment and work relative value unit (wRVU) misvaluation for hospital-based hand and upper extremity procedures.

Methods and Methods: Data on wRVUs, payments, and estimated operative times were collected from CMS for 53 procedures. Using regression analysis, we compared relationships between these variables, in addition to actual median operative times as reported in the NSQIP database, from 2011 to 2016. We then determined which procedures may be over-valued or under-valued based on operative time.

Results: There was a wide discrepancy between CMS and NSQIP operative times (R^2=0.49), with 60% of CMS times being longer than NSQIP times. Payments were more strongly correlated with CMS operative times (R^2=0.55) than with NSQIP operative times (R^2=0.24). Similarly, wRVUs were more strongly correlated with CMS operative times (R^2=0.84) than with NSQIP operative times (R^2=0.51). In general, for trauma-related procedures, any distal radius open reduction internal fixation (ORIF) was considered over-valued while any ORIF proximal to the distal radius was considered under-valued in analysis of both databases. Nearly all elective tendon procedures were considered under-valued. Thirty-nine percent of trauma procedures were considered under-valued compared to 70% of elective procedures. Notable compensation differences were found between trapeziectomy versus ligament reconstruction and tendon interposition, epicondyle debridement with tendon repair versus denervation, proximal row carpectomy versus four corner fusion, and distal radius open versus percutaneous fixation.

Conclusions: CMS may misvalue payment and wRVU rates of hospital-based hand procedures due to inaccurate operative time estimates. By revising CMS operative times for certain procedures, associated changes in payment may improve physician compensation models, correct misvaluation-based incentives, and serve as a catalyst to improve the quality and value of elective and trauma-related hand surgery**.**

Palmar Fascia Sparing Retrograde Endoscopic Approach for Trigger Finger Release: A Cadaver Study

Presenter: Ashley M Brown, MD
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Purpose: Trigger finger is one of the most common causes of disability and pain in the hand[1]. Surgical treatment options include open, percutaneous and endoscopic

release[2]. Current techniques necessitate incision of or blind trauma to the palmar fascia, violation of which may result in scarring and lasting discomfort[3]. Our study explores the safety and efficacy of a new endoscopic technique performed through a single incision at the proximal digital crease distal to the A1 pulley. Similar to endoscopic carpal tunnel release, this technique avoids an incision in the palmar fascia, which can be a source of significant morbidity.

Methods: The procedure was performed in the fingers of 4 embalmed cadaveric hands. The proximal digital crease was identified and incised transversely. Blunt dissection was performed down to the flexor tendon sheath. With the finger in extension, a 2.7 mm arthroscope with EndoSleeve attachment by A.M. Surgical, Inc. was introduced and placed on the distal edge of the A1 pulley. The endoscope was then advanced proximally (retrograde) along the length of the A1 pulley, which was well visualized. The fingers were subsequently dissected to assess for completeness of release and inspected for injury to nearby structures.

Results: Complete release of the A1 pulley was noted in sixteen out of sixteen fingers (100%). The average length of release was 1.4 cm ± 0.2 cm. No significant injuries to the A2 pulley, flexor tendon, digital nerves or vasculature occurred.

Conclusion: Our results suggest that the described endoscopic technique is a safe and effective option for treatment of trigger finger. The technique allows indirect and complete visualization of A1 pulley release through a single non-palmar incision.

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Patient-Reported Outcomes and Utility of Trapeziectomy with Ligament Reconstruction and Tendon Interposition

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Purpose: Trapeziometacarpal joint osteoarthritis can elicit a significant burden for afflicted patients. Amongst different treatment options, trapeziectomy with ligament reconstruction and tendon interposition (LRTI) has been shown to produce positive outcomes in terms of pain relief and function. Although considered safe by most surgeons, postoperative complications persist and the decision to undergo this procedure should take into account the patient's characteristics, baseline function and expectations. This study aims to gain more knowledge on the patient-reported functional outcomes and the utility measures of trapeziectomy with LRTI in the treatment of thumb osteoarthritis.

Methods/Materials: A survey was administered on consecutive patients who had underwent trapeziectomy with LRTI. Collected data consisted of demographic characteristics, the natural history of disease, the type of treatment received, the postoperative rehabilitation, the brief Michigan Hand Outcome Questionnaire (bMHQ) and the utility assessment questionnaires including the visual analogue scale (VAS), the time trade-off (TTO) and the standard gamble (SG) techniques. Quality adjusted life years (QALYs) were derived from these measures.

Experience: In total, 32 patients were enrolled in this study, with a mean age of 60.8 years. Right-hand dominance was reported in 84% of patients, and the operated hand was the same as the dominance in 37.5%. Occupation was equally distributed between manual laborers and office/other at 25% each, whereas the other half was retired. A similar proportion of patients took more than two months of work leave (40.6%) and did not take any time off (34%). A significant majority of patients (84%) considered their operation to have been successful.

Results: The mean normalized measure for patient-reported hand function on the bMHQ was calculated at 83.01. For utility measures, the VAS, SG and TTO produced a score of 0.2708, 0.7546, and 0.8350, respectively. The VAS, TTO and SG utility measures were significantly higher when patients perceived their operation to be successful ($p=0.001$). These utility health values translated into a mean of 37.73 QALYs for SG and 41.75 QALYs for TTO.

Conclusions: This is the first to study to quantify patients' reported outcomes and utility measures after undergoing trapeziectomy with LRTI. Reporting these health burden values will serve as comparison with other disease states and provide further insight for policy makers to advocate for this type of procedure.

Patient-Centered Outcomes of Traditional Open Carpal Tunnel Release: A Systematic Review of the Literature

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PURPOSE: The efficacy of carpal tunnel release (CTR) is difficult to assess due to variations in disease severity and operative approach. There is a paucity of data regarding patient-reported outcomes (PROs) following open CTR. The purpose of this study was to systematically review the literature on PROs following traditional open CTR to evaluate the need for more accurate, validated assessment tools relating to health-related quality of life (HR-QoL).

METHODS: PubMed, MEDLINE, and Cochrane Library databases were queried according to PRISMA guidelines for all studies investigating PROs following traditional open CTR. Traditional open CTR was defined as having a specified incision length >2.5 cm. Analysis focused on patient reported QoL, symptomatic relief, functional status, overall satisfaction, and return to work or activities of daily living (ADLs).

RESULTS: In total, 588 unique articles were screened, and 30 studies met inclusion criteria. The year of publication of selected studies ranged from 1993 to 2017. Most studies were either prospective randomized-controlled trials (16/30, 53%) or prospective non-randomized cohort studies (8/30, 27%). The average sample size was 65 ± 71 patients (range: 13 to 373; total 1,946) with mean length of follow-up of 14 ± 14 months (range 1 to 60 months). The most commonly utilized assessment tool overall was an unvalidated, custom survey, interview, or questionnaire (CSIQ; 21/30, 70%) followed by the validated Boston Carpal Tunnel Questionnaire (BCTQ; 13/30, 43%). Health-related QoL was formally assessed in only 3 studies using the validated 36-Item Short Form Survey. Symptomatic relief was measured in 29 (97%) studies, making it the most frequently reported item; however, 12 (41%) of these studies utilized unvalidated CSIQs. Functional ability was reported by 19 (63%) studies, with 15/19 (79%) utilizing validated questionnaires. The BCTQ was the most frequently utilized tool to assess symptomatic relief (13/30, 43%) and functional improvement (11/30, 37%). Fourteen studies (47%) reported patient satisfaction, and 12 studies (40%) documented time to return to work or ADLs, but all data related to satisfaction and return to work were represented by unvalidated CSIQs. Only one study measured all five parameters; in contrast, 26 studies (87%) reported at least two metrics.

CONCLUSIONS: Traditional open CTR offers excellent symptomatic and functional improvement and patient-reported satisfaction. There is a dearth of studies utilizing validated health related QoL assessment tools to evaluate outcomes following traditional open CTR. Subjective symptomatic relief is the most commonly reported outcome measure, followed by functional improvement. The majority of studies reporting on PROs following traditional open CTR utilize unvalidated CSIQs, especially for assessing patient satisfaction and time to return to work or ADLs. Further investigation of PROs with incorporation of new or existing validated assessment tools for HR-QoL, satisfaction, and return to work is warranted to achieve a consensus on currently available CTR techniques.

The Use of Immunosuppressive Agents in Peripheral Nerve Surgery Improves Motor and Sensory Recovery

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Purpose: Nerve grafting is often required in the repair of peripheral nerves injured by trauma or surgery due to the inability to re-approximate nerve ends without tension. Axonal regeneration in the setting of nerve grafting depends on a myriad of factors, including original mechanism of injury, immunogenicity of the donor graft, and local recipient extracellular environment. Autograft repair avoids the risk of immune rejection and results in improved outcomes in the setting of large nerve gaps, but allograft repair is a viable alternative in cases of limited donor site availability. The use of immunosuppression limits astrogliosis of peripheral nerve grafts and reduces the risk of allograft rejection, thereby allowing for more regenerative axonal fibers to grow across the injured nerve gap. However, whether immunosuppression improves clinical outcomes in peripheral nerve repair has not yet been elucidated. In this study, we conducted a systematic review and corresponding meta-analysis to determine the effect of immunosuppression on motor and sensory outcomes in peripheral nerve surgery.

Methods: A systematic review of PubMed was conducted in January 2019 to identify all published literature on outcomes of peripheral nerve repair and composite tissue allotransplantation of the extremities. Records were excluded if they were review, opinion, comment, or editorial articles, in a language other than English, or did not primarily focus on outcomes of peripheral nerve surgery. Records were then split into one of two groups: 1) peripheral nerve surgery with immunosuppression (IS+ group),

and 2) peripheral nerve surgery without immunosuppression (IS- group). Motor and sensory recovery were the main outcomes assessed using a binary "recovery reported" or "no recovery reported" methodology as determined by each study. For each group, outcome data on the proportion of cases with motor or sensory recovery was pooled and statistically analyzed using a random effects model for meta-analysis.

Results: Our search identified 409 articles of which 28 met eligibility criteria. The IS+ group included 5 articles describing 51 patients, and the IS- group included 23 articles describing 324 patients. The IS+ group was associated with significantly improved motor outcomes, with a mean of 54.5% (95% CI, 23.3%-85.6%) of cases reporting motor recovery in contrast to 12.2% (95% CI, 4.2%-20.3%) of cases in the IS- group (p=0.01). A similar result was observed when assessing sensory outcomes, with 68.6% (95% CI, 34.1%-100%) of cases in the IS+ group reporting sensory recovery as opposed to 31.9% (95% CI, 23.6%-40.1%) of cases in the IS- group (p=0.04).

Conclusion: Cases of peripheral nerve surgery performed with an immunosuppressive protocol were associated with improved motor and sensory outcomes. In our study, the IS+ group had a statistically greater mean number of cases reporting motor and sensory recovery than the IS- group, suggesting that immunosuppressive agents have a clinically favorable effect in the repair of injured peripheral nerves. Future studies are warranted to delineate the mechanism of this effect and to establish the use of immunosuppression in peripheral nerve repair as a clinical practice guideline.

Acute Versus Delayed Treatment of Intra-Articular Distal Radius Fractures

Presenter:	Justin Davis, MD
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Introduction: Delayed presentation of distal radius fractures, defined as greater than 21 days after injury, is a common problem at safety-net hospitals. Current literature suggests that the timing of surgery affects early clinical outcomes, but ultimately does not affect long-term clinical or radiographic outcomes[1-3]. The purpose of this study was to expand on previous studies to identify risk factors that may contribute to loss of reduction after distal radius fracture fixation with a focus on timing of presentation.

Methods and Patients: This was a retrospective chart review performed at our large county hospital, at which all fixation procedures were performed from 2012 to 2017.

After excluding patients with incomplete data, 456 patients were included in this study. Patients were separated into two main groups – timely surgery (0-21 days) and delayed surgery (21-42 days). We recorded demographic data and radiographic measurements including radial inclination, ulnar variance, radial height, and residual articular step-off to determine if normal radial bony anatomy was restored. Demographic data in the analysis included age, gender, diabetes, osteoporosis, laterality of injury, and smoking status. Radiographic measurements were taken at first presentation before any reduction, immediately post-operatively, and 3 months post-operatively. A student t-test was used to compare continuous variables with a normal distribution and Fisher's exact test for dichotomous variables.

Results: No difference was discovered between the two groups with respect to the variables of age, gender, diabetes, osteoporosis, laterality of injury, and smoking status. There was no difference in fixation methods between the two groups. Overall, there was no difference in pre-operative or immediate post-operative radiographic measurements. However, at 3 months, patients operated in a delayed fashion had a 4 mm loss of volar tilt compared to the timely surgery group ($p=0.003$).

Conclusion: This study demonstrates that patients presenting in a delayed fashion that require surgical fixation are at an increased risk of loss of volar tilt at 3 months. These findings suggest that measures to prevent loss of volar tilt post-operatively in delayed presentation such as augmentation with bone graft or bone graft substitution may be beneficial in these patients.

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Residency Training and Hand Surgery Practice Patterns: A NSQIP Database Analysis

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Purpose: The educational background of fellowship-trained hand surgeons varies with primary residency training in either orthopedic, plastic or general surgery. In order to study the effect of disparate training backgrounds on practice pattern variations, we utilized the National Surgical Quality Improvement Program (NSQIP) database to assess hand surgery volume and case variety by primary training specialty.

Methods: NSQIP was queried from 2008 to 2017 with hand surgery CPT codes as defined by the American Board of Orthopedic Surgery. The procedures were grouped according to type and specialty, and relative rates calculated. Hand society membership data was used to determine the expected composition the hand surgery workforce based upon completion of Subspecialty Surgery of the Hand Certification. Membership data currently indicates that 5% are general surgeons, 16% are plastic surgeons and orthopedic surgeons are the remaining 78% of hand surgeons. This information was used to determine relative contribution to the volume of hand surgical procedures performed in the study period with the assumption that the hand surgeries would be distributed accordingly.

Results: 145015 hand surgical procedures were performed by general 13267 (9.1%), plastic 28402 (19.6%), and orthopedic surgeons 103346 (71.3%). Orthopedic surgeons performed significantly more bone, fracture, joint and tendon cases. General and plastic surgeons performed higher than expected numbers of soft tissue coverage cases with respective excesses of 83% and 22%, while orthopedic surgeons performed 6.7% fewer of these cases than expected.

Conclusions: Hand surgery is an available fellowship pathway from multiple residencies. However, fellowship training does not level the field of real-world practice patterns, and residency training experiences significantly impact practice.

The Rate of Index Metacarpal Fracture, the Degree of Thumb Metacarpal Subsidence Using a Novel Staging System, and Patient Satisfaction Following Suture-Button Suspensionplasty

Presenter: Anusha Singh, BS

Co-Authors: Peter T Hetzler, BA, Nicole Le, BS, MPH, Robin T Wu, MD, Ajul Shah, MD, Shayan Cheraghlou, BS, Adnan Prsic, MD, James Clune, MD, J. Grant Thomson, MD, MSc

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Purpose: This current study seeks to uncover the potential factors that may lead to index metacarpal fracture and degree of metacarpal subsidence by radiographically reviewing patients who underwent suspensionplasty after trapeziectomy. We hypothesize that fracture and degree of subsidence may be due to the angle of suspension, placement of the suture button, and drill type.

Methods:

A retrospective chart review of a single hand surgeon was performed from 2011-2017. Demographic, operative, radiographic factors were collected. Metacarpal subsidence was determined to occur if there was any increase in preoperative to postoperative stage. Those patients without preoperative stages were excluded from the analysis. Complications, including the presence of second metacarpal fracture, were recorded. Statistical analyses were performed to determine if any factors were predictive of index metacarpal fracture or degree of thumb metacarpal subsidence using T-test analyses. Finally, a satisfaction survey was collected from patients.

Results: Seventy-three patients underwent suture-button suspension (average age 54). Fifty patients returned for x-ray follow-up with an average follow-up time of 8 months.

Prior to surgery, 86% of patients had either stage 0 or I thumb metacarpal position. After follow-up, 6 hands were stage 0 (24%), 10 were stage I (40%), 8 were stage II (32%), and 1 was stage III (4%) (Table 2). The rate of metacarpal subsidence was found to be 61 %. No significance was found when analyzing the effect of age ($p=0.43$), length of follow-up ($p=0.40$), angle of suspension ($p=0.22$), ratio of button height to index metacarpal height ($p=0.20$) on development of Stage II or III metacarpal subsidence. Pain level was not statistically different ($p=0.83$).

Of the 25 patients who received x-rays > 12 months from surgery, 14 patients were able to complete a satisfaction survey. Eleven patients (79%) were satisfied with surgery, and 2 (14%) were dissatisfied. Eight (57%) would recommend the surgery to a friend, 3 (21.5%) were unsure, and 3 (21.5%) would not. Average pain score before surgery was 8.3; 6 weeks after surgery was 4.2; and pain at x-ray follow-up was 2.5.

Conclusion: Second metacarpal fracture is a significant risk following trapeziectomy with suture button suspensioplasty. This preliminary study highlights the prevalence

of second metacarpal fracture, the lack of insight surrounding the potential causes of this fracture, metacarpal subsidence using a new staging system, and patient satisfaction following suture-button suspensionplasty.We have also found that a majority of patients who had greater than one year follow-up had mild to no metacarpal subsidence following surgery using a novel staging system. Furthermore, these patients tend to be satisfied with the surgery and have less pain than prior to surgery. Further study is required for full comprehension of the risks associated with fracture of the index metacarpal and elucidation of factors that may lead to an increase degree of thumb metacarpal subsidence. The relatively low incidence of fracture in the context of a prospective study necessitates a large study cohort in order to better determine the risk factors of the procedure leading to this complication.

Characteristics of Non - Obstetric Pediatric Brachial Plexus Injuries

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Purpose: Brachial plexus injuries (BPI) in the adult population are uncommon (<2%), however they are considered highly morbid injuries with long term, permanent disabilities. Patients are predominantly male with the principal mechanism of injury resulting from motor vehicle accidents.[1] In the pediatric population BPIs most often occur secondary to congenital brachial plexus palsies or obstetric traumas.[2] Currently there is minimal literature available on the causes of non-obstetric BPI in children. This is the first study to investigate the characteristics of non-obstetric BPI in the pediatric trauma population.

Methods: Data was retrieved from the National Trauma Dataset (NTDS) from the American College of Surgeons and includes all pediatric patients (<18 years old) who had a diagnosis of BPI during the years of 2015 and 2016. The combination of epidemiologic, demographic, and clinical characteristics data was collected.

Experience/Results: A total of 199 pediatric patients with traumatic BPIs were identified. Median age was 16 years [IQR 12.5-17] with 72.4% male and 57.3% of Caucasian race. The highest prevalence of concurrent injuries included soft tissue injuries and fractures to the head and face, brain injuries, all levels of spine/vertebral injuries with pneumothorax/hemothorax/lung contusions accounting for 25.8%, 18.1%, 23.2% and 29.4% respectively. Mechanism of injury was predominantly from motor vehicle collisions and accounted for 54.8%, followed by firearms, being stuck

by an object, and secondary to a fall and accounted for 18%, 9.5%, and 9% respectively. Only 2% of the brachial plexus traumas underwent primary brachial plexus repair at the time of the trauma and only 5.5% had targeted imaging on admission. Primary nerve repair, conduit, or repositioning of the nerves on admission was done in 5.5% of the patients. The most common concurrent intervention performed in the zone of injury was repair of the subclavian/axillary artery and brachial vein. Complications were encountered in 10% of the BPI patients with 2.5% presenting with DVTs and 2.5% with pneumonia.

Summary points:

- Traumatic BPIs occur most frequently in Caucasian males at the median age of 16
- The most common mechanism of injury is secondary to motor vehicle collisions
- The most common concurrent injuries involve the head and neck, the spinal column, and the thorax
- Operative intervention to the brachial plexus and peripheral nerves occurred in 2% and 5.5% respectively

Conclusion:

Traumatic BPIs stem primarily from motor vehicle collisions in the pediatric trauma population. Patients are predominantly young Caucasian males with the majority of concurrent injuries occurring to the face and skull bones, vertebrae, and thorax. Traumatic BPIs rarely undergo primary surgical repair of the nerve, however they undergo vascular repair in the zone of injury in the acute period.

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Predictors of Patient Satisfaction in Hand and Upper Extremity Clinics

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Introduction: Patient satisfaction is an important clinical marker for hand and upper extremity patients. To date, however, few studies have evaluated the predictors of patient satisfaction in the clinic setting. Therefore, the objective of the current study was to analyze patient satisfaction surveys to identify the predictors of patient satisfaction.

Methods: We conducted a retrospective analysis assessing patient satisfaction for patients presenting to the hand or upper extremity clinics at our university medical center. Patient satisfaction was assessed via Press Ganey Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) surveys and evaluated between the years 2012 and 2018. Patient demographics, satisfaction scores, and clinic experience questionnaire responses were evaluated. Statistical analysis was conducted to identify significant trends.

Results: Between 2012 and 2018, 102 patients completed a HCAHPS survey. Satisfaction scores ranged from 5-10 with an average provider rating of 9.56. After conducting statistical analysis, we found various variables to influence patient satisfaction. Patients were more likely to be satisfied when 1) spending adequate time with their surgeon, 2) feeling surgeon showed respect, 3) seeing surgeon within 15mins of appointment time, 4) feeling surgeon listened, 5) receiving understandable instructions, and 6) receiving understandable explanations ($p<0.05$). Satisfaction scores showed the greatest variability relative to the surgeon's ability to show respect. Lastly, we found patient satisfaction correlated with a patient's willingness to recommend the practice to others. We found the following variables did not influence patient satisfaction: 1) helpfulness and respectfulness of receptionist, 2) duration of patient-provider relationship, 3) number of clinic visits with surgeon, 4) ease in scheduling routine or urgent appointments, 5) answering patient concerns same day, and 6) clinic communication of patient results.

Conclusion: Achieving patient satisfaction is an important clinical marker in hand and upper extremity clinics. Patient satisfaction has defined predictors wherein various clinic factors can influence patient satisfaction and willingness to refer the surgeon to others. The data presented in this study can be used to educate providers to help improve satisfaction for our patients.

The Association between Concomitant Ulnar Nerve Compression at the Elbow and Carpal Tunnel Syndrome

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BACKGROUND: Many patients treated for ulnar nerve compression at the elbow (UNE) are concomitantly treated for carpal tunnel syndrome (CTS). We sought to investigate the association between the conditions.

METHODS: The Statewide Planning and Research Cooperative System (SPARCS) database was used to determine the number of patients with UNE concomitantly treated for CTS in New York State from 2003 to 2014. We then retrospectively reviewed each patient who received surgical treatment for UNE (n = 222 patients) or CTS (n = 1063 patients) at our tertiary care institution in 2014 and 2015 to assess concomitant treatment.

RESULTS: In the SPARCS database, the percentage of patients surgically treated for concomitant UNE and CTS steadily increased from 23% in 2003 to 45% in 2014. At our institution, 50 of 222 patients (23%) surgically treated for UNE underwent concomitant carpal tunnel releases. For concomitantly treated patients, 94% had examinations consistent with UNE and CTS, 87% of patients had median nerve compression on electrodiagnostic tests, and 72% of patients had UNE on electrodiagnostic tests.

CONCLUSIONS: Most patients concomitantly treated for UNE and CTS have objective findings of both conditions. At least one-fourth of patients indicated for operative ulnar nerve release also require a carpal tunnel release-far beyond the prevalence of CTS in the general population. A diagnosis of UNE merits a comprehensive workup by the treating surgeon and a high suspicion for concomitant median nerve compression.

Osteosarcoma of the Upper Extremities: Disease Characteristics and Survival

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PURPOSE: Osteosarcoma of upper extremities is very uncommon, with osteosarcoma of the hand representing 0.18% of all osteosarcomas. It is clinically unexpected, and diagnosis can be delayed due to its rarity. We comprehensively analyzed a US national database to report on tumor characteristics and survival of upper extremities osteosarcoma patients. We aim to increase the knowledge and improve awareness of the disease.

METHODS: We performed a descriptive study to identify demographics of upper extremities osteosarcoma patients diagnosed from 2004 to 2015 by querying the National Cancer Database (NCDB). Additionally, we compared tumor characteristics, treatment and survival according to location: hand vs. forearm, arm or shoulder. Statistical analysis was performed using a multivariate logistic regression model and survival was estimated and compared using log-rank test.

RESULTS: 991 patients diagnosed with upper extremities osteosarcomas were identified and met the inclusion criteria. Mean age at diagnosis of the patients with osteosarcoma of the upper extremities was 30.74 years old, most of them were white (76.5%), males (56.8%), less than 21 years old (45.9%), without any comorbidity (90.4%), and living in metropolitan areas (81.2%). From the total patients, 75 patients were diagnosed with osteosarcoma on the hand (7.6 %), while 916 patients were diagnosed with osteosarcoma on the forearm, arm or shoulder (92.4%). Most of the osteosarcomas located on the hand were ≤8 cm (50.7%), with high grade (58.7%), on stage II (33.3%) and did not have any metastasis to lungs (36%). According to the treatment, most of them underwent surgery with tumor excision and limb salvage (56%). Most of them did not receive any radiation therapy (93.3%), but most received chemotherapy (64%). On the other hand, most of the patients with osteosarcomas located on the forearm, arm or shoulder had similar characteristics, except that they had bigger tumors > 8cm (49.9%) more frequently. When demographics and tumor characteristics were compared between the two groups, patients with osteosarcoma of the hand were less likely to having a high-grade tumor (58.7% vs. 64.7%; OR: 0.13; IC: 0.02-0.84, p-value <0.05). No statistical differences were found on age, gender, histology, tumor size, metastasis to lungs, type of surgery and chemotherapy. Regarding to the survival, we found a 10-year overall survival of 51% for osteosarcomas of the upper extremities. No statistical difference was found between both locations.

CONCLUSION: This study identifies important aspects to consider in upper extremities osteosarcoma. Reported demographics, tumor characteristics and survival rates render an approximation of the disease aggressiveness in order to promptly approach, diagnose and treat; and avoid total amputation, conserving functionality and ultimately, aiming to improve survival rates.

Factors Associated with Residual Tumor in Margins after Excisional Surgery in Invasive Melanoma Patients

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PURPOSE: The surgical management of invasive melanoma has been debated for many years and recommended excisional margins were established to avoid recurrence. However, the presence of recurrence of the disease still prevails. We aim to describe the factors associated with the presence of residual tumor after surgical treatment in patients with invasive melanoma lymph nodes negative.

METHODS: We performed a descriptive study to analyze the factors associated with the residual tumor on margins after the excisional surgery in invasive melanoma patients with lymph nodes negative diagnosed from 2004 to 2015 by querying the National Cancer Database (NCDB). Patients were divided according to Breslow depth in four following groups: <1 mm (group 1), 1.01-2 mm (group 2), 2.01- 4 mm (group 3) and > 4 mm (group 4). Factors analyzed included age, sex, comorbidities, site of melanoma, ulceration, excisional margins and facility type. Statistical analysis was performed using Chi-square and a multivariate logistic regression model, p-value <0.05 was considered significant.

RESULTS: 26,440 patients diagnosed with invasive melanoma with lymph nodes negative met the inclusion criteria. 7,182; 10,227; 5,789 and 3,242 patients formed group 1, group 2, group 3 and group 4, respectively. In group 1, patients older than 80 years at diagnosis (16.8% vs 5.6%, OR: 4.45, CI: 2.33-8.52, p-value<0.001), with the melanoma located on the head and neck (30.5% vs 13.9%, OR: 2.14, CI: 1.28-3.57, p value=0.004), and patients who underwent surgery with excisional margins more than 2 cm (46.3% vs 30.9%, OR: 1.92, CI: 1.28-2.89, p-value=0.002) were more likely to present residual tumor on margins after excision, compared to the ones that did not have residual tumor on margins after surgery. In group 2, only patients with invasive melanoma located in the head and neck (33.9% vs. 15%, OR: 2.52, CI: 1.61-3.96, p-value <0.001) were more likely to present residual tumor after the excisional surgery. In group 3 and 4, older age and location of the melanoma in the head and neck were factors independently associated with the presence of residual tumor after surgery (p-value <0.05).

CONCLUSION: We found that older age at diagnosis and location in the head and neck were positive factors independently associated with the presence of residual tumor on the margins. We revealed a possible presence of microscopic melanotic tumor cells surrounding the invasive melanoma lesions that may be the cause for the association of wider excisional margins and the presence of residual tumor in group 1. Knowledge of the factors associated with the residual tumor will help to establish patient-centered management and decrease the recurrence of the disease.

A 20-Year Tertiary Cancer Center's Experience Utilizing the Gracilis Myocutaneous Flap

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BACKGROUND: The gracilis myocutaneous flap is a versatile reconstructive option and, as a pedicled flap, is a mainstay choice for the reconstruction of many complex defects of the pelvis, trunk, and abdominal wall. Despite wide applicability, concerns are often raised regarding the unreliable vascular perfusion of the distal third of the flap's skin paddle. This study presents an institution's 20-year experience utilizing the pedicled gracilis myocutaneous flap for various oncologic defects to highlight the versatility, safety, and utility of this flap.

METHODS: A retrospective analysis was performed for patients who underwent reconstruction utilizing a gracilis myocutaneous flap over the course of twenty years (January 1998 - June 2018). Patient demographics, comorbidities, and history of recipient bed radiation were recorded. Postoperative outcomes were reviewed to determine the incidence of infection, dehiscence, seroma, or hematoma for both donor and recipient sites. Incidence of flap skin or muscle loss was also recorded.

RESULTS: A total of 37 patients met our inclusion criteria, and data from 41 vertically oriented gracilis myocutaneous flaps was analyzed. The mean age for this cohort was 53 years, and the mean body mass index (BMI) was 24.7 kg/m^2. A majority of our patients had a previously irradiated wound bed (73%, n = 27). The most common defect prompting reconstruction was abdominoperineal resection (51.4%, n = 19), followed by total pelvic exenteration (29.7%, n = 11). The overall donor site complication rate was 19.5% (n = 8) and included infection (7.3%, n = 3), dehiscence (4.9%, n = 2), seroma (12.2%, n = 5), and hematoma (7.3%, n = 3). The recipient site complication rate was 41.5% (n = 17) and included infection (12.2%, n =

5), dehiscence (22%, n = 9), seroma (19.5%, n = 8), and partial flap loss (14.6%, n = 6). Partial flap loss included distal flap skin necrosis incidence (9.7%, n = 4). Recipient site hematoma or total flap loss did not occur in any patients. Mean follow-up time was 300.6 days.

CONCLUSION: When taking into account the size of the primary defect prompting reconstruction and prior recipient bed irradiation history, our cohort shows reasonable complication rates with no occurrences of distal flap tip necrosis or total flap loss. Donor site complication rates are similar to those seen with reconstruction utilizing the vertical rectus abdominus musculocutaneous flap, and the risks associated with abdominal wall weakness are avoided.[1] Distal tip skin necrosis rate was also low, which suggests that the distal third's vascular supply should not be a limiting factor when considering the gracilis myocutaneous flap for reconstruction. The risk of skin loss can be minimized through atraumatic microvascular dissection techniques including greater fascial and angiosomal preservation and maintenance of the proximal tissue perforators. Increased experience employing these techniques may allow for more frequent and efficient use of the pedicled myocutaneous flap in a variety of reconstructions.

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Perforator to Perforator Vascularized Sural Nerve Flap Using Supermicrosurgery in Extremity Reconstruction

Presenter: Mohammed Hassan El Fahar, MD, PhD, EBOPRAS, DAFPRS

Affiliation: Mansoura University, Mansoura

Rationale = Vascularized nerve grafts are superior to traditional nerve grafts, particularly in a scarred recipient bed. Longer defects are best repaired primarily with vascularized tissues, and a vascularized sural nerve is one option. In our series, we investigated the harvest of the vascularized sural nerve flap (VSNF) based only on one gastrocnemius perforator for the reconstruction of different nerve defects.

Materials and Methods = Nine patients with evident nerve injuries were diagnosed clinically and confirmed by nerve conduction, and EMG studies were performed. The VSNF was divided and folded to bridge the desired girth. Anastomosis was performed as perforator-to-perforator concept using supermicrosurgery.

Results: The average nerve gap was 9.1±1.1 cm. The VSNF was used to reconstruct peripheral nerve injuries in the extremities of the patients, including 5 cases of median nerve injury, 2 of posterior tibial nerve injury and 2 of peroneal nerve injury. The main cause of injury was machinery accidents (67%). The average harvested VSNF was 25.2±4.2 SD cm, with a range of 20 to 31 cm. The follow-up period was 26.4± 2.6 months.

Conclusions: The use of a VSNF is a very promising solution for the treatment of long gapping neuroma in peripheral nerves. The sural nerve flap is one of the best donor sites with constant anatomy. Supermicrosurgery allows a very short pedicle to be anastomosed without deep muscular dissection.

Hand Surgery Referral Patterns Among Primary Care Physicians in the United States

Presenter: Steven Junior Hermiz, MD
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Purpose: Board certified hand surgeons go through one year of fellowship training after completing one of three primary residency programs: orthopedic surgery (OS), plastic surgery (PS), or general surgery (GS). The purpose of our study was to examine Primary care provider's (PCP) referral patterns for hand surgery in the United States (US).

Methods: PCPs across academic medical institutions in the US were emailed a survey questionnaire. Participants were required to be practicing PCPs in the US. Questions were structured requiring participants to choose one of three options: OS, PS, or GS that they would likely refer to for particular hand pathology.

Results: 1439 questionnaires were sent. 731 surveys were completed (51% response rate, 353 males, 377 female). For treatment of arthritis 91.6% selected OS, 8.3% PS, 0% GS. Nerve decompression 83.7% OS, 13.8% PS, and 2.5% GS. Nerve injuries 61% OS, 37.9% PS, 1.1% GS. Tendon injuries 81.5% OS, 17.3% PS, 0.96% GS. Congenital deformities 52.3% OS, 47.6% PS, 0% GS. Fractures 97% OS, 2.6% PS, 0.27% GS. Sports related injuries 97.4% OS, 1.64% PS, 0.82% GS. Soft tissue masses 62.7% OS, 23.5% PS, 13.5% GS. Soft tissue coverage 89.6% PS, 7.7% OS, 2.6% GS. Skin cancer related problems 73.9% PS, 20.3% GS, 5.5% OS. There was significant variance when comparing selection of OS with PS ($p=0.018$) and GS ($p= 0.0001$).

There was also significant variance when comparing selection of PS with GS (p=0.0097).

Conclusion: Referrals for arthritis, nerve decompressions, nerve injuries, tendon injuries, soft tissue masses, fractures, and sports related injuries were more likely to be referred to OS. Referrals for soft tissue coverage and skin cancers were more likely to be referred to PS. Congenital deformity referrals were similar between OS and PS. Further work should be conducted to determine why referral patterns vary among specific specialties with similar overall training and board certification. In conclusion, educating PCPs on the capability or repertoire of plastic surgery trained hand surgeon is vital, as they appear to be the gatekeepers for referrals.

Adipose Stem Cell Therapy for Amputation Site Soft Tissue Restoration: A Prospective Randomized Controlled Clinical Trial

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Background: Nearly 2 million people in the United States experience limb loss each year. Challenges precluding successful long-term prosthesis use include skin break down, pain, and poor fit. These challenges are often exaggerated for military service members with combat-related wounds. The aim of this Department of Defense supported study, was to assess the efficacy of standard autologous fat transfer compared to fat graft enriched with adipose derived stem cells to reduce pain and improve lower extremity amputation site soft tissue volume and quality.

Methods: Ten patients with pain and limited function at amputation sites were randomized to either the Standard Group treated with autologous fat grafting to the amputation site; or the Enriched Group, which was enriched with stromal vascular fraction, which is a concentrated source of adipose derived stem cells (ASC). Outcome measures included: 1) Pain score (visual analog scale), 2) Graft cell composition (flow cytometry), 3) Volume retention assessed by CT scan, and 4) Quality of life questionnaires (RAND SF-Item Health Survey and satisfaction with physical appearance scale).

Results: Study subjects were randomized (Enriched, n=3, mean age 46.4±18.1; Standard, n=7, mean age 56.3±13.0). All participants received treatment with no significant adverse events. Follow-up was two years. No significant differences ($p=0.06$) were detected in graft cell viability (82.7±3.6% in the Enriched Group and 69.9±31.8% in the Standard Group). The composition of the harvested fat was similar between groups (Enriched: 36.0% ASC, 5.9% endothelial, 1.5% pericyte, 54.8% non-hematopoietic; Standard: 28.8% ASC, 4.3% endothelial, 1.3% pericyte, 42.3% non-hematopoietic).

Subjects in the Enriched Group experienced a significant reduction in pain, beginning at two months post-procedure and lasting through 24 months ($p<0.05$). The Standard Group reported at trend towards improvement in pain scores that reached statistical significance at three and six months post-operatively ($p<0.05$). The Enriched Group had better pain control than the Standard Group that reached statistical significance at two months post-procedure ($p=0.036$). Both groups demonstrated improvement in hypersensitivity, prosthetic fit, and pain at one month post-treatment, lasting through two years. Importantly, six of the ten subjects discontinued pain and/or anti-anxiety medication after fat grafting.

There was no significant difference between groups in graft volume retention ($p>0.05$).

There was significant improvement in self-rated satisfaction with physical appearance ($p=0.007$) and a trend for improvement in self-rated freedom from pain.

Conclusions: Fat grafting to individuals with complicated residual limbs reduces pain and hypersensitivity, while enhancing prosthetic fit and quality of life. Graft enrichment with adipose stromal cells further enhances pain relief.

Lymphaticovenous Bypass for Lymphedema Prevention in Melanoma Patients

Presenter: Cagri Cakmakoglu, MD
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Purpose: Extremity lymphedema is a feared sequela of axillary or ilioinguinal lymph node dissection (LND). In traditional lymph node dissection, no effort is made to preserve or restore upper or lower extremity lymphatic flow. We hypothesized that prophylactic lymphatico-venous bypass (LVB) could be a reproducible technique to preserve functional lymphatic flow following axillary and ilioinguinal LND in

melanoma patients. This study reports the first prophylactic LVB in melanoma patients undergoing complete LND for gross metastatic disease.

Methods: We present a case series of fifteen patients with malignant melanoma who had axillary or ilioinguinal LND for bulky regional involvement and who underwent prophylactic LVB. Details of the surgical procedure, common pitfalls, as well as indications are discussed.

Five cc of indocyanine green (ICG) dye is injected into the hand or foot web spaces. Meticulous complete LND is then started using loupe magnification, minimal cautery dissection, and sharp lymphatic and venous transection. During lymphadenectomy, the lymphatics are assessed using ICG lymphangiography and a fluorescent surgical microscope. Using the multispectrum platform with its rainbow color on-lay software, smaller lymphatic vessels are classified based on their signal intensity, with red indicating the highest intensity and blue the lowest. Those lymphatics that need to be transected and are red on the rainbow color on-lay scale are selected for anastomosis.

Results: During this study period, 15 patients underwent lymphatic preservation surgery (LPS). Multiple subdermal ICG dye injections allowed for visualization of 1–3 transected lymphatics after LND. An average of 1.8 LVBs (range 1–2) were performed per patient. All the anastomoses were patent as shown by ICG lymphangiography.

End-to-end anastomosis was employed in four patients and intussusception anastomosis was performed in 11 patients. LVB operative time varied from 40–150 minutes. Drain period ranged from 6 to 18 days.

Conclusions: Performing LVB in prophylactic setting with gross metastatic disease in melanoma patients distinguishes our study from others. In our study, using ICG angiography we identified lymphatic vessels under up to 42x magnification, including those with high flow based on a gradient scale via rainbow color on-lay software system.

Traditionally, isosulfan and methylene blue are used for lymphatic visualization. However, they have a risk of severe hypersensitivity reactions, isosulfan blue might interfere with oxygen saturation, and their use is associated with increased incidence of tissue necrosis. Using ICG eliminates these risks.

In 2017, Multicenter Selective Lymphadenectomy Trial -II showed no survival difference in patients with intermediate thickness node positive melanoma who underwent immediate CLND. Thus, most patients undergoing lymphadenectomy

currently have gross, many times bulky metastatic disease. Despite more extirpative surgery as compared to CLND for positive sentinel lymph node biopsy (SLNB), we were still able to easily identify lymphatics and appropriate recipient veins in all our patients. Expensive and time-consuming radioactive tracer studies were not needed.

This technique is reproducible as we have successfully completed this procedure in all 15 consecutive cases. Restoration of lymphatic flow following axillary or ilioinguinal LND in melanoma patients represents a new approach that may decrease the burden of iatrogenic extremity lymphedema.

Acute Vascular Compromise Risk Factors and Management in Vascularized Lymph Node Transfer: A 10 Year Review

Presenter: Nicholas T. Do, MD
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Background: Acute vascular compromise is a potential complication of any free flap but differences exist specific to the flap and the pathology prompting free tissue transfer. This study seeks to identify risk factors for early vascular compromise specific to vascularized lymph node transfer (VLNT) for breast cancer related lymphedema (BCRL).

Methods: All patients undergoing VLNT for BCRL between 2008 and 2018, as performed by the senior author, were retrospectively reviewed for re-operative episodes. Demographics, medical history, breast cancer treatment history, lymphedema history, peri-operative factors, and 1 year outcomes were analyzed. Rate of VLNT vascular compromise was compared to other free flaps (i.e. breast reconstruction) performed during the same time period.

Results: Fifty-four patients received 55 upper extremity VLNTs between 2008 and 2018. Patients mean age was 57.11±8.73years and mean BMI was 27.03±4.15 kg/m^2. Patients had experienced 3.58±2.52 years of lymphedema symptoms with increased circumferential differentiation in the affected arm and 2.48 ±1.84 cellulitis episodes per year. There were 8 vascular compromises: 2 arterial occlusions, 4 venous occlusions, and 2 partial skin paddle necroses. All VLNT flaps survived. Re-exploration rate was 15%, which was twice the rate for DIEP flaps during the same period (8%). Breast cancer treatment history elements nor severity of lymphedema, as defined by limb circumference metrics and number of cellulitis episodes, were not

significantly different between patients eventually experiencing vascular compromise and those that did not. Compared to non-vascular compromise patients, vascular compromise patients were more likely to require anastomotic revision during their initial surgery (63% vs 28%, p=0.048). While length of stay was longer with vascular compromise patients (22.57 vs 13.85 days, p=0.026), lymphedema outcomes at 1 year (circumferential limb measurements & number of cellulitis episodes) were not statistically different from non-compromise patients.

Conclusions: Vascular compromise has an incidence of 15% in VLNT. Breast cancer treatment history nor severity of lymphedema was not found to be associated with vascular compromise. Potential associated risk factors include need for anastomotic revision during the initial operation. If salvage is expeditious and successful, lymphedema outcomes at 1 year may not be adversely affected by vascular compromise.

Uncovering Lymphatic Transport Abnormalities in Patients with Primary Lipedema: An Update

Presenter:	Pedram Goel, MD
Co-Authors:	Daniel J. Gould, MD, PhD, Bassim El-Sabawi, MD, Ido Badash, BA, Patrick M. Colletti, MD, Ketan M. Patel, MD
Affiliation:	Keck School of Medicine of USC, Los Angeles, CA

Background: Although lipedema is often clinically distinguished from lymphedema, there is considerable overlap between the 2 entities. The purpose of this study was to evaluate lymphoscintigraphic findings in patients with lipedema to better characterize lymphatic flow in this patient population.

Methods: This is an updated 4-year experience containing significant new information of patients with lipedema receiving lymphoscintigraphy at our institution between January 2015 and October 2017. Patient demographics, clinical characteristics, and lymphoscintigraphic findings were extracted. Klienhan's transport index (TI) was utilized to assess lymphatic flow in patient's lower extremities (LEs). Scores range from 0-45, with values >10 denoting pathologic lymphatic transport.

Results: 19 total patients with lipedema underwent lymphoscintigraphic evaluation. Mean age was 54.8 and mean BMI was 35.9 kg/m2. Severity of lipedema was classified as stage 1 in 5 patients (26.3%), stage 2 in 4 patients (21.1%), stage 3 in 4 patients (21.1%), and stage 4 in 6 patients (31.6%). The mean TI for all extremities was 12.5. 24 (63.2%) LEs had a pathologic TI , including 7 LEs with stage 1 (29.2%),

3 LEs with stage 2 (12.5%), 6 LEs with stage 3 (25.0%), and 8 LEs with stage 4 lipedema (33.3%). The mean TI was significantly greater for extremities with severe (stage 3/4) lipedema than those with mild or moderate (stage 1/2) lipedema (15.1 vs. 9.7, p=0.049). Mean difference in TI scores between each LE for individual patients was 6.43 (SD 7.96).

Conclusions: Our results suggest that patients with lipedema have impaired lymphatic transport, and more severe lipedema may be associated with greater lymphatic transport abnormalities.

8:50 AM - 8:55 AM

Reconstructive Algorithm of Oncologic Resections of the Upper Torso and Shoulder Girdle

Presenter:	Margaret S. Roubaud, MD
Co-Authors:	Stephanie Nemir, MD, PhD, Alexander F. Mericli, MD, Matthew M. Hanasono, MD, David M. Adelman, MD, PhD
Affiliation:	University of Texas, MD Anderson Cancer Center, Houston, TX

Purpose: Oncologic resections of the upper torso and shoulder girdle are rare but are sometimes required for aggressive cancers such as sarcoma. Extirpative defects frequently include exposure of major neurovascular structures, bone, and viscera that significantly impact patient function. Due to the rarity of these resections, an advanced reconstructive algorithm has yet to be defined. We present the largest series to date of oncologic reconstructions in this region, including massive defects due to shoulder disarticulation and forequarter amputation. Our reconstructive algorithm includes local, regional, and microvascular free flap options for reconstruction.

Methods: A retrospective chart review of all plastic surgery reconstructions performed for malignant tumor extirpation of the upper torso and shoulder girdle from January 2008 to January 2018 at the University of Texas MD Anderson Cancer Center. Data collected include patient details (age, sex, BMI, comorbidities), oncologic history (tumor type and status, neoadjuvant and adjuvant treatment), surgical detail (resection size and components, services involved, reconstruction type performed) and outcomes (complications, length of follow up, patient status).

Results: A total of 262 procedures in 230 patients were identified which met inclusion criteria. 59% of patients were male with an average age of 55 years (Range 6 months-89 years). Most patients were treated for a primary tumor (51%), although 32%, 9%, and 8% were treated for recurrent, metastatic, and radiation-induced tumors respectively. The most common tumor type was sarcoma (77%). Defect size averaged

182 cm^2 with a range of 4 to 1350 cm^2 (20.2% measured 0-50 cm^2, 26.0% measured 51-100 cm^2, 25.2% measured 101-200 cm^2, 17.2% measured 201-400 cm^2, and 11.5% measuring >401 $cm^{2)}$. Exposed structures included bone in 62.2%, major vessels in 43.1%, major nerves in 37.4%, and viscera in 11.5%. Endoprostheses were present in only 4%. Amputations occurred in 15% of patients, including forequarter with or without chest wall in 10% and shoulder disarticulations with or without chest wall in 5%. Other large bony resections occurred in 23% of patients, including total humerus, scapulectomy, chest wall, and/or a combination of these bony deficits. 37% of extirpative defects were closed with local tissue rearrangement only, whereas 47% required a pedicled flap, and 16% required a free flap. Latissimus dorsi and pectoralis major pedicled flaps were most commonly performed. Anterolateral thigh (7.6%) and fillet of forearm (2.7%) were the most commonly performed free flaps. As the size of the defect grew, so did the need for advanced reconstructive techniques. Of the 30 patients who had defects >401 cm^2, 11 (37%) required a pedicled flap, 8 (27%) required a free flap, and 3 (10%) required both a pedicled and free flap.

Conclusion: Extirpative defects of the upper torso and shoulder girdle are rare but serious resections that require dependable reconstruction. In our series, approximately one-third of patients were treated with complex closure or local tissue rearrangement, whereas the remaining two-thirds required pedicle or free flap reconstruction. In particular, as defect size and exposed structures increased, the necessity for advanced reconstruction also grew. We propose a reconstructive algorithm to guide the reconstruction of these difficult defects.

Nipple Autograft: External Scaffolding Preserves Projection of Minced Costal Cartilage

Presenter:	Arash Samadi, MD
Co-Authors:	Matthew A. Wright, BA, Alexandra J Lin, BA, Daniel O. Lara, BS, Jaime L Bernstein, MD, Jason A. Spector, MD
Affiliation:	Weill Cornell Medicine, New York, NY

Introduction: Nipple reconstruction is an essential last step of breast reconstruction after total mastectomy, bearing psychological significance for cancer patients, resulting in improved general and aesthetic satisfaction. However, most techniques such as local tissue flaps and engineered tissue substitutes such as the Cook Biodesign® nipple reconstruction cylinder are limited by secondary scar contracture and loss of neo-nipple projection leading to inconsistent results and increased patient dissatisfaction. Approximately 30,000 patients undergo deep inferior epigastric

perforator (DIEP) flap breast reconstruction annually, during which the excised costal cartilage (CC) is normally discarded. Herein, we propose utilizing minced CC as a highly incorporative viable graft. Furthermore, we have previously shown biocompatible, biodegradable 3D-printed scaffolds maintain the volume and contour of engineered auricular cartilage in the setting of auricular scaffold fabrication. In this study, we hypothesize that incorporating biodegradable 3D-printed external scaffold in our nipple constructs will further augment preservation of neo-nipple projection and contour.

Methods: Custom external scaffolds were designed with inner dimensions matching the Cook Biodesign® nipple reconstruction cylinder (interior volume: ~900mm3), then 3D-printed using polylactic acid (PLA). Patient derived CC was minced in sterile fashion and half of the samples were packed into 3D-printed PLA scaffolds; in the remainder, an equal volume of minced cartilage was wrapped in Surgicel® only. The constructs were implanted into nude rats by creating a subcutaneous pocket using a CV flap technique. After 3 months, histological, topographical and gross analysis were performed. To measure volume and topography, constructs were imaged via computed tomography with an animal CT scanner and then digitally reconstructed.

Results: After 3 months in-vivo, gross analysis showed improved preservation of contour and projection of the "scaffold protected" construct as compared to the "unprotected" implant. Hematoxylin and eosin staining in both groups showed the presence of healthy and viable cartilage after 3 months in-vivo which was confirmed by LIVE/DEAD assay. Formation of fibrous tissue around the minced CC was noted in both groups and resulted in consolidation of the minced cartilage into a nipple like shape. Preservation of neo-nipple projection was significantly improved in the scaffold protected group in comparison to unprotected group (91.6% versus 64.1%, $p=0.045$). Similarly, volumetric analysis showed superior preservation of volume in the scaffolded group in comparison to the unprotected group (895.5mm3 versus 607.8mm3, $p=0.019$). Further, the resultant tissue was spongy and compressible much like a native nipple.

Conclusions: We demonstrate that minced autologous CC, which is usually discarded during a DIEP procedure can be used as a viable implant for nipple reconstruction with favorable biomechanical qualities. Our 3D-printed biocompatible/biodegradable external scaffolds significantly mitigate loss of projection and contour of the constructs. This allows for custom design of desired shape and size of the nipple enabling the immediate fabrication of individualized engineered autologous implants tailored to patient desire (different sizes/levels of projection), without the loss of projection or topography seen with traditional approaches to nipple reconstruction.

Robotic-Assisted Latissimus Dorsi Muscle Flap for Autologous Breast Reconstruction

Presenter:	Eul Sik Yoon, MD, PhD
Co-Authors:	Kyung-Chul Moon, MD, Hyun-Dong Yeo, MD, Byung Il Lee, MD, PhD, Seung Ha Park, MD, PhD
Affiliation:	Korea University, Seoul

Background: Latissimus dorsi (LD) muscle flap has been widely used for autologous breast reconstruction.[1] Traditional open LD flap harvest requires a posterior donor site incision with a length of 15 – 45 cm. Although the scar can be camouflaged for women when wearing the bra, it tends to be long, frequently widens, and hypertrophies with time.[2]

Therefore, a minimally invasive technique to harvest LD muscle flap via endoscopic approach have been developed. Despite continuous improvements in surgical techniques and technologies, two-dimensional view and nonflexible instruments are limitations of endoscopic harvest of the LD muscle flap.[3] Meanwhile, a robotic-assisted LD muscle flap has been first introduced for autologous breast reconstruction after mastectomy.[4] The authors has demonstrated a modified robotic surgical technique using a transaxillary gasless technique for robot-assisted LD muscle flaps in 2012.[5] The purpose of this study was to introduce our 7-year experience with the robotic-assisted LD muscle flaps in autologous breast reconstruction.

Patients and Methods: Between October 2012 and February 2019, a total of 33 patients underwent autologous breast reconstructions using robotic-assisted LD muscle flap. Among 33 patients, 21 patients had Poland syndrome. Seven and 3 patients underwent robotic-assisted LD flap following immediate and delayed breast reconstruction after mastectomy, respectively. Two patients had capsular contracture of implant. Subjective assessment was performed to evaluate satisfaction of overall outcome, breast symmetry, and scar. Mean follow-up time was 29.8 ± 12.5 months (range, 3 to 61 months).

Results: All 33 flaps were successfully transferred without converting to open technique. As our experience with robotic-assisted LD flap increased steadily over the years, we have achieved improvements in surgical techniques and robotic instruments to comfort during surgery, optimize the results, and minimize complications and contour defects compared to the first time with robotic surgery. In addition, the time for robotic surgery system also markedly decreased after experience accumulation. Recently, the time for robotic docking and robotic surgery were about 30 and 60

minutes, respectively. At the last visit, patients' average grading of satisfaction of overall outcome, breast symmetry, and scar were 4.75 ± 0.23, 4.32 ± 0.63, and 4.88 ± 0.15, respectively. No serious complications such as flap loss were recorded for any patient.

Conclusion: Autologous breast reconstruction using robotic-assisted LD muscle flap might be effective and safe.

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Intravenous Tranexamic Acid in Implant-Based Breast Reconstruction Safely Reduces Hematoma without Thromboembolic Events

Presenter:	Joseph Banuelos, MD
Co-Authors:	Jason M. Weissler, MD, Christin A Harless, MD, Steven R. Jacobson, MD, Nho Van Tran, MD, Minh-Doan T. Nguyen, MD, PhD, Oscar J Manrique, MD, Jorys Martinez-Jorge, MD
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Purpose: Antifibrinolytic medications, such as tranexamic acid (TXA) have recently garnered increased attention in plastic surgery. Despite its ability to mitigate intraoperative blood loss and need for blood transfusion, there remains a paucity of research on TXA in breast reconstruction. The aim of this study was to investigate whether intravenous TXA reduces the risk of postoperative hematoma following immediate implant-based breast reconstruction.

Methods: A single-center retrospective cohort study was performed to analyze all consecutive patients undergoing immediate two-stage IBR following mastectomy over two years (2015-2016). The incidence of postoperative hematomas and thromboembolic events amongst all patients was reviewed. The patients in the intervention group received 1000 mg of intravenous TXA prior to mastectomy incision and 1000 mg at the conclusion of the procedure. Fisher's exact test and the Mann-Whitney-Wilcoxon test were used. Multivariate logistic regression models were performed to study the impact of intravenous TXA after adjusting for possible confounders.

Results: A total of 868 consecutive breast reconstructions (499 women) were reviewed. Overall, 116 patients (217 breasts) received intravenous TXA, whereas 383 patients (651 breasts) did not. Patient characteristics and comorbidities were similar amongst the groups. Patients who received TXA were less likely to develop hematomas (n=1; 0.46%) than patients who did not (n=19; 2.9%) after controlling for age, hypertension, and type of reconstruction (pre-pectoral and sub-pectoral) [*p=0.018*]. Adverse effects of intravenous TXA, including thromboembolic phenomena were not observed. Multivariate analysis demonstrated that age and hypertension independently increased risk for hematoma.

Conclusion: Intravenous TXA safely reduces risk of hematoma in IBR. Further prospective randomized studies are warranted to further corroborate these findings.

National Analysis of Patients with Ulcerated Melanoma in the United States

Presenter:	Daniel Boczar, MD
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BACKGROUND: The incidence of malignant melanoma diagnosis has steadily risen in the United States over the past several decades. Predictive factors specific to ulcerated melanoma prevalence and treatment outcomes have yet to be described in the United States. The aim of this study was to investigate the National Cancer Database (NCDB) for patients presenting with ulcerated melanoma or non-ulcerated melanoma, analyzing patient demographics, facility/treatment type and tumor characteristics.

METHODS: Data was extracted from the NCDB for all patients diagnosed with melanoma between 2004 and 2015, and divided based on presence of ulceration. Patient demographics, facility/treatment type and tumor characteristics were described and analyzed using chi-square or Mann-Whitney tests as appropriate. Multivariate analysis was performed using logistic regression to assess independent associations adjusting for confounders.

RESULTS: A total of 459,211 patients were included, with 393,812 patients with non-ulcerated melanoma (85.8 percent) and 65,399 with ulcerated melanoma (14.2 percent). Ulcerated melanoma was significantly more prevalent among males and within patients older than 70 years ($p < 0.001$) and was correlated with Breslow depth greater than 2.00 mm and tumor stage II, III or IV ($p< 0.001$). Patients with private insurance were found to present a statistically significant lower rate of ulcerated melanoma. Patients with ulcerated lesions were found to be treated at Academic/Research programs less frequently compared to patients with non-ulcerated lesions. Also, ulcerated melanomas are more frequently found on extremities and less frequently found on the head and neck ($p< 0.001$). Furthermore, ulcerated melanoma patients experienced longer time to discharge after surgery (1.59 days for non-ulcerated melanoma versus 2.45 days for ulcerated melanoma) ($p<0.001$). In multivariate analysis, higher odds of ulceration were found in non-white patients compared to white patients; Ages 50-59, 60-69, 70-79 and 80+ years old compared to 0-49 years; Stage II, III and IV compared to Stage 0; Invasive behavior compared to in situ; And melanoma located on the trunk and extremities compared to head and neck.

CONCLUSIONS: This national database analysis of predictive factors associated with ulcerated melanoma diagnosis and prevalence may have the potential to influence diagnostic guidelines and treatment protocols for such lesions.

An Orthoplastics Approach to Extremity Reconstruction Following Oncologic Resection

Presenter:	Nicholas C. Oleck, BA
Co-Authors:	Haripriya S. Ayyala, MD, Margaret M. Dalena, BS, Ramazi O Datiashvili, MD, PhD, Edward S. Lee, MD, Jonathan D Keith, MD
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Purpose: A multidisciplinary, orthoplastics approach to a complex surgical challenge is an emerging concept in the field of reconstructive surgery. This team-based approach with evaluation and input from both orthopedic surgeons and plastic

surgeons before the initial tumor resection and reconstruction has broad implications and is particularly well suited for oncologic surgery. Traditionally, orthopedic oncologic surgery was performed by a single team with plastic surgery as an afterthought if soft tissue coverage was found to be inadequate at the time of surgery. A multidisciplinary approach may enhance the reconstructive options available to the patient, limit additional surgical procedures, and may improve both functional and aesthetic outcomes. In this study, the authors present their experience with lower extremity reconstruction following orthopedic tumor resection and investigate the impact of an orthoplastics approach on patient outcomes.

Methods: A retrospective review was performed for all patients with a diagnosis of lower extremity neoplasm requiring orthopedic resection and plastic surgery reconstruction between 2000-2017 at University Hospital in Newark, NJ. Comparisons between orthoplastic and traditional reconstruction groups were made utilizing Pearson's χ^2 and t-test, with $p<0.05$ as the degree of statistical significance.

Results: A total of fifty-four patients were included in our study. The mean patient age at date of surgery was 34.9 years. The most common neoplasm identified was osteosarcoma (n=10), followed by chondrosarcoma (n=9), and Ewing Sarcoma (n=4). Plastic surgery was involved concurrently with the orthopedic team for immediate reconstruction in thirty-six cases (66.7%) and consulted at a second stage in the remaining 18 (33.3%). No significant disparities in group demographics between the two sub-cohorts were identified. The most frequent reconstructive options utilized in the traditional group were a regional gastrocnemius muscle flap (n=8), adjacent tissue transfer (n=8), and rectus abdominus free muscle flap (n=3). In the orthoplastics group, regional gastrocnemius flap was also the most common (n=13), followed by free rectus abdominus muscle flap (n=10), and free latissimus dorsi muscle flap (n=6). Free flaps were used significantly more often in the orthoplastics cohort ($p < 0.05$) and local flaps were used significantly more often in the traditional group ($p < 0.01$). There was no significant difference in rates of minor complications between the two cohorts, including wound dehiscence, partial flap necrosis, seroma, hematoma and superficial surgical site infection. Major complications -- including deep wound space or prosthesis infection, allograft failure, flap loss and flap necrosis -- were significantly less frequent in the orthoplastics cohort ($p < 0.05$). Patients in the orthoplastics cohort required significantly fewer procedures on average compared to patients within the traditional group (1.61 vs. 2.58, $p < 0.01$).

Conclusion: The orthoplastics approach to extremity reconstruction appears to be a safe and effective alternative to traditional multi-stage reconstruction. Our findings suggest that this team-based approach may minimize the number of required operative procedures while maintaining comparable outcomes and complication rates.

A NSQIP Analysis of Reconstruction Following Vulvovaginectomy: Identifying Complications and Risk Factors

Presenter: Dustin T. Crystal, BS
Co-Authors: Louise L Blankensteijn, MD, Ahmed M. S. Ibrahim, MD, PhD, Samuel J. Lin, MD
Affiliation: University of Pennsylvania, Philadelphia, PA

Purpose: Albeit rare, vulvovaginal neoplasia exert a significant morbidity and mortality among patients. Wide surgical resection is standard of care and often performed in unison with a variety of reconstructive modalities. With a paucity of literature and large prospective trials, complication profiles are not well defined. This study aims to assess adverse events of reconstruction following vulvovaginectomy.

Methods: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) was queried from 2005-2016 for patients undergoing vulvovaginectomy for lower gynecologic dysplasia and/or neoplasia with concurrent reconstruction. Patients were isolated through International Statistical Classification of Disease (ICD) and Current Procedural Terminology (CPT) codes. Cohorts were assembled by reconstructive modality: local tissue rearrangements; flap reconstructions; other modalities (skin grafting, simple/intermediate/complex closure); and combined modalities (multiple concurrent reconstructive procedures). The Modified Frailty Index, an aggregate score of five NSQIP comorbidities, was utilized as a composite predictor of patient well-being and postoperative morbidity and mortality. 30-day complication profiles were stratified by reconstructive modality. Multivariate regression analysis controlling for age, body mass index, race, and operative time was utilized to determine risk factors associated with the development of complications.

Results: A total of 351 patients were identified as undergoing immediate reconstruction following vulvovaginectomy. The majority of patients were elderly (mean age of 62.7 +/- 13.8 years) and of overweight or obese body mass indices (64.1%). In total, 50.4% of patients experienced at least one postoperative complication within 30 days of the surgery. Stratifying by reconstruction, complications were statistically different between groups ($p<0.001$), with a greater incidence of complications in patients undergoing flap (65.1%) and combined modalities (73.3%) reconstruction compared to reconstruction by other modalities (20.9%) and local tissue rearrangements (25.0%). A history of disseminated cancer (OR 2.885; 95%CI 1.156-7.200; $p=0.023$) and a frailty index of 3 (OR 30.064; 95%CI 2.964-304.946; $p=0.004$) were identified as factors increasing the likelihood of all-

cause complications. A frailty index of 3 was additionally found to be a predictive factor increasing the likelihood of developing a wound complication (OR 5.283; 95%CI 1.002-27.849; p=0.050), while smoking conferred a significant risk towards the development of a severe systemic complication (OR 4.028; 95%CI 1.125-14.416; p=0.032).

Conclusions: Reconstruction following vulvovaginectomy is uncommon and the incidence of complications is high. Careful consideration should be given to patients with histories of disseminated cancer or frailty indices of 3 when counseling patients.

Characterization of Face Transplant Candidates at the First United States Institution to Perform a Face Transplant

Presenter:	Rebecca Knackstedt, MD, PhD
Co-Authors:	Maria Siemionow, MD, PhD, DSc, Francis A. Papay, MD, Risal S. Djohan, MD, Deb Priebe, BS, Brian Gastman, MD
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Introduction: With over 38 documented face transplants performed worldwide, an increasing number of patients are being referred by physicians or self for transplant consideration. However, these patients are not always eligible for transplantation or less aggressive reconstructive options exist. We have previously published a classification system, based on lessons learned from our institution and from cases worldwide, that was an extension of Cordeiro and Santamaria's. As the first U.S. medical institution to begin a face transplantation center, we have learned significantly from our evaluation process and we have experienced a high number of referrals for face transplantation consideration. In this article, we utilize the classification system previously described by our institution to characterize the patient population who presented for face transplant consideration and report on their evaluation and management. This is the first article of its kind to report on patients who present for face transplantation consideration to discuss their presentation and management.

Methods: After receiving IRB approval, chart reviews were conducted for patients who had been referred to the Cleveland Clinic for consideration for face transplantation. Medical records were reviewed for nature of defect, tissue deficiency, surgical and medical history and institutional recommendations. For each patient, the tissue deficiency was characterized as previously proposed by our institution.

Results: Including our initial face transplant in 2007, patients 19 patients were evaluated at the Cleveland Clinic for facial transplantation consideration. Eight patients enrolled in the protocol, three of whom were subsequently underwent transplantation and five of whom did not undergo transplantation at our institution. Five patients were evaluated in clinic, were deemed not appropriate candidates and thus were not enrolled in the transplant protocol. Six patients who were invited for clinic evaluation based on initial inquiry never presented for evaluation. Of the patients that were enrolled but not transplanted, one patient was a Vaii, one was a Vb and three were Vcii defect classifications. Of the patients that were not enrolled, one patient was a Vai, two were Vaii, one was a Vb and one was a Vcii defect classification. All were referred for conventional reconstruction.

Discussion: As an increasing number of patients are considered for facial transplantation, we hope that with transparent reporting, there is increased knowledge and discussion about this patient population. While facial transplantation is a remarkable tool that can restore form and function to individuals, it is not without risks. Thus, the decision to embark on a face transplantation pathway requires a careful discussion with patients, families and the care of a multi-disciplinary team. We hope that with the utilization of our previously published a classification system, the ease at which patients are discussed amongst institution can be encouraged and transparent reporting can be enabled.

Limb Salvage Rates and Functional Outcomes Using a Longitudinal Slit Arteriotomy End-to-Side Anastomosis for Limb-Threatening Defects in a High-Risk Patient Population

Presenter:	Cara K. Black, MD
Co-Authors:	Kenneth L. Fan, MD, Manas Nigam, MD, Kyle Luvisa, MPH, Michael DeFazio, MD, Vikas S. Kotha, BS, Christopher E. Attinger, MD, Karen Kim Evans, MD
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Purpose: Lower extremity salvage techniques using free tissue transfer(FTT) in patients with chronic wounds due to long standing osteomyelitis, diabetes, and peripheral vascular disease(PVD) are technically challenging and usually require an end-to-side anastomosis due to ongoing peripheral vascular disease. The Longitudinal Slit Arteriotomy End-to-Side Anastomosis (LS-ETSA) is our preferred technique because it is the least invasive arteriotomy for diseased recipient arteries. We reviewed our highly comorbid patients who underwent FTT with this technique to understand the success rates, overall outcomes and long-term limb salvage rates.

Methods: The LS-ETSA technique involves a longitudinal slit made in the recipient vessel, whereby the flap donor artery is sutured from heel to toe in an interrupted fashion. The slit of the recipient vessel sutured to the flap artery forms an elliptical area of arterial patency in the area of anastomosis. We prefer this technique because it is the least invasive arteriotomy for diseased recipient arteries and is least damaging to the intima. A retrospective review was performed to analyze outcomes of FTT using LS-ETSA between April 2012 and August 2018 by the senior surgeon. Pearson's Chi Square or Fisher's Exact test were used as appropriate for comparing categorical variables.

Results: 115 free flaps were identified. Patients were on average 55.9 years old, BMI 29.2 kg/m^2. Etiologies included: osteomyelitis (83.5%), hypertension (60.9%), diabetes (44.3%), tobacco use (46.1%), PVD (44.3%), hypercoagulability (35.7%), arterial calcifications (17.4%). Overall flap success was 93.0%. 27.8% required reoperation in the perioperative period due to complications. On univariate analysis, DM, HTN, and hypercoagulability were significantly associated with the eventual need for amputation ($p < 0.05$). Multivariate analysis showed that intra-operative thrombosis was independently associated with flap failure (OR 4.56, $p = 0.022$) and overall flap complications (OR 3.24, $p = 0.038$). There was an overall limb salvage rate of 83.5%, and of those salvaged, 92.7% were ambulating without a prosthesis at a mean follow up time of 1.53 years.

Conclusions: We present the largest series of LS-ETSA for patients undergoing FTT for limb threatening defects in the compromised host. This technique optimizes overall flap success, limb salvage rates and functional outcomes.

A Systematic Review and Meta-Analysis of Flap Reconstruction Outcomes for Sacrectomy Defects

Presenter:	Malke Asaad, MD
Co-Authors:	Aashish Rajesh, MBBS, Krishna S Vyas, MD, PhD, MHS, Waseem Wahood, MS, Matthew T Houdek, MD, Steven L. Moran, MD
Affiliation:	The University of Texas MD Anderson Cancer Center, Houston, TX

Purpose: Following excision of sacral tumors, plastic surgeons are often faced with a large soft tissue defect which necessitates flap coverage to promote wound healing and fill the resulting dead-space. The purpose of this meta-analysis is to evaluate the outcomes and complications following soft tissue reconstruction of sacrectomy defects.

Methods: Applying the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA), a comprehensive search of Embase, Ovid MEDLINE, and Cochrane databases was performed from 1950 to January 2019 for articles reporting outcomes of soft tissue flap reconstruction after sacrectomy. Comparison of complication rates at the flap site between those undergoing high sacrectomy (osteotomy at or above the S2 level) and low sacrectomy (S3 and lower); and radiation vs. no radiation, was conducted. The results were summarized with odds ratios (ORs).

Results: A total of 544 articles were identified in the initial search, out of which 26 met our inclusion criteria. A total of 353 patients underwent sacrectomy and flap reconstruction. Sacral chordoma was the most common cause of sacrectomy (n=143, 45%), followed by colorectal cancer (n=83, 26%). High sacrectomy was performed in 64% (n=187), and low sacrectomy in 36% (n=107) of the cases. Gluteal-based flap was the most commonly used (n=178, 50%) followed by the vertical rectus abdominis myocutaneous (VRAM) flap (n=134, 38%) and free latissimus dorsi (n=19, 5%).

Patients who underwent high sacrectomy had significantly higher local complications than those who underwent low sacrectomy [OR: 2.57 (1.12, 5.92); p=0.03]. Patients who underwent preoperative radiation had a higher complication rate than those who did not [OR: 2.91 (1.25, 6.79); p=0.01].

The pooled overall local complication rate in the gluteal-based flap cohort was 39% (95% CI*:* 27-50). Flap loss was reported in 1 patient. In the VRAM group, analysis revealed a pooled local complication rate of 46% (CI: 17-76%), while flap loss was reported in 2 patients. In studies that reported ambulation outcomes after gluteal muscle flap, 77 patients (91%) were ambulating independently, 7 patients (8%) needed assistance, and 1 patient (1%) was non-ambulatory.

Conclusion: Gluteal-based flaps and VRAM flaps are the two most common options for soft tissue reconstruction after sacrectomy. Both flaps demonstrate a high complication rate after this large procedure; however, total flap loss seems to be a rare occurrence. Patients with a previous history of radiation and high sacrectomy should be cautioned and counseled regarding the potential for wound complications. Most patients can achieve a good functional outcome following reconstruction.

Professional Burnout in United States Plastic Surgery Residents: Is It a Legitimate Concern?

Presenter: Demetrius M Coombs, MD

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Purpose: The rate of burnout in medicine is double that in other professions, and remains intimately associated with the desire to leave an institution, increased fiscal loses, substance abuse, depression, suicidal ideation, medical errors, and lower patient satisfaction scores. Unfortunately, no study, until now, has sought to examine burnout, as well as its relationship to medical errors and program-related factors, by directly sampling all U.S. Plastic & Reconstructive Surgery residents.

Methods: Cross-sectional study of data collected from current U.S. Plastic & Reconstructive surgery residents (Integrated and Independent) at ACGME-accredited programs during the 2018-2019 academic year as well as from participants in the 2018 ACAPS Plastic Surgery Boot Camps using the Stanford Professional Fulfillment Index (PFI), Maslach Burnout Index (MBI), Short Form-12 (SF-12) survey, alcohol use disorder identification test (AUDIT), and depression screening from the Personal Health Questionnaire (PHQ). Additional data collected included demographics, relationship status, call schedule, perceived impact within one's program, and admission of medical errors.

Results: One-hundred-ninety-five subjects responded. Residents from each post-graduate year in the first six years were well-represented. No relationship was found between burnout and age, gender, race, relationship status, or PGY-level. Residents who reported that they do not feel like they matched into the right program, would not recommend their program to medical students, and do not feel involved in program decisions had a significantly higher incidence of burnout; p=0.014, 0.001, and 0.013, respectively. There was a significant association between burnout and increasing hours worked in the week prior (p=0.031, OR=1.03). Residents who reported feeling that they were taking too much call had significantly higher incidence of burnout, as opposed to residents who felt they took an appropriate amount of call or too little call (p<0.001).Residents were more likely to be professionally fulfilled if they would recommend their program to medical students (p=0.02), felt involved in program decisions (p=0.008), and felt like they had matched into the right program (p=0.001).There was a significant increase is emotional exhaustion with increasing average weekly work hours (p=0.002, OR=1.04) and calls taken the month prior (p=0.03, OR 1.11). There was a significant increase in interpersonal disengagement with increasing average weekly work hours (p=0.002, OR=1.05) and calls taken the month prior (p=0.03, OR 1.12). A significant association exists between burnout and a major medical error that *could*have resulted in patient harm (p=0.014).A significant

association between burnout and lab errors (p=0.035) with a trending association between burnout and medication errors (p=0.078) was also observed.

Conclusion: This study represents the first and largest direct examination of burnout, self-reported medical errors, and program suitability in U.S. Plastic & Reconstructive residents using a validated scale and suggests that burnout and some medical errors may be related to program-specific, modifiable factors. Additionally, we propose a novel screening instrument for burnout amongst plastic surgery residents (SMOkE/R questionnaire) based upon the data and outline future studies in this three-part series to help optimize training within our specialty, facilitate curriculum development, and develop resources for residents burdened with burnout.

Development of Multi-Camera Mounted Surgical Lamp That Realizes Complete Automatic Recording of Plastic Surgery Videos without Cameraman

Presenter:	Hiroki Kajita, MD
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Purpose: Video recording of surgery has long been regarded as important. In many operating rooms, fixed-type video cameras are already installed. However, in reality, it is difficult to record good videos with these cameras because surgeons' heads and bodies often get in between the camera and surgical field, causing occlusions.
In order to solve the problem above, we devised a camera system in which multiple video cameras are installed corresponding to each group of light sources provided for the surgical lamp. In this study, we assessed the capture rate of the multi camera system during surgeries and applied the computer vision technologies to improve the usefulness of the videos.

Methods and materials: To make the camera system, we used a mobile stand type surgical light, which has five light modules, each containing seven LEDs. We replaced the center LED of each module with CCD camera, and adjusted the angles of the cameras, in order to capture the identical object illuminated by the LEDs, from different angles in the similar field of views.
To facilitate the viewing, we developed automatic video-switching system using image recognition technologies for the objects like surgical caps, surgical gloves, surgical fields and so on, which selects the camera that captures the surgical field with

the smallest occlusion by surgeons' heads and bodies. The viewpoints of the surgeons during procedures or the persons watching videos were also recorded by eye-tracking devices, and the information were also used to select better cameras or to validate the automatically edited videos.

Videos were recorded by our camera system for common plastic surgeries, and the capture rate of the surgical procedures, which equals to the rest of the fraction of the time period during which no cameras has captured the surgical field, were assessed. Also, as the user testing, the subjective evaluation on the camera system, recorded images and automatically edited videos were surveyed by questionnaires.

Results: With our camera system, the surgeons could automatically record the good surgical videos only by performing surgery as usual, without being conscious of the position of the cameras. Capture rate during the whole surgery were more than 95 percent, which were between 20 and 50 percent for the traditional cameras. Viewing the many screens at the same time was stressful, however, our video-switching system successfully selected the good-looking camera, and the viewers did not feel inconvenience.

Conclusions: Our multi camera system could not only automatically capture the almost all procedures of the surgeries but also display the images from the best viewpoints. If the camera system like ours are installed into the surgery room, every procedure of all the surgeries performed there will be automatically recorded, creating the huge volumes of video data. Supported by the computer vision technologies like image recognition, efficient utilization of tremendous number of surgical videos for the purpose of education or sophistication of the skills or techniques in the field of plastic surgery will be realized.

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The Reporting Quality of Randomized Controlled Trial Abstracts in Plastic Surgery

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Purpose: When evaluating RCTs, clinicians will often refer to the abstract for an initial assessment of the results and determine whether a full-text review is warranted. As such, the abstract may be the only portion of a RCT that is assessed and therefore must accurately reflect the full-text version of the article. This project aims to assess the reporting quality of RCT abstracts published within the top 5 plastic surgery journals using the CONSORT for abstracts checklist.

Methods: A computerized database search of OVID MEDLINE was performed. All primary RCTs published within the top 5 plastic surgery journals (by 2016 ISI impact factor) from 2011 to 2018 were included. Two reviewers, blinded to journal and author, independently and in duplicate, scored included abstracts using the 16-item CONSORT for abstracts checklist.

Results: This review identified 126 RCTs which satisfied the inclusion criteria. Included studies were distributed across four journals: Plastic & Reconstructive Surgery (n=83), JAMA Facial Plastic Surgery (n=8), Aesthetic Surgery Journal (n=33), Journal of Reconstructive Microsurgery (n=2), and the Journal of Hand Surgery – European Volume (n=0). Mean overall item adherence across all abstracts was 7. The most poorly reported items were 'trial registration', 'method of randomization', and 'source of trial funding' and appeared in 4%, 2.4% and 0% of abstracts, respectively.

Conclusions: There is limited adherence to the CONSORT for abstracts checklist among RCT abstracts published within the top 5 plastic surgery journals. Given the reliance of clinicians on abstract reporting, the omission of essential trial details can lead to the inaccurate interpretation of trial results and the improper application of its findings to clinical practice. Active endorsement of the CONSORT for abstracts checklist is urgently required to improve the quality RCT abstract reporting.

Googleglass for Surgical Tele-Proctoring in Low-Resource Settings: A Feasibility Study in Mozambique

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Introduction: Untreated surgical conditions account for one third of the total global burden of disease, and a lack of trained providers is a significant contributor to the paucity of surgical care in low and middle-income countries (LMICs). Wearable

technology with real-time tele-proctoring has been demonstrated in high-resource settings to be an innovative method of advancing surgical education and connecting providers, but application to LMICs has not been well-described. We share our six-month experience with Google Glass in Mozambique and demonstrate the feasibility of using wearable technology with tele-proctoring to expand access to training opportunities in reconstructive surgery in this low resource setting.

Methods: Google Glass with live-stream capability was utilized to facilitate pre and intra-operative tele-proctoring sessions between a surgeon in Mozambique and a reconstructive surgeon in the United States over a six month period. At the completion of the pilot period a survey was administered regarding the acceptability of the image quality as well as the overall educational benefit of the technology in different surgical contexts. Additional narrative interviews were conducted with both participants to gain further insight into potential challenges and limitations of the program.

Results: Twelve surgical procedures were remotely proctored using the technology. No complications were experienced in any patients. Survey results demonstrate the biggest limitations to the experience, from the perspective of both participants, were issues related to image distortion. Image quality was sufficient for the mentor surgeon to perceive and to comment on pertinent anatomical structures, instrument handling, positioning and technique, but distortion due to light over-exposure, motion artifact and image resolution were rated as moderate impairments. Video-stream latency and connection disruption were also cited as limitations. Despite image distortion, both surgeons found the technology to be highly useful as a training tool in both the intraoperative and perioperative setting.

Conclusion: Our experience in Mozambique demonstrates the feasibility of wearable technology to enhance the reach and availability of specialty surgical training in LMICs. Surgical aid to LMICs has long been dominated by short-term trips by high-income country volunteers, and creative solutions are needed to re-focus efforts on surgical education and prioritize the development of local surgeons within their countries and local practice settings. Despite shortcomings in the technology and logistical challenges inherent to international collaborations, this educational model holds promise for connecting surgeons across the globe, introducing expanded access to education and mentorship in areas with limited opportunities for surgical trainees and generating discussion around the potential for innovative technologies to address needs in training and care delivery in LMICs.

Eye-Tracking Technology in Plastic and Reconstructive Surgery: A Systematic Review

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Purpose: Eye-tracking technology offers a quantifiable assessment in plastic and reconstructive surgery and resulting aesthetic outcomes. There has been an increase in the use of eye-tracking technology to assess plastic surgery patients. We systematically reviewed and summarized the techniques and effectiveness of this technology.

Methods: Applying the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA), a comprehensive search of articles published on eye-tracking in Embase, Ovid MEDLINE, PsychINFO, and Cochrane Databases was performed from 1946 to January 2019. The resulting publications were screened by two independent reviewers, for their relevance to plastic and reconstructive surgery.

Results: A total of 586 articles were identified in the initial search, out of which 23 met our inclusion criteria. The median number of observers was 36 (range 3-403). The groups evaluated came under three categories; pre- and post-operative images (median 14; range 1-32), conditions without post-operative images (median 18; range 1-178), and controls (median 13; range 1-95). Eye-tracking was most commonly used to assess individuals with cleft lip/palate (9 studies) followed by facial deformities (4 studies; 2 facial paralysis, 1 peripheral facial deformities, 1 disfigured faces), nasal conditions (3 studies; 1 crooked nose, 1 rhinoplasty, 1 nasal deformities), prominent ears (2 studies) and breast reconstruction (2 studies). Other fields included facelift (1), coronal synostosis (1), and orthognathic patients (1). The number and borders of Areas of Interest (AOIs) varied among studies ranging from 1 to 20 (median, 4). Time given to evaluate each image (median 8 seconds; range 2.5-10), time to define fixation (median 100 milliseconds; range, 40-200), and the type of eye tracking machine also varied among studies. All 19 studies that evaluated fixation patterns among conditions vs. controls reported significant differences between the two groups. Five out of seven studies assessing visual data between pre- and post-operative patients identified significant differences between the pre- and post-operative groups, while two studies did not (facelift and rhinoplasty patients). Nine studies examined the relationship between severity indices, attractiveness scores, or personality ratings and gaze patterns. Correlation was found in seven out of the nine studies.

Conclusion: This systematic review demonstrates the utility of eye tracking technology as a quantifiable objective assessment and emerging research tool for evaluating aesthetic outcomes in several domains of plastic and reconstructive surgery.

Thermographic Camera, a New Tool for Evaluating Diabetic Foot Syndrome

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Introduction: Diabetic foot syndrome is a concerning complication, being the most common cause of hospitalization for diabetic patients with a great impact on patient's quality of life and with high costs of the health care system. The incidence is 6.3% and in 20 % of the cases limb amputation is required [1]. Early detection and treatment is important and might prevent the necessity of realizing an amputation. This evaluation could be realized through a new innovative method that measures local temperature using a thermographic camera and predicts the possibility of a new ulceration onset before the presence of any clinical signs [2].

Material and methods: This paper presents a prospective study in which were enrolled 40 patients with type 2 diabetes, 20 with feet complications like ulcers, foot deformities or abundant callus and 20 without any clinical signs. Physical examination, complete blood tests and assessment of neuropathy and peripheral arterial disease were realized. Thermographic camera was used for evaluating their feet surface temperature and also for assessing tissue viability in patients that needed local debridement and additional surgery.

Results: Mean temperature between the two feet in patients with local feet complications had a difference of 2°C in comparison with patients without local complications where the difference was less than 1°C. A difference of more than 1.5° C showed an increased risk of an ulceration onset in patients with no feet complications.

Conservatory or surgical treatment was decided considering local temperature and patient's status. Evaluation of tissue viability using thermographic camera permitted to assess the proper zone for amputation and to create proper flaps in covering defects after surgery.

Conclusions: Dynamic infrared thermography is a rapid noninvasive technique that can evaluate skin temperature with assessment of inflammation, infection, peripheral circulation and tissue viability of feet in diabetic patients. This can be helpful in choosing the proper treatment between conservative and surgical and in avoiding in some cases amputations. Thermographic camera might be also used in periodic evaluation of high-risk patients in order to prevent ulcer occurrence.

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A Novel Suture Training Device to Innovate the Surgical Curriculum in Medical School

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Purpose: Suture training is a critical component of the medical school curriculum, as it serves as the first opportunity to learn proper technique. For those students who enter surgical specialties such as plastic surgery, early and repetitious practice is crucial in developing competence for residency. Currently, the majority of medical schools in the United States utilize suture training tools such as porcine feet or sponges to simulate human tissue. At our institution, satisfaction survey data has indicated dissatisfaction with the accessibility, quality, and longevity of these materials. Herein, the purpose of this project is to devise a novel tool for suture

training using medical grade silicone and a three dimensional (3D) printed stencil to create life-like, standardized tissue defects.

Methods: Our plastic surgery department's 3D printing lab developed a 10cm x 5cm x 2cm mold. Using Blender software, tissue defects of varying depths, shapes, and sizes were included in the design. Different textures of silicone were poured into the mold and dyed with pigment to simulate the layers of skin, fat, and muscle. Plastic surgeons were consulted on material textures and layer depths. Study outcomes included a thirty-question survey given to fourth year medical students following a thirty-minute practice session with the silicone device. Questions measured texture characteristics and similarity of suture material to human tissue on a scale from 1 to 5 (5 being identical to human tissue). Additionally, the survey assessed limitations with current suture training models, and impression of this novel device's educational utility.

Results: Twenty-five fourth year medical students participated in the study. All (n=25) had sutured on human tissue an average of 46.0 (SD: 66.0) times. Additionally, all participants had sutured on porcine feet and sponges. The most common barriers to self-directed suturing practice were accessibility to material (n=23) and material longevity (n=20). The mean score for the silicone pad's tissue layers (4.20, SD: 0.5) and "feel" (4.36, SD: 0.64) was significantly higher ($p<.0001$) than those for porcine feet (2.52, SD: 1.00 and 2.48, SD: 0.87 respectively) and sponges (1.21, SD: 0.51 and 1.38 SD: 0.65, respectively). Upon assessment of varying suturing techniques on each material, the mean scores for the silicone pad's interrupted sutures (4.56, SD: 1.411), running sutures (4.30, SD: 0.62), and knot tying (4.44 SD: 0.711) were significantly higher ($p<.0001$) than those for porcine feet (3.08, SD: 1.04; 2.16, SD: 0.85; and 3.36, SD: 0.95 respectively) and sponges (1.75, SD: 0.85; 1.66, SD: 0.816; and 2.04, SD: 0.99 respectively). All (n=25) participants stated that the silicone suture pad was the best tool to practice suturing, and 92% (n=23) stated that their suturing skills would be better or much better if the silicone pads replaced porcine feet and sponges during medical school.

Conclusion: Preliminary survey data demonstrate that the silicone suture pad generated with a 3D printed stencil serves as a portable and realistic training tool. Additional evaluation with a greater sample size of medical students is needed to further compare the device's ability to enhance the medical school suturing curriculum.

Effects of the New York State Breast Cancer Provider Discussion Law on Breast Reconstruction Rates: A Provider-Based Study on New York State Surgeons

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Purpose: Insurance coverage for breast reconstruction has been promised by the Women's Health and Cancer Rights Act since 1998, but reconstruction rates remain at a national estimate of 42%. Studies have identified breast surgeons as gatekeepers of reconstructive care. Largely in response to these studies, New York State (NYS) instituted the Breast Cancer Provider Discussion Law of 2010, which mandated patient education and expedient referral to plastic surgeons at the time of cancer diagnosis. Previous research from our group demonstrated that from 2008-2014, reconstruction rates increased, especially among historically disadvantaged patients. While we hypothesize that the NYS law contributed to the overall increased rate and reduction in social disparities in reconstructive care, demonstrating causal effect solely from outcomes-based studies is difficult. Thus, we conducted a provider-based survey of NYS breast surgeons on law awareness and its impact on their practices with an emphasis on changes in social disparities in breast reconstruction.

Methods: An anonymous electronic survey was distributed in three deployments to members of the American College of Surgeons who were designated as practicing breast surgery. Participants were queried on demographic information and law awareness. Participants were then asked about discussion of options, referral, and follow up with their breast cancer patients both before the law and currently. Finally, participants provided optional open-ended responses on the impact of the law on their practices, specifically with regard to social disparities, and their opinions on the effect of breast reconstruction on their patients.

Results: Of the 281 functioning email addresses identified in the directory, 31 responded (response rate 11.0%), of which 28 performed oncologic breast surgery. Half of the respondents were female, and 35.7% were in academic practice. Nearly 86% were aware of the law, most commonly through surgical societies (25.0%), then the news media, hospital/medical centers, or colleagues (17.9% each). Prior to the law, 89.3% always discussed reconstruction with patients undergoing oncologic breast surgery, which increased to 96.4% currently ($p = 0.2117$). Only 14.3% of the respondents found that more than 75% of their patients received reconstruction prior to the law, which increased to 21.4% currently. Rates of always following up increased from 78.6% to 82.1%. Respondents overwhelmingly believed that reconstruction positively impacts women by giving "hope and … optimism as they face the challenge of breast cancer treatment and survivorship." While most respondents did not see a difference in the demographics of their own patients, they

agreed that the law would theoretically increase underrepresented minorities who seek reconstruction.

Conclusion: This is the first provider-based study on the NYS Breast Cancer Provider Discussion Law of 2010. Cancer care is multidisciplinary in which reconstructive surgeons play a significant role in the recovery of breast cancer patients. Patient health education by the provider is vital to comprehensive care. Continued efforts to improve the quality of life of breast cancer patients, especially those from historically disadvantaged backgrounds, is an important topic in plastic surgery health policy. Continued outcomes- and provider-based research may inform and shape future policies for continual improvement of patient care.

CD26-Positive Fibroblasts Are Present in Greater Abundance in Breast Capsule Tissue of Irradiated Breasts

Presenter:	Mimi R. Borrelli, MD
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Introduction: Breast capsular contracture remains the most common complication of implant-based breast reconstruction and represents a major problem in plastic and reconstructive surgery. The pathological fibrosis of capsules which form around the implanted tissue results in breasts that are abnormal in shape and texture, and which can be a source of significant pain. The etiology of capsular contracture remains uncertain; however, breast irradiation is known to be an important risk factor which causes or worsens capsular contracture. Recent work has identified a fibrogenic fibroblast subpopulation characterized by CD26 surface marker expression. We aimed to investigate the role of CD26-positive fibroblasts in the formation of breast implant capsules following RT.

Methods: Breast capsule specimens were obtained under institutional review board approval from irradiated and non-irradiated breasts of ten patients undergoing bilateral mastectomy with history of unilateral RT at the time of expander-implant exchange. Specimens were processed for Hematoxylin and Eosin staining, and immunofluorescence staining for CD26 and vimentin, a pan-fibroblast marker. CD26-positive, CD26-negative, and unsorted fibroblasts were isolated by fluorescence activated cell sorting (FACS), and their expression of genes associated with fibrotic activity was compared.

Results: Capsule specimens from irradiated breast tissue were significantly thicker, and had significantly more CD26-postive fibroblasts on both immunofluorescence imaging and FACS analysis than did capsule specimens from the non-irradiated breast. CD26-positive fibroblasts expressed greater levels of TGF-β1 and serum amyloid A1 than CD26-negative fibroblasts, and CD26-positive isolated from irradiated tissue had the highest expression of these fibrotic genes.

Conclusion: CD26-positive fibroblasts were found in greater abundance in capsules of irradiated compared to non-irradiated breasts and demonstrated greater fibrotic potential in gene expression analysis. This fibrogenic fibroblast subpopulation may play an important role in the development of capsular contracture, especially following irradiation, and targeted depletion or modulation of CD26-positive fibroblasts may represent a potential therapeutic option.

Comparison of Implant Utilization Trends in the US Versus Europe and the Impact of Breast Implant-Associated Anaplastic Large Cell Lymphoma Scientific Publications

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Background: Anecdotal differences in implant utilization between the US and Europe have been previously reported, however, there are no robust reports analyzing implant sales data and the potential variations in utilization trends guided by scientific publications discussing breast implant-associated anaplastic large cell lymphoma (ALCL).

Methods: Through a partnership with one of the world-wide leading breast implant manufacturers, we compared sales trends between the U.S and Europe over a 5-year period, with a focus on utilization trends after ALCL-related publications.

Results: We noted a higher usage of smooth devices within the U.S when compared to Europe (87.53% vs. 5.17%, respectively. $p<0.0001$). Analyzing implants by size, the highest percentages of total sales are found in sizes between 300cc and 550cc in both regions (69.35% in the U.S and 67.68% in Europe). Significant differences were found in the 100cc to 295cc and 555cc to 800cc groups, with users in Europe preferring smaller implants (28.96% vs. 12.74%, $p<0.0001$), and U.S users preferring larger sizes (17.89% vs. 3.34%, $p<0.0001$). Finally, after conducting a change-point

analysis, we found no correlation between scientific publications and variations in breast implant sales.

Conclusions: We demonstrate definitive and discrete differences of implant utilization trends between the two regions. ALCL-related scientific publications have not impacted implant utilization trends in the regions analyzed.

A Transdermal Drug Delivery System for Deferoxamine Improves Vascularity and Fat Graft Take Post Irradiation

Presenter:	Mimi R. Borrelli, MD
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Purpose: Radiotherapy (RT) is an important curative and preventative oncological treatment but causes significant collateral damage to healthy soft tissue in the radiation field. The long-term outcome of RT is pathological tissue fibrosis, which distorts tissue aesthetic appearance, impairs function, and can profoundly effect patient quality of life. Fat grafting is gaining popularity as a technique able to restore and regenerate irradiated tissue. Grafted fat, however, is often poorly retained in the damaged and hypovascular recipient site. We have previously shown that pre-conditioning the irradiated tissue with subcutaneous injections of deferoxamine (DFO) can improve perfusion and subsequent fat graft retention. Repeated subcutaneous injections, however, may be painful and further irritate the recipient site. In this study, we therefore explored whether DFO preconditioning using a transdermal drug delivery system (TDDS) could reverse radiation-induced soft tissue damage and enhance subsequent fat graft survival.

Methods: Female CD-1 nude-mice underwent external beam irradiation of the scalp with 30 Gy fractionated in 5 Gy doses every two days for a total of 12 days. After a 5-week recovery period, mice either received a DFO-TDDS or a control carrier TDDS, which was replaced changed every other day for a 2-week period. Laser Doppler analysis (LDA) was recorded prior to irradiation, following irradiation, and 24 hours following each TDDS treatment. Human lipoaspirate was then injected into the subcutaneous plane of the scalp (200ul/graft), and fat graft retention was monitored radiographically every 2 weeks for 8 weeks total, at which point the skin and transplanted fat were harvested for mechanical strength testing (MST) and histological

analysis. Blood samples were obtained from mice receiving the DFO-TDDS after 24 hours to assess systemic levels of DFO by mass spectrometry.

Results: The DFO-TDDS application resulted in significantly increased perfusion at the recipient site, as indicated by both LDA and CD31 immunofluorescent staining. The mice receiving DFO-treated also had reduced skin stiffness, and significantly greater fat retention compared to the mice receiving the control carrier TDDS. Intravenous systemic levels of DFO were below a quantifiable level (BQL) at 24 hours after DFO-TDDS placement.

Conclusion: Transdermal DFO delivery offers an effective and non-invasive mechanism to improve perfusion and reduce stiffness of irradiated tissue. These findings are also associated with improved fat graft retention at irradiated, DFO preconditioned recipient sites making this approach promising in the reconstruction of post-oncologic irradiated soft tissue defects.

A Model of Radiation-Induced Hind Limb Contracture and Skin Fibrosis Rescued by Fat Grafting

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Introduction: Radiotherapy (RT) is an effective anti-cancer treatment, able to reduce tumor size and decrease local cancer recurrence. However, the long-term outcome of RT is significant and pathologic fibrosis of the soft tissue surrounding the malignancy. Radiation-induced soft tissue fibrosis can disrupt tissue aesthetic appears and impair function, such as impaired swallowing and limb contracture. Fat grafting is gaining popularity as a surgical technique able to prevent or reverse the radiation-induced soft tissue fibrosis. We developed a mouse model of radiation-induced hind limb contracture and investigated the potential of grafted fat to restore mobility to the irradiated hind limb.

Methods: The hind limbs of $Prrx1^{Cre}$;$R26^{mTmG}$ mice were irradiated with 30 Gy fractionated in 5 Gy doses every two days for a total of 12 days. The $Prrx1^{Cre}$;$R26^{mTmG}$ mice were used to label a fibrogenic subpopulation of fibroblasts in

ventral skin (PRRX-1^{+}) by embryonic expression Cre. A four-week period followed irradiation to allow limb contracture to develop, and mice were then sacrificed, and hind limbs were processed for histology. To explore the therapeutic effects of fat grafting, CD-1 nude mice were irradiated with the same irradiation protocol, and at 4-weeks, the mice were injected with 200ul of human lipoaspirate fat or lipoaspirate enriched with stromal vascular cells (SVCs, 10,000 cells/200ul) directly into the subcutaneous space on the ventral surface of the irradiated hind limbs. We used two control mice; mice injected with 200 ul of saline or mice who received sham surgery with no injection. Limb extension was measured every two weeks for a total of 12-weeks, and mice were then sacrificed for hind limb skin mechanical strength testing (MST) and histologic analysis.

Results: Hind limb irradiation significantly reduced limb extensibility compared to the non-irradiated side, and contracture was associated with in a significant increase in the fibrogenic Prrx1+ fibroblast subpopulation in mouse ventral skin. Fat grafting progressively increased limb extension, reduced skin stiffness, and reversed the fibrotic histological changes in the skin. The greatest improvements were found in mice who received fat grafted with SVCs.

Conclusion: We present a mouse model of radiation-induced hind limb contracture which we use to show that grafted fat can reverse the fibrotic changes seen in irradiated skin and can improve the extensibility of contracted limbs post irradiation.

Effects of Oxidative Stress on MicroRNA Content of Human Adipose Mesenchymal Stem Cell-Derived Exosomes and Skin Flap Survival in a Mouse Model

Presenter: John S Mayo, MD
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Purpose: Flap necrosis is a serious complication following surgery for soft tissue coverage. Recently, exosomes secreted from adipose-derived mesenchymal stem cells (ADSC-exos) have been shown to improve skin flap survival after ischemia-reperfusion injury. Exposure of ADSCs to oxidative stress via low doses of H_2O_2 in culture has also been demonstrated to enhance flap survival by ADSC-exos, but the exact mechanisms are unclear. The aims of this study were to determine whether (1) angiogenesis-promoting microRNA (miRNA) content is altered in exosomes after

preconditioning parent ADSCs with H_2O_2 (H_2O_2-ADSC-exos), and (2) H_2O_2-ADSC-exos improve viability of random pattern skin flaps using a mouse model.

Methods: Exosomes secreted by human ADSCs at passage 6-8 were isolated using ExoQuick precipitation solution after 65 hours in culture medium containing exosome-depleted fetal bovine serum ± 50 µm H_2O_2. Nanoparticle tracking analysis (NTA) was used to determine size and concentration of purified exosomes, and small non-coding RNA sequencing was performed to evaluate expression profiles of miRNA cargo. Approximately 3×10^{10} particles (in 300 µl) of ADSC-exos (n=4), H_2O_2-ADSC-exos (n=5), or 300 µl vehicle (n=5) were injected into 4 × 2 cm random pattern skin flaps of BALB/c mice. On day 7, flap survival was determined grossly based on color, texture, and overall appearance, and sizes of viable and necrotic areas were measured in digital images using ImageJ software. Flap tissues were processed for histologic and angiogenic protein analyses.

Results: H_2O_2 treatment increased exosome particle concentration 2-3-fold as detected by NTA, suggesting that oxidative stress enhances exosome production by ADSCs. A total of 495 and 454 known miRNAs were identified in ADSC-exos and H_2O_2-ADSC-exos, respectively. Using a cutoff of >2 fold change and $p<0.01$, two miRNAs were increased (miR-10395-5p and miR-10395-3p) and 12 miRNAs were reduced (miR-16-5p, miR-23a-3p, miR-23b-3p, miR-24-3p, miR-31-5p, miR-93-5p, miR-122-5p, miR-134-5p, miR-152-3p, miR-196a-5p, miR-221-3p, miR-222-3p) in H_2O_2-induced exosomes. Twelve of these 14 miRNAs are known to be involved in angiogenesis, with 9 of the downregulated miRNAs known to be inhibitory, thereby possibly increasing angiogenesis by release of inhibition. Enhanced viability ($p<0.05$) of skin flaps treated with H_2O_2-ADSC-exos (49±5% flap survival area) compared to vehicle (32±4% flap survival area) corresponded to increased capillary density in the H_2O_2-ADSC-exos group compared to the other groups ($p<0.001$).

Conclusions: Exosomes hold immense potential as an allogeneic “off-the-shelf” cell-free regenerative medicine treatment option that offers the benefits of stem cell therapy while representing a theoretically safer alternative. The broad repertoire of miRNAs in exosomes secreted by ADSCs likely contributes to the favorable therapeutic effects of ADSC-exos on skin flap survival. Altered miRNA content in exosomes secreted from parent ADSCs pretreated with H_2O_2 may be partially responsible for the enhanced skin flap recovery previously observed in ischemia-reperfusion injury, but further investigation is warranted. Work in our laboratory is in progress to examine the proangiogenic cytokine protein cargo of ADSC-exos and H_2O_2-ADSC-exos to determine the relative importance of a protein-based mechanism of action.

The Effect of Nylon Vs Simple Polyglycolic Acid Vs Polyglycolic Acid Enhanced with Growth Factors in the Healing of Cutaneous Wounds in an Animal Model

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Wound care is an essential aspect of health care and requires a great deal of human and material resources. It is estimated that about 6.5 million people in the United States currently suffer from chronic wounds, causing expenses of up to 50 billion dollars a year.

The current study aims to compare the results in wound healing with nonabsorbable suture, simple multifilament absorbable suture and multifilament absorbable suture enhanced with growth factors derived from stem cells of mesenchymal origin in an animal model, based on 3 parameters:

- Angiogenesis (Capillaries by field 40X)
- Inflammatory infiltrate (Inflammatory cells by field 40X)
- Inflammatory infiltrate (Lineage)

Twenty Wistar rats were selected and divided into 2 groups of 10 Wistar rats each. Three full-thickness wounds of 1.5 centimeters were made on the dorsal skin, with a gap of 1 centimeter between each other. The wounds were sutured immediately by means of Nylon in 2 simple stitches, Polyglycolic Acid and Polyglycolic Acid sutures embedded in growth factors (AAPE® by Prostemics ® laboratory), both in 2 simple inverted stitches.

Subsequently, subjects were biopsied, and, by optic microscopy, we were able to determine and compare the histological parameters of the first group, determined on day 7 postoperatively and on day 28 postop for the second group, respectively.

The results were relatively variable in the Inflammation Type both in the group of day 7 and day 28, so there was no statistical significance among those items (Type of inflammation day 7 $p = 0.8481$ day 7 $p = 0.8481$ and day 28 $p = 0.3614$).

However, in the New Capillaries by Field chart, at the site of the scar there were statistically significant differences on days 7 and 28 postop, with $p=0.04027$ and $p = 0.01016$ respectively. Dunn's adjusted tests were performed to discern the significance among the different groups, finding significance on the experimental group in day 7

against poliglycolic acid and against both other sutures on day 28. Moreover, macrospcopically, we found a mature scar by day 28, with less palpable fibrosis and no scab whatsoever in most of the biopsies of the experimental group, compared against the other 2 groups.

Our study shows statistically significance in terms of Angiogenesis, proving the modulating role that Growth Factors play on wound healing, it also sets base for further research on its application for chronic/complex wounds as being a reproducible and well-documented model for wound healing in animal subjects.

Safety of Topical Tranexamic Acid in Plastic Surgery: Recommendations for Clinical Use

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Objective: Topical use of tranexamic acid to reduce bleeding is receiving increasing attention in plastic surgery[1]. Administration onto the wound surface only may be just as effective in reducing blood loss as intravenous use[2] and reduce bleeding with about 1/3[3]. Topical use may reduce the possibility of systemic adverse effects[4].
Topical use is still off-label and surgeons need guidelines regarding safe doses and modes of administration. We wanted to investigate both the possibility of systemic adverse effects and local adverse effects on wound healing and skin cells after topical use.

Materials and Methods: For evaluation of possible local effects, cell toxicity studies on human keratinocytes and fibroblasts and evaluation of re-epithelialization in an ex vivo human skin wound model were performed using various concentrations of tranexamic acid. For evaluation of possible systemic effects, serum levels of tranexamic acid were determined after topical use on large wound surfaces in skin-reducing surgery.

Results: Systemic concentration after topical application of tranexamic acid even to large wound surfaces does not rise above lowest threshold level for systemic effect. Short topical exposure even to high concentrations is well tolerated by both in vitro keratinocytes and fibroblasts and does not significantly affect wound re-epithelialization. However, prolonged exposure to topical tranexamic acid above a

threshold level around 10 mg/ml prevented re-epithelialization and prolonged exposure to concentrations above 50 mg/ml caused epithelial detachment in an ex vivo human skin wound model through an assumed non-toxic mechanism. Conclusion: Surgeons should be conscious of dosage, mode of administration and possible adverse effects when using topical tranexamic acid.

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Prevention of Postsurgical Lymphedema Via Immediate Delivery of Sustained-Release 9-Cis Retinoic Acid

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Introduction: Lymphedema is a disfiguring disease affecting over 250 million people worldwide and 5 million cancer survivors in the US. Nine-*cis* retinoic acid (9-*cis* RA) has recently been shown to stimulate lymphangiogenesis in vivo and limit postsurgical lymphedema. Unlike other pro-lymphangiogenic drugs being studied, 9-*cis* RA demonstrates a favorable risk profile in cancer patients and is already approved for clinical use in the US and UK for other conditions. Previous animal studies have tested 9-*cis* RA in intraperitoneal injection form, which has poor translatability to future clinical trials. The purpose of this study is to investigate the pro-lymphangiogenic effects of 9-*cis* RA contained within a single-use depot pellet drug delivery system in a clinically relevant mouse lymphedema model.

Methods: Hindlimb lymphedema was induced in 18 mice via combined lymphatic injury, consisting of inguinal and popliteal lymphadenectomy followed by irradiation. Animals were split into 2 groups: 1) the treatment group received pellets containing 9-*cis* RA, 2) the control group received placebo pellets. Pellets were placed within the surgical wound intraoperatively, with experimental pellets resulting in sustained drug release over 30 days. Using electronic calipers, paw thickness was measured weekly for 6 weeks and normalized by calculating percent change relative to the unaffected paw. Lymphatic drainage was measured at postoperative week 6 via indocyanine green (ICG) lymphography, after which animals were sacrificed for histological analysis. All outcomes were statistically analyzed using Student's *t*-test.

Results: Compared to control animals, significantly less paw swelling was observed in 9-*cis* RA-treated animals postoperatively at week 3 (7% mean difference, P=0.04), week 4 (12% mean difference, P=0.0002), week 5 (9% mean difference, P=0.0005), and week 6 (11% mean difference, P=0.0007). No significant difference in paw thickness was observed within the treatment group over time, indicating reduced lymphedema progression. 9-*cis* RA-treated animals had significantly faster lymphatic drainage than control animals as measured by ICG clearance at 24, 48, 72, 96 and 120 hours following ICG injection ($P<0.05$). Histological analysis of animals treated with 9-*cis* RA pellets revealed 55% reduced epidermal thickness compared to control animals (P=0.04), indicating reduced epidermal hyperplasia.

Conclusion: The first 6 weeks after lymphatic injury, animals treated with 9-*cis* RA pellets at the time of surgery demonstrate changes consistent with reduced lymphedema progression compared to control animals receiving placebo. This is evidenced by significantly reduced paw swelling over time, faster lymphatic drainage, and reduced epidermal hyperplasia on histology. In conclusion, we demonstrate that 9-*cis* RA contained within a single-use depot pellet drug delivery system has favorable properties in limiting postsurgical lymphedema.

Modulating Macrophage Phenotype to Decrease Muscle Fibrosis in Ischemia Reperfusion Injury

Presenter:	David M. Stepien, MD, PhD
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Objective: Muscle fibrosis is a devastating sequela following ischemia-reperfusion injury that results in significant functional impairment and poor outcomes. Directing the response to muscle injury from a profibrotic to a regenerative pathway would be

of great clinical value. We hypothesize that macrophage-specific knockout of *Tgfb1* and pre-clinical ligand trap binding of TGF-β1 in wild-type animals will reduce the development of muscle fibrosis and will increase regeneration of myofibers after injury with organized production of collagen by fibroadipogenic progenitor cells (FAPs).

Methods: Ischemia was induced in the left hindlimb of *LysMCre-Tgfb1*$^{fx/fx}$ and age and strain matched controls with clamping of the femoral vessels for 3 hours with simultaneous injection of cardiotoxin (CTX) into the left tibialis anterior (TA) muscle. Left and right TAs were harvested one week following injury. Histologic sections were stained with H & E for morphology, picrosirius red for collagen quantification, and Masson's trichrome for fibrosis architecture. Picrosirius stained slides were imaged and analyzed using ImageJ to measure positive collagen staining. Myovision software was used to calculate myofiber cross-sectional area (CSA) and Feret diameter (n=3 per group). Sections were stained for immunofluorescence for F4/80, PDGFR-α, and TGF-β1. Mean fluorescent area also calculated with ImageJ. Flow cytometry was performed to quantify macrophage, neutrophil, and monocyte markers (n=4 each). Next, adaptive transfer of *LysmCre*^{mtmg} macrophages was performed into *LysMCre-Tgfb1*$^{fx/fx}$ mice. Separately C57BL/6J mice were treated with a TGF-β1/3 ligand trap (TGF-BRII-Fc) or vehicle following IR CTX (n=3 each). Similar analyses performed as described above.

Results: *LysMCre-Tgfb1*$^{fx/fx}$ mice demonstrated significantly less fibrosis and muscle injury compared to controls. We found significantly higher area of fibrosis by picrosirius red staining in C57BL6/J animals compared to *LysMCre-Tgfb1*$^{fx/fx}$ which appeared uninjured, grossly similar to uninjured control (52.32 vs 13.39um^2, $p<0.0001$). Immunofluorescence showed decreased macrophage infiltration (F4/80) at the injury site and organized PDGFR-α staining in LysMCre-*Tgfb1*$^{fx/fx}$ injured muscle compared to WT mice. Flow cytometry revealed lower numbers of macrophages present in injured knockout muscle compared to WT. Adoptive transfer of LysmCre^{mtmg} macrophages recapitulated a fibrotic phenotype. TGF-βRII-Fc treatment of WT mice produced similar results to *Tgfb1* knockouts almost completely mitigating fibrosis as quantified by picrosirius red staining (57.29 vs 17.17μm^2, $p<0.0001$).

Conclusions: Our *LysMCre-Tgfb1*$^{fx/fx}$ animals demonstrated markedly reduced muscle injury with no obvious areas of fibrosis. The presence of increased PDGFR-α interstitial staining in wild type muscle compared to *LysMCre-Tgfb1*$^{fx/fx}$ injured muscle suggests a disorganized proliferation of FAP cells within the wild type injury site. The decrease in FAP proliferation in the *LysMCre-Tgfb1*$^{fx/fx}$ muscle suggests that macrophage-derived TGF-β1 may induce FAP proliferation and without it, the response to injury may be more regenerative than pro-fibrotic. Treatment with TGF-βRII-Fc ligand trap yielded similar results to knockout suggesting it may offer a

viable therapeutic agent for prevention of muscle fibrosis in ischemia reperfusion injury.

Platelet Rich Fibrin with Adipose Derived Stem Cells for the Treatment of Chronic Cutaneous Wounds: A Randomized Clinical Trial

Presenter:	Nicolo Bertozzi, MD
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Introduction: Chronic wounds represent a relevant health-care problem with enormous social and economic burden. Regenerative surgery offers innovative options for the treatment of chronic ulcers with promising results and reduced rate of complications [1 - 4]. The aim of this randomized clinical trial was to compare the application of Platelet Rich Fibrin (PRF) combined with autologous Adipose-derived Stem Cells (ASCs) versus the application of PRF alone for the treatment of chronic cutaneous ulcers.

Materials and Methods: To date, 33 patients with chronic skin ulcers have been randomized in two different groups: PRF alone (control group: 19 patients) and PRF+ASCs (experimental group: 14 patients). Patients with neoplastic or clinically infected wounds have been excluded from the study. The production and application of PRF or PRF+ASCs has been performed with Vivostat (Alleroed, Denmark). In our study, we used PRF and PRF+ASCs by local application and infiltration of wound margins.

Patients were evaluated up to 12 weeks after the procedure with regular office visits. At week 4 and 12 we also preformed Laser Doppler Flowmetry (LDF) and Transcutaneous Oximetry ($Tcp0_2$) [5].

Results: Patients reported significant pain reduction in both groups. Results of LDF and $Tcp0_2$ provided promising results in terms of increased wound bed perfusion and oxygenation. Control group showed wound area reduction of 16% at 4weeks and 49% at 12 weeks post-op while in the experimental group the area reduction was 49% and 81% at 4 and 12 weeks, respectively.

Conclusions: Both treatments may represent a feasible option for the treatment of chronic wounds. Our preliminary data suggest that the application of PRF + ASCs enhance the healing process more effectively than the PRF alone.

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Nanofiber System for Sustained Release of IGF-1 Nanoparticles to Nerve and Muscle

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Introduction: Despite extensive research efforts, no therapeutic agents are currently clinically indicated for the treatment of peripheral nerve injuries. Insulin-like growth factor 1 (IGF-1) is an ideal therapeutic candidate as it can accelerate axonal regeneration and also minimize the deleterious effects of prolonged denervation on muscle and Schwann cells. However, given its short half-life, a practical delivery system is needed to stabilize the protein and provide sustained release to target tissues. Using a novel encapsulation method, we demonstrated sustained release of bioactive IGF-1 from nanoparticles, in vitro, and improved nerve regeneration and functional

recovery, in vivo [1]. An optimized carrier system to maintain the nanoparticles at target tissue sites for the duration of drug release and avoid frequent re-dosing is now needed. We therefore developed a biocompatible nanofiber hydrogel composite that could be loaded with IGF-1 nanoparticles; fine-tuned its drug release kinetics *in vitro* and *in vivo;* and applied it in a chronic denervation median nerve model to assess its impact on functional recovery.

Methods: An injectable nanofiber-hydrogel composite system (made of PCL nanofibers covalently bonded to hyaluronic acid) was developed by electrospinning. Its 3-D structure was formulated to mimic that of fat extracellular matrix (ECM). The release kinetics of this delivery system were then optimized *in vitro* and *in vivo* (using ELISA and immunofluorescent staining) to achieve controlled release of IGF-1 at therapeutic levels (~10 times EC_{50}) for a prolonged period. Finally, using a chronic median nerve denervation model, we tested the effects of this modality on axonal regeneration, Schwann cell senescence, muscle atrophy and muscle force.

Results: The level of synthetic mimicry between our drug-delivery system and ECM fat was noted to confer high levels of biocompatibility as evidenced by a minimal inflammatory response 25 days post injection. The release kinetics of IGF-1 from the nanofiber system were superior to other carriers (fibrin glue and saline). This system kept a significantly higher concentration of the injected IGF-1 nanoparticles next to the nerve and within muscle when compared to fibrin glue and saline. Functional analysis is currently ongoing.

Conclusion: We introduce a novel drug delivery system in which IGF-1 nanoparticles are combined with a nanofiber hydrogel carrier to provide sustained local concentrations of bioactive IGF-1within target nerve and muscle. This therapeutic approach has the potential to improve functional outcomes via enhanced axonal regeneration and maintenance of denervated muscle and Schwann cells. IGF-1 and the polymer components of the engineered delivery system are currently used in FDA-approved formulations and devices, which will facilitate clearance of regulatory hurdles.

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Breast Implant Illness: A Prospective Cohort Study of 50 Breast Implant Explantations

Presenter: Mark Lee, MD
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Aim/Purpose: To examine possible causes and outcomes of Breast Implant Illness

Introduction: Breast Implant Illness" (BII) is a poorly defined cluster of non-specific symptoms, attributed by patients to being caused by their breast implants. These symptoms can include joint pain, skin and hair changes, concentration and fatigue. Many patients complaining of BII symptoms are dismissed as psychosomatic. There are currently over 10 000 peer reviewed papers on breast implants but at the time of writing only 2 papers discussing this entity. At the same time mainstream media and social media are exploding with non-scientific discussion about BII.

Method: We have prospectively followed 50 consecutive patients, self-referring for explantation due to "Breast Implant Illness". We analyzed their pre operative symptoms and followed up each patient with a Patient Reported Outcome Questionnaire (PROQ). All implants and capsules were, if possible, removed enbloc. Explanted implants were photographed. Implant shell and capsule sent for histology and microbiological culture.

Results: BII symptoms were not shown to correlate with any particular implant type, surface or fill. There was no significant finding as to duration of implant or location of original surgery. Chronic infection was found in 36% of cases with Proprionibacterium acnes the most common finding. Histologically, synoviocyte metaplasia was found in a significantly greater incidence than a matched cohort that had no BII symptoms ($p<0.01$). 82% of patients reported partial or complete resolution of BII symptoms on PROQ. None of the 50 patients would consider having breast implants again.

Conclusions: The authors believe BII to be a genuine entity worthy of further study. We have identified microbiological and histological abnormalities in a significant number of patients identifying as having "Breast Implant Illness". A large proportion of these patients have reported resolution or improvement of their symptoms in patient reported outcomes. Improved microbiology culture techniques may identify a larger proportion of chronic infection and further investigation of immune phenotypes and toxicology may also be warranted in this group.

Relative Motion Orthoses for Zones IV-VII Extensor Tendon Repairs: A Comparison to the Norwich Regime.

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Objectives/Aims: The purpose of this study was to evaluate the outcomes of using a digit based relative motion splinting regime in comparison to the more traditional Norwich regime following uncomplicated long extensor tendon repairs in zones IV-VII.

Methods: All eligible patients, in a single centre, with open extensor injuries from zones IV- VII in 2015 were rehabilitated using the Norwich Regime, static forearm based palmar splint and early active mobilisation. From 2016 to 2018 all patients were commenced on a Relative Motion (RM). All obtained data was recorded in a prospectively maintained database. Twenty-three patients (25 fingers) were treated using the Norwich Regime. Fifty-eight patients (64 fingers) were treated using the yoke splint regime. Descriptive statistics were used to characterise the patients according to gender, finger injured, extensor zone of injury, side injured, hand dominance and occupation. Primary endpoints were Total Active Motion of the digit (TAM) percentage and grip strength percentage at discharge. The secondary endpoints were TAM degrees at discharge, TAM degrees at 4 weeks, grip strength measured in kg/F at discharge, number of hand therapy sessions needed, day of discharge from hand therapy post injury, number of consultant clinic appointments and days to return to work. Statistical significance was set at value of $p<0.05$.

Results: The mean TAM percentage at discharge was higher in the RM group 97.88% +/- 3.37% (n=64) versus 77.76% +/- 15.5% (n=25). The RM group had an average of 42.57 degrees more TAM at discharge compared with the Norwich group (RM 239.85 vs Norwich 197.28, $p<0.0001$). At 4 weeks patients in the RM group had on average 79.99 degrees more TAM compared with the Norwich group (RM 191.10 vs Norwich 111.11, $p<0.0001$). All patients in the RM group achieved a score of "Excellent" or "Good" in TAM Kleinert Classification at Discharge (³100% = excellent, ³75% - 100% = good). The patients in the RM cohort achieved a higher mean percentage of grip strength at discharge, 88.85% versus 65.82% in the Norwich group. Norwich group needed 4.34 more Hand Therapy sessions on average than the RM group ($p=0.0001$, 95% CI: 2.38 to 6.29). The Norwich group were discharged 38 days later than the RM group ($p<0.0001$, 95% CI: 22.89 to 53.26). The Norwich group needed 1.69 more clinic appointments ($p=0.0001$, 95% CI: 0.90 to 2.47). There was no incidence of tendon rupture or tenolysis in either group.

Conclusion: This study demonstrates that Relative Motion splinting can be used safely while consistently producing significantly superior results to Norwich regime. Our data shows that patients using Relative Motion, achieve higher TAM scores and grip strength than the Norwich Regime. They also required fewer sessions with the hand therapist, fewer outpatients' appointments and hand an earlier return to work.

A New "Jl" Technique: Simplification and Standardization of the Pattern in the Breast Reduction / Mastopexy and in the Planning of the DIEP Flap

Presenter: Manuel Baccari, MD
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Breast reduction surgery is one of the most requested interventions in plastic surgery [1]. Over time, many surgeons studied the technique, in order to overcome its limits, in particular, focusing their attention on skin incision and glandular remodeling [2]. To date, the choice of the pedicle is considered independent from the cutaneous excision pattern, and for this reason many authors focused on the comparison between the individual components, skin or pedicle. There is an actual controversy between vertical mammoplasty and the traditional keyhole methods of breast reduction [3-4]. In recent years, many authors proposed a different L technique, associated with different possibilities of pedicles, some of which appear particularly elaborate and unwieldy. The aim of the present study is to report a new JL technique and the results of the follow up of 45 patients operated during the last 6 years, using this method. Aged between 28 and 75 years with an average age of 42 years. In 25 cases, these patients had bilateral breast hypertrophy, in 20 cases the deformations were asymmetric. All the patients underwent a thorough individualized preoperative evaluation to establish a correct diagnosis, excluding malignancies, and to determine the level of ptosis according to Regnault [5]. Age, weight, height, BMI, jugular-nipple distance, amount of breast tissue removed, degree of patient satisfaction was recorded, and photos were taken before and after the operation. We associate a L-cutaneous incision with a superomedial pedicle and a glandular resection according to Hall Findlay. The procedure is a safe and reliable with only about 7% risk of complications, good breast shape and projection, short and inconspicuous scars accompanied by 90% of excellent patient satisfaction This technique allows obtaining excellent results in any degree of mammary reduction, ptosis and in breast autologous planning in postmastectomy breast reconstruction. It is an easy to learn and excellent method to be taught in university hospitals.

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Lymphatic Flow-Dynamics Under Compression Therapy: Photoacoustic Imaging Study

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Purpose: Compression therapy plays an important role in a conservative treatment for lymphedema. However, it is difficult to assess how the lymph flows in real time when elastic bandage is wrapping. We evaluated how compression therapy for healthy extremities affect lymphatic flow by using photoacoustic imaging.

Method

Indocyanine green was subcutaneously injected into the hands or feet, and lymphatic vessels and veins were observed in a video with the photoacoustic imaging device (PAI-05) for healthy volunteers. First, we evaluated the lymphatic flow at rest and subtle motion without pressure. Then, a roll-type film dressing was wrapped around

like the elastic bandage to simulate compression therapy. Finally, lymphatic vessels and veins at the same site were evaluated as well as during non-compression.

Result: Under compression, there was less change at rest compared with non-compression, but lymphatic pumps were observed more frequently during subtle movement.

Discussion: Photoacoustic imaging is a new device that can observe blood vessels and lymphatic vessels three-dimensionally in high resolution of 0.2 mm.

Evaluation of lymphatic flow under elastic bandage has not been possible with conventional modalities, however it is possible to evaluate lymphatic flow under compression in real time with transparent dressing materials because light can reach the subcutaneous skin and the generated ultrasound can be detected.

The results of this study revealed that the frequency of lymphatic transport was improved by mild exercise under compression therapy. It was objectively supported that the effectiveness of exercise therapy under compression for patients with lymphedema.

Factors Associated with Return to Work after Surgical Treatment for Carpometacarpal Osteoarthritis of the Thumb, A Cohort Study

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Objective: The percentage of patients that return to work after surgery and the duration until a return to work is an important outcome for patients, surgeons and society. The aim of this study is twofold: first to identify factors contributing to the time to return to work after CMC-1 OA surgery, and second to calculate the costs of lost productivity.

Methods: CMC-1 OA patients who had undergone surgery and had paid employment were included. Time to RTW was measured by questionnaires at 6 weeks and 3, 6 and 12 months after the surgery. A Cox survival analysis was used to estimate the return to work. The association between costs of lost productivity and work characteristics was measured with a regression analysis. The human capital method was used to calculate the costs of lost productivity on patient and population level.

Results: In total, 629 CMC-1 OA patients with a mean age of 55 years were included. After one year 79% of the patient returned to work. The median time to RTW was 12 weeks (25% - 75%: 6 – 22 weeks). Compared with light physical labor, patients with moderate (HR 0.538) or heavy physical labor (HR 0.499) had a longer period of RTW. An increase of 10 points of the MHQ work (HR 1.21) and MHQ hand function of the unaffected side at baseline (HR 1.11) were associated with RTW with. Patients who were operated on the dominant hand also had a longer period of RTW (HR 0.745). The total CMC-1 OA related costs of lost productivity were estimated at €11.574 (25%-75%: €5.787 – €21.220) on patient level and €59.7 million on Dutch population level per year.

Conclusion: In the first year after surgery for osteoarthritis of the thumb, 79% of the patients returned to work and 50% of the patients returned to work within 12 weeks. Factors associated with return to work were workload, whether the dominant hand was treated or not, the Michigan Hand Questionnaire work score and, hand function of the unaffected side at baseline. The total costs of lost productivity in the first year after surgery was €11.574 on patient's level, resulting in €59,7 million on population level per year.

Topical Moistening of the Wound Surface with Tranexamic Acid 25 Mg/Ml to Reduce Bleeding: The Norwegian Method.

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Introduction: Intravenous prophylactic use of tranexamic acid (Cyklokapron®) is widespread in surgery with high volume bleeding, as it reduces bleeding by about 1/3[1]. Fear of possible systemic adverse effects prevent use in all surgery. Topical use of tranexamic acid can provide a sufficient concentration at the bleeding site while avoiding systemic effects. Topical use is however off-label.

Methods: The Plastic Surgery Unit at St Olav's University Hospital, Trondheim, Norway has used a simple topical moistening of the wound surface with TXA 25 mg/ml prior to closure a as a preventive measure to prevent bleeding since 2012. The method has gained popularity among Norwegian plastic surgeons. We describe the details of the method and the clinical effect on postoperative bleeding in two

randomized controlled trials, bilateral reduction mammoplasties (n=30)[2] and mastectomies (n=202)[3], respectively.

Results: Moistening a wound surface with 25 mg/ml TXA significantly reduced bleeding as measured by postoperative drain production at 24 h by approximately 1/3 in both studies ($p<0.001$), which equals the results from intravenous administration. Total drain output was also significantly reduced by 1/3. Re-bleedings occurred in two reduction mammoplasties and eight mastectomies; of the total ten re-bleedings, nine were in the placebo groups ($p<0.05$). There were no differences regarding late hematomas, infections or wound ruptures. In mastectomy patients undergoing axillary clearance, late seroma formation needed aspiration more often and was significantly more voluminous in the TXA group ($p=0.008$), but there was no increase in chronic seroma.

Conclusion: Moistening a wound surface with 25 mg/ml TXA is a low cost and simple preventive measure to reduce postoperative bleeding and possibly prevent postoperative re-operations due to hematoma without any risk of systemic effects. It may also prevent re-bleeding and reduce drain output. We recommend this as a routine intervention for most wounds in plastic surgery. Local adverse effects of topical use should be further explored.

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Septal Suture Repair with Orbital Fat Repositioning (Stick-out Procedure) for Lower Blepharoplasty

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Background: Among the major changes of the lower eyelid caused by aging, eye bags and tear trough deformity are the main targets of surgical treatment. Orbital fat repositioning is a good method to correct eye bags and tear trough deformity simultaneously. However, the weakened orbital septum remains weak and the orbital fat is not preserved in orbit. Septal suture repair strengthens orbital septum so that the bulging is flattened, and orbital fat is preserved in orbit, but tear trough deformity is not corrected. Therefore, we devised a method (stick-out procedure) to simultaneously perform septal suture repair and fat repositioning during lower blepharoplasty.

Methods: A retrospective chart review was made of all patients who underwent lower blepharoplasty with stick-out procedure between 2015 and 2018. A total of 289 patients were included. 107 patients underwent transconjunctival approach and 182 patients underwent subcilliary approach. After the preseptal space is dissected, the origin of the orbicularis oculi (the tear trough ligament), and the orbicularis retaining ligament was released. The bulging orbital fat pad was then repositioned to the tear trough. Then septal suture repair was performed by suturing the arcuate expansion of the capsulopalpebral fascia to the arcus marginalis, except for the site where the fat repositioning was performed. As a result, only the minimum volume of fat needed to correct the tear trough was sticking out from the gap between the repaired arcuate expansion and repositioned.

Result: All patients demonstrated a significant rejuvenation of the lower lids with elimination of the eye bags and tear trough deformity. There were no permanent major complications, such as ectropion or prominent sunken. Mild sunken occurred in 4 patients (1.3 precent), and one patient (0.3 percent) experienced mild lid retraction that resolved spontaneously. 2 patients (0.6 percent) underwent minor revision because of undercorrected eye bags and tear trough deformity. Except these cases, there was no recurrence of eye bags or tear trough deformity during follow up of up to 42 months. Approximately 98 percent of the patients were satisfied.

Conclusion: Eye bags and tear trough deformity are effectively corrected by the stick-out procedure, which perform the septal suture repair and fat repositioning simultaneously during lower blepharoplasty. Since fat preservation and orbital septal reinforcement are achieved at the same time, the lower eyelid contour remains stable longer with low recurrence than the conventional methods.

A One-Size-Fits-All Approach to Pressure Ulcers: Whole-Buttock Fasciocutaneous Advancement Flap

Presenter: Guan-Ming Simon Feng, MD
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Background: Despite its ancient history, treatment of pressure ulcer remains a challenge mainly due to its high incidence of recurrence. We want to present our experience on the surgical reconstruction of pressure ulcers using a large whole buttock fasciocutaneous flap that is easily designed, suitable for decubitus ulcers of various location and size, and easily recycled in the event of a recurrence.

Methods: A 6-year retrospective review of patients (from January 2013 to Dec 2018) who underwent our whole buttock fasciocutaneous advancement flap for gluteal pressure sore was performed. Data were collected on patient demographics and surgical outcomes. The key steps that vary from the traditional rotation flaps include elevation of a large, seemingly oversized flap to achieve tension free closure, avoiding placing incisions over bony prominences (e.g. ischial and trochanteric regions), placing the V-Y type closure wound in the posteromedial thigh, and use of closed incisional negative wound therapy post operatively for 1 week.

Results: 72 patients underwent this surgical technique for 91 flaps between 2013 and 2018 for coverage of all types of buttock pressure ulcers (sacral, Ischial and trochanteric). 65% healed without need for further operation. The average follow-up period for all flaps was 24 months. 12 of the 91 flaps was performed for coverage of recurrent pressure ulcers.

Conclusion: The same technique can be used for defects at various location, covering very large size defects, and is easily recyclable in case of recurrence. It is also technically simpler to perform than other reconstructive options. We recommend this one-size-fits-all whole buttock fasciocutaneus flap to reconstruct gluteal decubitus ulcers in selected patients.

The Banking of the Remaining Costal Cartilage from the First Stage Auricular Reconstruction in Subcutaneous Pocket for Using in the Second Stage.

Presenter: Kachin Wattanawong, MD
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Background: Regarding the second stage of Nagata's auricular reconstruction technique: The cartilage graft framework was harvested from the 6th rib which banked under the skin[1] and also cartilage from the remaining cartilage which put back into preserved perichondrium pocket.[2] However, re-harvesting rib cartilage in scar area had the risk of pleural injury. And free diced cartilage graft augmented in the subcutaneous tissue was widely used in cosmetic operations with proof of viability and acceptable result.[3, 4] So banking of remaining cartilage from the first stage ear

reconstruction in the subcutaneous pocket could be facilitated the ease of operation for the second stage and reduce risk of pleural injury. The length of harvested costal cartilage graft in the first stage could be shorten and reduced donor site morbidity. This study was to propose the new idea of managing the remaining costal cartilage from the first stage for the ease of second operation.

Methods: The retrospective review the patient completely operated 2 stages auricular reconstruction and follow up at least three months from March 2013 to July2018 in Ramathibodi hospital. In the first stage auricular reconstruction with Nagata's technique: when the framework fabrication was finished and the donor site was repaired in layers, the subcutaneous pocket was created in the dependent area near chest incision with the size of pocket fit to amount of the leftover cartilage. The big pieces of cartilage were assembled together and firstly banked in the pocket. The smaller ones were packed tightly around the big ones in order to facilitate one piece cartilage healing. In second stage, the previous chest incision was used to harvest the banked cartilage.

Results: In total, 10 cases were operated with this technique. There were no donor site complication. The cartilage harvesting was quicker and easier than harvested the rib cartilage and the patients fell less post-operative pain. The gross appearance of the cartilage was normal and united together as expected which was ready to fabricate into the semi-lunar shape. After gaining some experience, we can shorten the length of rib cartilage graft in the first stage.

Conclusion: The subcutaneous banking of the remaining reduced operation time and effort of surgeon. The patients also fell less pain at the donor site.

Immediate Reconstruction of Breast Conserving Surgery Defects with Locoregional Perforator Flaps: Long Term Oncoplastic Results to Expand Reconstructive Arsenal

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Introduction: The algorithm for reconstruction of mastectomy defects, either modified radical or sparing mastectomies, have been well established. Besides, most of the patients undergoing breast conserving surgery receive either no reconstruction or volume displacement techniques, fat grafting and local flaps. There is not much

data on optimal flap coverage in immediate reconstruction of breast conserving surgery defects. This clinical case series presents different examples of locoregional perforator flaps with long term follow up.

Patients and Methods: From August 2013 to April 2018, a total of 46 patients have undergone breast conserving surgery for breast cancer followed by immediate reconstruction with locoregional perforator flaps. Patients underwent reconstruction with thoracodorsal artery perforator flap (TDAP) were excluded since there have been substantial amount of data on this flap. The age of the patients ranged between 22 and 58 with an average of 47. The BMI of the patients ranged between 19 and 43 with an average of 27,3. Operative time, approximate volume of resected specimen, rate of flap survival, duration of hospitalization, rate and type of complications, rate of local recurrence and reported rate of cosmetic results have been evaluated. Average duration of follow up was 24 months ranging between 18 and 36 months.

Results: There were 19 lateral thoracic artery perforator flaps (LTAP), 5 anterior intercostal artery perforator flaps (AICAP), 11 lateral intercostal artery perforator flaps (LICAP) and 11 superior epigastric artery perforator flaps (SEAP). Fourty perforator propeller flaps and 6 perforators plus flaps have been used. One LTAP flap suffered necrosis of half of its volume and reconstructed with a latissimus dorsi flap. One LICAP flap suffered distal partial necrosis and subsequent wound care. There were no local recurrence of any patient during follow up period. Two patients developed metastatic disease.

Conclusion: Using locoregional perforator flaps provides sufficient volume in for immediate reconstruction of breast conserving surgery defects with minimal donor site morbidity. Avoidance of muscle dissection resulted in decreased postoperative pain and immediate mobilization together with increased level of comfort. With use of locoregional perforator flaps in breast reconstruction, the position of the patient does not change during surgery and resultant scars remain in and close to the breast. The color match of the skin is near identical. The texture of the transferred tissue is similar to native breast tissue. These flaps provide the advantage of being similar in terms of color, texture and thickness of transferred tissue. The volume of flaps usually proportionates to the general body habitus of the patients. Taken together, these flaps fulfill the fundamental of “replace with like” principle.

Use of locoregional perforator flaps also means, thoracodorsal system flaps will remain as salvage options together with lower abdominal flaps in case of completion surgery or complication management. From this point of view, use of locoregional perforator flaps can be introduced as an addition to autologous reconstruction of breast conserving surgery defects.

Secondary Rhinoplasty: Epidemiology and Our Way of Surgical Treatment.

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Secondary rhinoplasty: epidemiology and our way of surgical treatment. Secondary rhinoplasty is one of the most popular surgeries in facial plastic surgery. According to the literature, up to 25% of patients turn to a plastic surgeon for secondary rhinoplasty. The urgency of this problem has iatrogenic etiology The main principles that we use are complete revision of the existing structures of the nose, excision of fibrous tissue, reconstruction of the supporting structures of the nose using cartilage autografts and prevention of postoperative cicatricial deformity. Purpose of the study Study of iatrogenic nasal deformities, their main causes, ways of prevention and methods of nasal structure reconstruction Materials and methods 60 secondary rhinoseptoplasty were performed using costal cartilage autograft this year. The essence of our method proposed is an integrated approach to secondary rhinoseptoplasty: The first stage is the classical V-inverted transcolumellar incision and vestibular incisions. A revision with the excision of all the scar tissue of the nose is performed. Then we assess the integrity of all cartilage structures after the previous operation. Due to the detailed preoperative examination of the patient, the deficiency of septal cartilage is assessed according to CT scan. In this regard, the operation was performed by 2 surgical teams. Simultaneously, the second team of surgeons carried out the costal cartilage harvesting. In most cases we prefer to use the cartilaginous part of the XI rib. Rib harbesting is carried out from an incision of 1-2 cm length. Muscles are not intersected, but only pulled to the sides. The costal cartilage undergoes full skeletonization, which enables to preserve perichondrium. This minimizes the risk of complications associated with pneumothorax. In addition, due to this, there is no postoperative contour deformity at the site of costal cartilage harvesting. We use a stitchless technique with the imposition of a special glue, which gives excellent aesthetic results. With the help of cartilage autograft, septal extension graft is formed, as it is a reliable method for restoring the supporting structures of the nose. After completing the main stage of the operation, we camouflage the dorsum of the nose with diced cartilage. Since diced cartilage retains its matrix, it helps to avoid the cartilage lysis. Fixation is performed with sutures. After that, we put cast and fix silicone splints to the nasal septum. The patient wears cast and silicone splints for 7 days, after that cast langet is placed for another 7 days. Such prolonged compression has a positive effect on the rehabilitation period. This tactic, according to our observations, provides the most predictable and favorable result. Results In all cases of applying an integrated approach, we managed to achieve a good aesthetic and

functional result not only from a medical point of view, but also from the point of view of patients. Findings An integrated approach to secondary rhinoseptoplasty is an effective and reliable method. This technique, in our opinion, allows achieving a better aesthetic and functional result and reducing the risk of possible complications.

Patient Characteristics Predict Success Following Pedal Soft Tissue Augmentation

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Introduction: Pedal fat grafting has been shown to improve pain and functional impairment from forefoot fat pad atrophy. We aim to determine if patient demographics and foot characteristics play a role in the level of impact that is achieved following surgery.

Methods: We performed a retrospective review of patients who received forefoot autologous fat injections for the treatment of pedal fat pad atrophy. Patient improvement of pain and functional impairment was measured using the Manchester Foot Pain and Disability Index. One-way ANOVA statistical analyses were used to evaluate correlation between patient characteristics and an improvement in survey scores assessing pain and functional impairment from the time of surgery to 6 months, to 12 months, and from 6 months to 12 months. Patient characteristics examined include gender, age, BMI, unilateral or bilateral injections, a flexible or rigid foot arch, previous foot deformity or surgery, and the presence of callus.

Results: 44 patients received fat injections into the ball of their foot. 73% of them were women, their mean age was 61 years and mean BMI was 26.6 kg/m^2. 75% had injections performed bilaterally. 41% had a flexible arch, 73% had a past history of pedal deformity or surgery, and 43% had callus. Significant findings included a correlation between female gender and an improvement in pain from the time of surgery to 12 months later ($p=0.02$), a correlation between unilateral injections and an improvement in pain from the time of surgery to 6 months later ($p=0.03$), and a correlation between a healthy BMI and an improvement in functional impairment from 6 months post-surgery to 12 months post-surgery ($p=0.01$).

Conclusion: Patient characteristics correlate with the impact of pedal fat grafting surgery and the time course of improvement following surgery. Female gender was

found to correlate with improvement in pain at 12 months post-surgery. Patients undergoing unilateral foot fat grafting may see clinical improvements in pain faster than those receiving bilateral injections. Ultimately, both groups see clinical improvement at 1 year. Similarly, patients classified as overweight may see faster improvement in functional impairment than those with lower BMI with no difference at 1 year. Given our findings, we advocate for all patients with suspected fat pad atrophy to be considered for soft tissue augmentation. Large scale studies are called for to further elucidate the impact of various patient characteristics on the probability of success in pedal fat grafting.

The Combined Abdominoplasty with Umbilical Hernia Repair and Umbilicoplasty (CARP) Technique: A Tension Free, Pedicle Preserving, Umbilical Hernia Repair Technique

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Background: Ventral and umbilical hernias present a unique challenge to surgeons caring for postpartum patients with diastasis of the rectus abdominus muscle (DRAM) who are undergoing abdominoplasty. Midline umbilical hernia repair without DRAM plication increases the risk of recurrence while traditional open hernia techniques, especially in combination with abdominoplasty, undermine both peripheral and central umbilical vascular supplies. We review our experience with this novel, tension-free, pedicle preserving, umbilical hernia repair and umbilicoplasty technique used during abdominoplasty.

Methods: Patients undergoing combined abdominoplasty, DRAM plications, and umbilical hernia repair (CARP) were reviewed from 2010-2019 at a two-surgeon, aesthetic practice. Hernia repairs were performed in conjunction with our colleagues in general surgery (IG). Demographic, operative, and outcomes data were assessed. Steps of the technique: 1) Raising the abdominal flap with circumferential umbilical stalk dissection; 2) a 6-cm vertical celiotomy is made caudal or cephalad to the umbilicus; 3) Hernia reduction is performed; 4) Intraperitoneal hernia repair with running poldioxanone suture, incorporating the base of the umbilical stalk; 5) Closure of the celiotomy site; 6) Plication of the DRAM with running or interrupted polydioxanone suture which removes tension from the repair; 7) completion of abdominoplasty.

Results: A total of n=72 patients were included. The average patient demographic was a 39.1±10.5-year-old multiparous female, BMI 20.9±7.0, with at least 1 previous abdominal/pelvic surgery (57.0%). The most common previous abdominal surgery was cesarean section (43.1%). Five patients had prior umbilical/ventral hernia repairs who presented with recurrence. At 5 years of follow-up, postoperatively, no hernia recurrences occurred. Other complications included two (2.7%) cases of delayed healing along the abdominoplasty incision line treated with local wound, one (1.4%) case of cellulitis treated with antibiotics, and one (1.4%) pulmonary embolism treated with anticoagulation. The addition of hernia repair and umbilicoplasty added an average of 14 minutes to our traditional abdominoplasty with DRAM plication procedure time.

Conclusion: The CARP procedure is a safe alternative to traditional umbilical/ventral hernia repair and can be performed during standard abdominoplasties with DRAM plication. It adds minimal additional time to traditional abdominoplasty procedures and has a low complication profile complimented by its tension free design without requiring a mesh.

A Novel Approach to Assessing Patient-Reported Outcomes after Female Cosmetic Genital Surgery

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PURPOSE: Patient-reported outcomes after female cosmetic genital surgery have been well-documented. Methods for assessing patient-reported outcomes after female cosmetic genital surgery vary widely between studies, and these methods are often very detailed, time-consuming and difficult to reproduce. This paper aimed to assess patient-reported outcomes after female cosmetic genital surgery using a novel and efficient method and survey.

METHODS: A retrospective chart review identified 77 patients who underwent female cosmetic genital surgery performed by one of six plastic surgeons in a large group private plastic surgery practice from 2009 to 2018. Demographic, clinical and

operative information were reviewed and recorded. Clinical outcomes were assessed by evaluating postoperative complications. A novel survey was developed and extrapolated from the BREAST-Q, the patient-reported outcome measure after breast surgery, to assess patient-reported outcomes after female cosmetic genital surgery with respect to four domains, including satisfaction with outcome, physical well-being, psychosocial well-being, and sexual well-being. The survey included 14 questions with possible responses of "disagree," "somewhat agree" or "strongly agree" and was administered to all patients who underwent female cosmetic genital surgery during the study period by telephone interview. Patient-reported outcomes were assessed by evaluating responses to questions and by comparing pre-operative and postoperative responses in individual patients.

RESULTS: 77 women underwent female cosmetic genital surgery during the study period. All patients underwent central wedge excision for labia minora hypertrophy with or without extension for clitoral hood hypertrophy. Over a mean follow-up of 37.4 months, the overall postoperative complication rate was 35.1% (27 patients), which included wound dehiscence, asymmetry or redundancy, hematoma, decreased sensation and dyspareunia, and the revision surgery rate was 27.3% (21 patients). The patient-reported outcomes survey response rate was 50.6% (39 patients), with a mean age of 30.0±11.4 years and a mean body mass index (BMI) of 22.2±3.6 kg/m^2, a mean time since surgery of 55.6 months, a revision surgery rate of 25.6% (10) and an overall complication rate of 35.9% (14 patients), which included wound dehiscence, asymmetry or redundancy, decreased sensation and dyspareunia. With regard to satisfaction with outcome, despite the high complication and revision surgery rate, 97.4% (38 patients) felt overall the surgery was a good experience and were satisfied with the results after surgery and only 2.6% (1 patient) did not. When compared to preoperative assessment, patient-reported outcomes after female cosmetic genital surgery showed significant improvement, with regard to physical well-being (97.4% (38) vs. 38.5% (15)), psychosocial well-being (100.0% (39) vs. 5.1% (2)) and sexual well-being (100.0% (39) vs. 12.8% (5)) ($p<0.001$).

CONCLUSIONS: This novel and efficient method and survey can be used to assess patient-reported outcomes after female cosmetic genital surgery, with respect to four important domains. Despite a high potential complication and need for revision surgery rate, the vast majority of patients who undergo female cosmetic genital surgery feel it is a good experience, are satisfied with the results after surgery and show significant improvement in patient-reported outcomes after surgery with regard to physical well-being, psychosocial well-being and sexual well-being.

The State of Insurance Coverage of Ancillary Gender Reassignment Surgeries in the United States

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Introduction: Plastic surgery plays an essential role in the treatment of gender dysphoria. In the Standards of Care of the World Professional Association of Transgender Health – genital and chest surgeries are currently considered medically necessary. Ancillary procedures such as facial surgery, laryngeochondroplasty, hair restoration/removal, and body contouring are considered cosmetic surgeries except in individual circumstances. However, these procedures, and especially facial surgeries, address secondary physical characteristics and can alleviate the dissonance between gender identity and sex assigned at birth. As insurance companies base their coverage benefits on said guidelines, we sought to assess the frequency of coverage provision for ancillary transition-related surgeries through a cross-sectional analysis of U.S. insurance policies.

Methods: We conducted a cross-sectional study of insurance policies on ancillary gender confirmation surgeries in the United States. We selected the largest and most popular insurance companies based on their state enrollment data and market share. Policies were identified through web-based search and confirmed with a telephone interview. We compiled a list of eligible procedures and grouped them into five categories: body masculinisation, body feminisation, facial procedures, hairline restoration, and hair removal, and laryngeochondroplasty. We then abstracted medical necessity criteria from publicly accessible policies.

Results: Sixty-one insurance companies held an established policy. One third of insurers possessed a favourable policy for at least one ancillary procedure. Laryngeochondroplasty was the most covered category (26%, n=16), whereas body masculinisation was the least covered (8%, n=5). Almost two thirds of the companies with favourable policies also held established coverage criteria (n=12). We identified four recurring medical necessity criteria: age, hormone therapy, continuous living in a congruent gender role, and referral from a mental health professional. Strikingly, 25% of policies possessed additional subtype-specific variations within their criteria.

Conclusion: There is a low prevalence of U.S. insurance coverage for ancillary gender surgeries and wide variability in coverage criteria. This may stem from the absence of established medical necessity guidelines and reflect the individualised

nature of the gender transition sequence. Additional data on the improvements of these procedures to patient quality of life will be important for improving patient access. Re-evaluation of ancillary transition-related procedures from cosmetic to medically necessary based on clinical judgement or establishment of defined coverage criteria may augment coverage of these procedures and better address the needs of transgender patients.

Microneedling of Immature Scars Is Safe and Improves Scar Aesthetics

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Purpose: 1. Dispelling previous myths that immature scars could not be treated with Microneedling

2. Microneedling scars as early as 6 weeks following wound closure is safe

3. Microneedling improves scars aesthetics Scar formation involves the remodeling of extracellular matrix proteins.

Wound contraction and hyperproliferation can result in hypertrophic or keloid scars with features linked to poor cosmetic results. Currently early intervention with Microneedling in immature scars is not the standard of care and some recommend waiting upwards of 1 year prior to Microneedling treatment. Our hypothesis is that mechanical stimulation of the myofibroblasts at the early tissue formation stage can positively influence the extracellular matrix to influence cell activity to produce collagen, matrix metalloproteinases and cytokines which lead to flat scars with minimal discoloration as a result of small parallel collagen bundles

Methods and Materials: Subjects were enrolled between 6 weeks and 4 months following closure of their wounds. Once enrolled the patients were treated with 3 Microneedling treatments 1 month apart and a final evaluation at 2 months following the last treatment. The treatment areas included facelift, breast mastopexy and tummy tuck scars. The patients consented to participate in the Institutional Review Board approved study. 25 patients were enrolled, and data was analyzed using ANOVA and Post Hoc testing.

Results: The Vancouver Scar Scale demonstrated a statistically significant improvement when compared from the initial evaluation to the final evaluation at the

2 months follow up following the 3 treatments (7.00 vs 3.08). P value < 0.001. The Patient & Observer Scar Assessment Scale showed statistically significant improvement when initial evaluation was compared to the 2 months follow up (23.72 vs 11.76). P value < 0.001. Conclusions: Early Microneedling on immature scars is safe and has demonstrated improvement in both VSS & POSAS scores when initial evaluation is compared to 2 months follow up.

Comparison of Patients Satisfaction with Aesthetic Outcomes Following Lower Extremity Reconstruction: Muscle Vs. Fasciocutaneous Free Flaps

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Introduction: As microvascular reconstruction has become a routine procedure with high success rates, the emphasis has moved towards providing a reconstruction which is also aesthetically pleasing. The aim of this study was to compare patient's satisfaction with aesthetic outcomes following single-stage muscle or fasciocutaneous free flap reconstruction to the lower limb.

Methods: Retrospective data was collected between July 2013 and May, 2018 at a single centre. The inclusion criteria were adult patients who had successful free tissue transfers to the lower limb following any aetiology. A Likert Scale questionnaire was sent to all patients who met the criteria. The questionnaire included questions relating to the recipient and donor-site.

Results: Questionnaires were sent to 83 patients, who met the inclusion criteria. Forty-Seven (57%) patients responded to survey. Twenty-two of these underwent reconstruction with muscular flap (47%) and 25 with fasciocutaneous flap (53%). Flap texture reported a significant aesthetic difference between the two groups (p=0.003); Patients with fasciocutaneous flap reconstruction being more satisfied with results. No significant difference was observed in the other flap variables assessed. Comparison of donor-site demonstrated no significant difference in aesthetic variables between the two groups.

Conclusion: Despite increasing success in lower extremity salvage many patients still find the aesthetic results suboptimal which impacts their global sense of well-being. Aesthetic consideration should be viewed as an integral part of lower limb

reconstruction and appropriate resource for secondary ‘refinement’ procedures allocated.

Umbilicoplasty Techniques: A Comparative Study of Aesthetic Outcomes

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Background: The umbilicus is arguably one of the most noticeable and critiqued areas after abdominoplasty. The ideal native female umbilicus has been described as small, t-shaped or oval and with superior hooding[1]. In abdominoplasty, numerous umbilicoplasty techniques have been described[2]. However, few studies have objectively compared these techniques and whether they can predictably achieve cosmetically pleasing outcomes. We aimed to compare the aesthetic outcome of four different umbilicoplasty techniques as rated by plastic surgeons, plastic surgery residents and surgical nurses.

Methods: Four different umbilicoplasty techniques, performed by four different plastic surgeons, were assessed. A total of 40 patients (10 patients per technique) were randomly selected by a third-party, blinded to the final aesthetic outcome or patient characteristics and without the influence of the original surgeon. Included were cases done in the past 5 years with at least six-month follow-up. Evaluators were shown four photos at a time and asked to rank the umbilici from 1 (most aesthetically appealing) to 4 (least aesthetically appealing). Each photo corresponded to one of the four techniques, but evaluators were blinded to that information. Evaluators were then asked to rank factors that influenced their umbilical evaluation in the study as well as factors important in achieving an aesthetically pleasing umbilicus in general.

Results: 25 evaluations were analyzed consisting of 11 board certified plastic surgeons, 10 plastic surgery residents and 4 registered nurses. An aggregate “cosmetic score” was given to each of the four techniques (surgeons) after rank data was un-blinded. There was no statistical difference in cosmetic scores between the four techniques evaluated (one-way ANOVA $p=0.15$). Despite that finding, 82% of evaluators still ranked “surgical technique” as the most important factor in achieving an aesthetically appealing umbilicus. “Shape of umbilicus” and “scarring” were the two most important factors to the evaluators while “superior hooding” and “orientation of the umbilicus” were far less important.

Conclusion: Umbilicoplasty technique is still considered the most important factor in creating an aesthetically appealing umbilicus. Our study, however, showed that no one technique was superior to the others in cosmetic outcome. Moreover, shape and scarring of the umbilicus influence the perception of a beautiful umbilicus more than superior hooding or orientation.

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A Cross-Sectional Analysis of Insurance Coverage of Extremity Contouring after Massive Weight Loss

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Introduction: Following bariatric surgery, patients often experience redundant skin in the upper arms and medial thighs as sequelae of massive weight loss. Insurance companies have unpredictable criteria to determine the medical necessity of brachioplasty and thighplasty which are often ascribed as cosmetic procedures. Currently, the literature is void on insurance coverage criteria for contouring of the extremities following massive weight loss.

Methods: We conducted a cross-sectional analysis of insurance policies for coverage of thighplasty and brachioplasty in January 2019. Insurance companies were selected based on their state enrolment data and market share. A web-based search and direct calls were conducted to identify policies regarding brachioplasty and thighplasty. A comprehensive list of standard criteria was compiled based on the policies that offered coverage.

Results: Of the 56 insurance companies assessed, half did not provide coverage for either procedure (n=28). No single criterion featured universally across brachio- and thighplasty policies. Functional impairment was the most commonly cited condition for pre-approval of brachioplasty and/or thighplasty (94%). Conversely, a minimum weight loss was the least frequent criterion within the insurance policies (6%). Only

5% of the insurance companies (*n*=3) would consider coverage of liposuction-assisted lipectomy as a modality for brachioplasty or thighplasty.

Conclusion: We propose a comprehensive list of reporting recommendations to help optimise authorisation of thighplasty and brachioplasty in the post-bariatric population. There is great inter-company variation in pre-approval criteria for brachioplasty and thighplasty, illustrating an absence of established recommendations or guidelines. High-level evidence and investigations are needed to ascertain validity of the limited coverage criteria in current use.

Vaginal Rejuvunation by Fatgrafting and PRP

Presenter: Amani Landoulsi Landoulsi Helal, MD
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Introduction There is evidence that the increasing request of genital cosmetic procedures derives from women's desire for a standardized, pre-pubic genital appearance, namely "Barbie doll look", in which the labia minora are narrow and not visible and the vagina opening appears very tight, but also to improve sexual functioning.

Aim to describe a surgical procedure and its results: the vulvo-vaginal rejuvenation by autologous fat (Microfat) mixed with platelet-rich-plasma (PRP) and an injection of Nanofat in all the pubis area.

Some complimentary procedures are performed such as labioplasty for the minor labia, revision of clitorial hoods, or Laser (fractional CO2 laser, erbium YAG laser) to regenerate the mucosa, improving tissue trophism and restoring the correct functionality.

Method: The surgical procedure consists in a vaginoplasty by lipofilling mixed with PRP and injected on the posterior vaginal wall far from the vascular axes and transferred to labia majora. Nanofat, injected subcutaneously in all the pubis. we present 30 cases of females between 30 to 64 years of age, 8 patients listed strictly aesthetic, 2 patients listed strictly functional and 10 listed a combination of two factors. To assess the results regarding the sexual quality of life we used the modified Stabbatsberg self-rating scale.

Findings: There were no intra-operative complications with this simple procedure. During follow-up we observed an improvement in self-esteem, in sexual function

(disappeared of dyspareunia) and in a vulvo-perineal rejuvenation. No post-operative complications occurred.

Conclusions: Vaginal rajuvination by Combination of Several Techniques (Microfat mixed with platelet-rich-plasma (PRP) and an injection of Nanofat) is a minimally invasive technique that is safe and easy to perform. Further studies are necessary to assess more thoroughly the effectiveness and safety of this procedure and assess medium- and long-term results.

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General and Specific Considerations for Composite Breast, Gluteal and Calf Augmentation

Presenter: Katarina Andjelkov, MD, PhD
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PURPOSE: Suboptimal results with breast, buttock and calf implants were the main reason of raising popularity of composite augmentation techniques. Combination with fat grafting allow surgeons to improve the final results, additionally increase the volume, overcome implants' downsides, but also treat complications. Fat grafting can be done together with an implant insertion or as a staged procedure. Furthermore, the staged procedure can be implant or graft staged. Authors present their experience in composite augmentation, the rationale behind, safety considerations and mechanism of graft-implant interaction.

METHODS: We have reviewed 232 cases on breast (35), gluteal (63) and calf (134) augmentation for both reconstructive and cosmetic indications and reviewed outcomes, complication rates and patients' satisfaction.

In cases of breast augmentation, implants were placed in subglandular or submuscular pocket. In gluteal implant augmentation, we used intramuscular position of the implant, while in calves the implant was inserted in subfascial pocket. After liposuction, lipoaspirate was purified in closed system that allowed removal of oil and blood components and provided us with homogenous fat grafts. Whether it was done immediately or as a staged procedure, fat was placed in all cases in subcutaneous layer.

RESULTS: The indications for staged composite breast augmentation in most of our cases were complications of breast implant surgery such as: rippling, "double-bubble" deformity, or further improvements in the shape or size. The immediate composite breast augmentation was performed in cases of breast asymmetry. We had one case of infection that was resolved with antibiotics.

The composite buttock augmentation was performed immediately in cases of asymmetry, while the staged was indicated in cases of under augmentation or asymmetry. We did not have complications.

With regards to composite calf augmentation, we always performed staged procedure. The indications for graft staged procedure were in most of the cases augmentation of the lower third of calves in cases of club-foot deformity.

CONCLUSION: Composite augmentation is gaining more popularity among surgeons and patients. There are some common considerations for all three analyzed areas but, also some differences that are important in planning cosmetic and reconstructive procedures.

Breast augmentation with breast implant and fat is a powerful tool specially when it comes to the treatment of breast implant complications surgeries.

Autologous fat grafting in comparison to the use of implants in gluteal augmentation is preferred method among our patients but provides variable results in terms of volume retention and it is associated with the most dreadful complication which is fat embolism. Having on mind patient safety and longevity of the result, when larger volumes are required, we suggest composite augmentation.

In order to avoid compartmental syndrome, we only perform staged composite calf augmentation.

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Ten Years of Mommy Makeovers: A Propensity Matched Analysis of Combined Abdominoplasty and Breast Augmentations

Presenter: Daniel Maxwell, MD
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Background: Abdominoplasty (AP) and primary breast augmentation (BA) are two of the most frequently requested aesthetic procedures, making up 30% of all cosmetic surgical procedures performed in the United States. The effects of pregnancy and breastfeeding, as well as bariatric surgery have lasting impacts on the female form, contributing most notably to laxity of the abdominal domain and deflation of the breast parenchyma. Though there is literature that supports and refutes the use of both combined and component procedures, there is little data addressing the complications and long-term outcomes. Our aims were 1) To review our experience in performing combined abdominoplasty and breast augmentation (MM) and determine its complication and outcomes profile and 2) Compare these outcomes to propensity matched patients undergoing singular component procedures.

Methods: Patients undergoing MM with either BA or mastopexy-augmentation (MA) and patients undergoing MM component procedures alone (BA, MA, and AP) were retrospectively reviewed from 2006 – 2018 in a two-surgeon aesthetic practice. Patients were propensity matched with baseline characteristics using multivariable logistic regression. Only patients undergoing primary procedures were included. Patients undergoing additional body lifts, brachioplasty, or other lift procedures were excluded. Our primary outcome was overall complications. Multivariate risk analysis and survival analysis were performed for individual and combined groups.

Results: The 1200 included patients were grouped into MM (n=300), BA (n=300), MA (n=300), and AP (n=300), respectively. The typical demographic included

40.98±9.92-year-old, 24.97±4.89 kg/m^2 BMI, G1P1 females with at least one previous abdominopelvic surgery (60.6%). The most common comorbidities were hypertension (8.9%) and type-II diabetes (4.0%). Thirty-six massive weight loss patients were included. The overall incidence of complications at 1, 3, 5, and 10 years of follow-up was 4.25% (51/1200), 9.0% (108/1200), 9.5% (114/1200), and 9.8% (118/1200). By group, overall complication rates were 12.0% (36; MM), 5.0% (15; BA), 7.0% (21; MA) and 15.3% (46; AP). However, MM group complications split into component breast and abdominoplasty procedures are 3.3% for breast augmentation and 9.3% for abdominoplasty (p=0.213). The most common breast and abdomen complications were capsular contracture (3.0%) and seroma (5.0%), respectively. However, the rates of capsular contracture (BA 2.5% vs 1.5%; MA 2.5% vs 4.3%) and seroma (4.3% vs 5.3%) were similar between MM and component procedures (all p>.100). Massive weight loss, periareolar incisions, and smoking status were not associated with increased complications.

Conclusions: Abdominoplasty and augmentation mammoplasty procedures are safe to perform simultaneously in multiparous and post-bariatric weight loss patients with risk of increase post-operative complication compared to their individual component procedures.

Implant Removal with Simultaneous Mastopexy and Fat Grafting without Pre-Expansion

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Goals/Purpose: All patients who undergo breast augmentation are counseled on the need for future operations due to sequalae which may include capsular contracture, implant malposition, rupture, ptosis, size change, or preferential removal. Patients who opt for prosthetic removal are often left with a deflated, ptotic, and non-aesthetic breast appearance. To improve the aesthetic outcome, Del Vecchio was the first to describe simultaneous implant exchange with fat grafting (SIEF) with recipient-site pre-expansion.[1] This technique was effective in producing satisfactory results in patients with minimal to no ptosis. Our technique differs in that no recipient-site pre-expansion was performed and additionally incorporates mastopexy. We found that we could improve the shape, ptosis, and volume in patients with all degrees of ptosis. We present our series of implant removal with simultaneous mastopexy and fat grafting without recipient-site pre-expansion.

Methods/Technique: Our method was performed on patients with both saline and silicone implants. Patients with saline implants underwent deflation in the clinic at least two weeks prior to surgery while those with silicone implants had them removed at time of surgery. Our technique followed a stepwise sequence. Implants were removed and capsulorrhaphies were implemented to re-establish a more aesthetic breast footprint. Next, mastopexies were performed. Liposuction of donor sites was accomplished using a 5 mm Mercedes tip cannula at -10 inches Hg negative pressure, and the fat was processed via centrifugation at 100 g for 30 seconds. Fat was then transferred into the subcutaneous and parenchymal planes. All fat grafting was performed at the time of implant removal and mastopexy. No recipient-site tissue pre-expansion was performed.

Results/Complications: The technique was implemented in fifteen patients between 2008-2018. The average age and BMI of our cohort was 47.1 years and 24.3, respectively. Thirteen patients had saline implants and two patients had silicone implants. The average amount of fat grafted per side was 297 cc and 289 cc, right and left respectively. Two patients suffered minor, unilateral, peripheral nipple necrosis that did not require revision. One patient opted for re-augmentation with prosthetic implants. The remainder of cases had uneventful post-operative courses without any complications or clinically detectable fat necrosis or oil cysts. All patients were satisfied with both volume and shape of their final results.

Conclusion: Patients who opt for removal of prosthetic implants may suffer from significant deflation. Our technique demonstrates that implant removal with simultaneous mastopexy and fat grafting can produce satisfactory results without recipient-site pre-expansion in patients with all degrees of ptosis.

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Comparing Three Different Methods to Find an Ideal New Nipple-to-Fold Distance in Breast Augmentation

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Purpose: Breast augmentation is one of the most popular plastic surgeries in the world. When performing breast augmentation with IMF approach, one of the most important steps during tissue-based planning is to decide ‘where to incise’. The

process of determining the new nipple-to-fold distance has a decisive effect on the quality of the scar. Final scar is best when it is located in the newly formed inframammary fold. The purpose of this study is to identify the differences by comparing the three widely used methods in the planning phase of breast augmentation and to review the results when applied to actual surgery.

Methods: Consecutive 35 patients with primary augmentation via IMF approach were reviewed. Secondary surgeries, concurrent augmentation mastopexy cases and primary surgeries with endoscopic axillary approach were excluded. All patients were planned with three different methods before surgery. In each patient, the ideal new nipple-to-fold distances were proposed by 'High Five System'[1], 'Randquist formula'[2] and the 'ICE' principle[3]. The actual operation was performed by selecting the longer value of 'High Five system' and 'Randquist formula', if the IMF was to be lowered. The location of the scar was evaluated at each patient's most recent visit, whether it was properly located in the fold.

Results: A total of 70 breasts in 35 patients were included in this study. The average volume and width of the prosthesis were 274cc and 11.1cm. When High Five System was applied, the average new N:IMF distance was 7.4cm. When Randquist formula was applied, it was 7.7cm. However, when the ICE principle was applied, it was as long as 8.54cm. The average value of new N:IMF distance taken in the actual operation was 7.93cm. In 67 out of 70 breasts, the scar was located within 0.5cm of the new IMF.

Conclusion: In this study the ICE principle yielded the longest new N:IMF distance, followed by Randquist formula and High Five System. The ICE principle is thought to be designed to locate breast footprint slightly lower than the other two methods, creating straight upper pole slope and skyward-pointing nipples. When operated using High Five system or Randquist formula, the results showed that the scar was placed within the fold in most patients. It should be noted that different new nipple-to-fold distances can be derived depending on what kind of method is used in planning breast augmentation, which affects the shape of the breast and the quality of the scar after surgery.

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Anatomically Based Breast Augmentation: A 6-Plane Autologous Approach

Presenter: Brenton Richard Robinson, MD
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PURPOSE: With concerns about the high rate of breast implant complications, surgeons and patients increasingly seek alternative options. A general belief that fat transfer provides less volume than many patients may need for augmentation led us to expand previously published concepts (1,2) into a multi-planar anatomic approach to consistently permit transfer of larger volumes.

Avoiding breast parenchyma itself, there are 6 distinct anatomic planes in the breast. We proposed that by grafting each of these separately, greater volumes could be added without overwhelming the capacity for neovascularization. Also, by modulating volumes placed in each plane, specific shapes, better symmetry, and increased central projection might be achieved.

METHODS: Preoperatively, patients are marked when vertical, creating contour maps outlining each anatomic plane to be grafted. Augmentation planes and graft harvest sites were infiltrated with non-distorting volumes of 1:500,000 epinephrine; 30 minutes was waited for vasoconstriction. Gold-plated, multi-holed 2.4 and 3.0mm cannulas (1mm orifices) facilitated harvest of particulate fat. Preferential harvest of accessory breast mounds would improve peripheral contours of the breasts and decrease chest circumference. Harvest syringes were heparinized to prevent fibrin formation and potentiate growth factors (3). All harvested fat was commingled, creating a confluent “mosaic graft" mass with consistent physiologic properties. 1.5mm cannulas (1mm holes) on 10cc syringes were used to graft each anatomic plane using 2mm incisions and cross tunneling. Cannulas were kept tangential to the chest wall to avoid intrathoracic penetration. Volumes were transferred to create desired shape and size. Compression-wear was used for harvest sites, but not on breasts themselves.

The 6 anatomic planes are listed below, with expected enhancements and potential transfer volumes noted:

- **Subpectoral/Preperiosteal** (projection of entire breast mound), 50cc
- **Intrapectoral** (central and superior fill), 30cc
- **Prepectoral** (central and superior fill), 50cc
- **Deep Subglandular** (inferior enhancement and central projection), 60cc
- **Superficial/Subcutaneous** (inferior fullness and medial cleavage), 30cc
- **Sub-areolar/Intra-nipple** (youthful projection of NAC), 24cc

Experience: Over 5 years, in 3 dozen cases (average 2-year follow-up), there were no significant complications, no fat necrosis nodules, and no secondary revisions. Skin expansion was not needed. Enhancements ranged from 120-300cc per breast.

Results: Natural appearing breasts were consistently produced, indistinguishable from unoperated breasts by visual inspection and palpation. Scarring was negligible. Patients reported no issues with subsequent mammograms.

Conclusions: Breast augmentation with up to 300cc of fat graft bilaterally can be accomplished using a 6-plane, anatomically based technique. This approach can also be applied for reconstructive care, post-explant augmentation, asymmetry correction, and for reconfiguration of post-pregnancy and post-menopausal concerns. Further work is needed to determine fat survival in each grafted plane.

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Rating Trends across Leading Review Websites for Aesthetic Plastic Surgeons

Presenter: Meredith Grogan Moore, BS

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Introduction: As utilization of physician rating sites continues to bourgeon, there is little insight on sources of variation in surgeon ratings and review volumes. User-generated content on physician review websites may significantly influence patients' provider perceptions and ultimately their choice of doctor for elective procedures. For board-certified aesthetic surgeons whose patients rely on review profiles as one of few data points available when selecting their plastic surgeon, online reviews are especially relevant.

Purpose: This study seeks to evaluate online reviews for the entire directory of active members of the American Society for Aesthetic Plastic Surgery (ASAPS).

Methods: Each unique practicing ASAPS member listed on the consumer-facing "ASAPS Find a Surgeon" tool was searched in three popular physician rating websites (HealthGrades, Vitals, and RealSelf) for a total of 5,337 web searches over a 21-day period in early 2019. Demographic data, overall ratings (out of 5 stars), number of reviews, practice location, and other site-specific information (e.g., wait times for HealthGrades, profile view counts for RealSelf) were tabulated from each member's page on each site and then analyzed using descriptive statistics, Student's T-test, correlation coefficient testing, and ANOVA.

Results: A total of 1,778 plastic surgeons were included. All had ratings on at least one of the three websites, with 1563 (88%) rated on all sites. The most commonly used site was Vitals.com with 1739 (98%) of surgeons possessing 1+ reviews on this outlet. Aesthetic surgeons were well-regarded on all three websites (mean 4.4±,0.5, range 1.35-5; 5-point scale) with a median of 23 ratings on each site. Increasing surgeon age, as indicated on HealthGrades, had a -0.15 correlation with average rating. Male surgeons commanded significantly more reviews across websites than female surgeons (106 vs. 77, $p<0.005$), but both genders similarly received an average of 4.4 stars out of 5. ANOVA demonstrated statistically significant difference in average physician rating ($p<0.005$) between regions, with surgeons in the South and West of the United States garnering more stars than those in the Northeast or Midwest while review quantities across regions were comparable.

Conclusions: Active ASAPS members achieve generally positive reviews by their patients, and most on multiple review platforms. There is regional variation by practice location associated with ratings received, and male surgeons receive more reviews than female surgeons. Numerical rating appears to fall with increasing surgeon age. Given the increasing popularity of review websites and clinical case

volume implications, accredited aesthetic surgeons should have a vested interest in the quantity and quality of patient-provided data on physician rating outlets.

High Cost of Cosmetic Surgery Tourism

Presenter: Sameer Massand, MD
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Purpose: Medical tourism is an increasingly popular practice among cosmetic surgery patients.[1] Often, these procedures are performed in the developing world, placing patients at risk for atypical infections. Non-tuberculosis mycobacterium has been a frequently reported agent in these cases. There is no standard management of these infections, and all options pose significant morbidity to affected patients. We present two cases treated at our institution and a literature review of non-tuberculosis mycobacterial infection in patients who underwent cosmetic surgery in developing nations.

Methods: A review of institutional medical records for patients with mycobacterial infections after cosmetic surgery was performed. A literature search was conducted to identify reports of patients who suffered similar infections following medical tourism to developing nations for cosmetic surgery. Individual treatment courses were reviewed for management and associated morbidities.

Results: Two patients underwent abdominoplasty procedures in the Dominican Republic and later presented with mycobacterial infection. One patient has undergone four formals operative debridement's, and has received antibiotic therapy for 18 months. Her course has been complicated by adverse effects of antibiotic agents, a peripherally inserted central catheter (PICC) associated deep venous thrombosis (DVT), and a tunneled catheter associated infection. The second patient has undergone bedside procedures, drain placement, and antibiotic therapy which has also resulted in side effects requiring medication adjustment. Thirty-five similar cases were identified by literature review. These patients underwent an average of 2.1 surgical procedures and received antibiotics for an average of 7.9 weeks. The most frequently used agents were azithromycin or clarithromycin, amikacin, and cefoxitin. Fifteen (43%) patients required medication adjustment due to side effects or medication expense.

Conclusions: Patients who undergo cosmetic surgery as medical tourists are placed at risk for atypical infections and prolonged morbidity. Mycobacterial infections are examples of such complications, and their management requires multiple surgical procedures and long-term antibiotic therapy. Surgical interventions include operative debridements, explantations, catheter placements and aspirations. Indicated antibiotic regimens are expensive and have strong side effect profiles. Patients are left without the cosmetic results they originally sought and require highly morbid treatment courses.

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An Analysis of Photographic Manipulation of 'before and after' Pictures on Instagram: How Often Do Doctors 'doctor' Their Own Photos?

Presenter: Colton G. Boudreau, MSc
Co-Authors: Sarah Al Youha, MD, PhD, Jason Williams, MD, MEd, FRCSC
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Background: Instagram is the second most used social media platform and many plastic surgeons use Instagram to post before/after photographs for the public to view. This study aims to analyze the degree of similarity between before and after photographs displayed on the accounts of the top 100 plastic surgeon influencers on Instagram.

Methods: The top 100 plastic surgeon influencers on Instagram were ranked by number of followers. Every other before/after montage beginning with the most recent were analyzed for a total of 3 per account. Each before/after panel (n = 237) was assessed by two blinded observers using a five-point scale (5 = very similar, 1 = very dissimilar) on eight characteristics. Additionally, an expert professor of photography reviewed photographs and scored colour balance (1= measurable difference; 5 = no measurable visible difference), “amatureness” (1= less professional, 5 = very professional), and digital artifacts (1 = obvious artifacts, 5 = no visible artifacts).

Results: Average scores (+/- 95% confidence interval) are as follows: lighting 3.37(0.17), patient positioning 3.79(0.19), camera angle 3.84(0.18), clothing or hair-style 3.90(0.18), skin tone 3.57(0.14), background 3.69(0.19), zoom 3.87(0.17), image quality 4.08(0.14), and cumulative score 30.11(1.10)/40. Professional photographer

scores yielded: colour balance 2.71(0.19), “amatureness” 2.96(0.14), and digital artifacts 4.81(0.07), and cumulative professional assessment score 10.27(0.23)/15 . No significant differences in cumulative total eight-parameter scores were found based on surgeon geography, stated degree(s), indicated board certification or society membership. Surgeons located in South America had a statistically significant decrease in total professional assessment score compared to those located in North America (p=0.03), and surgeons indicating board certification on their Instagram profile had significantly increased total professional assessment scores (p=0.04). Otherwise, total professional assessment scores yielded no statistically significant findings between aforementioned comparison groups.

Conclusion: This study highlights that heterogeneity exist in all assessed parameters of before/after photograph presentation on social media and indicate a need for improvement in standardization of photographs posted to such platforms. This study can help guide plastic surgeons when posting on social media, as well as educate consumers on aspects to consider when viewing before/after photographs.

Targeted Breast Reinnervation for Post-Mastectomy Pain

Presenter: Marco A Swanson, MD
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Purpose: Chronic pain following mastectomy is a recognized entity with a detrimental impact on quality of life with reported rates as high as 60%. As an alternative to long-term pharmacologic therapy and its associated consequences, we propose a novel surgical technique, Targeted Breast Reinnervation (TBR) that can be applied to immediate and delayed autologous or implant-based reconstruction. TBR is similar to the increasingly popular treatment for phantom limb pain known as Targeted Muscle Reinnervation and a mastectomy is analogous to an amputation of the breast. However, as opposed to coapting the cut nerve to a non-functional muscle nerve, in TBR, a cadaveric nerve graft is 1) coapted to the cut nerve proximally using a conduit, 2) arborized distally by splitting the fascicles and 3) parachuted to the targeted skin area distally using nerve protectors to direct axonal growth superficially. In this case series we describe the TBR technique and present our initial results. Furthermore, we propose the use of a well-described method in migraine surgery to assess whether a patient is a good candidate for TBR and pre-operatively identify the operative target.

Methods: All patients presenting to the senior author's clinic with post-mastectomy pain and anesthesia were presented with this technical option and its risks, including but not limited to recurrent pain and neuroma. Pain was measured pre-operatively and post-operatively using a visual analog scale (VAS). Pre-operative sensation was measured in 4 quadrants using a similar "Tens Test" in unilateral patients. A nerve block was performed pre-operatively in clinic and responders were scheduled for surgery. Immediately pre-op, all patients underwent a repeat nerve block with 1% lidocaine mixed with methylene blue. Subjective changes in sensation and light touch, VAS scores, and tinel's sign, if present, were assessed pre-operatively and at all follow-up visits.

Results: Three consecutive female patients who had undergone mastectomy presented with chief complaints of pain and anesthesia of the breast. Patient 1, a 57-year-old female status post sub-pectoral immediate reconstruction with tissue expanders endorsed 7/10 pain pre-operatively and 0/10 eight weeks post-operatively. Patient 2, a 38-year-old female status post bilateral second-stage reconstruction endorsed a 7/10 pain pre-operatively, which decreased to 2/10 six weeks post-operatively. Patient 3, a 63-year-old female status post delayed tissue expander insertion due to concurrent Humira therapy, endorsed a 5/10 pain with complete lack of sensation pre-operatively and became pain-free with subjective improvement in sensation 14 months post-operatively.

Conclusion: Though early in its inception, TBR has demonstrated promising results in the attempt to decrease and potentially eliminate post-mastectomy pain irrespective of reconstruction technique. Furthermore, a pre-operative block with methylene blue can serve as a useful diagnostic and operative adjunct to increase the predictability and efficacy of this technique. To date there have been no adverse events, recurrent pain, or neuromas associated with this technique.

Is Our Effort Appropriately Valued? an Analysis of Work Relative Value Units in Immediate Breast Reconstruction

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Background: The Work relative value units (wRVUs) system was developed as a quantifier of physician labor, technical skill, medical decision making, and training time required to complete surgical procedures.[1] Thus, more complex surgical procedures that require greater technical skills and are more time consuming should

yield a greater compensation. Historically, it is known that prosthetic breast reconstruction reimburses considerably more per hour than autologous breast reconstruction.[2] However, there is limited data comparing wRVUs and operative times in breast reconstruction procedures.

Purpose: This study aims to compare mean operative times and wRVUs per minute across three different modalities of breast reconstruction.

Methods: A retrospective analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database was performed to identify all patients undergoing implant, pedicle and free flap based reconstruction over a 6-year period (2012–2017). Calculation and comparison of mean operative times, wRVUs and wRVU per minute was performed.

Results: A total of 3,167 patients were included in the analysis. 2,265 (71.5%) underwent immediate implant-based reconstruction, 759 (24%) underwent immediate free flap breast reconstruction and 143 (4.5%) underwent immediate pedicle flap based reconstruction. Patients were distributed in unilateral and bilateral cases, and according to the use of acellular dermal matrix during implant based reconstruction. Consistently, mean operative time was greater for free flap breast reconstruction, followed by pedicle flap and implant-based reconstruction ($p<0.0001$). However, wRVU per minute and dollars per minute was found to be higher for prosthetic reconstruction in all comparisons ($p<0.0001$).

Conclusion: In our analysis, the more complex and time-consuming procedures resulted in a lower reimbursement in dollars and wRVU per minute for the procedure.

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Covalently Bonded Alginate Derivative Reduces Capsule Thickness in Submuscular Rodent Model of Breast Reconstruction with Delayed Radiotherapy

Presenter: Matthew A. Wright, BA

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PURPOSE: Capsular contracture (CC) remains the most common complication following device-based breast reconstruction, occurring in up to 50% of women who also undergo adjuvant radiotherapy either before or after device-based reconstruction. While certain risk factors for CC have been identified, there remains no clinically effective method of prevention. Our group has previously shown the alginate derivative E9, a novel, non-toxic small molecule known to have potent anti-inflammatory effects, to reduce capsular thickness around stiff polydimethylsiloxane implants in a murine model and to reduce clinically apparent capsular contracture in a rodent model of subcutaneous implantation. Capsule thickness has proven challenging to measure, however, due to baseline fascia present in the subcutaneous plane which is indistinguishable from newly formed capsule. The purpose of the present study is to determine the effect of E9 coating, with and without delayed, targeted radiotherapy, on capsule thickness and morphologic change around smooth silicone implants placed under the latissimus dorsi, a submuscular plane which both lacks confounding baseline fascia, and which makes for a more clinically relevant model.

METHODS: Twenty-four female Sprague Dawley rats were used in this study. Each animal had 2cc smooth silicone breast implants (Mentor Corporation) implanted bilaterally under the latissimus dorsi muscle. Twelve received uncoated implants and twelve received implants coated with E9. Half of the animals from each group received 20 Gray of targeted radiotherapy on postoperative day ten. At three and six months after implantation, the tissue surrounding the implants was harvested for analysis of capsular histology. Capsule thickness was measured at five different locations per implant in a blinded fashion, and a three-way ANOVA test was used to compare mean capsule thicknesses across all groups and timepoints. Additionally, microCT scans of one rat from each group on the day of implantation and the day of sacrifice were qualitatively analyzed for morphologic change.

RESULTS: Overall, capsules surrounding E9-coated implants were significantly thinner ($p = 0.001$) per three-way ANOVA. The greatest difference in capsule thickness was seen in the irradiated six-month groups, where mean capsule thickness was 80.0 ± 25.8 μm for uncoated versus 47.6 ± 10.1 μm for E9-coated implants ($p = 0.017$). Grossly at explant, no differences were seen between the two groups aside from skin changes attributable to irradiation in those rats which had received delayed radiotherapy, and MicroCT did not reveal significant morphologic differences between groups.

CONCLUSIONS: E9 coating of smooth silicone breast implants significantly reduces capsule thickness in this high-fidelity rodent model of submuscular breast reconstruction with delayed radiotherapy. Interestingly, despite significant differences in thickness, there was little evidence of capsular contracture grossly or on microCT in any of the groups, a finding which may be attributable to the submuscular device placement, and which also likely reflects the complexity of CC pathophysiology which is influenced by factors beyond the capsule alone, including surrounding muscle, fascia, and skin.

Proposed Etiology of Red Breast Syndrome

Presenter:	Michel Alain M Danino, MD, PhD, FRCSC
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Introduction: Despite the well-established benefits of Acellular Dermal Matrices, a poorly defined entity referred to as Red Breast Syndrome has emerged with an incidence of 1.7-14.3%. It is commonly described as a delayed erythema localized on the skin over the ADM appearing days to weeks after reconstructive breast surgery without systemic signs of infection. The aim of our study is to clarify the etiology of this phenomenon.

Methods: Patients presenting with RBS without infectious signs following one- or two-stage breast reconstruction with implants using ADMs were recruited prospectively between April 2017 and June 2018 as a case series. All reconstructions consisted of sub-pectoral prosthesis placement with the ADM acting as an infero-lateral hammock. We started broad-spectrum antibiotics, admitted for observation and operated for washout of pocket and implant when no clinical improvement was observed in 24 hours of antibiotic therapy. A control group constituted of asymptomatic patients undergoing two-stage expander with ADM to permanent implant exchange. During surgery, two $1cm^2$ pieces were collected from the ADMs, one sent for bacterial cultures and the other for scanning electron microscopy. Image analysis of specimens was performed at 3000X and 6000X magnifications, including bacterial count and Van Heerden's semiquantitative biofilm scale.

Results: Study group: 9 breasts in 8 patients presented with red breast syndrome. All 9 ADMs utilized were AlloDerm® *Ready-to-Use* (LifeCell Corporation, NJ) with a size of 16x8cm. The mean time-to-onset of RBS was 2.5 weeks in 7 patients and 4 years in one patient, whereas the mean time from symptoms to surgical exploration

was 4 days. Postoperative cultures revealed commonly found bacteria from skin flora and gastro-intestinal tract. Furthermore, biofilm from different bacterial populations was found on all samples on scanning electron microscopy pictures.

Control group: 8 breasts were reconstructed with Allergan Biocell® expanders, The average size was 490cc and all procedures were done with submuscular insertion assisted by AlloDerm® (16X8cm). Definitive expander-to-implant exchange occurred between four to 16 months after the first stage. Specimens from the implant-ADM interface with Biocell® expansion had no clinically identifiable "Velcro-effect" or macro-texturing ingrowth, but showed a rate of 100% (n=8) for biofilm formation under electron microscopy.

Conclusion The presence of bacterial biofilm was demonstrated on ADMs in all cases. This suggests that biofilm on ADMs is not always symptomatic. We postulate that bacterial biofilm could be a causative agent of red breast syndrome but we do not have enough data to propose a 'tipping point' which would ultimately cause the syndrome to start.

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Arnica Montana and Bellis Perennis for Seroma Reduction Following Mastectomy and Immediate Breast Reconstruction: Prospective, Randomized, Double-Blinded, Placebo- Controlled Trial

Presenter: Adi Maisel Lotan, MD

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Purpose: Seroma is a common surgical complication created by the inflammatory process that follows mastectomy and reconstruction [1, 2]. It is, therefore, common practice to insert surgical drains, which often remain in place for long periods and delay recovery [3, 4]. In light of the many advantages of homeopathic treatment, there has been a global trend of integrating this with conventional medicine [5]. In this study, we examined the effect of *Arnica montana* and *Bellis perennis* on seroma prevention after mastectomy and breast reconstruction.

Methods: This was a prospective double-blind randomized analysis of 55 patients (78 breasts), who underwent mastectomy and immediate breast reconstruction between 01/2016 and 08/2017. Patients were randomly assigned and treated with *Arnica montana* and *Bellis perennis* or placebo from surgery and up to the time of drain removal.

Results: *Arnica montana* and *Bellis perennis* significantly reduced drain removal time (discharge< 30 ml) by 18% (2.4 days, $p < .05$), 11.1 (6.1) days in the study groups compared with 13.5 (6.4) days in the placebo group. Age, body mass index, mastectomy type and lymph node dissection were similar among groups. Patient opioid intake was lower ($p < .057$) in the study group. Quality of life, postoperative pain, hemoglobin and cortisol levels and complications were not associated with any treatment.

Conclusion: *Arnica montana* and *Bellis perennis* have been shown to reduce seroma formation and opioid intake following mastectomy and reconstruction. As this treatment lacks side effects and is inexpensive, it should serve as a valuable treatment adjunct in patients undergoing mastectomy and reconstruction.

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Are Transversus Abdominis Plane Blocks the New Standard of Care in Microsurgical Breast Reconstruction? a Systematic Review and Meta-Analysis

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Purpose: Transversus abdominis plane (TAP) blocks have been shown to significantly reduce pain and narcotic consumption following several major abdominal surgeries, however, their widespread adoption in microsurgical breast reconstruction has been slow. This study investigates the current body of evidence on the use of TAP blocks in microsurgical breast reconstruction.

Methods: A systematic review of patients undergoing autologous breast reconstruction with TAP blocks was performed. Information on patient demographics, pain scores, and postoperative narcotic consumption were noted. Meta-analysis of hospital length of stay (LoS) was performed using a random effects model.

Results: Ten studies published between 2011-2018 were included. All studies were either a randomized control trial/prospective case-control study [LoE II (5, 50%)] or a retrospective cohort study [LoE III (5, 50%)]. Across all studies, 174 patients (5 studies) received a single intraoperative TAP block injection, 185 patients (4 studies) received a TAP catheter for intermittent postoperative analgesia, and 325 patients served as controls for a total of 684 included patients. The majority of TAP block delivery techniques were ultrasound guided (7/10 studies). Liposomal bupivacaine (LB) was the most commonly used analgesic (4 studies, 139 patients) followed by conventional bupivacaine (3 studies, 105 patients). Studies reported on a mixed cohort of both uni-and bilateral, as well as immediate and delayed reconstructions. Abdominally based flaps investigated included DIEP, MS-TRAM, TRAM and SIEA flaps. Nine of the included studies analyzed postoperative narcotic consumption with the use of TAP blocks. Of those, all but one found a significant reduction in oral, intravenous, and/or total morphine requirements in the experimental TAP group when either the daily average and/or total inpatient consumption was compared to the control. Only one study performed a formal analysis of cost with the use of a

liposomal bupivacaine TAP block and found no statistically significant increase in hospital expenses in the TAP block group. Hospital LoS was significantly shorter for patients undergoing single intraoperative TAP block injection with any analgesic as compared to standard narcotic-based protocols (mean difference= -0.95 days, [95% CI -1.72 to -0.17 days], p=0.02). Looking at TAP blocks specifically with liposomal bupivacaine, there was a mean decrease of 0.83 days as compared to the control which was not statistically significant (95% CI -1.90 to 0.25 days, p= 0.13). No study reported adverse outcomes related to the TAP injections themselves. One prospective cohort study specifically looked at chronic postsurgical pain (CPSP) outcomes following the use of standard 0.25% bupivacaine delivered via TAP catheters and found no significant reduction in the incidence of CPSP at 6 and 12 months.

Conclusions: Several high-quality studies have demonstrated that TAP blocks in microsurgical breast reconstruction significantly reduce narcotic consumption and hospital LoS. However, there remains considerable variability with regards to delivery technique, analgesic type, and dose. While the current data supports the use of TAP blocks in autologous breast reconstruction, additional studies with more standardized protocols should be performed to determine the most optimal practice.

What Affects Breast Cancer Procedure Type in a Racially and Economically Diverse Patient Population When All Parties Are Given Equal Access to Care?

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Purpose: The National Accreditation Program for Breast Centers has endorsed a standard that surgical oncologists must offer a referral for plastic surgery at the time of breast cancer diagnosis. Few institutions offer the presence of plastic surgeons at tumor boards with immediate availability for consultation on the day the patient meets their oncology team. This multi-disciplinary approach to care is offered throughout the Henry Ford health care system in metropolitan Detroit and it addresses disparities in care that exist nationally. While disparities in care have been shown to decrease breast reconstruction (BR) rates, little is known about the impact of socioeconomic and demographics on pre-operative procedure choice in diverse women that have full access to BR. There is also a paucity of literature addressing the impact of these factors on baseline patient reported outcomes (PROS).

Methods: Women with a breast cancer diagnosis who were diagnosed in the Henry Ford Health System from April 2017 to Dec 2018 were recruited to participate in a prospective longitudinal survey study of PROS. Women with an established surgical plan who agreed to participate were given a demographic survey and the pre-operative BREAST-Q© breast conservation (BCS), Mastectomy (M), or breast reconstruction (BR) modules. Univariate analysis using student T-test and chi-square test was performed to evaluate differences in demographics, breast satisfaction, and QOL for women scheduled to undergo one of the three procedures. Multivariate linear regression analysis assessed the association of breast satisfaction and QOL with scheduled procedure types while accounting for patient, disease, treatment, socioeconomic and demographic factors. An alpha of 0.05 was used as the cutoff for significance.

Results: 166 women took the pre-operative demographic and BREAST-Q surveys. 111 completed BCS, 15 completed M, and 40 completed the BR module. Univariate analysis demonstrated that compare to M, those who were younger ($p < 0.001$) and employed full-time ($p=0.041$), had higher rates of BR. Those with less than 35K income had the lowest rate of BR ($p=0.039$). However, univariate analysis demonstrated no association between race, education, and marital status with procedure type. When accounting for potential confounding variables using a multivariate regression analysis, regardless of procedure type, women who are separated/divorced reported lower breast satisfaction score ($\beta= -11.1$, $p=0.034$) and sexual well-being ($\beta= -15.3$, $p=0.026$) compared to married women/significant other. Procedure type did not affect PROS, but socioeconomic and demographic factors did such that women who made greater than 35K income reported higher psychosocial scores ($\beta= 8.2$, $p=0.035$) and sexual well-being ($\beta= 12.7$, $p=0.023$). Higher sexual wellbeing was also observed in women of Black/AA race compared to white ($\beta= 13.6$, $p=0.008$).

Conclusion: In a diverse population of patients who are provided with education about reconstructive procedures and who have full access to plastic surgeons through a multidisciplinary clinic, financial reasons and social support played a significant role in procedure choice. Financial status and race also impacted perceptions with outcomes, therefore, efforts to address disparities in care should not only focus on improving access and education but also address patient perceptions and financial concerns.

Outcomes in Subpectoral Versus Prepectoral Implant-Based Reconstruction with Fat Grafting

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PURPOSE: While subpectoral implant placement is traditionally considered the standard of care for implant-based breast reconstruction, more evidence is emerging that prepectoral implant placement, particularly when combined with acellular dermal matrix (ADM) and delayed fat grafting, is a good alternative with less morbidity. To date, there are no studies that investigate outcomes of prepectoral implant-based reconstruction when combined with delayed autologous fat grafting versus subpectoral implant reconstructions combined with delayed fat transfer. Thus, the purpose of this study was to compare outcomes of immediate prepectoral breast reconstruction to the subpectoral approach with or without fat grafting.

METHODS: A retrospective review of 406 patients (644 breasts) who underwent single-stage breast reconstruction by a single surgeon (AOY) from 2010 to 2017 was performed. Demographic, operative and oncologic data were collected. All patients underwent either Wise, Modified Wise-pattern, or Yin-Yang mastectomy flap reconstruction in addition to implant placement with an ADM sling and an inferior de-epithelialized dermal flap. Outcomes of infection, flap necrosis, dehiscence, capsular contracture, seroma/hematoma, oil cysts, rippling, implant loss, and recurrence were recorded.

RESULTS: Implants were placed in the prepectoral plane in 288 patients (452 breasts) and the subpectoral plane in 118 patients (192 breasts). Out of 452 prepectoral breasts reconstructions, 121 (37%) underwent delayed fat grafting. Out of 192 subpectoral implant reconstructions, 163 (87%) underwent delayed autologous fat transfer. Patients in the prepectoral group had a higher BMI (28.6 vs. 24.9, $p<0.001$) and were more likely to receive chemotherapy (43.2% vs. 29.9%, $p=0.001$). Average volume of fat grafted was 60-100cc and was not significantly different between prepectoral and subpectoral cohorts.

The rate of capsular contracture in the prepectoral fat-grafted group was significantly lower than in the prepectoral group without fat grafting (2.58% vs. 11.79%; $p<0.001$). The subpectoral fat-grafted cohort also had lower rates of capsular contracture than the subpectoral group without fat grafting but did not achieve statistical significance (2.38% vs 12.08%, $p=0.06$). Both fat-grafted cohorts had a higher incidence of oil cysts than the respective nonfat-grafted control groups (prepectoral 20.7% vs. 1.8%, $p=0.001$; subpectoral 17.8% vs 6.9%, $p=0.001$).

Capsular contracture, oil cysts, implant loss, infection, flap necrosis, seroma/hematoma, rippling, and local recurrence rates were similar between both fat-grafted cohorts.

CONCLUSIONS: Complication rates were similar between prepectoral and subpectoral fat-grafted cohorts as well as between prepectoral and subpectoral non-fat grafted cohorts. The rate of capsular contracture was lower in the PF than the PNF group, suggesting a possible protective role for fat grafting against capsular contracture accompanying prepectoral placement. Prepectoral placement of implants with subsequent fat grafting may be a safe and less invasive alternative to subpectoral pectoral implant placement in certain patient populations. Larger randomized controlled trials are warranted to better elucidate this association.

Prophylactic Nipple-Sparing Mastectomy and Breast Reconstruction in Young High-Risk Females: Analysis of Decision-Making, Reconstructive Outcomes and Patient Satisfaction

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Background: Prophylactic nipple-sparing mastectomies (NSMs) in young "previvors" with high-risk genetic mutations are rising dramatically with increasing awareness of cancer predispositions and genetic testing. However, there is a paucity of data on management, appropriate timing of diagnostic and interventional therapies, and surgical and patient-reported outcomes. The purpose of this study was to better understand the appropriate management of young, high-risk patients with regards to genetic testing, mastectomy, and breast reconstruction by analyzing patient decision-making, reconstructive outcomes and patient satisfaction.

Methods: A retrospective review of patients under the of age 30 undergoing prophylactic NSM from 2006-2018 at a single institution was performed. Demographics, indications, referral trends, operative characteristics and reconstructive outcomes were analyzed. A survey was developed to query factors behind patient decision-making and utility of available resources including reasons for genetic testing, influences for undergoing mastectomy, decisions behind breast reconstruction, and preoperative patient comprehension. Patients also completed BREAST-Q surveys to evaluate satisfaction and quality of life.

Results: Twenty-two patients (44 breasts) ages 23 to 29 underwent prophylactic NSM (average age of 27) for BRCA1 (68.2%) and BRCA2 (31.8%) diagnoses. Average age of genetic diagnosis was 22.9 after which patients waited, on average, 4.1 years to surgery (range: 5.6 months to 12.8 years). Most patients were referred by breast surgeons (45.5%), though 22.7% presented initially to plastic surgeons. Eighty-two percent of patients had a first-degree relative with BRCA or breast cancer diagnoses.

Inframammary incisions were most commonly utilized (90.9%). All patients underwent immediate reconstructions with two-stage tissue expanders (34 breasts, 77.3%), immediate implants (eight breasts, 18.2%), or abdominal perforator flaps (two breasts, 4.5%). Smooth, round implants were utilized in 95.2% of cases and textured, anatomic implants in 4.8% with 61.9% in a dual-plane position and 38.1% under total submuscular coverage. There were no cases of complete nipple or major mastectomy flap necrosis. Four breasts (9.1%) had partial nipple necrosis resolved with local wound care and one breast (2.3%) had minor cellulitis, resolved with oral antibiotics. There were no cancer occurrences within a mean follow-up of 34.9 months.

Surveys were completed by six patients, at an average 23.1-month follow-up, who underwent implant-based reconstruction. Most patients (66.7%) cited family advice and personal decisions as the most important reason for undergoing genetic testing, and experiences of close friends (50%) for undergoing mastectomy. 83.3% cited the recommendations of their plastic surgeon as the most important influence in reconstructive modality. 66.7% of patients would undergo mastectomy and 83.3% reconstruction at the same age. 100% of patients felt they completely understood risks and benefits of NSM and 66.7% of reconstruction. Patients reported high BREAST-Q scores for Satisfaction with Breasts (75.5), Satisfaction with Information (82.7), Physical Well-Being (85.5) and Psychosocial Well-Being (76.5).

Conclusions: Young adults with high-risk mutations undergoing prophylactic NSM and reconstruction have low rates of reconstructive complications and high satisfaction and quality of life. Decisions to undergo testing and surgery are highly personal, though health-care professionals are influential in treatment choices. Continued development of educational resources is needed to optimize shared decision-making in the reconstructive process.

Enrichment of Fat Grafts with Adipose-Derived Stromal Cells for Breast Augmentation: A Randomized Double-Blind Placebo-Controlled Trial of Fat Graft Survival

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Background: The main problem with fat grafting is the postoperative graft resorption which often leads to repeated procedures to achieve the desired volume. Cell therapy in the form of adding stromal vascular fraction or culture-expanded adipose derived-stromal cells to the fat graft are some of the most promising strategies to improve graft retention [1] To assess the efficacy of using high-dose culture-expanded adipose-derived stromal cells to enhance fat graft volume retention in the human breast, we have conducted a randomized, double-blind, placebo-controlled clinical trial.

Methods: This clinical trial was performed in healthy women with small, symmetrical breasts who underwent a bilateral breast augmentation by fat grafting. In each patient, one breast was treated with normal fat grafting and the other with fat grafting enriched with expanded adipose-derived stromal cells (10×10^6 cells per mL fat). The patients underwent two surgeries: 1) A small liposuction to obtain the adipose tissue for isolation and ex-vivo expansion of the cells for 17 days, 2) a larger liposuction after 17 days to conduct a bilateral breast augmentation with fat grafting with unilateral addition of the expanded cells. MRI scans of the breast were performed the day before breast augmentation, and 4 months and one year after surgery. The primary outcome was fat graft volume retention after 4 months and 1 year based on MRI. The study is registered at www.clinicaltrialsregister.eu and was approved by the National Ethics Committee in Denmark (number 2014-000510-59).

Results: Ten women were enrolled in the study. The mean fat graft volume per breast augmentation was 310 cc fat [range 300-350 cc]. The cell-enrichment of the fat grafts did not improve the volume retention after 4 months or 1 year. After 4 months the retention of the cell-enriched grafts was 54.3% (95% CI 39.4-69.2) versus 56.2% (95% CI 42.7-69.6) in the control group (p=0.552). After 12 months the retention in the cell-enriched grafts was 54.0% (95% CI 30.4-77.6) versus 55.9% (95% CI 28.9-82.9) in the control group (p=0.566). The difference in mean retention after 1 year was only -1.9 % (95% CI (-)9.11-5.31%). No serious adverse events occurred in any of the patients.

Conclusion: Our study showed that enriching fat grafts with high-dose expanded

adipose-derived stromal cells did not lead to any improvement in fat graft survival in the breast.

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Assessing Flap to Mastectomy Specimen Volume in DIEP Flap-Based Breast Reconstruction

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Background: Matching flap volume to native breast volume is critical to optimizing aesthetic outcomes in autologous breast reconstruction. However, surgeons may not systematically nor accurately evaluate mismatches pre-operatively. This study assesses the accuracy of pre-operative estimations of abdominal adiposity to breast volume, and proposes the Northwell scale, a novel classification system relating abdominal adiposity to breast volume.

Methods: A prospective study of patients undergoing mastectomy and immediate DIEP flap reconstruction was performed. Reconstruction utilizing more than one hemi-abdomen per breast were excluded. Mastectomy specimen and flap weights were measured intra-operatively to evaluate the accuracy of ratings. 9 blinded surgeons were asked to rate pre-operative photographs of 9 representative patients as class I: abdominal volume greater than breast volume; class II: abdominal volume similar to breast volume; class III: abdominal volume less than breast volume.

Results: 32 patients underwent bilateral immediate breast reconstruction. The average mastectomy specimen was 758.0 ± 338.6 grams (Class I: 558.7 ± 249.3; Class II: 807.1 ± 339.0; Class III: 859.0 ± 351.4) and the average DIEP flap was 734.1 ± 337.5 grams (Class I: 824.6 ± 353.77; Class II: 798.9 ± 343.2; Class III: 520.1 ± 209.7). Based on intraoperative weights, 8 patients (25.0%) were class I, 16 (50.0%) were class II, and 8 (25.0%) were class III. Class I patients had an average flap:breast volume (F:B) of 1.50; class II patients had a F:B of 0.99; class III patients had a F:B ratio of 0.63. Surgeons accurately predicted the class in 67.9% of cases ($p < 0.001$).

Conclusions: This study validates our novel classification scheme and shows that surgeons may misjudge the ratio of abdominal adiposity to breast volume. In 50% of patients (class I & III), F: B mismatch was quite sizable by absolute weight, and may present difficulty in insetting to native breast skin envelopes and lead to poorer immediate aesthetic outcomes. These considerations should be discussed with patients pre-operatively. Future work will elaborate on differences in insetting techniques, revision procedures, and the final aesthetic outcomes based on Northwell class.

Breast Flap Neurotization Following Autologous Breast Reconstruction: A Prospective Trial

Presenter:	Shelby Nathan, MD
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Purpose: Restoration of breast sensation following autologous breast reconstruction (ABR) is integral to the reconstructive paradigm for breast cancer patients. We hypothesize that innervation of reconstructed breast flaps will improve sensation and quality of life (QoL).

Materials/Methods: Free flap ABR patients with and without nerve allograft neurotization were recruited prospectively. Sensation testing was performed with a Pressure Specified Sensory Device™ (PSSD) at 12-24 months postoperatively in superior, lateral, medial and inferior poles on both the mastectomy skin as well as the flap skin. The BREAST-Q™ was administered.

Results: Thirty-two women were enrolled with a total of 54 reconstructed breasts (neurotized: n=22, non-neurotized: n=32). Average age was 51.9 years (range: 21-77) with a mean BMI of 28.9 (range: 20-47). Average follow-up was 15.8 months (range:12-24). Free TRAM flaps were most commonly performed (87%). Mastectomy skin exhibited greater sensation than flap skin ($p=0.20$) and one-point moving tests elicited a greater response than one-point static ($p<0.00$). In all but one area (inferior mastectomy), the neurotized group had more sensation with one-point static (p: 0.01-0.99) and one-point moving testing (p: 0.33-0.92). The superior mastectomy pole experienced significantly greater sensation in the neurotized group ($p<0.001$). There was no difference in surgical site outcomes between the groups. 9% neurotized vs. 5% non-neurotized patients reported “more sensation” after reconstruction ($p=0.32$). QoL demonstrated the neurotized group was more satisfied in 9 of the 11 parameters (p: 0.09-0.89).

Conclusion: The return of breast sensation after ABR has become an important topic in reconstructive plastic surgery. Although multiple modalities have been proposed to increase postoperative sensation (e.g. nerve conduits, allografts and autografts), there is a paucity of prospective clinical trials investigating sensory outcomes. This abstract highlights the largest cohort to-date, which quantitatively and qualitatively measures the effect of neurotization with nerve allografts on the return of sensation following ABR. To do so, we have directly measured sensation, patient-reported return of sensation, and breast-associated quality of life. These preliminary results suggest neurotization during ABR may lead to increased sensation as well as improved QoL. We hope that these results will further the knowledge of this topic, potentially improve patient outcomes, and stimulate a discussion regarding clinical management.

Assessing the Accuracy of a Three-Dimensional Surface Imaging System in Breast Volume Estimation

Presenter:	Jeffrey W Kwong, BS
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Background: Preoperative prediction of breast volume can guide patient expectations and aid surgical planning in breast reconstruction. Here, we evaluate the accuracy of a portable surface imager (Crisalix S.A., Switzerland) in predicting breast volume compared to anthropomorphic estimates and intraoperative specimen weights.

Methods: 25 patients (41 breasts) undergoing mastectomy were scanned preoperatively with the Crisalix surface imager, and one of three attending plastic surgeons provided an anthropomorphic volume estimate. Intraoperative mastectomy weights were used as the gold standard. Volume conversions were performed assuming a density of 0.958 g/cm^3.

Results: The Pearson correlation coefficient between imager estimates and specimen volumes was 0.811. The corresponding value for anthropomorphic estimates and specimen volumes was 0.848. The mean difference between imager and specimen volumes was -233.5 cm^3, while the mean difference between anthropomorphic estimates and specimen volumes was -102.65 cm^3. Stratifying by breast volume, both surface imager and anthropomorphic estimates closely matched specimen volumes for breast volumes 600 cm^3 and less, but the two techniques tended to underestimate true volumes for breasts larger than 600 cm^3. Stratification by plastic surgeon providing

the estimate and breast surgeon performing the mastectomy did not eliminate this underestimation at larger breast volumes.

Conclusion: For breast volumes 600 cm^3 and less, the accuracy of the Crisalix surface imager closely matches anthropomorphic estimates given by experienced plastic surgeons and true volumes as measured from specimen weights. Surface imaging may potentially be useful as an adjunct in surgical planning and guiding patient expectations for patients with smaller breast sizes.

Oncologic Safety and Surveillance of Autologous Fat Grafting Following Breast Conservation Therapy: A Matched Control Study

Presenter:	Summer E. Hanson, MD, PhD
Co-Authors:	Sahil K Kapur, MD, Patrick B. Garvey, MD, FACS, Mike Hernandez, MS, Mark W. Clemens, MD, Rosa F Hwang, MD, Mark J Dryden, MD, Charles E. Butler, MD
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Background: Autologous fat grafting (AFG) has become an increasingly popular adjunct following breast reconstruction. The impact of AFG on oncologic safety and surveillance remains questionable in breast conservation therapy (BCT). The purpose of this retrospective study was to compare oncologic outcomes of delayed AFG in the setting of breast conservation therapy (lumpectomy with radiation) to a matched cohort of BCT patients not reconstructed with AFG.

Methods: The authors retrospectively reviewed a prospectively maintained database for patients who underwent delayed AFG following BCT between 2006 and 2016. A control group of patients with BCT, but not AFG, was identified with similar cancer stage, age, body mass index (BMI) and length of follow-up. All patients had follow up visits and imaging at regular intervals at our institution. The primary outcome of interest was loco-regional recurrence (LRR). Secondary outcomes included post-operative complications such as palpable mass, fat necrosis, calcifications, and oncologic surveillance.

Results: Seventy-two patients were identified per cohort (BCT versus BCT+AFG). There were no differences in median age [50yrs versus 51yrs; p=0.87], BMI [28.2 kg/m^2 versus 27.2 kg/m^2; p=0.38] or length of follow up [61.9 months versus 66.8 months; p=0.144] between BCT and BCT+AFG patients, respectively. Overall, four patients in each cohort experienced LRR (5.6%; p=1.00) with similar cumulative incidence estimates observed (log-rank test $P = 0.534$). There were no significant

differences in post-operative palpable mass (9.7% versus 19.4; p=0.1), fat necrosis (34.7% versus 33.3%; p=0.86), calcifications on mammogram (37.5% versus 34.7%; p=0.73), or indication for breast biopsy (15.3 versus 22.2; p=0.23) between BCT and BCT+AFG cohorts, respectively.

Conclusions: Overall, we found no differences in LRR in BCT patients with or without delayed AFG. Furthermore, there was no difference in the rates of fat necrosis, palpable mass, and abnormal radiographic findings. Biopsy rates were similar between the groups. This study represents the largest matched comparative cohort of AFG in BCT demonstrating oncologic safety and no interference with follow up surveillance.

Establishing Institution-Specific Normative Data for the Breast-Q Reconstruction Module: A Prospective Study

Presenter:	Kevin M. Klifto, PharmD
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Background: The BREAST-Q has been used extensively to assess patient-reported breast surgery outcomes; however, breast satisfaction in a general female population is relatively unknown and prior research in the Army of Women (AoW) did not reflect the general United States population or our community.[1] We sought to assess breast satisfaction in a cohort of female participants more representative of the general US population and of our patient population at Johns Hopkins (JH).

Methods: This is a single-center, cross-sectional, patient-reported outcomes study. A preoperative BREAST-Q reconstruction module and demographic form were administered to 300 female participants who presented for gynecology appointments (JH population). Eligible patients were women with no history of breast cancer or breast surgery and were not pregnant. We assessed participant-related factors capable of influencing BREAST-Q scores using linear multivariate regression analysis and compared JH population demographics to the AoW study population and the United States Census Bureau data using the independent t-test and Pearson's χ^2 test. JH population mean BREAST-Q scores were compared to AoW using the minimal important difference (MID) to establish clinical significance.[2-3]

Results: Increasing BMI had a significant association with lower Satisfaction with Breast and lower Psychosocial Well-being scores. Increasing participant age was associated with significantly lower Sexual Well-being scores. African American participants had significantly higher scores for Satisfaction with Breasts, Psychosocial Well-being, and Sexual Well-being compared to Caucasian participants. Participants with bra cup sizes A, B, C, and DD had significantly higher Sexual Well-being scores than sizes less than A; bra cup sizes A, B, and C were associated with significantly higher Physical Well-being: Chest scores than sizes less than A. Study participants reported lower Physical Well-being: Chest scores, but higher Physical Well-being: Abdomen scores than the AoW members. After comparing MID, Physical Well-being: Chest scores were clinically significantly lower in our study participants compared to AoW members (MID>1). All other BREAST-Q domains had a MID<1.

Conclusions: We found associations between BREAST-Q scores and BMI, age, Race, and bra cup size in our population. Our populations Physical Well-being: Chest scores were lower than AoW normative data. Determining normative BREAST-Q scores in a representative population of women could serve as an important baseline for breast outcomes research.

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Amifostine Curtails Pathologic Alterations of Type I Collagen in an Irradiated Breast Reconstruction Model: A Raman Spectroscopic Analysis

Presenter: Alexandra O. Luby, MD

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Objective: As indications for adjuvant radiation therapy (XRT) have expanded in recent years, an increasing number of breast cancer patients are receiving radiation therapy as a component of treatment. While XRT is highly effective, it often damages the skin and soft tissues of the breast. Radiation induced damage to dermal type I collagen reduces cutaneous elasticity and strength, which can ultimately limit patient candidacy for expander-based breast reconstruction. In the present study, we utilized Amifostine (AMF) as a prophylactic radio-protectant with the objective of mitigating dermal type I collagen injury associated with XRT. To investigate this, we utilized Raman spectroscopy to analyze the chemical properties of dermal type I collagen in a murine model of irradiated expander-based breast reconstruction.

Methods: Female Lewis rats were grouped (n=7/group): Expander without XRT (Control); Expander + XRT (XRT); Expander + AMF + XRT (AMF). Expanders were surgically placed in a sub-musculocutaneous plane on the dorsum of the animal and filled to achieve a final volume of 15 cc. Both the XRT and AMF group received a total XRT dose of 35 Gy. The AMF group received AMF pre-treatment 30 minutes prior to XRT. After a 20-day recovery period, tissues overlying the expander were harvested and sectioned. Raman spectroscopy was performed to study the chemical properties of dermal type I collagen.

Results: Based on the (853+877)/1657 cm^{-1} band intensity ratio (Pro+Hyp/Amide-I ratio), collagen turnover was impaired in expanded, irradiated tissues (mean ratio=0.492; SD=0.086) compared to the control group (mean ratio=0.660; SD=0.089). This impaired collagen synthesis was not observed in animals receiving AMF pre-treatment (mean ratio=0.685; SD=0.098), supporting its efficacy as a radio-protectant. Additionally, based on the 853/877 cm^{-1} band intensity ratio (Hyp/Pro ratio), the hydroxylation of proline within collagen was reduced in expanded, irradiated tissues compared to controls. This decrease in the Hyp/Pro ratio was paralleled and supported by the observed reduction in collagen synthesis (Pro+Hyp/Amide-I ratio). This reduction in hydroxylation of collagen proline was mitigated by AMF pre-treatment. The 1656/1673 cm^{-1}intensity ratio (α-helix/β-sheet ratio) was evaluated to detect changes in collagen secondary structure, and interestingly, no significant changes in the α-helix/β-sheet ratio were found between irradiated and non-irradiated expanded tissues. These results suggest that radiotherapy reduces collagen synthesis, but the integrity of collagen secondary structure is preserved.

Conclusion: This study further elucidated the mechanism of dermal type I collagen radiation injury. Pathologic changes in the chemical composition of irradiated tissues were detected utilizing Raman spectroscopy. Radiation significantly impaired collagen synthesis, resulting in a marked reduction in the collagen content of irradiated tissues. Amifostine was shown to mitigate these detrimental effects, as AMF pre-treatment demonstrated a significant preservation in type I collagen synthesis in this model of irradiated expander-based breast reconstruction. Utilizing AMF as a prophylactic radio-protectant in breast cancer patients has the potential to increase reconstructive options available to patients and their plastic surgeons and improve surgical outcomes in the aftermath of radiotherapy.

Differential Gene Expression in Capsules Derived from Smooth and Textured Silicone Implants

Presenter:	Giulia Daneshgaran, MD
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Purpose: Capsular contracture is the most common complication of implant-based breast surgery in the US, leading to abnormal breast contour, increased firmness, and pain to touch. It is well-established that smooth implants have higher rates of capsular contracture than textured implants. Assessing the effect of implant texture on contracture pathogenesis may help identify therapeutic targets for this disease process. The purpose of this study is to elucidate the pathogenesis of capsular contracture by examining RNA expression in a rat model of capsular formation around textured and smooth silicone implants, with pathological correlation.

Methods: A small animal model of capsular contracture was developed using Fischer rats. Ten animals underwent miniature smooth or textured silicone implant insertion in the sub-mammary gland position. Six weeks postoperatively, implant capsules were harvested for histological and molecular analysis. RNA sequencing was performed to identify target genes expressed in extracted capsules. Selected gene expression levels were confirmed with quantitative reverse transcriptase polymerase chain reaction (qRT-PCR) and immunohistochemistry (IHC). Additionally, implant capsules collected from patients with and without capsular contracture were analyzed and correlated with results from our animal model.

Results: RNA sequencing data was subjected to the Probability of Positive Log Ratio (PPLR) algorithm. Transcripts were identified for further characterization using cutoff values of PPLR >= 0.975 (2-fold increase) or a PPLR <= 0.025 (2-fold decrease). We identified 18,555 transcripts that met PPLR inclusion criteria. Quantitative RT-PCR was performed for matrix metalloproteinase-3 (MMP-3), troponin T3 (TNNT-3), and neuregulin-1 (NRG-1). Expression of MMP-3 and TNNT-3 was upregulated in textured implant capsules compared to smooth implant capsules with a mean relative fold change of 8.79 ($p=0.0059$) and 4.81 ($p=0.0056$), respectively. Expression of NRG-1 was downregulated in textured implant capsules with a mean relative fold change of 0.40 ($p<0.0001$) compared to smooth implant capsules. IHC staining of capsules extracted from our animal model was consistent with differential expression patterns, with smooth implant capsules expressing less MMP-3 and TNNT-3, and more NRG-1 than textured implant capsules. Similarly, IHC staining of human specimens revealed that contracted capsules had lower expression of MMP-3 and TNNT-3, and greater expression of NRG-1 compared to healthy capsules.

Conclusion: We demonstrate that capsules around smooth and textured implants have different histological appearances and different patterns of gene expression. Importantly, pathological correlation reveals that contracted capsules have expression patterns for MMP-3, TNNT-3 and NRG-1 that are consistent with capsules derived from smooth implants, which are known to have higher contracture rates. These results may help elucidate the mechanism of capsular contracture and identify potential genes for the development of future therapeutic targets for this condition.

Evaluating the Success of Facial Feminization Surgery through Artificial and Human Intelligence

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Purpose: Male-to-female transgender patients desire to be identified as female, not only with their partners, but also in public settings. Facial feminization surgery (FFS) entails highly visible changes in the facial hard and soft tissues which may affect such social first impressions. No study to date has evaluated the impact of FFS on how patients are gender-typed. To study the effectiveness of FFS we investigated preoperative/postoperative gender typing using both 1) neural networks trained on

facial features (artificial intelligence) and 2) a large public online survey (crowd sourcing).

Methods: For both studies, standardized frontal and lateral view preoperative and postoperative images of twenty patients who completed staged FFS (combinations of frontal sinus wall setback, supraorbital recontouring, mandibular angle reduction, genioplasty, upper lip shortening, septorhinoplasty, tracheolaryngeoplasty) were used; in addition, ten male and ten female unoperated control patients were included. 1) For the first study, the images were analyzed by four public neural networks trained to identify gender. Preliminary results led us to 2) a second study, using an online crowd sourcing platform. Respondents identified the gender of the same images, randomized, with a confidence rating (1=not confident, 10=highly confident). Age and smoking status were recorded as distractants. All results were recorded and analyzed for statistical significance.

Results: 1) For the neural network study, all four programs provided a gender; two also provided a confidence score. The networks correctly identified male and female controls 98.6% and 91.2% of the time. Preoperative FFS patients were recognized as female only 54.5% of the time, while post operatively this improved to 93.7%. Confidence scores (ranging from -1=confidently masculine to 1=confidently feminine) also significantly improved from 0.27 (preop) to 0.87 (postop) ($p<.0001$), with controls of -0.91 (male) and 0.89 (female).

2) For the crowd sourcing study, 802 people completed the survey. Control male and female images were correctly gender-identified 99.0% and 99.4% of the time with confidence 8.9 and 9.0, respectively. Preoperative FFS patients were identified as female only 57.3% of the time; by contrast, post-operatively 94.3% were identified as female, a statistically significant improvement of 37% ($p<.0001$). The confidence rating also improved from 1.41 to 7.78 ($p<.0001$).

CONCLUSION: The success of FFS (patients more likely to be identified as female) was demonstrated by both artificial and human intelligence methods. This is the first study of its kind evaluating how machine learning and the public gender type FFS patients.

A Reliable Alternative for Reconstruction of Medial Canthal Region Defects, Nasolabial Perforatory Flap

Presenter: Alp Ercan, MD
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Introduction: Medial canthal region is a common area of skin cancer prevalence and it also represents one of the most challenging regions of the face to reconstruct. This is due to the many anatomical structures present, the concavity of the area and the differences in skin texture. Glabellar flaps and mustarde advancement flaps are classically used to reconstruct this problematic region, however these flaps have limited mobility and reach. They may also result in hard to overcome complications such as ectropion and obliterans of glabellar region. Facial artery with its numerous small cutaneous perforators can be a souce for many free-style skin flaps that can be islanded with ease (1). These kinds of flaps have greater mobility and reach for reconstruction of small-to-moderate-sized facial defects compared to many of the traditional flaps. Our study aims to evaluate the reliability and versatility of such flaps that are based on the same donor area as the the traditional nasolabial flap. We present a case series of 27 patients with a defect on the medial canthal region reconstructed by a single island flap harvested from the nasolabial sulcus.

Materials and Methods: Between January 2016 and September 2018, 27 patients with basal cell carcinoma (BCC) on medial canthal region, proven by histopathologic study, underwent reconstruction with facial artery-based propeller and advancement flaps over the nasolabial sulcus. All of the surgeries were performed on an out-patient setting under local anesthesia and patients were discharged the same day. The mean age was 64.8 ± 8.3 years. The mean size of the defect was 2.4 cm (length) × 1.9 cm (width). Patients were followed for a period of 4-13 months

Results: No significant flap loss was encountered in any of the patients. 7 of the flaps had moderate amounts of venous congestion; out of which 2 flaps developed partial flap necrosis. The problems were in the most distal part and could be overcame by wound management and close out-patient follow-up. In 4 patients' secondary flap debulking was utilised after 3 months because of aesthetic concerns. All of the patients had acceptable aesthetic and functional outcomes.

Conclusion: This approach following a novel paradigm was introduced to find an alternative solution to an old problem and outcomes are encouraging. Using the same donor area as the traditional nasolabial flap it is possible to reconstruct medial canthal region with high reliability. There are two main drawbacks of this procedure; 1st is the necessity of a debulking procedure in a number of patients, 2nd one is the need for removal of hair in male patients' late term. We find epilation to be highly satisfactory to overcome this problem. We believe our simplified approach achieves highly reliable and easily reproducible postoperative outcomes along with a high level of

patient satisfaction in an area which can be reconstructed in a variety of ways, but often with suboptimal results.

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Occlusal & Dental Outcomes Following Facial Allotransplantation

Presenter:	Demetrius M Coombs, MD
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Introduction and Objectives: Most of the literature surrounding face transplantation focuses on immunology, function, and psychology. Dental and orthognathic outcomes remain persistently underreported. This study sought to review the worldwide face

transplant experience, and for the first time, evaluate dental, orthognathic, and skeletal outcomes.

Materials & Methods: All composite allografts containing maxilla and/or mandible with alveolus were examined, and dental and orthognathic complications recorded. Clinical photographs, radiographs, and/or CT scans from the literature were analyzed using Angle's Classification, cephalometrics, and facial profile angles. The most recent orthognathic outcomes of our three facial transplants patients are also presented.

Results: The worldwide experience consists of 45 face transplantations; 25 patients received allografts containing maxilla or mandible, and 16 (64%) involved double-jaw. All documented patients had at least one dental/occlusal complication: TMJ ankylosis (9/25, 36%), dental caries and extractions (32%), palatal fistula (28%), Angle class II malocclusion (24%), class III (12%), open bite (20%), maxillary rotation (8%), skeletal non-union (8%), hardware infection (4%); 28% of patients underwent revision surgeries involving Lefort I, III, or mandibular osteotomies. Imaging conducive to Angle, cephalometric, or facial profile angle analysis was

available in 100% (7) of reported maxilla, and 63% (10) of double jaw transplants. The majority of maxilla-only transplants had insufficient teeth, while soft tissue profile was most commonly class II. Double jaws were equally Angle class I, II, or III, but mostly class I or class III with regard to facial angle profile. All of our patients have received maxilla and/or mandible, and all have required dental extractions. Angle classification, cephalometrics, and facial profile angles vary across our patients, while class III soft tissue facial profile appears to predominate.

Conclusion: Dental and orthognathic complications remain extremely common but underreported after facial allotransplantation involving either single or double jaw composites. In fact, every documented face transplant has at least one occlusal or skeletal defect. The risk of malocclusion increases with simultaneous transplantation of maxilla and mandible, and often necessitates revision surgery in this unique population. Craniofacial principles and advanced surgical planning should be utilized to achieve facial balance. Additionally, we must standardize the way in which face transplant patients are presented in the literature.

Does Mandibular Distraction Vector Influence the Rate of TMJ Ankylosis?

Presenter: Keliang Xiao, MD
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Introduction: Since its advent by McCarthy et al [1] in 1992, mandibular distraction has become the primary choice for treatment of patients with moderate to severe Robin Sequence [2]. Based on the Ilizarov principle of bone lengthening [3], mandibular distraction relieves airway obstruction by lengthening the mandible. Despite its effectiveness, a potential yet problematic complication of mandibular distraction is TMJ ankylosis. Previous studies report TMJ ankylosis rates of up to 10% [4], while other studies have shown virtually no incidences of TMJ sequalae [5]. A theory on this difference relates to distraction vector; a vertical vector is more likely to lead to TMJ ankylosis because of the cranially directed pressure withstood by the TMJ during activation, as compared to horizontally or obliquely directed vector. Historically, our center has used a vertical distraction vector with a more recent conversion to an obliquely oriented vector. The purpose of this presentation is to discern if there is difference in rates of TMJ ankylosis between vertical and oblique distraction groups.

Methods: After IRB approval, a retrospective chart review was performed of all patients who underwent mandibular distraction at Children's Mercy Hospital from 1997 to 2015. All operations were performed by 3 surgeons. Ankylosis rates were compared between the two groups.

Results: 94 patients were reviewed. The average age of presentation was 103 days. 70 underwent vertical distraction, while 24 underwent oblique distraction. TMJ ankylosis was recorded in 12 cases, all in the vertical vector group, a 17% rate of ankylosis. There were no cases of ankylosis in the oblique vector group. The average age at diagnosis of TMJ ankylosis was 6.5 years. When excluding all syndromic patients in both groups, 48 patients remained. 34 underwent vertical distraction versus 12 for the oblique group. There still was a 12% rate of ankylosis, all in the vertical group.

Conclusion: Vertical mandibular distraction carries a significantly increased risk of TMJ ankylosis and should be avoided.

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6.

A Systemic Review of Dual Innervated Gracilis Muscle for Facial Reanimation Using Cross Face Nerve Graft and Masseteric Nerve

Presenter: Thanapoom Boonipat, MD

Co-Authors:	Jesse D. Meaike, MD, Krishna S Vyas, MD, PhD, MHS, Carrie E Robertson, MD, Samir Mardini, MD
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Purpose: Dynamic facial reanimation is the gold standard treatment for a paralyzed face. The use of cross face nerve graft (CFNG) in combination with the masseteric nerve to innervate free gracilis muscle has been reported, with the goal of providing both spontaneity from the CFNG and strong innervation from the masseteric nerve. We systematically reviewed and summarized the outcomes of these techniques.

Methods: A comprehensive search of the Ovid EMBASE, MEDLINE, Cochrane, and Scopus databases was performed from 1946 to July 2018 for dual innervation of gracilis muscle using CFNG plus masseter nerve for facial reanimation. Two independent reviewers screened the full texts to identify relevant articles.After data extraction from included studies, meta-analysis was performed to compare outcome parameters defining functional outcomes.

Results: Six of 20 articles from 2012-2018 met criteria. A total of 48 patients were reviewed (mean age of 42.1 years (6-79 years)). The majority of dual innervations procedures were performed using CFNG as end-to-side coaptation and masseteric nerve as end-to-end. In the 26 patients that Terzis scores were available, most achieved good to excellent results, with no differences between CFNG as end-to-side and masseteric nerve as end-to-end or the reverse coaptation. All but two patients achieved function of gracilis activated by masseter within 2-5 months.Further details will be provided during presentation.

Conclusions: This systematic review demonstrates inconsistent results using current available dual innervation techniques, with the masseter providing the majority of the innervation. Meta analyses of comparative outcomes are limited by inconsistent methods of objective evaluation among authors.

Anticoagulation Protocols in Hypercoagulable Microvascular Head & Neck Reconstruction

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Background Inherited and acquired hypercoagulable conditions affect 15% of the population, and these conditions are often considered a relative contraindication to microvascular surgery. Anticoagulation protocols may be used to improve outcomes of microvascular surgery. The effects of anticoagulation protocols on success rates in the hypercoagulable head and neck population, as well as complications related to these protocols, have not been well described.

Methods A retrospective review was conducted of subjects who underwent microvascular head and neck reconstruction at a tertiary medical center over a 6 year period. Hypercoagulable subjects were defined as having an inherited coagulopathy or pre-operative thrombotic event. Peri-operatively, subjects were treated with individualized anticoagulation protocols. Outcomes studied were microvascular flap complications (thrombotic event or flap loss) and anticoagulation-related complications (flap or donor site hematoma). Multivariate analysis was used to compare outcomes.

Results: A total of 137 head and neck microvascular reconstructions were performed during the study period. A pre-operative thrombotic event had occurred in 23 of 24 subjects; 18 of 23 subjects (78.3%) had a history of DVT, 5 (21.7%) of PE, and 5 (21.7%) of spontaneous thrombotic stroke before age 50. Five subjects (20.8%) were diagnosed with an inherited or acquired thrombophilic disorder pre-operatively. All subjects were treated with aspirin intra-operatively and daily post-operatively (n=26, 92.9%), unless contraindicated by allergy. Subjects were stratified based on pre-operative and intra-operative risk factors to receive either: *Group 1* (low risk): prophylactic-dosing subcutaneous anticoagulation (n=13, 46.4%); *Group 2* (medium risk): prophylactic-dosing continuous heparin infusion at 500 units/hr (n=8, 28.6%); or, *Group 3* (high risk): therapeutic anticoagulation/ continuous PTT goal-based heparin infusion (n=5, 17.9%). An inferior vena cava (IVC) filter was utilized in 12 reconstructions and was placed pre-operatively in 9 subjects (32.1%) and post-operatively in 3 subjects (10.7%). All flaps were successful; however, 2 of 28 flaps (7.1%) were salvaged by operative revision from post-operative thrombotic events, one arterial and one venous, occurring on post-operative day one. Focal necrosis requiring surgical excision and advancement occurred in 2 of 28 flaps (7.1%). A hematoma occurred at the site of flap inset in 3 of 28 reconstructions (10.7%) and at 2 donor sites (7.1%). Multivariate analysis of anticoagulation protocol did not demonstrate a statistical effect on flap complication rate or salvage. However, there was a statistically significant higher rate of both flap and donor site hematomas in Group 3 with the use of therapeutic anticoagulation ($p=0.04$). Subjects who had an IVC filter had a statistically higher rate of hematomas ($p=0.002$) and trended towards increased flap complications ($p=0.06$).

Conclusions In our experience, the choice of anticoagulation protocol in hypercoagulable subjects does not affect reconstructive outcomes. However, we found that thrombophilic subjects who are deemed highest risk and receive IVC filters and therapeutic anticoagulation peri-operatively are more likely to have post-operative complications, including an increase in hematomas with therapeutic anticoagulation.

Novel Method of Double Innervated Free Gracilis Muscle Functional Transfer for Facial Reanimation

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Purpose: Dynamic facial reanimation is the gold standard treatment for a paralyzed face. The use of cross face nerve graft (CFNG) in combination with the masseteric nerve to innervate free gracilis muscle has been reported in various configurations, with the goal of providing both spontaneity from the CFNG and strong innervation from the masseteric nerve. We report a novel modification to the existing nerve configuration, with presentation of outcomes of our case series.

Methods: A total of eight patients received free gracilis muscle transfer using the new double innervation method between September 2014 and December 2017. The cross face nerve graft, which was performed nine months prior, was sutured in an end-to-end fashion to the obturator nerve. The ipsilateral masseter nerve was coapted to a nerve graft obtained from extra length of obturator nerve obtained during the harvest of the gracilis muscle. This nerve graft was then sutured in an end to side fashion to the sural nerve graft proximal to the end-to-end obturator coaptation (Figure will be provided during presentation). Video analysis was performed on preoperative and all postoperative follow up. Two independent experienced raters performed Terzis 5 stages classification on the videos. Time to smile with biting down and time to natural smile was also assessed.

Result: All patients recover smile function with teeth clenching (average 7.5 months, range 3-12). Two patients did not recover smile function at 4 and 8 months follow up but achieved smile at their 10 and 12 months follow up. Seven of eight patients recover spontaneous smile by average of 8.4 months (range 7-12), with one patient having no function after 12 months of follow up. Average follow up time was 22 months. Based on the Terzis reanimation grading, four patients achieved moderate result, two achieved good result, and two achieved excellent result.

Conclusion: Our new novel method of dual gracilis innervation represents a viable technique that does not risk denervation of the gracilis muscle and provide good spontaneous emotional smile and aesthetic symmetry. We hypothesize that placing the masseter nerve at a disadvantage by using the extra nerve graft which requires the signal to go through three anastomosis, the cross face nerve graft have more time to provide a stronger signal without being taken over by the masseter.

A Computerized Approach to Facial Transplantation: Evolution and Application in Three Consecutive Face Transplants

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Introduction: Face transplant (FT) candidates present with unique anatomic and functional defects unsuitable for autologous reconstruction, making the accurate design and transplantation of patient-specific allografts particularly challenging. In this case series, we present our computerized surgical planning (CSP) protocol for FT.

Methods: CSP, computer-aided design and manufacturing (CAD/CAM), intraoperative navigation, and intraoperative computerized tomography (CT) have been successfully incorporated into a comprehensive protocol. Three consecutive FTs were performed. CSP and postoperative results were compared using CT-derived cephalometric measurements, and the literature was reviewed.

Results: Two full and one partial FT were successfully performed using the CSP protocol. CSP facilitated the execution of FT with minor angular and translational cephalometric variations on immediate postoperative imaging. Our evolving experience was accompanied by a decreased reliance on cadaveric simulation, from 10 mock transplants and a research procurement prior to the senior author's first clinical FT (2012) to 6 mock transplants and no research procurement prior to the third FT (2018). Operative time was significantly reduced from 36 to 25 hours, as was the need for major orthognathic surgical revision. This reflects the learning curve and variable case complexity, but is also representative of improved planning and execution, complemented by the systematic incorporation of CSP into FT.

Conclusion: A CSP protocol allows for refinement of operative flow, technique, and outcomes in partial and full FT. Standards for functional and aesthetic outcomes are

bound to evolve with the field's growth, and computerized planning and execution offer a reproducible approach to FT through objective quality assurance.

The Orbital Index: Developing a Risk Stratification Tool for Predicting Delayed Enophthalmos in Orbital Floor Fracture Management

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Background: Early identification of surgical indication is critical to optimizing outcomes in orbital floor fracture management.[1-3] Absolute indications for surgical repair of orbital floor fractures are acute muscle entrapment and globe malposition. However, identifying those at risk for delayed enophthalmos and requiring subsequent surgery remains a challenge despite multiple proposed criteria. The purpose of this study was to validate a clinical prediction tool using computed tomography data to stratify risk for delayed enophthalmos and establish a threshold for surgical intervention.

Methods and Materials: The Orbital Index stratifies fractures by size, location, and inferior rectus rounding (a surrogate for fascioligamentus sling disruption)[4,5]; scale of 0-6. A twenty-year (1998-2018) single-center retrospective analysis of orbital floor fractures was performed, scores were assigned and verified by two investigators, and treatment outcomes were ascertained comparing operative rates. Inter-observer reproducibility across scoring components was assessed with Weighted Cohen's Kappa statistic comparing scores of craniofacial specialists, plastic surgery residents, and medical students. Providers were surveyed pre-and post-intervention to determine whether use of this tool improved understanding and communication.

Results: The Orbital Index demonstrated high fidelity, inter-observer reproducibility, and identified a score of ≥4 as a tentative surgical threshold. Retrospective chart review identified 201 fractures meeting inclusion criteria; 35% scored 0 (operative rate 3%), 12% scored 1 (8%), 10% scored 2 (10%), 11% scored 3 (18%), 9% scored 4 (50%), 12% scored 5 (63%), and 11% scored 6 (77%). A statistically significant difference in decision for operative intervention was found between scores of 3 vs 4 ($p=0.04$), but not scores 0 vs 1 ($p=0.27$), 1 vs 2 ($p=0.82$), 2 vs 3 ($p=0.43$), 4 vs 5 ($p=0.43$), or 5 vs 6 ($p=0.29$). Mean weighted Cohen's Kappa was 0.73 corroborating scoring reproducibility. Participants demonstrated increased ability to correctly identify surgical need with use of the Orbital Index ($p=0.01$). Pre-and post-

intervention surveys demonstrated increased subject self-reported understanding (p=0.001) and communication. (p=0.0003)

Conclusions: The Orbital Index is a reproducible tool to stratify risk for enophthalmos in orbital floor fracture management.

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Outcomes Following Tooth-Bearing Maxillomandibular Facial Transplantation

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Introduction: Achieving optimal occlusion with tooth-bearing maxillomandibular composite facial allografts is challenging. Donor to recipient cephalometric matching, computerized surgical planning (CSP) and execution, and postoperative rehabilitation play complementary roles in achieving optimal functional outcomes.

Methods: Two tooth-bearing maxillomandibular face transplants were performed after informed consent and institutional review board approval in two patients who sustained ballistic composite facial injuries. Patient 1 underwent total face, double jaw, teeth, and tongue transplantation in March 2012. Patient 2 underwent partial face, double jaw, and teeth transplantation in January 2018. Le Fort III and bilateral sagittal

split skeletal osteotomies were performed in both transplants. CSP was used in both cases, and the allografts were transferred in intermaxillary fixation (IMF) with prefabricated dental splints prior to rigid skeletal fixation.

Results: Normal class I occlusion was achieved at the conclusion of each surgery. Patient 1 had a 2x2mm palatal fistula in the early postoperative period and also gradually developed class III malocclusion. Orthodontic treatment was started at 5 months post-transplant but failed. A Le Fort III advancement was performed a month later with successful restoration of class I occlusion. The palatal fistula was successfully repaired at 9 postoperative months. Patient 2 developed postoperative palate and floor of mouth dehiscence, requiring palatal repair and hyoid and genioglossus advancement on POD 11. Orthodontic treatment was initiated for class II malocclusion. On POD 108, he was diagnosed with left mandibular nonunion. Left coronoidectomy, open reduction and internal fixation were performed. IMF was maintained for 2 weeks. Orthodontic treatment was then resumed, with normalization of the occlusion by 10 months post-FT.

Conclusion: Maxillomandibular transplantation is a viable reconstructive solution for composite midface defects not amenable to autologous reconstruction. Patients receiving maxillomandibular tooth-bearing allografts are prone to developing gradual occlusal changes during the period of postoperative sensory-motor recovery. Improvement of functional outcomes and prevention of major complications rely on close attention to occlusal relationships, temporomandibular joint dynamics, dental health, and the intraoral donor-recipient soft tissue interface. In addition to cephalometric matching, CSP, and allograft transfer in IMF, pre-emptive initiation of early orthodontic treatment regardless of the immediate postoperative occlusion achieved is recommended for patients with tooth-bearing allografts. If necessary, orthognathic revisional surgery can be performed safely to restore normal occlusion when noninvasive interventions fail.

Latissimus Dorsi-Rib Osteomyocutaneous Flaps for Composite Cranial Defects: A Case Series and Anatomical Study

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Purpose: Latissimus dorsi-rib osteomyocutaneous flaps (LDRF) are versatile in reconstructing compromised composite defects of the cranium. The flap restores the contour of the skull, protects the brain, and improves neurological status. There are benefits to using autologous rib instead of alloplastic material, however, rib viability and flap success relies on adequate blood supply. Our aim was to present the outcomes of 6 patients treated with LDRF and provide an anatomical basis for this flap.

Methods: Six patients with cranial defects treated with LDRF were evaluated retrospectively. Defect size, etiology, previous reconstructive attempts, outcomes, and complications were assessed. Red latex was injected into the subscapular arterial system of twenty fresh cadaver sides. In the prone position, latissimus dorsi (LD) muscle was dissected from the ribs in a mediocaudal to superolateral direction to locate interconnecting vessels between the thoracodorsal and lateral posterior intercostal systems. The number, diameter and length of perforators, and distance from midline were measured.

Results: All patients had a history of at least 2 previous failed reconstructions. Defects were secondary to gunshot injury, post-CVA cranioplasty, post ablation irradiation and post frontal ICH cranioplasty. Three defects were reconstructed using 2 ribs while the remaining 3 patients received 1 rib. A prolene mesh was used to fill in the donor site defects in 4 patients. Follow-up ranged from 6 to 35 months. All patients had stable reconstructions. Headache resolved in 2 patients after reconstruction and neurological status improved in 2 patients.

An average of 13.75 perforators could be localized in each cadaveric LD muscle. No perforator was found for the 7^{th} rib. Not all cadaver sides contained perforating vessels for the 8^{th} and 12^{th} ribs. The distance from the midline to the first perforator was not different between the ribs ($p=0.499$). Perforator diameter and pedicle length tended to decrease at more inferior rib levels. The 10^{th} rib (4.65 ± 2.01) followed by 9^{th} rib (3.7 ± 1.63) had the highest number of perforators. The 8^{th} and 12^{th} ribs contained the least perforators. The 8^{th} rib had the longest perforators (4.26 ± 1.52 cm).

Conclusion: The latissimus dorsi-rib osteomyocutaneous flap can successfully address large composite cranial defects, provide support and enhanced contour with negligible donor site morbidity. The 10^{th} followed by the 9^{th} rib has the best vascular supply for this flap. If 2 ribs are considered for the flap, the 9^{th} and 11^{th} are recommended. If only 1 rib is necessary for reconstruction, the 10^{th} is ideal.

Skull Base Reconstruction Using Free Flaps Following Extended Tumor Ablation: A Retrospective Study of 45 Cases

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Background: Oncological resections at the skull base often results in extended defects and exposure of the brain, dura, and adjacent structures, and sometimes patients suffer from fatal postoperative complications like meningitis and cerebrospinal fluid leak(1). The primary goals of skull base reconstruction involve separation of central nervous system from external or mucosal contamination, obliterating dead space, and restoring acceptable appearance and function when possible. While small defects can often be successfully closed using local flaps or distant pedicled flaps, surgical resection frequently results in the creation of complex, large and three-dimensional defects, which can be reconstructed only through the use of microvascular tissue transfer (2, 3).

Methods: A retrospective study was conducted of patients diagnosed with tumors infiltrating the skull base, who underwent extended tumor resection and primary microvascular free flap reconstruction between 2007 and 2017 at the University of Tokyo, Japan. The parameters investigated include demographics, tumor characteristics, preoperative therapies, reconstructive procedures, and above all, postoperative complications.

Results: 43 patients underwent a total of 45 skull base free flap reconstruction during the study period. 28 males and 15 females were included in the study. Two patients developed a tumor recurrence and were treated with surgical skull base resection and a second microvascular reconstruction. The mean age was 55.8 years (range 1-80 years) at operation (4). Tumors were resected via an open extracranial approach and all operation included resection of a portion of skull base and exposure of the intracranial compartments to skin or upper aerodigestive tract. Reconstruction was undertaken using mainly the rectus abdominis musculocutaneous flap (69%), followed by the anterolateral thigh flap (22%). Latissimus dorsi musculocutaneous flap and superficial circumflex iliac perforator flap were used in 2 cases each (5). There were no flap losses, no reoperations due to anastomoses-related complications, and no perioperative death.

Conclusion: In our series, free flap transfer is versatile for skull base reconstruction and safely utilized even in a 1-year-old infant or the elderly. Multiple reconstructions using free flaps were successfully conducted in 2 cases. With consideration for tumor

characteristics, defects following tumor ablation, donor-site morbidity, and patient's background, we choose optimal flap for each patient and pursue more reliable and aesthetic reconstructions and less donor-site morbidities.

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The Effects of Intra-Arterial and Intravenous Chemotherapy on Head and Neck Microvascular Reconstruction: A Retrospective Propensity Score-Matched Analysis and Pathologic Comparison

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Backgrounds: For locally advanced head and neck cancers, intra-arterial (IA) chemotherapy is utilized for locoregional control with favorable results. However, whether IA chemotherapy affects clinical outcome of microvascular reconstruction remains controversial.

Methods: We retrospectively reviewed 572 patients who underwent head and neck microsurgical reconstruction from January 2014 to August 2018. Patients with prior history of chemotherapy were included and categorized into two groups according to history of IA chemotherapy (IA group)/ intravenous chemotherapy (IV group). A 1:1 propensity score matched analysis was performed. Microsurgical revision rates were evaluated along with complications and flap survival. Recipient vessel specimens were analyzed by histological examination.

Results: We identified 45 patients with IA chemotherapy and 201 patients with IV chemotherapy. The median time from chemotherapy to surgery was 2.3 months (0.6-51.2 months) in the IA group and 3.2 months (0.5-42.5 months) in the IV group. After propensity score matching, the IA group had significantly higher rates of arterial thrombosis (OR 4.98, p=0.021), wound-related complications (OR 3.30, p=0.02) and revision surgery within one month (OR 3.73, p=0.035). Based on histology, IA group vessels showed a higher intima/media ratio than the IV group (0.45±0.06 versus 0.23±0.03, p=0.02)

Conclusions: Despite treating local advanced head and neck cancers with good results, IA chemotherapy may cause subsequent deleterious effects on local tissue due to the high concentration of cytotoxic chemotherapeutic agents. Surgeons should be cautious in selection of recipient vessels when performing microvascular reconstruction.

Conformity of 3D Surgical Plans with Actual Results: A Comparison of Vsp Accuracy between Five Different Craniofacial Procedures

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Background and Purpose: Virtual surgical planning (VSP) is a powerful tool for facial and reconstructive indications in plastic surgery. The purpose of this study is to compare the virtual plan to the actual postoperative result in 5 procedural categories using VSP performed by a single surgeon. We hypothesize that implant cranioplasty will be most conforming and mandibular distraction the least.

Methods: Stereolithography formats were obtained and reviewed for the plan and the post-operative CT from patients in 5 categories: Implant cranioplasty (I), cranioplasty for craniosynostosis (C), orthognathic surgery (O), mandibular reconstruction (M), and mandibular distraction (D). Digital renderings were imported and analyzed using Mimics (Materialise, Leuven, Be), using volumetric overlays, and linear data. Each category cohort was then compared and stratified. Statistics included ANOVA testing in SPSS statistical software package (Version 25; IBM, Armonk NY). Post hoc Bon Ferroni comparison was carried out for groups that displayed significant variance.

Results: 124 patients (59 orthognathic; 16 mandibular reconstruction; 32 cranioplasty for craniosynostosis; 8 implant cranioplasty; 9 mandibular distraction) with completed

VSPs and post-operative CT scans were identified. Average volume discrepancies (%) in each group were the following: I = 6.16 ±2.5; M = 14.41±11.4; C = 44.1±13.8; O = 20.8±6.2; D = 52.4±25.2. Implant cranioplasty was found to be significantly more conforming when compared to cranioplasty for craniosynostosis (p = 1.03E-14), orthognathic surgery (p = 6.98E-18), and mandibular distraction (p= 1.13E-12).

Conclusion: Conformity between VSP and actual post-operative result is greatest for implant cranioplasty, and least for mandibular distraction. To our knowledge, this is the first study comparing the use of VSP across multiple surgical procedures in the craniofacial realm all performed by one surgeon. Despite imperfect conformity between VSPs and post-operative CTs in all categories, clinical endpoints were universally excellent, indicating that successful reconstruction still relies on a subjective aspect dictated by the comprehensive experience and artistic judgement of the surgeon. Future research directions include the use of this and similar analyses to develop models for process improvement in virtual surgical planning.

Simultaneous Zygomatic Osteotomies with Reduction Mandibuloplasty- Our Approach to Mid and Lower Facial Feminization in the Transfeminine Patient

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Purpose: Facial feminization surgery (FFS) is aimed at treating gender dysphoria associated with anthropometrically masculine facial features.[1] When combined with appropriate hormonal therapy and body contouring, FFS is a crucial component of the gender transition process. This study describes a combined middle and lower facial feminization technique that has resulted in high patient satisfaction.

Methods: A single-surgeon, single-institutional retrospective review was performed of patients undergoing concurrent reduction mandibuloplasty and zygomatic osteotomies between August 2017 and October 2018.

Procedure: Reduction mandibuloplasty was performed first, which allowed harvesting of bone graft for the zygomatic portion of the procedure. The lateral body and mandibular angle were reduced via an angle-splitting ostectomy with lateral cortex excision and gonial angle reduction. Chin reduction was performed for wide square-shaped chins via central wedge excision osseous genioplasty. Zygomatic

osteotomies were performed in all cases[2], using previously harvested mandibular bone as a bone graft designed according to the degree of desired zygomatic augmentation.

Results: 10 transfeminine patients were analyzed. Two patients reported histories of prior facial surgery, and one patient reported history of untreated pediatric nasal fracture. Mean follow-up after surgery was 5.9 months. Patient satisfaction was high, and six of the patients included in this study have undergone further FFS of other facial areas since. Transient V3 hypoesthesia was noted in 4 patients. Transient marginal mandibular nerve weakness was noted in one patient, which resolved after 3 months. Minor mandibular contour asymmetry was noted in one patient, who declined revision.

Conclusions: Our approach to feminization of the mid and lower thirds of the face often involves simultaneous zygomatic osteotomies with outfracturing, and reduction of the mandibular angles and chin via osseous genioplasty. This approach spares morbidity of a separate bone graft donor site for zygomatic augmentation by utilizing already-harvested mandibular bone. The overall aesthetic effect is tapering/softening of the lower face and enhancement of the cheekbones, resulting in feminized facial proportions. This study serves to describe our experience with the application of aesthetic craniofacial techniques to the transgender population.

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Augmented Reality to Remotely Teach Surgery: Sustainable Overseas Cleft Outreach and Future Directions

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Introduction & Objectives: Augmented Reality (AR) technology permits a remote yet "hands- on" virtual interactive presence. A 2014 multi-center proof-of-concept investigation demonstrated AR is safe, reliable, and accurate/precise when used for international knowledge transfer in the operating room. The goal of this study was to

build an augmented reality educational platform that allows a remote, yet "hands-on" virtual interactive presence in order to transfer cleft skills/knowledge to overseas colleagues. We designed a curriculum comprised of remote and in-person surgical connections and compared the efficacy of the two modalities in building long-term capacity and sustainability of cleft care. With lessons learned, we suggest exciting opportunities to further utilize this powerful technology for effective education and collaboration.

Material & Methods: A 12-month AR-based curriculum was designed and approved by the Ministry of Health in Trujillo, Peru. Global Smile Foundation and PROXIMIE, L.L.C. provided logistical/technical partnerships; grant support was provided by The Plastic Surgery Foundation and Cleft Palate Foundation. Three semi-annual site visits engaged Peruvian colleagues in evidence-based didactics, on-site cleft surgery, and familiarization with the AR platform. Each month, AR was used to remotely guide cleft repairs in Trujillo, Peru. Quarterly assessments by Peruvian and U.S. surgeons utilized Lickert Surveys and VAS Questionnaires.

Results: Two plastic surgeons, serving a population of over 3,000,000 Peruvians, were recruited into the study. Neither had specialized cleft training. Mulliken’s technique for unilateral and bilateral nasolabial repair was taught during site visits and remote sessions. Sustained gains in seven areas of cleft care were demonstrated by self-reporting and by assessment of the remote surgeon. Site visits preferentially augmented capacity for anatomic diagnosis, principles of repair, and intra-operative decision-making. Remote sessions preferentially developed capacity for cleft anthropometry, operative anatomy, and operative efficiency. 18 months after completion of AR-based curriculum, no child with cleft lip required transfer to tertiary care center (Lima, Peru) because of diagnosis or severity of cleft lip; 6 patients were transferred for treatment of additional congenital anomalies.

Conclusion: A curriculum that combines on-site training and AR-based "hands-on" remote teaching can build sustained capacity of comprehensive cleft care in under-resourced international areas. A comprehensive site-specific needs assessments and trusted partnerships are pre-requisites. We plan to next test the efficacy of an AR-based curriculum in developing sustained international capacity for NasoAlveolar Molding (NAM). Our experience advocates for a multitude of exciting new avenues to use AR in plastic surgery residency education and to connect craniofacial plastic surgeons across institutions in order to pool expertise and wisdom.

What the Eye Can't See: Craniofacial Comparisons of Trans and Cisgender Women

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Purpose: Facial feminization surgery (FFS) encompasses a set of procedures designed to alter anthropometrically masculine features to feminine features in the transfeminine patient. In this study, we sought to obtain objective data on craniofacial skeletal proportions in transgender women seeking FFS in order to facilitate surgical planning in this patient population.

Methods: A single-surgeon retrospective review was performed of transfeminine women presenting for FFS over one year. Those with pre-operative computed tomography (CT) scans were included and those with previous facial trauma or surgery were excluded. An age and race-matched control group was established using nontrauma CT scans of cis-female patients.

The following measurements were determined: nasofrontal angle, zygion to zygion (Zy-Zy), maxillozygion-maxillozyion (MZ-MZ), opisthocranion (OP)-orbitale superius (OS), OP- orbitale (OR**)**, OP- MZ, OP-anterior nasal spine (ANS), Bigonial width (Go-Go), midfacial height (MFH, nasion to ANS), lower facial height (LFH, ANS to Gn), chin width, chin height (So-Gn), and gonial angle. To help control for differences in head and facial size, ratios were calculated between certain measurements to obtain relative dimensions of upper, mid, and lower facial features.

T-tests and ANOVA were used to compare facial dimensions between ciswomen and transwomen, with $p < 0.05$ considered significant.

Results: 23 trans-women were studied (versus 15 cis women). At the time of maxillofacial CT, the average age of transwomen was 33.7 years and 37.8 years for ciswomen ($p=0.2$).

Significant differences between ciswomen and transwomen craniofacial dimensions were observed in midfacial width (Zy-Zy - 121.6 mm vs. 128.9 mm; $p<0.001$), and measurements of absolute upper and mid-facial projection [OP-OS (169.4 mm vs. 182.7 mm; $p<0. 001$), OP-ANS (189.8 mm vs. 200.5 mm; $p<0.001$), OP-MZ (165.4 mm vs. 174.5 mm; $p=0.004$)]. Transgender women had longer lower faces (LFH - 62.4 mm vs. 70.5 mm; $p=0.013$) and greater chin height (31.1 mm vs. 36.5 mm; $p<0.001$). Absolute values for MFH (52.9 mm vs. 52.2 mm; $p=0.243$), bigonial width (90.5 mm vs. 95.1 mm; $p=0.069$), mz-mz width (91.2 mm vs. 94.6 mm; $p=0.2718$), chin width (33.4 mm vs. 32.6 mm; $p=0.201$), and gonial angle (126.7 degrees vs. 124.5 degrees; $p=0.413$) did not differ between cis- and transgender women.

There was no significant difference in relative mid to lower facial width proportions (zy-zy/go-go, 1.35 vs 1.36, p=0.61; mz-mz/go-go, 1.01 vs 1.00, p=0.59). However, transgender women had a significantly higher LFH/MFH ratio than cisgender women (1.30 vs 1.18, p=0.023)

Conclusions: Certain facial skeletal features help to distinguish masculine versus feminine faces, and a proper understanding of these differences is critical in facial analysis of those seeking facial feminizing surgery.[1] Absolute mid-facial width and facial projection tend to be greater in the transgender woman seeking FFS. In addition, the relationship between vertical dimensions of the mid and lower facial skeleton appear to play a role in facial feminization. To allow for accurate surgical planning and execution, further characterization of anthropometric and cephalometric characteristics in the transgender population are critical to elucidate.

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National Analysis of Patients with External Ear Melanoma in the United States

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Background: External ear melanoma (EEM) is a rare condition with controversies in the literature. We analyzed patients with EEM in the United States compared to other head and neck melanomas (OHNMs).

Methods: The National Cancer Database (NCDB) was used to select patients with head and neck melanoma from January 1, 2004, to December 31, 2015. We categorized patients into 2 groups based on tumor location (EEM versus OHNM) to assess variables related to patients, hospital type, tumor, and treatment. Mann-Whitney and χ^2 tests were used to estimate statistical significance. Moreover, we performed multivariate logistic regression to identify independent associations adjusted for confounders.

Results: A total of 137,233 patients met the criteria of the study. Among them, 16,991 (12.4%) had EEM and 120,242 (87.6%) had OHNM. For patients with EEM, the mean (SD) age was 66.26 (15.798) years. Most of the patients with EEM were men (85.5%), insured by Medicare (52.4%), and treated in Academic/Research Programs (47.7%) or Comprehensive Community Cancer Programs (32.3%). Most of the EEM tumors had invasive behavior (68.0%), were Stages 0 (30.3%) or I (40.3%), and were without ulceration (76.9%). Mean time to receive any treatment was 14.1 days for EEM compared with 14.6 days for OHNM (*P*<.001*)*. We noticed a greater proportion of EEM in men (14.8%; adjusted odds ratio [aOR] 2.72 [2.605–2.852]; *P*<.001) compared to women (6.22%; reference). EEM was an independent factor for tumor Stage I (14.47%; aOR 1.61 [1.101-1.224]; *P*<.001) and invasive behavior (13.86%; aOR 1.268 [1.15-1.389]; *P*<.001) compared to OHNM.

Conclusion: EEM was found to represent 12.4% of all head and neck tumors registered on NCDB and was associated with higher odds of tumors with invasive behavior compared to OHNM. Furthermore, men were found to have a higher likelihood to develop EEM compared to women.

Risk Factors Contributing to Post-Operative Infection in Distal Radius Fractures

Presenter:	Justin Davis, MD
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Introduction: Distal radius fracture (DRF) is one of the most common injuries, accounting for one-sixth of all fractures[1,2] with an annual incidence of more than 640,000[3] in the United States. In previous studies, several risk factors for post-operative surgical site infection (SSI) in DRF surgery have been identified, but diabetes mellitus (DM) has not been previously demonstrated to be an independent risk factor.[4] The purpose of this study was to expand on previous studies to identify risk factors contributing to SSI in patients undergoing surgical treatment of DRF's, focusing on the role of DM and glucose control.

Methods: This was a single-institution retrospective chart review of patients with operative treatment of DRF's from 2012 to 2017. After excluding patients with incomplete data, 541 patients were included in this study. Patients were divided into two groups - those with post-operative SSI and those without. Potential risk factors for infection included surgery length, presence of Kirschner-wires (K-wires) or external-fixators (ex-fix), diagnosis of DM, uncontrolled DM defined as an HgBA1c>7, open

fracture, smoking, osteoporosis, gender, and age. Variables were screened for inclusion in the final model by performing bivariate analysis for each independent variable, with infection as the dependent variable. Variables with a p-value <0.10 in the initial screen were included in the final model. Multiple logistic regression was performed to control for confounding variables, using the independent variables selected in the bivariate analyses. A p-value of <0.05 was considered statistically significant.

Results: Twenty patients (3.7%) had SSI's, while 521 (96.3%) did not. Uncontrolled diabetes (OR = 7.83, p=0.002), the presence of an ex-fix or k-wires (OR =3.73, p=0.007), and smoking (OR=3.79, p=0.007) were statistically significant independent predictors of SSI. Of note, DM alone (as opposed to uncontrolled DM) was not an independent risk factor.

Conclusion: The previously identified risk factors for SSI of smoking, and the use of k-wires or ex-fix were confirmed in this study. Additionally, this study demonstrates that patients with uncontrolled DM (HgA1c>7) are at increased risk for SSI, independent of other risk factors. Notably, the presence of DM alone is not an independent risk factor, highlighting the importance of glucose control.

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Medicare Compensation Rates for Hand and Shoulder/Elbow Surgery by Operative Time: A Comparative Analysis

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Purpose: There is a high demand for shoulder/elbow experience among hand-fellowship trainees due to the perception that this exposure will improve their professional "marketability" in a subspecialty they perceive as having higher compensation.

Materials and Methods: We collected data on work relative value units (wRVUs), payments, charges, number of procedures performed, and operative times for the most common hand (N=83) and shoulder/elbow (N=30) surgeries. For each procedure, we calculated wRVUs/min, payments/min, charges/min, and reimbursement (payment-to-charge percentage) and compared overall non-weighted and weighted means (by frequency of procedure) for these 4 values between the two fields.

Results: For shoulder/elbow procedures, arthroplasty and arthroscopic rotator cuff repair had the highest payment and wRVU assignments. Open and arthroscopic biceps tenodesis/tenotomy and epicondyle debridement had the greatest wRVUs/min. For hand procedures, upper extremity flaps, carpal stabilization, distal radius open reduction and internal fixation (ORIF), both-bone ORIF, and interposition arthroplasty had the greatest wRVU assignments with correspondingly high payments. Open carpal tunnel release, thumb/finger amputation, and percutaneous distal radius fixation had the highest wRVUs/min. A non-weighted comparison of the 2 subspecialties showed that hand surgery has a higher mean payment/min ($10.46±3.22 vs. $7.52±2.89), charge/min ($51.02±17.11 vs. $41.96±11.32), and reimbursement (21±4.7% vs. 18±5.1%) compared with shoulder/elbow surgery (all, $p < 0.01$). Non-weighted mean wRVUs/min were similar (0.12±0.03 vs. 0.13±0.03, $p = 0.12$). When weighted procedure frequency, hand surgery had greater wRVUs/min (0.15±0.036 vs. 0.13±0.032), payments/min ($14.17±4.50 vs. $6.97±2.26), charges/min ($75.68±30.47 vs. $42.61±7.83), and reimbursement (20±5.0% vs. 17±6.0%) (all, $p < 0.01$).

Conclusion: When weighted by surgical frequency, hand procedures were associated with greater overall compensation rates compared with shoulder/elbow procedures. Hand-fellowship trainees may pursue shoulder/elbow experience for an additional surgical skill set as opposed to monetary reasons.

Dorsoproximal Interphalangeal Island Flaps to Repair Finger Lesions at the PIP Joint

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Background: Tissue flaps are not commonly used to cover the volar region or the lateral aspect of the PIP joint, and skin graft or cross-finger flap is typically used to repair the damage, resulting in lack of tissue at this site. The aim of this study is to demonstrate the clinical application of the dorsoproximal interphalangeal island flap as an option to treat various lesions. The blood supply of the mini-axial flap is provided by two bilateral branches of the proper digital artery. These vessels can be rotated with the pedicle on both sides of the finger.

Methods: Treatment using flaps was performed in 13 patients, 9 males and 4 females. Twenty-one flaps were rotated in total. The flaps were used mainly for repair of volar contracture in finger with burn injuries. Five patients required two or more fingers to be treated concomitantly. The mean patient age was 18 years, and age ranged was 7 to 56 years. The majority of the patients presented with palmar finger contracture located at the PIP joint. In two cases the flaps were rotated to the lateral radial or ulnar surface of the finger.

Results: The majority of flaps survived and provided satisfactory functional and aesthetic improvement of the volar scar contracture in the PIP region. The donor site was preserved. The skin color and texture provided by the flap matched the natural color and pliability of the finger skin. The patient follow-up period ranged from six months to twelve years.

Conclusions: The dorsoproximal interphalangeal island flap is an option to repair lesions that lack soft tissue and range in size from 10x15mm to 12x18mm at the volar site of the PIP joint. The arch of rotation of this flap allows lateral ulnar and radial rotation around the same joint. Although it was not the main purpose of the study, the use of two flaps in one patient to repair a proximal lack of tissue caused by syndactyly demonstrated the possibility of reducing the amount of skin needed for grafting.

Hand and Wrist Injuries Are Common Among Collegiate Athletes: Injury and Surgical Intervention Rates Vary with Athletic Division

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Purpose: The rates, severity and consequences of hand injuries sustained by National Collegiate Athletic Association (NCAA) athletes have not been well characterized. There is a trend in high-performing athletes to return to athletic activity quickly. A descriptive epidemiology study was performed to better understand the injuries among male and female athletes competing in various divisions in collegiate athletics, the treatment thereof and the time lost from the athletic activity.

Methods and Materials: The NCAA Injury Surveillance Program (NCAA-ISP) was accessed for various sports from 2004 to 2015. Data was stratified by injuries sustained, mean loss of activity time following the injury, male and female sport and need for surgery following injury. Descriptive statistics were performed to examine the association between sports, event type and gender. $p<0.05$ was considered significant.

Results: 103,098 hand and wrist injuries were reported in all evaluated NCAA sports from 2004-2015. Male athletes experienced 72,423 injuries (6.37/10,000 athlete events) and female athletes sustained 30,675 injuries (6.14/10,000 athlete events). Division I athletes suffered significantly more of these injuries (7.61/10,000 athlete events) compared to athletes in divisions II (4.72/10,000 athlete events, $p<0.001$) and III (5.98/10,000 athlete events, $p<0.001$). This trend was consistent for both male and female athletics. The most common injury sustained included wrist and phalangeal ligamentous injuries, followed by wrist tenosynovitis, nailbed injuries, infection and hand, wrist and phalangeal contusions. The most common hand and wrist fracture sustained was a metacarpal fracture. Overall, 3.65% of hand and wrist injuries required surgical intervention. A significantly higher percentage of division I athletes underwent surgical intervention (4.28%) compared to athletes in divisions II (3.46%, $p<0.001$) and III (2.97%, $p<0.001$). This trend again remained consistent for both male and female athletics. Approximately half of all athletes that sustained hand and wrist injuries missed less than one day of athlete events. The mean time lost due to hand injury was 7.14 days for all athletes. Division I athletes tended to miss fewer days (6.29 days) due to injury, though this was not significant compared to division II (7.96 days, $p=0.057$) and division III (7.86 days, $p=0.244$) athletes. Division I male athletes missed the mean fewest number of days (5.66 days), which was significant compared to division II male athletes (8.37 days, $p<0.004$) but not compared to division III male athletes (8.99 days, $p=0.071$). The difference in mean time lost was not significant for female athletes between the different divisions.

Conclusion: Hand and wrist injuries are common among collegiate athletes. Division I athletes experience higher rates of these injuries and higher surgical intervention rates, while tending to miss fewer days due to injury.

Initial Experience with Multifilament Stainless Steel Tendon Repair System (PONTiS) in Traumatic Hand Injuries

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Hypothesis: The PONTiSmultifilament braided steel knotless tendon repair system provides a durable alternative to traditional flexor tendon repair in urban populations.

Background: Traumatic hand injuries remain a common and often debilitating surgical challenge requiring prompt intervention to ensure optimal functional outcome. Complications prolong recovery and increase morbidity with complication rates ranging from 0-20% with traditional suture repair methods. The PONTiS flexor repair system (PFRS) is a new multifilament, braided steel, tendon repair system. Here we review our initial experience with the device at an urban, level-1 trauma center.

Methods: We reviewed the charts of patients undergoing traumatic tendon repair with PFRS in the upper extremity between February 2015 to September 2017. All patients presented through our trauma triage service with acute traumatic hand injuries. Surgeries were performed by 3 surgeons on two teams: Plastic and Reconstructive (n = 2) or Orthopedic (n = 1) surgery.

Results: Our cohort consisted of 81 patients with an average age of 38.1 ± 14.4 years for a total of 312 repaired tendons. The typical demographic profile included African American (49; 70.0%) males (50; 71.4%) who are right-handed (58; 82.9%) laborers (25; 35.7%), receiving laceration injuries (54; 77.1%) to their left hand (38; 54.3%) at zone 2 (22; 31.4%) of the volar left index (35; 50.0%) and ring fingers (31; 44.3%). Median follow up time was 5.6 months with a range of 0 – 688 days. Fractures, arterial injuries, and nerve injuries were present in 21.4% (n = 15), 24.3% (n = 17), and 61.4% (n = 43) of cases respectively. The average number of tendons injured per case was 3.7 ± 3.4. An epitendinous suture was used in 74% of repairs. The total complication rate was 16% with a tendon rupture rate of 2.5% and a re-operative tenolysis rate of 6.4%. On multivariate analysis, large soft tissue deficit (OR 9.99; CI 1.47 – 66.7; p = 0.043) and zone 2 involvement (OR 7.94; CI 1.99 – 55.6; p = 0.016) were found to be an independent risk factors for developing a complication. The use of an epitendinous repair was found to be protective in preventing complications (OR 0.096; CI 0.018 – 0.503; p = 0.010).

Summary: The PONTiS system is a durable alternative to traditional tendon repair methods with tendon rupture and operative tenolysis rates that may be superior to traditional suture repair. Soft tissue integrity and epitendinous repair are important considerations when using the PONTiS system.

Maintenance of Certification in Plastic Surgery-Trained Hand Surgeons: Who Re-Certifies?

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Purpose: Board certification for physicians is an important quality measure designed to protect patients by maintaining standards for professionalism, ongoing education, and practice improvement. Over the last 25 years, the plastic surgery board certification process has evolved to comply with standards set by the American Board of Medical Specialties. Plastic surgeons are now required to participate in a 10-year Maintenance of Certification (MOC) program which requires proof of professional standing, continuing medical education (CME), and successful completion of a recertification exam. Plastic surgeons who have completed an ACGME-accredited hand fellowship are eligible to receive subspecialty certification in hand surgery. The purpose of this study is to evaluate board recertification trends in plastic surgery-trained hand surgeons and identify areas for improvement.

Materials and Methods: A cross-sectional study of all American Association for Hand Surgery (AAHS) members was performed. Data was collected on age, years in practice, gender, degree, specialty, and academic affiliation from program websites and online resources. Board certification was verified on the American Board of Plastic Surgery website. Statistical analysis was performed in SPSS (SPSS Inc., Chicago, IL).

Results: A total of 323 plastic surgery-trained, U.S.-based hand surgeons were identified as members of the AAHS. One hundred ninety-nine (61.6%) of these members earned subspecialty certification in hand surgery during their career. At the time of this study, 83.9% of surgeons maintained active hand certificates. Those with expired certificates tended to be older (average age 66.7 vs. 52.5 years, $p<0.001$), males (17.9% expired vs. 0.5% expired in females, $p=0.05$) in private practice (22.1% expired vs. 9.5% expired in academics, $p=0.02$). Surgeons with “lifelong” primary plastic surgery board certificates (issued before 1995) were less likely to recertify in

hand subspecialty compared to those required to participate in the MOC program (43.1% vs. 0.8% expired, $p<0.001$).

Conclusions: Maintenance of active board and subspecialty certification is important to ensure ongoing physician competence and provide patients with the highest standard of care. Plastic surgery-trained hand surgeons participating in MOC may choose to recertify in general plastic surgery or hand surgery. This study shows that younger age, female gender, and academic practice are positive predictors of active hand subspecialty certification, and that the institution of the MOC program has been successful in increasing the rate of subspecialty recertification.

Outpatient Management of Hand Infections: The Role of Early Intervention over Antibiotic Therapy

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Purpose: Acute infections of the hand and upper extremity vary widely in severity. While prompt surgical management is a fundamental of the management of severe infections, there are many patients in whom outpatient treatment is ideal. This study seeks to track the natural history of patients treated with hand infections at an urban medical center and identify clinically relevant factors to improve patient management. Our hypothesis was that interventions performed in the urgent care setting led to a successful outcome and rapid resolution.

Materials and Methods: A prospective database was maintained of patients presenting to the emergency department and observation unit over a three-year period in which hand service consultation was requested for infection. Exclusion criteria included hospital admission, operative intervention, poly-trauma, return visit within 30 days, and follow-up less than 14 days. Procedural treatment and antibiotic utilization were recorded**.** All patients had received at least one dose of IV antibiotics empirically. Treatment plans were not dictated by the study parameters. Descriptive statistics were utilized to compare demographic data. Chi Square analysis was performed on categorical data. The primary endpoint was defined as complete resolution of induration, erythema, and drainage at 2 weeks.

Results: 816 patients were identified with 330 meeting the inclusion criteria. Mean age was 45 years. 70% were male. 23% had diabetes mellitus. 67% received more than one dose of IV antibiotics. 98.3% of patients were discharged on oral antibiotics, 93% filled the prescription, but only 50% completed the entire course. 43% underwent a procedure in the emergency department. 71% of patients had resolution by two weeks, 98.5% by two months and all infections were resolved by six months.

No significant difference was seen between patients who completed oral antibiotic treatment and those who did not (78% vs 74% p=0.36). Patients in whom an intervention was performed had a higher rate of resolution versus IV antibiotics alone (86% vs 65% p=0.01**).**

Diabetes was a significant risk factor for delayed recovery. Only 63% demonstrated resolution at two weeks versus 81% for non-diabetics (p=0.001). Further stratification revealed 55% of diabetics with a HgbA1C > 8 % had resolution at two weeks versus 84% of those under this threshold (p = 0.02).

Conclusions: Outpatient management of many hand infections is a safe practice and represents appropriate utilization of resources. High resolution rates were demonstrated in our sample. An intervention may be more important than oral antibiotics in the eventual outcome. If an incision and drainage is being considered for a patient, it may be the single most important factor in the patients' course. While all patients in our cohort received one dose of IV antibiotics extended treatment was not associated with improved outcomes. Patients with diabetes, especially those with poor glycemic control, should be considered for inpatient admission or close follow-up due to high failure rates. Compliance with oral antibiotic therapy is poor in our urban population, however completion of antibiotic treatment did not significantly affect resolution. Further research is underway to identify evidence-based treatment pathways.

Scholarly Productivity Among Hand Surgeons: An Analysis of 832 Surgeons

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Introduction: Research is essential to provide state-of-the-art clinical care to patients. In addition to its clinical relevance, research productivity is a benchmark of

achievement in academic medicine. The purpose of this study is to evaluate trends in academic productivity among hand surgeons.

Methods: A cross-sectional study of all American Association for Hand Surgery (AAHS) members was performed. Data was collected on age, years in practice, gender, degree, specialty, practice location, academic affiliation, and title from program websites and online resources. Board certification was verified on specialty-specific websites. National Institute of Health (NIH) funding was determined using the Research Portfolio Online Reporting Tools (RePORT) database. Number of published manuscripts and h-index were obtained from Scopus (Elsevier Inc., New York, NY). Statistical analysis was performed in SPSS (SPSS Inc., Chicago, IL).

Results: A total of 832 surgeons were identified. The majority were male (87.9%) and practiced in the U.S. (90.2%). Mean age was 52.3 years and mean number of years in practice was 15.9. Average number of published manuscripts and h-index was 25.0 and 6.3, respectively. Eighty-two surgeons practiced internationally in 30 countries worldwide – Canada (2.6%), Argentina (1.2%), and Brazil (1.1%) were most commonly represented. Surgeons practicing in the U.S. published more manuscripts (26.0 vs. 15.6 manuscripts, p=0.04) and had higher h-indexes (6.5 vs. 4.7, p=0.09) than international surgeons.

Orthopedic and plastic surgeons represented the largest proportion of AAHS members at 52.2% and 43.0%, respectively. There were no significant differences in scholarly activity when comparing orthopedic to plastic surgeons (25.4 vs. 28.9 manuscripts, p=0.51, and h-index 6.2 vs. 7.3, p=0.15). General surgeons published an average of 4.8 manuscripts and had a mean h-index of 2.2 – statistically less than both orthopedic (p=0.002) and plastic surgeons (p<0.001).

Overall, age, years in practice, board certification in primary specialty, sub-specialty certification in hand surgery, academic practice, academic rank, affiliation with a hand surgery fellowship program, advanced degrees, and NIH funding all positively correlated academic productivity. Multivariate regression was performed to control for confounding effects, with *h*-index as the dependent variable and the above parameters, plus gender, as independent variables. Age (β=0.111, p<0.001), academic rank (β=4.005, p<0.001), association with a fellowship program (β=2.768, p<0.001), and NIH funding (β=11.748, p<0.001) remained statistically significant predictors of *h*-index (R^2=0.466, p<0.001). Gender, board certification in primary specialty, board certification in hand surgery, and advanced degrees were not significant predictors.

Conclusion: Research is critical to advancing the field of medicine. Orthopedic or plastic surgery training, board certification, academic affiliation, and variables associated with seniority (age, years in practice, and academic rank) were associated with increased academic productivity.

A Comprehensive Analysis of the Characteristics of Acral Lentiginous Melanoma

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Purpose: Acral lentiginous melanoma is the least common subtype of cutaneous melanoma and typically occur on palms, soles and nails. Tumor characteristics and severity of the disease are not well understood in the US population. We aim to describe and compare the characteristics of the disease of acral lentiginous melanoma with the common malignant melanoma of the extremities.

Methods: The National Cancer Database (NCDB) was queried for patients diagnosed with acral lentiginous melanoma from 2004 to 2015. We described demographics, disease and treatment characteristics of the acral lentiginous melanoma. Comparison of age, gender, stage of the disease, Breslow depth, ulceration, mitotic count, lymph nodes involvement, regression, surgery, radiation, and immunotherapy were determined between the acral lentiginous melanoma with the common malignant melanoma located in the extremities. Statistical analysis was performed using Chi-square and multivariate logistic regression model. *P*-value <0.05 was considered significant.

Results: 5203 and 118485 patients were diagnosed with acral lentiginous melanoma and common malignant melanoma of the extremities, respectively. Mean age at diagnosis of the patients with acral lentiginous melanoma was 64.3 years old. Most of them were white (84%) females (54.9%), and between 61 and 80 years old (45.6%). Most of the patients with acral lentiginous melanoma were diagnosed at stage I (36.6%). Most common tumor characteristics presented in these patients included a Breslow depth <=1 mm (32.3%), without ulceration (60.7%), with a mitotic count of 1 or more/mm^2 (32.7%), without any regression (40.7%), with lymph nodes positive (66%), and without presence of lung (57.2%), liver (57.4%) and brain (57.4%)

metastases. In addition, most of these patients underwent surgery procedures (98.8%), without any radiation therapy (97.3%) or immunotherapy (91.7%). When compared with the common malignant melanoma of the extremities, acral lentiginous melanoma patients were more likely to be present at >80 years old (OR: 2.85; CI: 2.12-3.82, p-value<0.001), be on stage III (OR: 4.22; CI: 1.47-12.16, p-value=0.01), and have ulceration (OR: 1.52; CI: 1.33-1.74, p-value<0.001). At the same time, acral lentiginous melanoma patients were less likely to have a mitotic count of 1 or more/mm^2 (OR: 0.57; CI: 0.48-0.67, p-value <0.001), compared to the common malignant melanoma of the extremities. No statistical difference was found for sex, lymph nodes involvement, regression, surgery, radiation, and immunotherapy between these two groups.

Conclusion: This study found that acral lentiginous melanoma has more negative predictive factors compared to the common malignant melanoma of the extremities. Knowledge of the disease characteristics of this type of melanoma will allow us to approach a patient with this diagnosis correctly and be aware of the severity of the disease.

Beyond Core Sutures: A Novel Approach to Tendon Repair

Presenter:	Nicholas J. Albano, MD
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Purpose: The currently practiced methods of Zone II flexor tendon repair in fingers are limited. Decades of research have focused on applying stronger suture material and increasing the number of core sutures.[1,2,3] Despite these efforts outcomes remain unpredictable. This study utilizes the would be discarded or not-repaired flexor digitorum superficialis (FDS) tendon tissue along with novel suture techniques to enhance the strength of the repair and redistribute the forces away from the regenerative front of the healing tendon. Additionally, we believe this technique will prevent adhesion formation around the repair site.

Methods: Two novel methods of flexor digitorum profundus tendon repair were tested in a cadaveric sheep model. Each novel method of repair incorporates a portion of the flexor digitorum superficialis (FDS) tendon. The Asymmetric Repair (AR) utilizes the FDS tendon as an onlay support, while the Circumferential Repair (CR) incorporates the FDS tendon as a wrap. Clinical standard repairs using 2-strand, 4-

strand Kessler method, 6-strand M-Tang method served as controls. Ultimate tensile strength was used to compare techniques. All repairs were performed in sheep tendons (n=10/group) by a single surgeon. All tensile strength testing was performed with 2 newtons (N) of preload, at a rate of 20mm/minute until failure.

RESULTS AND CONCLUSIONS: These entirely new approaches using the autologous tendon tissue from the FDS to redistribute force away from the repair site are achievable. Furthermore, greater peak force is required before failure of both AR(66.38±15.24N) and CR(65.86 ± 15.17N) than the strongest clinical standard (6-strands:56.84 ± 8.79N).The native reclaimed FDS tissue redistributes the force away from the repair site, which can produce a more robust repair. Both novel techniques and the 6-strand repair are currently undergoing cyclical testing prior to implementation within in vivo studies.

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The Impact of Smoking Status on 30-Day Postoperative Adverse Outcomes Following Free-Flap Transfers of the Upper Extremity: An Analysis of the National Surgical Quality Improvement Program

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Introduction: Cigarette smoking has been associated with negative impacts on wound healing, yet studies of the effects of smoking on postoperative free tissue transfer complications remain debated.[1-3] Free tissue transfer of the upper extremity

can successfully address many reconstructive challenges, but it is quite complex and requires adequate wound healing.[1,3] This study explores the effects of smoking on 30-day postoperative outcomes following upper extremity free tissue transfer procedures.

Methods: The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database was used to identify all patients who underwent a free tissue transfer of the upper extremity between 2008 and 2016. Patients were identified using Current Procedural Terminology (CPT) codes that correspond to a principal operative procedure of free muscle, myocutaneous, skin, fascial, bone, or osteocutaneous flaps with microvascular anastomoses, with an associated secondary upper extremity procedure or postoperative diagnosis. Patients with a history of cigarette smoking within one year prior to admission for surgery (n=16) were compared to those without this smoking history (n=74). Univariate analysis was used to determine possible individual risk factors for 30-day postoperative major and minor complications, readmissions, and reoperations, and multivariate regression models were used to evaluate the impact of these risk factors on 30-day outcomes.

Results: Those with and without smoking history had no differences observed in age, sex, or race distribution. Non-smokers had a higher preoperative body mass index (28.67 vs. 24.64 kg/m^2, $p<0.001$). Smokers had had a higher prevalence of chronic obstructive pulmonary disorder (6.25 vs. 0%, p=0.030), with no differences observed for other comorbid conditions, including hypertension or diabetes. Smokers experienced lengthier hospital stay (5.9 vs. 3.7 days, p=0.002), though operative times, as well as distribution of wound class and American Society of Anesthesiologists (ASA) classification, did not differ. Neither smokers nor non-smokers experienced any postoperative major complication, and transfusion rates (12.5 vs. 8.1%), total complications (12.5 vs. 10.8%), reoperations (0 vs. 5.8%) and readmissions (2.7 vs. 6.3%) were comparable. Smokers did not experience any postoperative infections. Regression analysis revealed that a ≤1-year history of smoking was not associated with increased odds of any 30-day adverse postoperative outcomes.

Conclusion: A smoking history, as defined in the present study as a history of cigarette smoking within a year prior to admission for surgery, did not significantly impact the outcomes of upper extremity free tissue transfer procedures in the 30-day postoperative period. Smoking history patients incurred a lengthier hospital stay as compared to patients without a smoking history.

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A Biopolymer Adhesive Film for Sutureless Epitendinous Repairs: An Ex Vivo Comparison in the Porcine Deep Flexor Tendon

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Purpose: Biopolymer adhesives have recently emerged as an alternative for joining of tissues in various fields of surgery. This study investigates the use of a novel chitosan based adhesive biopolymer foil for the use of tendon repairs.

Methods: In an ex vivo laboratory experiment porcine deep flexor tendons were repaired by either:

Group 1. Simple circumferential suture epitendinous repair + Adelaide core repair (current gold standard)

Group 2. Sutureless biopolymer adhesive foil + Adelaide core repair

In both groups a Cross Locked Cruciate (Adelaide) core tendon repair (4/0 Ticron) was used. In group one an additional simple circumferential epitendinous repair (6/0 Prolene) was used. In group 2 no circumferential suture repair was used. Instead, a chitosan biopolymer film (2.5 x 2.5 cm) was wrapped around the porcine tendon and activated by laser-activation from an infrared diode laser (GaAIAs diode). Both sample groups were tested using an Instron-5543 (Canton, USA) tensile testing machine. Endpoints were tensile strength, maximum load and load at clinical failure (2mm gapping force).

Results: Sutureless biopolymer supported Adelaide repairs are easier and faster to perform. The biopolymer repaired tendon provided higher load to failure stability when compared to conventional circumferential suture supported Adelaide repairs.

Conclusion: In this first preliminary laboratory study biopolymer supported Adelaide repairs could show superior mechanical stability in mechanical testing szenarios. The repairs are easier to reproduce and faster to perform.

Activated biopolymer films could present an alternative for conventional sutured circumferential tendon repairs in the near future.

Reconstruction of Fingertip Defects with Homodigital Sensate Propeller Flap

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Purpose: Traumatic fingertip injuries are one of the most common hand injuries. Many surgical techniques have been described for reconstruction of fingertip injuries. The ideal flap option for fingertip injuries must be reconstruct length, sensory and esthetic padding of the finger with minimal donor site morbidity. In this study, we present our result about homodigital sensate propeller flap for fingertip defects.

Materials and Methods: Between 2014 and 2017 years, 11 patients who treated with homodigital sensate propellar flap. Before surgery, general characteristics of patients were reviewed. We evaluated the active and passive range of motion of the joint, aesthetically satisfaction, sensitivity and two-point discrimination at least 12 months after surgery.

Results: 8 patients were male,3 female. The mean age of them was 35.9 years. Defects size of the soft tissues ranged from 1 to 3.2 cm^2. Venous congestion was observed in 3 patients, there was no other complication after surgery. The range of motions of the joints were not affected. Two-point discrimination and sensation improved between 5 to 9 months after surgery, Cold intolerance, hypersensivity, anesthesia was not observed in any fingertip. All patients were very satisfield with the result.

Conclusion: Reconstruction of fingertip defects with single session, enough bulky and sensate flap that do not cause functional impairment is very important. The

homodigital propellar flap provides a single-stage, sensate and very satisfield reconstruction of the fingertip defects.

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Incidence of Readmission Following Pediatric Hand Surgery: An Analysis of the National Surgical Quality Improvement Program - Pediatric Database from 2012 to 2017

Presenter: Christopher James Goodenough, MD, MPH
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Purpose: Thirty-day readmission rate is a frequently used measure to assess quality in surgical outcomes. There are limited data available in the published literature regarding readmission rates following pediatric hand surgery. This study aims to identify factors associated with an increased risk of readmission following hand surgery in a pediatric population.
Methods and Materials

The National Surgical Quality Improvement Project – Pediatric (NSQIP-P) contains data on 30-day complications following surgical procedures for patients, ages 0-18 years. The 2012-2017 NSQIP-P databases were queried for pediatric patients who underwent procedures with hand-specific Current Procedural Terminology (CPT) codes. Patient demographics, operative details, readmission and complication data were extracted. Univariate analyses were performed using Fisher's exact test and Mann-Whitney U test to assess the incidence and risk factors for readmission. A multivariate logistic regression model was created using significant variables. Secondary outcomes included wound complications and reoperation.

Results: A total of 6688 pediatric patients were identified who underwent a hand-specific procedure; 88 were excluded due in incomplete data, leaving 6600 patients included in the analysis. There were 45 patients who were readmitted in the study cohort, giving an overall readmission rate of 0.68%. The median time to readmission was 12 (IQR 5,20) days. On univariate analysis, patient factors that were associated with readmission included younger age (31.9 v 38.4 months, p=0.04), smaller size (30.3 v 34.6 pounds, p=0.01), prematurity (20.0% v 7.6%, p<0.01) and higher American Society of Anesthesiologists Physical Status (ASA) Class (p<0.01). Significant operative factors included inpatient admission at index operation (20.0% v 3.5%, p<0.01) and longer anesthesia (158.3 v 99.9 minutes, p<0.01) and operative times (106.2 v 57.5 minutes, p<0.01). Complex syndactyly repair was associated with higher readmission rates (1.30% v 0.53%, p<0.01). On multivariate analysis, ASA class 3 (OR 3.95, 95% CI 1.57-9.34) or class 4 (OR 25.80, 95% CI 3.47-118.14), and inpatient surgery (OR 2.95, 95% CI 1.19-6.68) remained significant predictors of readmission. One hundred twenty-four patients (1.9%) experienced a wound complication. Significant factors predicting wound complication included younger age, smaller size, prematurity, inpatient operation and longer anesthesia and operative times. Among patients who were readmitted, 8 (17.8%) readmissions were related to a wound complication. Six (4.8%) patients with a wound complication required reoperation. However, only increased anesthesia time was a significant predictor of reoperation.
Conclusions

Overall, pediatric hand surgery is associated with a very low risk of 30-day readmission. Higher ASA class and inpatient surgery increase patients' risk for readmission. In particular, complex syndactyly repair is associated with a higher risk of readmission than other hand procedures. This information is useful in surgical planning and preoperative counseling of parents.

3D Printed Flexor Tendon Repair Simulator Promotes Early Medical Student Surgical Interest

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Purpose: In order to position themselves for a successful match into plastic surgery residency, medical students must identify their surgical interests early on in their

training. However, during preclinical years students have limited exposure to surgical fields. They learn rudimentary knot tying, suturing, and wound care, but this curriculum cannot give a complete understanding of 1) the required skills needed to be successful in plastic surgery, and 2) whether students would ultimately find career fulfillment in applying these skills in a clinical setting. Previous studies have evaluated the benefits of early surgical exposure for students in the form of visiting lecturers, panels, and mentorship, but few have been able to bring complex surgical procedures into a controlled classroom setting. The aim of this study was to determine whether hands-on exposure to a three dimensional (3D) printed surgical training device simulating flexor tendon repair in the hand could help identify and promote early medical student interest in surgical subspecialties.

Methods: Five workshops were held for 44 preclinical medical students to give a comprehensive overview of flexor tendon repair. Each two-hour workshop contained didactic and hands-on components. The didactic portion covered functional hand anatomy, physical exam findings of flexor tendon injury, overview of repair technique, and post-operative rehabilitation. The hands-on portion included an instructional video and practice on our 3D printed flexor tendon surgical trainer. The device included a surgical platform with an anatomically accurate and bendable finger, with pulleys through which to thread silicone tendons (0.5 cm in diameter). Each student received one device and two lacerated silicone tendons, and they practiced core sutures and epitendinous sutures under the supervision of plastic surgery attendings and residents. Outcome measures included a pre- and post-workshop questionnaire to assess anatomical knowledge, perceived suturing skills, and attitude towards the surgical field.

Results: Forty-four medical students (35 first years, 9 second years) attended our workshop. Compared to baseline pre-workshop scores, anatomical knowledge scores increased by 57.25% on post-workshop evaluation (28.75% vs. 86.00%, $p<.0001$). Ninety percent of students (n=40) said that the workshop either moderately or significantly increased their interest in learning more about surgical subspecialties, and 72.72% (n=32) said that this workshop either moderately or significantly increased their desire to pursue a surgical career. Additionally, 97.72% of students (n=43) said that the workshop was either moderately or very valuable for their medical education. All (n=44) participants said that they hope to see similar hands-on workshops in the future.

Conclusions: A two-hour workshop using 3D printed flexor tendon repair devices successfully introduced junior medical students to the anatomy and principles of a complex surgical procedure performed by plastic surgeons. Teaching surgical techniques beyond basic skin suturing in a controlled classroom setting successfully promoted junior medical student interest in surgical subspecialties. Further

investigation on the use of 3D printed training devices for other surgical procedures may help further justify the role of 3D printing technology as an effective means to bring earlier surgical exposure to preclinical medical students.

Limb Salvage Versus Amputation in Osteosarcoma of the Upper Extremities

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Purpose: Osteosarcoma in the upper extremities is rare. The goal for the treatment of osteosarcomas is complete resection of the tumor with a posterior reconstruction of the damaged structures. Currently, there is still a controversy between performing an excisional surgery with limb salvage versus limb amputation due to osteosarcoma. We aim to study the patients, facility and tumor characteristics associated with limb amputation due to osteosarcoma.

Methods: A descriptive study was performed to identify patients, facility and tumor characteristics in patients who underwent limb amputation due to an osteosarcoma of the upper extremities from 2004 to 2015 by querying the National Cancer Database (NCDB). Patient's characteristics included age, sex, race, comorbidities, Hispanic origin, insurance, income, and education. Facility characteristics included facility type, facility location, and urban/rural setting. Tumor characteristics included tumor site, tumor size, and stage of the disease. Statistical analysis was performed using Chi-square and a multivariate logistic regression model.

Results: A total of 777 patients diagnosed with osteosarcoma of the upper extremities who underwent surgery met the inclusion criteria. From these patients, 125 (83.9%) had an amputation of the limb and 652 (16.1%) patients underwent a local excisional surgery with limb salvage. Patients who underwent amputation of the limb due to osteosarcoma were less likely to be diagnosed between 61 and 80 years (aOR: 0.04, CI: 0.003-0.42, P-value=0.01) when compared to patients who had excisional surgery with limb salvage. On the other hand, facility located in the South Atlantic (aOR: 8.51, CI: 1.10-65.86, P-value=0.04) and Stage III of the disease (aOR: 7.45, CI: 1.22-45.54, P-value=0.03) were positive factors independently associated to amputation of the upper extremities due to osteosarcoma, when compared to patients who underwent local excisional surgery with limb salvage. No statistical differences were found on

sex, race, comorbidities, Hispanic origin, insurance, income, education, facility type, facility location, urban/rural setting, tumor site, and tumor size.

Conclusion: This study determined the factors associated with the amputation of the upper extremities due to osteosarcoma. We found that patients in facilities located in the South Atlantic and with stage III of the disease were more likely to undergo amputation. Knowledge of these factors will help us to understand and take the best surgical decision when facing the osteosarcoma of the upper extremities.

Revision Surgery Following Gracilis Transplantation for Pediatric Facial Reanimation

Presenter:	Terence Kwan-Wong, MD
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Purpose: Management of pediatric patients with facial paralysis is challenging and numerous surgical techniques have been described for smile reconstruction. A free gracilis muscle transfer innervated by a cross face nerve graft (CFNG) from the contralateral facial nerve, or by the ipsilateral motor nerve to masseter (MNTM) is recognized as the gold standard for smile reconstruction owing to its reliable outcomes. Despite the ubiquity of this technique in the pediatric population, there are limited data regarding the rate of secondary surgery to improve the cosmesis, symmetry, or function of the reconstruction. The purpose of this study was to assess the occurrence and type of secondary surgical procedures following pediatric facial reanimation using gracilis muscle transplantation.

Methods: Following ethics board approval, a retrospective cohort study was performed and included children who underwent facial reanimation using free gracilis muscle transfer at our pediatric hospital between 1985 and 2014. Medical charts were reviewed to assess secondary surgical procedures performed at least one year following the initial reanimation surgery. Procedures related to early postoperative complications, including hematoma or infection, were excluded. Indications for surgical revision were subdivided into major revisions – which involved a non- or poorly functioning muscle transplant necessitating a new gracilis muscle transplant – and minor revisions, where muscle function was acceptable, but surgery was intended to improve cosmesis and/or symmetry.

Results: There were 261 cases of facial reanimation utilizing a free gracilis muscle transfer between 1985 and 2019. 173 unilateral (66%) and 88 bilateral (34%) reconstructions were performed. Fourteen patients, seven male and seven female, required surgical revision (5.4%). The mean time to revision was 2.5 years following the initial surgery. Among patients requiring revision, ten had muscle transplants innervated by a CFNG, and four by the MNTM. There was no statistically significant difference in the rate of revision between CFNG versus MNTM (7.7% vs. 4.8%, p=0.4). Minor revisions to improve cosmesis and symmetry were performed in 12 patients (4.6%). Only two patients (0.8%) required major revisions, in which the gracilis muscle from the primary surgery was removed and replaced with a new free functioning gracilis muscle. There was no significant difference in revision rate for patients undergoing unilateral versus bilateral procedures (6.8% vs. 3.5%, p=0.4).

Conclusions: Our study supports the use of gracilis muscle transplantation as a reliable technique for smile reconstruction in pediatric facial palsy, with low rates of secondary revision. Secondary surgery is most often performed to improve cosmesis and/or symmetry, and major revisions requiring microvascular transplantation of new muscle transfer are rare.

Analysis of Microsurgical Outcomes in Resident-Led Reconstruction: A Review of 163 Consecutive Cases

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Purpose: With the advances in microsurgery, the published success rate of microsurgical reconstruction by experienced microsurgeon is greater than 95%. However, it is unknown whether the training residents can produce similar results. At our county hospital, while under direct supervision residents perform and lead all aspects of microsurgical reconstruction, from raising the flap to performing microanastomoses, with only as needed faculty assistance. In this study, we retrospectively reviewed the outcomes of 163 consecutive microsurgical cases to determine the efficacy and safety of resident-led reconstructions at the county hospital.

Methods: We performed a retrospective review of patients who underwent microsurgical reconstruction at the county hospital from 2016 to 2018. Demographic, surgical procedure, flap data, resident levels, and complication data were collected.

Results: Of the 163 flaps performed, the most commonly performed reconstruction was breast (63.8%), followed by lower extremity (11.7%), upper extremity (6.7%), head and neck (6.1%), and genital (1.2%). The median procedure time was 540 minutes (240 – 990) and anastomoses time for each flap was 57 minutes (27 – 180). The venous anastomoses were performed by PGY3 (1.6%), PGY4 (37.1%), PGY5 (3.2%), and PGY6 (58%) while the arterial anastomoses were performed by PGY4 (18%), PGY5 (3.3%), and PGY6 (78.7%). The average number of anastomosis attempts was 1.3 with a range of 1 to 3. The total flap success rate was 96.3% with a takeback rate of 4.3%.

Conclusion: In conclusion, our analysis shows that resident-led reconstruction can achieve similar microsurgical success as the published rates. We believe resident-led microsurgical reconstruction can be safely performed with as needed faculty assistance in high-risk and complicated cases while allowing resident education and maturation of technical and decision-making skills.

A Twenty-Year Experience of Sternal Wound Complications and Closure: Timing Does Matter

Presenter: Adam S. Levy, MD
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Background: Sternal wound (SW) infection and dehiscence following median sternotomy from cardiac surgery remain difficult clinical problems with high morbidity. Older classification systems regarding timing to SW reconstruction fail to take into account recent improvements in critical care, ubiquitous usage of the wound VAC, and next-generation antibiotic therapies, which may all prolong time to reconstruction. Herein, we review our series of patients to examine timing of sternal wound closure and resultant complications.

Methods: Records of patients undergoing SW reconstruction by the senior author (JAA) from 1996-2018 at a single high-volume cardiac surgery center were reviewed. Indications included SW infection or dehiscence. At time of reconstruction, all patients underwent removal of sternal hardware, thorough debridement and closure with bilateral pectoralis muscle advancement flaps. Deep tissue and bone cultures were sent in most cases. Patients were split into Group 1, 2, and 3 based on timing of

wound closure after cardiac surgery: 0-7 days, 8-30 days and >30 days. SW reconstructions > 6 months from the index cardiac operation were excluded. Outcomes, including demographics, recurrent infections, need for re-operation, and other complications were evaluated. One-way ANOVA or Kruskal-Wallis test was used for comparisons.

Results: 505 patients were identified during the study period that met the above criteria, of which complete data were available on 323 who were included for analysis. Mean age at time of surgery was 65.8 years (range 19-90). Twenty-four (7.4%) patients died during the study period (15 within 30 days; 4.6%). The three groups included 13, 148, and 162 patients with the mean time to SW surgery of 3.8, 17.2, and 63.0 days, respectively. Post-debridement cultures were positive in 3 (23.1%), 70 (47.3%), and 85 (52.5%; $p=0.23$) and rates of post-operative infection were significantly different: 0%, 0.7%, and 8.0% ($p=0.01$). Rates of extubation while in the operating room were 28.6%, 54.9%, and 84.5% ($p<0.01$). Seroma rates were 0%, 7.4%, and 3.7%; hematomas were 0%, 2.0%, 1.9%; partial wound dehiscence 7.7%, 0.7% and 11.1%. There were no significant differences in need for subsequent SW re-operations (7.7%, 6.8%, 8.6%, $p=0.13$). Median post-operative length of stay (LOS) was 20, 16 and 7 days ($p=0.03$) and median time to drain removal was 27.5, 24 and 19.5 days ($p=0.56$). Post-operative death was seen in 15.4%, 6.1%, and 8.0% ($p=0.28$)

Conclusions: In this large series of over 500 cases of SW reconstruction, we find that delayed reconstruction >30 days is associated with a significantly elevated infection rate. Yet, this same delayed group >30 days following the initial cardiac surgery procedure had the shortest post-operative LOS and was most likely to be extubated in the operating room. Further studies are necessary to delineate optimal timing of reconstruction.

The Mechanism of Skin Improvement in Radiation Wounds Following Fat Grafting: The Fate of Adipose Derived Stem Cells and Role of Stromal Vascular Fraction

Presenter:	Tim Daugherty, MD
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Purpose: Consequences of radiation include thickened, fibrotic and inelastic skin. Fat grafting helps alleviate this damage by decreasing epidermal thickness, increasing vascularization, and decreasing fibrosis. The exact mechanism is not understood and carries many hypotheses including the effects of Adipose Derived Stem Cells (ADSCs) within fat. The first aim of this study was to determine which components of fat cause benefits seen with post-radiation fat grafting with the hypothesis pure ADSC group would have the greatest difference in epidermal thickness. The second aim was to determine the mechanism by which these skin changes are mediated with the hypothesis that human ADSCs can differentiate into epithelial stem cells to regenerate the skin.

Methods: The dorsal skin of nude mice was directly radiated. Four weeks post-radiation, injections were performed under the radiated skin with either human lipoaspirate, stromal vascular fraction, or pure ADSCs. The pure ADSCs were confirmed as p63- with flow cytometry prior to injection. The mice were euthanized at 2- and 4-weeks post-injection. Epidermal thickness was measured to determine treatment effect. Immunohistochemistry was performed using an antibody specific for human epithelial stem cell marker p63 and imaged using confocal microscopy. Nuclei positive for DAPI or p63 were quantified using ImageJ.

Results: At two weeks, all experimental groups that were injected with human cells (ADSC, SVF, and lipoaspirate) had statistically thinner epidermis compared to the radiation only control group without statistical differences between experimental groups. At four weeks, Lipoaspirate and SVF groups remained statistically thinner than control groups with no statistical difference between the two. At four weeks the epidermal thickness of the ADSC group was not statistically different than controls. There was a significant decrease in epidermal thickness from week 2 to week 4 in the lipoaspirate, SVF, and Matrigel-only groups. Immunohistochemistry showed the presence of p63+ human cells in all experimental groups and absence in control groups. At 2 weeks, there is a statistically higher percent of p63+ cells in the ADSC and SVF groups compared to all other groups. From week 2 to week 4, there was significant increase in the percent of p63+ cells present in the lipoaspirate group. At week 4, all experimental groups had a statistically higher percentage of p63+ cells than control groups without statistical differences between the experimental groups.

Conclusions: These findings suggest that improvements seen in radiated skin after fat grafting are due to presence of transferred ADSCs. ADSCs are likely not the only factor necessary to mediate the changes and the other components present within the SVF and Lipoaspirate are likely important since these two groups maintained significantly thinner epidermis at 4 weeks whereas the pure ADSC group did not. The ADSCs appear to convert into epithelial stem cells as evidenced by the presence of p63+ human cells within the epidermis of the experimental groups and absence in

control groups. The increase in percentage of p63+ cells from week 2 to 4 suggests that these stem cells are continuing to divide and regenerate the skin.

Limb Salvage Rates and Outcomes in Patients with Chronic Lower Extremity Wounds Following Radiation Therapy

Presenter:	Peter J. Wirth, MD
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Purpose: Radiation therapy imparts a plethora of histopathologic changes on tissue, including fibrosis, scarring, loss of tissue planes, necrosis, atrophy, vascular damage, and bacterial colonization. There is a paucity of data on the management of chronic lower extremity wounds following radiation therapy which are among the most complex wounds to manage. Previous studies have focused on topical therapies and wound care following radiation therapy [1]. Commonly, patients have undergone many previous failed attempts at wound closure including wound healing adjuncts, skin grafts or local flaps. Free tissue transfer (FTT) is the best option to restore healthy tissue in an irradiated field. We sought to explore the success rates of FTT and limb salvage in patients with chronic wounds following irradiation to the lower extremity.

Methods: A retrospective review was performed to analyze outcomes of FTT for long standing chronic wounds with prior radiation therapy between May 2012 and July 2017 by the senior surgeon. Seven patients were found to have wounds caused by a history of radiation of the lower extremity. In all irradiated lower extremity patients, we utilize the following principles: end-to-side anastomosis, creating the anastomosis outside of the zone of injury, excising all irradiated tissue, and replacing with new vascularized tissue.

Results: A total of six male and one female patients were identified, with an average age of 68.4 ± 9.2 and BMI of 27.8 ± 3.8. Comorbid conditions included hypertension (57.1%), peripheral vascular disease (57.1%), underlying hypercoagulability (42.9%), type two diabetes mellitus (14.3%), and any smoking history (14.3%). Patients had the wounds for an average of 25.5 months prior to FTT. 57.1% of patients were diagnosed with osteomyelitis. All patients underwent surgical debridement and excision of all irradiated tissue and coverage with either an ALT flap (71.4%), vastus lateralis flap (14.3%), or latissimus dorsi flap (14.3%). Overall flap success rate was 100% with one patient requiring reoperation for dehiscence. Overall limb salvage rate was 85.7%

with one patient eventually undergoing elective amputation due to pain and poor bone healing. 100% of patients were ambulating (including one with a prosthesis) at a mean follow up time of 1.4 years.

Conclusions: Previous studies have focused on topical therapies and wound care following radiation therapy. This is the first case series to report the long-term outcomes of FTT for coverage of chronic LE wounds following radiation therapy. In this series, patients had undergone wound care for over two years (mean 25.5 months) prior to FTT. We advocate for early free tissue transfer in these patients to restore healthy tissue to an irradiated area. In our experience, these patients have successful limb salvage outcomes. Larger, multi-center studies are needed to determine limb salvage rates and risk factors in this particular patient population.

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Improving Quality of Life through a Burned Hand Patient's Rehabilitation Program

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Background: Burn injuries, including hands are one of the most devastating injuries. Hand burns do not often play a major role in the mortality. But, they represent a huge problem that may eventually lead to chronic disabilities, lifelong impairment, and significant functional and occupational limitations. These comorbidities can negatively affect a patient’s quality of life (QoL) besides, making re-integration into society is difficult. This study aims to investigate the effect of our designated burn rehabilitation program on improving quality of life of hand burns patients.

Methods: A randomized controlled study was conducted for 12 months. It included 60 adult patients with hand burns who were randomly divided and assigned to a study and control groups. Both groups underwent basic rehabilitation. A newly designed program was implemented for the study group. Data were collected using three tools; bio-socio demographic characteristics, the Burn Health Knowledge Questionnaire,

and the Burn Specific Health Scale-Brief (BSHS-B). The quality of life of patients with hand burns was evaluated three times.

Results: One month and three months after implementing the burn rehabilitation program, the total mean scores for the QoL of patients in the study group improved from 31.1 ± 11.3 to 118.5 ± 21.3 and 135.4 ± 24.3, respectively ($P < 0.001$). In addition, the changes in QoL of the patients in the control group significantly improved from 24.8 ± 12.1 to 57.6 ± 19.1 and 87.5 ± 23.8, respectively ($P < 0.001$). Despite this steady improvement in the control group, the mean scores on the QoL sub-scales and total mean scores remained lower than those in the study group.

Conclusions: Based on the results obtained in the current study, the design and implementation of a burn rehabilitation programme based on clinical knowledge improves the quality of life of patients with burns. Therefore, this program is recommended for use early as a part of the treatment process for patients with burns. Level of Evidence: Level I, risk/prognostic study.

Substance Abuse and Alcohol Intoxication in Burn Injury

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Background: Approximately half of all burn injuries in the United States are associated with acute alcohol or substance intoxication. Substance abuse and intoxication not only increases an individual's risk of suffering an acute burn, but is predictive of poorer post-injury compliance. There is also a growing body of evidence that alcohol abuse alters gastrointestinal physiology and results in higher rates of sepsis and multi-organ failure. This study is a retrospective review evaluating outcomes related to substance abuse and alcohol intoxication in patients admitted to an ABA accredited burn center.

Methods: A retrospective review of patients with burn injury admitted to the University of Kansas Medical Center between 2009 and 2012 was performed. Cohorts were evaluated for demographic information, % total body surface area (TBSA) injury, circumstance surrounding injury, presence of inhalation injury, and comorbidities. Alcohol intoxication was determined based upon a blood alcohol concentration (BAC) drawn at the time of admission and substance abuse was identified based upon a urine drug screen (UDS). Opiate abuse was excluded due to

iatrogenic administration during emergency transportation following the injury. Primary outcomes included length of stay (LOS), ICU days, and hospital complications.

Results: There were 507 patients who met inclusion criteria. A positive UDS (n=205) was identified in 40% of admissions. Marijuana was the most common (n=144), followed by benzodiazepines (n=91), cocaine/amphetamines (n=61), and LSD/PCP (n=9). Fifty-three patients tested positive for polysubstance abuse. Patients with a positive UDS had significantly longer LOS (12.1 vs 9.2 days, p=.0005) and were more likely to suffer an inhalation injury (20.0% vs 10.6%, p=0.0046) than those testing negative. They were more likely to develop cellulitis (36.1% vs 22.5%, P<0.01) and sepsis (14.6% vs 7.6%, p=0.031). Pulmonary complications including pneumonia (14.6% vs 6.6%, p=0.0048) and respiratory failure (22.4% vs 14.6%, P<0.05) were also seen more frequently. There were no significant differences in burn size or mortality. There were 222 patients with a BAC on admission who were included in data analysis. Patients who met criteria for alcohol intoxication (n=81) were more likely to suffer respiratory failure (34.6% vs 19.1%, p=0.0164) and alcohol withdrawal (13.6% vs 1.4%, p<0.0001). These patients did not suffer larger burns or increased mortality. Patients who had both a positive UDS and alcohol intoxication had significantly longer LOS (15.3 vs 10.3, p=0.039) than non-intoxicated patients, despite not suffering more severe burns. They also had an increased likelihood of inhalation injury (28.2% vs 10.0%, p=0.0227) and respiratory failure (38.9% vs 10%, p=0.0025).

Conclusions: Intoxication at time of admission with illicit substances, alcohol, or both was associated with higher rates of inhalation injury, respiratory failure, and a longer length of stay. It was also associated with a greater risk of complications including pneumonia, intubation, respiratory failure, alcohol withdrawal, sepsis, and cellulitis, despite similar burn severity. Understanding the impact that alcohol and substance abuse have on the burn patient population is beneficial to guiding clinical care. Anticipation of the increased demand and specific complications inherent to alcohol and substance abuse patients can allow physicians to provide more effective and efficient treatment, improving both patient outcomes and expenses.

Patient Self-Assessment of Split-Thickness Skin Grafting after Burn Injury

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Introduction: Although most practitioners are satisfied with the results of burn treatment with split-thickness skin grafting (STSG), there is limited information about the patient's self-assessment. To understand this outcome, we developed a novel survey-based tool and prospectively evaluated patient-reported outcomes (PRO) after skin grafting for burn injuries.

Methods: A prospective survey was designed and administered from July 1st, 2018 – February 20th, 2019, at an American Burn Association-verified burn center to all patients who underwent excision and grafting of burn injuries more than 3 months previously. Patient satisfaction with the appearance of both the skin graft and donor-sites was measured on a five-point Likert scale [very unsatisfied (1) - very satisfied (5)]. Patients were also asked about tightness (graded from 1-5) and their thoughts on donor site location choice.

Results: We surveyed 37 patients with 93 grafts (3±2 grafts/patient) with a mean age of 38±17 years, follow-up time of 11±14 months, 18±18% total body surface area burned, and 15±15% grafted. The majority of patients were male (N=20 patients, 54%), overweight (BMI: 28±8), and had darker skin (Fitzpatrick type 4, N=16 patients, 43%).
Half of our patients were satisfied or very satisfied with their skin grafts (N=48/93 grafts, 52%), and the other half were neutral (N=26/93 grafts, 28%) or unsatisfied (N=19/93 grafts, 20%). Similar satisfaction rates were seen with donor sites (satisfied or very satisfied, N=46/93 sites, 49%) All patients complained of tightness (N=37/37 patients, 100%, median, 3 [IQR: 1-5]) and nine (24%) would have chosen a different donor site. Patients with sheet grafts (N=25/93 grafts, 27%) were significantly more satisfied with the appearance of their grafts than those who received meshed grafts (N=68/93 grafts, 73%) (median, 5 [IQR, 3-5] vs. 3 [IQR, 2-5], Mann Whitney U, P=0.01). The meshed appearance was the most common skin graft concern, and hyperpigmentation was the most common donor site concern.
Of the patients that would have chosen a different donor site, the most common reason (N=8/9 patients) was due to visibility when wearing clothing that revealed the lower extremity (namely shorts and skirts). There were no differences in skin graft assessments based on age, sex, BMI, and skin type.

Conclusions: To our surprise, almost a quarter of our patients were unsatisfied with the appearance of their grafts. This study shows that practitioners should be more attentive toward the patient's assessment of skin grafts. As we expected, sheet grafted areas resulted in better patient satisfaction, and meshed grafted areas resulted in poorer satisfaction. These results remind us that discussions about meshing, donor site location and hyperpigmentation, and long-term tightness are needed to improve patient self-assessments of skin grafting after burn injury.

Bilateral Supraclavicular Flap: Still a Reliable Option for Severe Burn Neck Contracture

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Introduction: Burn injuries to the neck can lead to significant functional impairment and major aesthetic problems (1).

The necks can be constructed with a wide range of surgical technique such as skin grafts, local, regional or free flaps (2)

The supraclavicular flap (3) is excellent as it is similar in colour, thickness and texture to the recipient area, and the operative technique is simple (4).

Purpose: To present our experience with bilateral supraclavicular flaps for releasing postburn mentosternal contractures.

Material and Method: Between July of 2007 and July of 2017 we used 105 supraclavicular flaps for neck scar contracture reconstruction in 90 patients. 15 cases involved bilateral reconstruction using two flaps from both sides of the shoulder (3 male patients and 12 female patients).

Of the 30 flaps, 28 were vascular-pedicled island flaps. The remaining flap were skin-pedicled flaps.

Surgical procedure: The design is made so that anterior, posterior, and distal edges reach the inferior border of the clavicle, the upper area of the trapezius muscle, and the upper arm, respectively. Fusiform design is prefered, as they allow the donor site to be closed primarily. Scar contracture is released completely. Flap is harvested in a suprafascial manner. Flaps are rotated up to 180 degrees and sutured in a cross manner passed the midline so that the extension of the defect is covered. Primary closure of the donar site is desired by not exceeding 10 cm flap width. When the flap width exceeds 10 cm, split-thickness skin grafts are needed.

Results: The supraclavicular flap is a good option for neck burn scar release. However, when the neck contracture affects more than 50% of the aesthetic unit, bilateral flap is mandatory.

Of the 30 flaps, three flaps exhibited superficial distal necrosis which epithelialize spontaneously. One developed total necrosis after hypertensive crisis resulting in a hematoma that required a full-thickness skin grafts.

In two cases, donor site exceeded 10 cm and a split thickness skin graft was used.

No numbness of the shoulder or functional problems were observed in the donor site and the appearance of the scars was acceptable.

Conclusions: The supraclavicular artery flap is a recommended alternative when microsurgery is not an option. This thin flap is easily and quickly harvested, has a reliable pedicle, and minor donor-site morbidity when closed primary.

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Adductor Magnus Tendon Transfer for Femoral Nerve Palsy: Anatomical Studies and Clinical Applications

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Background: Femoral nerve palsy is a devastating condition, with the loss of quadriceps function resulting in the inability to run, climb stairs, drive, and even ambulate without support. Most cases are surgical in nature, but traumatic and malignant causes are possible. Peripheral nerve grafting and transfers have been described to treat this. However, many patients present too late for nerve-based reconstruction. An alternative option is tendon transfers. Though well-established in

upper extremity reconstruction, tendon transfer in the lower extremity pose challenges both in terms of available donors and the biomechanical demands placed upon them. We describe the successful use of adductor magnus tendon transfer to restore knee extension in patients with femoral nerve palsy, in conjunction with gracilis, sartorius or tensor fascia lata to augment strength and improve knee stabilization. We also present intra-operative and cadaveric details to outline the anatomic considerations of this transfer.

Methods: Four lower extremities were dissected including cadaveric and intraoperative specimens. The anatomy of the adductor magnus was noted, with focus on the maximal length of its pedicle, branching pattern, and relationship to the gracilis pedicle. The tendon was studied regarding the length available to be weaved, the proximal musculotendon junction, location of the adductor hiatus, and relationship of the tendinous insertion to external landmarks.

In addition, three patients presented to us with femoral nerve palsy with no possibility of nerve-based reconstruction. In these patients, adductor magnus tendon transfers were performed, with various components of the sartorius, gracilis, and tensor fasciae latae used if available, needed, and healthy enough for transfer. Follow-up on these patients ranged from 6-18 months.

Results: Anatomic data showed that the pedicle arose with or near the gracilis pedicle, with adequate length for excursion. To achieve a good quality transfer and excursion, fascial attachments to the femur, which extend from the musculotendon junction to the tendon insertion, must be taken down. This distance is 16.7±0.1 cm. The useful tendon for weaving extends from the level of the femoral vessels entering the adductor hiatus, a total length of 10.7±0.3 cm. The hiatus ends 7.7±0.1 cm from the insertion and the tendon travels on the posterior aspect of the palpable border of the adductor longus and inserts on the adductor tubercle on the medial aspect of the femur at the level of the superior aspect of the patella.

All three patients underwent adductor magnus transfer for femoral nerve palsy who could not have nerve-based reconstruction, with additional gracilis transfer (augmented with sartorius or tensor fasciae latae when available) for additional knee support and stabilization. Two patients had excellent results, with restoration of near normal strength and the ability to ambulate without braces. The third had contraction on exam with poor motion at the knee, suggesting inadequate tensioning or tendon weave rupture requiring re-exploration.

Conclusions: Adductor magnus is an anatomically reliable and useful tendon transfer option to restore knee extension in patients with isolated femoral nerve palsy

who cannot undergo nerve-based reconstruction. Further work is needed to optimize patient selection, post-operative rehabilitation, and outcomes.

The Omentum Flap in Thoracic and Mediastinal Reconstruction

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Purpose: The use of omentum flaps for thoracic reconstruction is uncommon. The impact of vasopressors, and the laminar pattern of blood flow associated with left ventricular assist devices (LVADs) on the outcome reconstructions using omentum flaps has not previously been reported.

Methods: A retrospective review was conducted of all patients who underwent chest wall or mediastinal reconstruction using pedicled omentum flaps between July 2003 and January 2019.

Results: Forty patients (60% male) underwent chest wall or mediastinal reconstruction using a pedicled omentum flap at a mean age of 58 years (SD± 15.8). Median follow-up was 24.3 months (IQR 3.3, 49.7). Significant medical co-morbidities were present in 32 (80%) patients. Omentum flaps were performed as the primary reconstructive method in 17 (42.5%) patients, as an adjunct to other reconstructions in 10 (25%), and as salvage of failed reconstructions in 13 (32.5%). The most common indication was reconstruction of anterior chest wall/sternal defects (n=16, 40%), followed by coverage of repaired bronchopleural fistula (n=6, 15%), osteoradionecrosis of the anterolateral chest wall (n=5, 12.5%), reconstruction of anterior/lateral chest wall following oncologic resections (n=5, 12.5%), coverage of replaced infected LVAD (n=4, 10%), coverage of exposed/replaced aortic root vascular grafts (n=4, 10%). The omentum was harvested via a laparotomy in 39 patients (97.5%), and laparoscopically in 1 patient (2.5%). The majority of omentum flaps were based on the right gastroepiploic artery (n=35, 87.5%). Vasopressors were used in 26 patients (65%). None of the flaps had complete necrosis. Thirty (75%) patients underwent reoperation allowing omental flap inspection. Out of these 30 patients, 8 (27%) patients had partial flap necrosis. There was no difference in flap complication rates in patients who received vasopressors during the case compared to those who did not (p=1.0). Thirteen (33%) flaps were skin grafted at a median of 13 days (IQR 5. 5, 26. 5) with 100% skin graft viability. Postoperative bleeding that required return to the operating room occurred in 6 (15%) patients; one other patient

(2.5%) expired during hospital admission due to acute cardiogenic shock. Abdominal incisional hernia developed in 8 (20%) patients; In patients with LVADs, the omentum remained viable with no evidence of recurrent infection during the follow-up period.

Conclusion: The ability of the omentum to easily reach various regions in the chest makes it a reliable and indispensable reconstructive method that provides well-vascularized coverage of chest wall, intrathoracic defects, exposed or infected vascular grafts and LVADs.

Unique Complications of Venous Anastomotic Couplers: A Systematic Review of the Literature

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Background: The microvascular anastomotic coupler has proven to be a safe alternative to hand-sewn venous anastomosis that can decrease anastomosis time.[1] Microsurgical venous complications including anastomotic thrombosis and flap failure, are well described in the literature for both coupler and hand-sewn anastomoses;[2] However, complications unique to the coupler are less well described. After observing a patient with late postoperative venous coupler extrusion following free flap reconstruction in a non-radiated field, we performed a systematic review of the literature to determine the prevalence of complications unique to the venous anastomotic coupler.

Methods: We performed a systematic review in the PubMed and MEDLINE OVID databases from inception to January 2019 to identify articles in English using a search strategy that included various combinations of “venous,” “anastomotic,” “coupler,” “microvascular,” “extrusion,” and “complication.” We included all retrospective and prospective outcomes studies utilizing end-to-end venous anastomotic couplers in humans. We excluded those that used arterial anastomotic couplers, performed end-to-side anastomoses, or were reviews of other studies. Articles were reviewed in parallel for outcomes of flap failure, venous thrombosis, hematoma, partial flap necrosis, infection, coupler extrusion, and coupler palpability. We followed the 2009 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Guidelines.

Results: We identified a total of 165 articles, of which thirty-three retrospective studies and 8 case reports met inclusion criteria. In aggregate, there were 8247 patients receiving 8956 free tissue transfers utilizing the microvascular coupler for venous anastomosis to the head/neck, breast, extremities and trunk. Combined reoperation rate was 3.18% and all-cause flap failure was 0.67%. Complications requiring reoperation included venous thrombosis (1.99%), partial flap necrosis (0.44%), hematoma (0.40%) and infection (0.29%). Coupler palpability or extrusion was reported in 3 retrospective studies and only 2 of the remaining 30 retrospective studies specifically mentioned no cases of palpability or extrusion. In total, there were 8 cases (0.09%) of palpable or tender couplers and 6 cases (0.07%) of coupler extrusion. All individual reports of extrusion or palpability required subsequent removal of the device. Patients presented with these complications between 6 weeks to 2 years. Four of the 6 cases of coupler extrusion had a prior history of radiation, and no flaps were lost as a result of coupler extrusion.

Conclusion: The frequency of most complications from venous coupler use remains low and is comparable to conventional hand-sewn anastomosis. However, venous coupler extrusion and palpability in the late postoperative period is a complication unique to anastomotic coupler use and has a 100% reoperation rate. Since most studies of venous coupler use do not include palpability or extrusion, the prevalence of each is probably higher than reported. Discussion of extrusion and palpability should be part of the informed consent process, and surgeons should screen for this as a postoperative complication.

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Standardized Perioperative Clinical Care Improves Patient Outcomes and Reduces Cost in below-Knee Amputation

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Purpose: Although advances have been made in lower extremity reconstruction, particularly with microvascular free tissue transfer, there are still instances where lower extremity amputation (LEA) with prosthetic rehabilitation cannot be avoided or results in more efficient patient care and improved functional outcomes. In the United States, vascular conditions make up 82% of LEAs, and it is estimated that the total number of vascular-related amputations will double between 2005 and 2050. The most recent literature suggests that the rate of LEAs in the U.S. has remained consistently higher than outside the U.S., with below the knee amputations (BKA) making up approximately 73% of all unilateral LEAs nationwide. With the increasing rate of BKA, it is important to develop evidence-based frameworks that standardize and guide perioperative patient care to expedite patient recovery and reduce cost of care. The purpose of this study was to develop, implement, and evaluate a standardized perioperative care pathway for patients undergoing BKA.

Methods: We developed an evidence-based clinical pathway that includes guidelines for surgical technique, multi-modal pain control, and early physical therapy. The pathway was implemented by all surgeons performing BKAs at a large level 1 trauma center beginning November 2017. We conducted a retrospective cohort study to evaluate the impact of this intervention. Our study compared patient outcomes for all BKAs that occurred during the 12-month period post implementation (n=80) to all BKA performed over 12 months preceding implementation (n=72). The primary outcome was length of stay (LOS); secondary outcomes included mortality, cost of care, and opiate use. Cox proportional-hazards regression was used to compare LOS between study arms while controlling for differences between the pre- and post-implementation patient population.

Results: After controlling for potential confounders, pathway recipients had a median LOS 1.88 days shorter than non-pathway patients (12.06 vs 13.94, p=0.04). Pathway care was also associated with 31.84% decreased inpatient opiate use by morphine equivalent dosage. No significant difference in mortality was noted in pathway care vs non-pathway care (2.4% vs 5.3%, p=0.35). Pathway care among patients receiving non-urgent BKAs resulted in a 31.6% reduction in mean cost compared to non-recipients ($19,339 vs $33,204, p=0.03), but did not lower cost of care urgent amputations ($99,007 vs $91,981, p=0.66).

Discussion and Conclusion: Despite the diverse nature of causes of amputation, standardizing perioperative care for BKA significantly improves patient outcomes by reducing length of stay and opiate use. Additionally, we observe a reduction in the cost of care, although this benefit is only observed for non-urgent amputations. In our patient population, non-urgent amputations primarily represent individuals undergoing BKA due to diabetic complications, whereas emergent amputations typically result from polytrauma or complications of sepsis. We hypothesize that cost is not reduced

among patients receiving amputations urgently because of the significant variability in the clinical conditions encountered in the urgent setting, which limits the ability of the standardized care pathway to account for other orthopedic and traumatic injuries and systemic infections. Standardized perioperative care can improve patient outcomes and cost savings in routine inpatient plastic surgery procedures.

An Effective and Efficient Technique: The Application of Topical Anesthesia for Cutting Split Thickness Skin Graft

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Introduction: Topical anesthesia (TA) has been used in many medical procedures (i.e., laser treatment or intravenous injection), and has proven safety/effectiveness for split-thickness skin graft (STSG) harvesting. However, most studies were published in the 1980s–1990s, and to our knowledge no relevant study has been reported in an Asian population. We evaluated the efficacy and effectiveness of TA for harvesting STSG.

Materials and Methods: Patients who underwent STSG under TA between January 2016 and December 2018 were included. Patients with wounds suitable for immediate skin graft reconstruction were eligible for TA using a eutectic mixture of lidocaine and prilocaine (EMLA).

Data on patient characteristics, wound etiology and location, wound and graft sizes, application time, and weight of EMLA cream were recorded. Pain of skin graft harvest was evaluated using a visual analog scale (VAS). The control group consisted of patients who underwent STSG under general anesthesia (GA) between December 2017 and December 2018. Postoperative donor site pain, operative time, and operation room (OR) staying time were recorded in both groups.

Results: Sixty-five patients (40 males, 25 females; mean age 55.1 ± 20.2) underwent TA for STSG. Most patients in this group had tolerable pain during skin graft harvesting (VAS, 2.6 ± 3.1), and only five (7.7%) had moderate pain (VAS > 5). Average anesthetic cream application time was 181.7 ± 76.8 minutes, and average applied cream amount was 1.93 ± 0.86 g/10 cm^2. Most patients had trauma-related wounds (55.4%), followed in incidence by infection-related skin necrosis (18.5%).

Twelve patients underwent STSG under GA. There was no significant difference in age, defect, and skin graft size between groups. However, the TA group had lower donor site pain score early postoperatively (1-hour, 1.1 ± 1.5 vs. 0.3.2 ± 2.1, P = 0.002; 4-hour, 1.3 ± 1.7 vs. 2.5 ± 2.0, P = 0.067) and less OR staying time (33.0 ± 8.3 vs. 69.7.9 ± 14.2 min, P < 0.001).

Conclusion: Topical EMLA anesthesia is feasible and effective in harvesting STSGs in Asian patients. It is a good choice for patients with high anesthetic risk and can shorten operative time, making the operation more efficient.

Flap Reconstruction for the Prevention of Pelvic Hernia after Abdominoperineal Resection

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Purpose: Symptomatic pelvic hernia after abdominoperineal resection (APR) occurs in up to 13% of cases[1] and presents as pelvic pain, urinary and bowel dysfunction. Pelvic reconstruction with vascularized myocutaneous flaps aims to minimize wound complications and may ameliorate pelvic hernias by obliterating dead space. Previous studies have demonstrated that myocutaneous flaps reduce perineal wound complications but have not specifically evaluated pelvic hernia sequela. We hypothesized musculocutaneous flap reconstruction for perineal wound reconstruction at the time of APR would decrease the incidence of pelvic hernia. The aim of this study is to quantify the effect of flap reconstruction after APR on the incidence of pelvic hernia.

Methods: A retrospective case-control study of patients undergoing APR for rectal cancer at a single academic institution over an eleven (11) year period was conducted. A total of 21 patients were identified of which 11 met inclusion criteria: 5 of these had undergone a vertical rectus abdominis myocutaneous flap (VRAM) at the time of APR; 6 did not have any flap reconstruction. Radiological imaging (CT and MRI) was used to evaluate for both occurrence and risk for pelvic hernia by measuring pelvic contents; on midline sagittal views, the ratio of viscera area to total pelvic area was measured. On axial views, distance (cm) from pelvic outlet to the first loop of viscera was measured. Standard statistical analysis with SPSS was performed and included Mann Whitney U test to compare nonparametric data between the two groups.

Results: Between the two groups, post-operative viscera-to-pelvis ratios were statistically different (p=0.004). The median difference between the pre- and post-operative ratios was also statistically different between the no flap (NF) and with flap (WF) groups (NF=0.18, WF= -0.51, p=0.009). Median viscera-to-total pelvis area ratio increased from 0.43 to 0.63 in the NF group and decreased from 0.54 to 0.06 in the WF group post-operatively, however these changes did not reach statistical significance (p=0.08, 0.08). Distance from the pelvic outlet to first visualization of bowel was not significantly different between the two groups (p=0.79) Median pre-operative viscera-to-total pelvis ratios were not significantly different between the NF and WF groups (NF=0.43, WF=0.54, p=0.931), indicating equally matched pre-surgery cohorts.

Conclusion: Our study demonstrated that VRAM reconstruction significantly decreases the incidence of pelvic hernia based on pelvic viscera-to-total pelvic area ratio. VRAM flap reconstruction may prevent bowel/viscera content from entering the pelvis after APR due to the obliteration of dead space in the posterior pelvic space. Through imaging studies, this study sought to investigate the role of VRAM reconstruction in the prevention of pelvic herniation. While limited by a small sample size, the results of our study suggest that VRAM reconstruction helps prevent bowel from entering the pelvis after APR. Further prospective study is indicated to determine the clinical significance of these findings.

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Complications Following Flap Reconstruction for Abdominoperineal Resection with Sacrectomy: A 20-Year Retrospective Review

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Purpose: Abdominoperineal resection (APR) is a radical procedure commonly performed for advanced and recurrent pelvic malignancies. Sacrectomy in the setting of an APR is often accomplished using a combined anterior and posterior approach

for a high-level sacrectomy (above the S2/3 vestigial disc) or anterior alone for lower sacral resections. To better understand the rate and types of complications associated with this patient cohort, we reviewed the outcomes in patients who underwent soft tissue reconstruction following APR with sacrectomy at our institution.

Methods: A retrospective review was conducted to identify all patients who underwent flap reconstruction for abdominoperineal resection with sacrectomy over a 20-year period (from 1999 to 2018). Sacrectomy above the level of the S2-S3 disc was considered high sacrectomy and sacrectomy at the level of S3 or below was considered low sacrectomy. Major and minor complications in abdominal and perineal wounds were recorded.

Results: Over a twenty-year period, a total of 46 patients underwent flap reconstruction for abdominoperineal resection with sacrectomy (APRS). The median age of our patient cohort was 57 years (Inter Quartile Range (IQR) of 49-64) with a median follow-up of 17 months (IQR, 7-45). 28 patients (61%) underwent this procedure for colorectal cancer while 8 patients (17%) had been diagnosed with sacral chordoma. 39% (n=18) underwent APRS for primary disease and 61% (n=28) underwent the procedure for recurrent cancer (26 recurrent rectal cancer, 1 recurrent uterine cancer, and 1 recurrent sacral anaplastic meningioma). Six patients of our total patient cohort (13%) underwent pelvic exenteration along with the APRS. Rectus abdominis muscle flap (RAM) was used as the reconstructive option in 42 patients (91%), while other flaps (2 Gluteal, 2 anterior thigh flaps) were used in the rest of the patients. Half of our cohort (n=23) had a major perineal complication. The median time to the first major perineal complication was 111 days (IQR 22 – 660 days). When comparing complications in the RAM group to the other flaps group, no significant differences were found in major or minor perineal or abdominal wall complications. APR with high-sacrectomy was performed in 27 patients (59%) and was associated with significantly increased full thickness dehiscence in the perineal region when compared to APR with low sacrectomy [33% vs. 0% respectively; p=0.0076].

Conclusion: Based on this analysis, the RAM flap was the workhorse flap for pelvic reconstruction after APRS. Due to the high morbidity and complexity of these procedures, for patients who undergo more extensive resections, close wound surveillance and postoperative wound care protocols can be beneficial in order to reduce complications.

Foot Fracture May Predict Poor Patient Reported Functional Outcomes in Lower Extremity Reconstruction of the Traumatically Injured Lower Extremity: A Case-Control Study

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Background: A paucity of evidence currently exists regarding the factors affecting the success of lower extremity reconstruction at restoring a functional limb. We aim to determine the effect of foot fracture on outcome measures of ambulatory success after lower extremity salvage in a trauma population.

Methods: A retrospective chart review was performed on 166 patients presenting to an urban level 1 trauma center between 01/2007 and 01/2015 who received soft tissue coverage of a lower extremity traumatic wound. Demographics, injury, and perioperative data were recorded. Patients were administered the Lower Extremity Functional Scale (LEFS) questionnaire via phone. The LEFS is out of 80 possible points. Ambulatory success is measured on a scale of 0 to 4, with 0 indicating "extreme difficulty or inability to perform activity", and 4 indicating "no difficulty". Functional outcomes were compared using a two-tailed two-sample unequal variances t-test.

Results: Of the 166 patients with traumatic injuries requiring lower extremity reconstruction, 30.1% (50/166) completed the LEFS questionnaire. These included 5 patients (10%) with foot fractures and 45 patients (90%) without foot fractures. Mean time from injury to completion of the LEFS was 5.6±8.1 months. Mean age at time of injury was not significantly different in patients with foot fractures (34.6±9.5 years, range 25-49) than in patients without foot fractures (42.8±16.1 years, range 20-74, p=0.17). There was no significant difference in rates of tibia fracture in patients with (80%; 4/5) and without (64%; 29/45) foot fractures. Of those with foot fractures, 80% (4/5) were hindfoot fractures and 20% (1/5) was a midfoot fracture. A total limb salvage rate of 92% (46/50) was achieved. Patients with foot fractures had significantly lower scores for LEFS measures of "walking between rooms" (1.4±0.8 vs 2.9±1.2, p=0.02), "walking two blocks" (0.8±0.4 versus 2.1±1.5, p=0.0004), and "running" (0.0 versus 1.1±1.5, p=0.00001) than patients without foot fractures. Average total LEFS scores were significantly lower in patients with foot fractures (24.2±4.7) than in patients without (38.1±18.6) foot fractures (p=0.002).

Conclusion: Sustaining a foot fracture during severe traumatic injury that necessitates lower extremity reconstruction may result in significantly decreased ambulatory success scores. Fractures of the foot may predict poor patient reported functional outcomes following lower extremity reconstruction and should be considered as a factor in the pre-operative risk and benefit assessment when deciding whether to attempt reconstruction of the mangled limb.

Mucormycosis Following Thermal Burn Injuries: A Systematic Review

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Purpose: Severe thermal injuries induce a state of immunosuppression, increasing the risk of developing opportunistic bacterial and fungal infections. Mucormycosis is an opportunistic, invasive and rapidly progressive fungal infection that can occur in immunosuppressed patients, often resulting in morbidity and mortality. Here, we present a systematic review of the literature aimed at identifying risk factors that contribute to mortality in burn patients affected by mucormycosis.

Methods: A systematic review of the literature of mucormycosis infection in burn injury patients was performed. The variables assessed included patient demographics, burn site and surface area, coexisting medical conditions, coinfections, infection site, time to diagnosis, species isolated, additional procedures required due to mucormycosis, inpatient complications, and mortality. Individual patient data was stratified based on mortality to conduct a pooled analysis using SPSS 25.

Results: A total of 46 papers were included in the final analysis, encompassing a total of 189 patients with burn injuries who were diagnosed with mucormycosis. The average age of patients was 35.6 years, 77.7% were male, and 13.0% had preexisting diabetes mellitus. The average burn total body surface area (TBSA) was 50.9%, and 59.1% of patients also experienced inhalation injury. The average post-injury day when mucormycosis was diagnosed was 19.6 days. The most common sites of mucormycosis were the upper extremities (45.3%), face and head (25.6%), and lower extremities (22.1%), with 32.4% of patients having mucormycosis identified from multiple sites. The most common species isolated was *Mucor circinelloides* (24.2% of patients), followed by other *Mucor* spp. (17.9%), *Lichtheimia* spp. (13.7%), *Absidia* spp. (9.5%), and *Rhizopus* spp. (9.5%). Approximately 78.6% of patients underwent additional debridement after diagnosis of mucormycosis, and 49.1% required amputation. The overall mortality rate was 56.9%, with 16.5% of mortalities listing invasive fungal infection as one of the causes of death. There was no significant difference in age ($p=0.812$) or post-injury days when diagnosed with mucormycosis ($p=0.498$) between survivors and nonsurvivors. Patients that survived had an average TBSA of 46% while nonsurvivors had an average TBSA of 59% ($p=0.010$). Of the patients that survived, 14.8% had preexisting diabetes mellitus

compared to 23.8% in cases of mortality, although this association was not significant (p=0.335). There was a significant association between fungal species and mortality (p=0.009). The mortality rate of patients infected with fungal species in the *Mucor* genus was 60% compared to 38.5% in patients infected by other fungal species (p=0.044).

Conclusion: In burn patients affected by mucormycosis, TBSA and fungal species both contribute to a patient's mortality risk. The severity of the initial injury and potential fungal pathogens must be taken into consideration to inform patient prognosis.

Automatic Measurement of Intracranial Volume from Three-Dimensional Photography

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Introduction and objectives: Intracranial volume (ICV) is an important measurement to identify and evaluate cerebral growth abnormalities. ICV can be objectively quantified from computed tomography (CT) or magnetic resonance imaging (MRI) scans. However, CT involves radiation and MRI requires sedation or general anesthesia in young children. This study presents a radiation-free, reproducible, automatic, accurate method to measure ICV from three-dimensional (3D) photography, a fast and non-invasive imaging modality.

Material and methods: A training dataset of retrospective head CT images was collected from 575 patients without known cranial pathology (average age 5 ± 5 years; range 0-16 years; 259 females and 316 males). A test dataset of retrospective pairs of head CTs and head 3D photographs was collected from 30 patients (average age 1 ± 3 years; range 0-9 years; 10 females and 20 males). 3D photographs were acquired using the 3dMDhead System and were taken at an average of 10 ± 13 days from their corresponding CTs. We segmented the head skin and cranial bone from CTs and the cranial base was automatically identified via automated registration. The head volume and ICV above the cranial base were calculated from CTs to create a polynomial regression model with respect to the age and sex of the patients. Finally, the 3D photography of a patient was registered to a reference template to identify its cranial base and extract the head shape from which the head volume was calculated.

The ICV was quantified using the regression model with the head volume from 3D photography, the age and sex information, and then compared to the ground truth from CT.

Results: The regression model estimated the ICV of the normative population from the head volume calculated from CT images with an average error of 3.76 ± 3.15% ($p = 0.79$) and a correlation (R^2) of 0.96. We obtained an average error of 4.07 ± 3.01% ($p = 0.57$) in estimating the ICV of the patients from 3D photography using the regression model.

Conclusions: 3D photography with image analysis provides measurement of ICV with clinically acceptable accuracy, thus offering a non-invasive, precise and reproducible method to evaluate cranial growth in young children.

Functional Influence of Breast Implant Surface Texture with Micro Topographical Features on Capsular Contracture

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The shell texture of a breast implant is an important factor associated with a risk of capsular contracture often necessitating additional surgery. The objective of this study was to characterize differences of commercially available implants in terms of texture, topography, and wettability as well as the behavior of capsular contracture. The implants utilized in this study were BellaGel® Smooth, BellaGel® Textured, BellaGel® Micro or Motiva® SilkSurface®. The shell texture of these implants was characterized using a scanning electron microscopy, X-ray microtomography, three dimensional confocal laser scanning microscope, and contact angle goniometer. In addition, silicone breast implants were emplaced beneath the panniculus carnosus muscle on the dorsum of Sprague Dawley rats and observed for up to 8 weeks postoperative days. The fibrous capsule around silicone implants were explanted for histological, immunohistochemical examination, and western blotting. BellGel® Micro and Motiva® SilkSurface® textures resulted in significant decreases in capsule thickness ($P < 0.05$) and collagen production ($P < 0.05$) at 8 weeks with respect to the BellaGel® Smooth and BellaGel® Textured group. Fibrous tissue formation markers (Vimentin, α-SMA, and TGF-β) were significantly reduced in BellaGel® Micro and Motiva® SilkSurface® textures with respect to the BellaGel® Smooth and BellaGel® Textured group. Significant ($P < 0.05$) decreases in inducible nitric oxide synthase, an inflammation marker, were observed in the

BellaGel® Micro and Motiva® SilkSurface® textures. In summary, surface texture with microtophographical features led to decreased fibrotic capsule formation compared with other surfaces. This finding may offer to design an improved silicone breast implant, which could alleviate capasular contracture.

Key word; Silicone breast implant, texture, capsular contracture, inflammation

A Novel Technology for Contour Conforming Projected Flap Markings

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Purpose: Markings for planning incisions in reconstructive surgery are commonly drawn free-hand and to the surgeon's best estimate, leading to potential mistakes that can increase procedure time and patient risk. In our previous study published in the Plastic and Reconstructive Surgery Journal, we have shown that these markings can be improved by designing accurate flaps on the computer and projecting the image as a stencil onto a patient using a handheld projector. The biggest limitation of this technology is the distortion of the projected flap markings on contoured areas of the human body (nose, breast etc). The aim of this study was to develop and test a technology which prevents distortion of projected flap markings onto various surfaces of the human body. In addition, we aimed on creating a system where the projected flaps could be modified using the surgeons hand gestures.

Material and Methods: In collaboration with the startup Summit Technology Laboratory, we developed a camera-projector system that allows for topographic mapping of the area of interest and modification of projected flaps to conform to the human contour. To assess the accuracy of this system, we projected rhomboid and wise pattern breast markings onto respective areas of interest and assessed distortion of flap markings. In addition, we also tested the manipulation of these flaps using hand gestures.

Results: Using our technology, we found that both projected wise pattern markings onto the breast and projected rhomboid flap onto the zygoma had 0 percent error in geometry. Our technology also allowed for manipulation of these flaps (rotation, scaling etc.) using hand gestures.

Conclusion: We have developed and validated a system to project and manipulate flap markings onto areas of human contour without distortion. This device increases the accuracy of surgical planning, helps mark “unmarkable tissue” (e.g. burned tissues), and creates a completely new an immersive way of training surgeons.

Searching for an Ideal Preclinical Model to Analyze Oncological Safety of Breast Lipofilling. Preliminary Results

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Introduction: Preclinical studies (PS) aiming to evaluate the microenvironment of breast cancer (BC) is very important for analysis of risk and the behavior of this disease to treatments proposed in humans, such as breast lipofilling. Laboratorial studies used so far for this purpose present serious methodological problems. They are based on models that use cancer-induced carcinogens that have a residual systemic effect or through the use of non-luminal human BC implanted in immunosuppressed murine hosts. This manuscript, though, presents preliminary results of a big project aiming to develop a PS capable of assessing risks. The primary objective here was to analyze the effectiveness of cafeteria diet (CD) - a known risk factor for BC in humans - to stimulate the mammary gland and the time required for this to trigger some effect over the murine breast tissue.

Methods: 18 Sprague-Dawley rats with 28 days of life were randomly divided into 4 groups: 2 controls (C1 and C2), where rats were fed with standard diet, and 2 groups that received CD (D1 and D2). Cafeteria diet was introduced at rats’ age of 6 weeks, what is similar to the human age (HA) of 7 year-old. The following variables were collected and analyzed: Weight, naso-anal length (NAL), Lee Index (LI) – what is similar to the human BMI, fasting glycemia (FG), perigonadal fat pad weight (PFW), and groin fat pad volume (GFV). Six thoracic breasts, adipose tissue of omentum and subcutaneous of each rat were harvested for analysis. These samples were studied through histological analysis with HE staining. Statistical analyses were performed on SPSS software using paired t-tests, analysis of variance (ANOVA, one way) for ordinal variables and McNemar's test for categorical variables.

Results: Ten rats (C1 e D1) were analyzed with 17 week-old (HA=20year-old) and 8 (C2 e D2) with 26 week-old (HA=32year-old). The mean weight in C1 was 250.14g and in D1, 332.65g (p=0.01); in C2, it was 263.09g and in D2, 426.76g

(p<0.001). The mean LI, were respectively, 303.37, 313.43, 298.12, 332.63 in groups C1, D1, C2 e D2 (p=0.45 between C1 and D1; p=0.002 between C2 and D2). The mean FG value was 76.06mg/dl (p=0.26); the mean PFW was 8.21g (p<0,001 between control and CD groups in both times). The mean GFV was 5.08ml, with significant difference between C1 and D1 (p=0.007) and, C2 and D2 (p=0.001). Regarding the mammary microenvironment, it was observed 20% of duct ectasia (DE) in D1 vs. 8% in C1 (p<0.001) within 11 weeks under CD. One adenofribroma was observed in D2 at 12nd week after cafeteria diet onset and other at the 13rd.

Conclusion: This study showed that the CD was an effective method to induce changes in the breast microenvironment even in young rats without compromise the glycemic status (which might be a bias). These data suggest that CD can be an effective inducer for tumorigenesis in older rats. These preliminary results can lead to the development of future pre-clinical models for the assessment of BC risk.

Lipovol: A Free and Validated Software for Measuring Fat Graft Volume Retention in the Breast with MRI

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Background: Fat graft volume retention in the breast is difficult to measure because the graft is dispersed in the breast tissue preventing delineation of the graft.[1] The authors present a new automated software (Lipovol) to measure fat graft volume retention in the breast based on MRI scans and a validation study of the software's accuracy.

Methods: The Lipovol software calculates fat graft volume retention in the breast using two MRI scans of the same patient recorded before the surgery and after a follow-up period (e.g. a pre-operative scan and a 4-months post-operative scan). The software works by guiding the user to align the two MRI scans in a matrix using osseous pointers. Thereafter, the software can delineate the breasts with an algorithm and calculate the difference in breast volume. The difference in breast volume is then divided by the injected fat graft volume to calculate the fat graft volume retention.

The validation study was designed to test the accuracy of the software in measuring changes in breast volume. It was performed on 28 patients with known changes in

breast volume: 14 patients who received silicone implants and 14 patients who received fat grafting to the breast examined right after surgery. The accuracy of the software was calculated as the difference between the known change in breast volume (i.e. implant volume or fat graft volume) and the measured change in breast volume. The measurements were performed by 4 blinded observers with a total of 224 individual measurements and 96 repeated measurements.

Results: The software measured the fat graft volumes with a systematic error of only 5.7% (95% CI 3.3-8.0%) overestimation and an average inter-observer variation of 20.8 mL (95% CI 17.6-24.0 mL). The change in breast volume after a breast augmentation with breast implants were associated with a significantly higher systematic error of 24% (95% 17-31%) overestimation ($p < 0.001$) but the inter-observer variation of 19.8 mL (95% CI 15.2-24.4 mL) was similar to what was seen in the fat grafting patients.

Conclusion: The LIPOVOL software was very accurate in predicting the known volume changes after breast augmentations, especially when measuring changes in breast volume after fat grafting. The software will be made freely available in MeVisLab (www.mevislab.de) and we propose this software as the new gold standard technique for measuring fat graft retention in the breast.

1. Glovinski PV, Herly M, Muller FC, et al. Avoiding a Systematic Error in Assessing Fat Graft Survival in the Breast with Repeated Magnetic Resonance Imaging. *Plast Reconstr Surg Glob Open.* 2016;4(9):e1023.

The Use of Vitamin D3 (Calcitriol) for Improving Autologous Fat Graft Retention

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Background: Autologous fat grafting is a powerful technique for replacing soft tissue but is limited by unpredictable long-term tissue retention and considerable inter-patient variability. After injection, fat grafts typically experience extreme ischemia causing adipocytes to necrotize and release factors inducing macrophage recruitment and inflammation. This process continues until tissue revascularization occurs. We hypothesize that reducing tissue inflammation and the rate of necrotic tissue clearance will increase graft retention during the revascularization period, ultimately improving

tissue replacement by stem and progenitor cell remodeling. Calcitriol, the active form of Vitamin D3, significantly inhibits apoptosis through reduction of oxidative stress and is a potential key stimulator of triglyceride accumulation. This study investigates the novel use of calcitriol for improving adipose tissue survival by reducing inflammation and phagocytic tissue clearance.

Methods: In vitro, adipose tissue from 3 human donors was cultured for 48 hours in 1% oxygen and 0nM, 15.6nM, 62.5nM, and 250nM calcitriol. Tissue viability was assessed, and qRT-PCR was performed to measure genes related to hypoxia or inflammation. In vivo, an immunocompromised mouse model was used to evaluate the impact of calcitriol on fat graft outcomes. Lipoaspirate tissue (0.3mL) from 3 human donors was implanted bilaterally on the mouse dorsum and assessed at multiple timepoints out to 12 weeks. Study groups included lipoaspirate incubated with calcitriol for 60 min prior to injection or thrice weekly intraperitoneal calcitriol injections. Study outcomes included residual graft volume (%) and graft injury as observed through histology.

Results: Under hypoxic culture conditions, calcitriol did not significantly impact adipocyte viability in vitro but did decrease expression of inflammatory cytokines including SOD1, IFNγ, and IL6. In vivo, lipoaspirate submersion prior to grafting increased graft retention at 1 week ($p=0.081$, not statistically significant) and 4 weeks ($p<0.05$) while intraperitoneal calcitriol injections significantly increased fat graft volume retention at both 1 and 4 weeks ($p<0.01$). Results from 12-week data are pending.

Conclusion: Calcitriol, an FDA-approved drug with known immunomodulatory properties, appears to be a promising drug for improving long term fat grafting outcomes. In vitro, calcitriol exhibited anti-inflammatory properties and hypoxic tissue had decreased expression of inflammatory cytokines SOD1, IFNγ, and IL6. In vivo, calcitriol submersion and intraperitoneal injection both significantly increased fat graft volume retention by 4 weeks. Used in tumescent fluid, calcitriol has potential as a simple, economical means of increasing fat graft retention.

Quality and Quantity-Cultured Peripheral Blood MNC Improve the Fat Graft Vascularization and Survival

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Introduction: Fat grafting is a valuable technique in soft-tissue reconstruction. However, ischemia of the grafted tissue with subsequent necrosis and tissue loss impedes us from having satisfied long-term results. Recently, the Quality and Quantity (QQ) culture has been established to increase the vasculogenic potential of endothelial progenitor cells (EPC) in peripheral blood-derived mononuclear cells (PBMNC). Our experiment was designed to test whether QQ-cultured MNC (MNC-QQ) can contribute to vasculogenesis in the human fat graft and decrease the tissue loss.

Methods: Adipose tissue and peripheral blood were harvested from healthy subjects. Fat grafts were created with PBMNC (N=16), MNC-QQ (N=16) and stromal vascular fraction (N=16) before grafting in BALB/c nude mice and compared to non-enriched control fat grafts (N=16). Grafts were explanted after 1 and 7 weeks, and analyzed by weight persistence, immunohistochemistry and qPCR.

Results: Weight persistence after 7 weeks was significantly higher in the MNC-QQ-group (89.8±3.5%) and SVF-group (90.1±4.2) compared to control (70.4±6.3%). With 96.6±6.5 vessels/mm^2, grafts in the MNC-QQ-group had the densest vessel network and scored significantly better than control (70.4±5.6 vessels/mm^2). MNC-QQ exerted a direct effect on vasculogenesis by integrating in vessels, and a paracrine VEGF-mediated effect. Tissue consisting of fibrosis and perilipin-positive adipocytes was unchanged among all groups.

Conclusions: QQ-cultured MNC containing EPC stimulate the formation of a blood vessel network in the fat graft and enhance the graft survival, indicating its potential for clinical fat grafting.

Fibroblasts of Striae Distensae Exhibit Increased Profibrotic Signaling and Activation

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INTRODUCTION: Striae distensae (stretch marks) are common disfiguring cutaneous lesions found in a variety of clinical situations; adolescence, pregnancy, obesity, and in association with topical and systemic corticosteroids. Despite their prevalence, the etiology of striae distensae remains elusive, and this has significantly hindered development of effective treatment strategies. Fibroblasts, the principal cell type involved in skin homeostasis and repair, are likely to play an important role in the pathophysiology.

OBJECTIVE: To elucidate the key cellular and molecular features distinguishing fibroblasts in striae distensae and normal skin.

METHODS: Abdominal skin samples were obtained from female patients undergoing abdominoplasty operations (mean age: 54.3, range 31-69, n=15). From these skin samples, striae distensae and normal skin samples were isolated. Skin tensile strength was assessed, and histological structure was compared using Hematoxylin and Eosin, Trichrome, and Picrosirius Red staining together with a novel computational assessment of collagen fiber networks. Fibroblasts were isolated by flow cytometry using a positive and negative gating strategy ($CD45^{-}CD235a^{-}CD31^{-}CD90^{+}$LIVE single dermal cells) for analysis of gene expression using mRNA microarrays. Immunofluorescence staining and flow cytometry were used for confirmation of gene expression data at the protein level.

RESULTS: Striae distensae exhibited reduced tensile strength, more disordered collagen fibers, and decreased epidermal thickness compared to normal skin. Microarray analysis revealed 296 up-regulated and 174 down-regulated genes in fibroblasts isolated from striae compared to normal skin. CD26 surface marker and signaling pathways involved in fibrosis such as Wnt-, TGFβ-, and FAK-PI3-AKT-pathways were significantly up-regulated in samples from striae compared to normal skin. Moreover, the collagens 4A1 and 5A2 were up-regulated, whereas collagen 2A1 was downregulated. The anti-fibrotic macrophage migration inhibitory factor (MIF) receptor, CD74, and the AMPK pathway were significantly downregulated in striae compared to normal skin. Increased expression of CD26, and decreased expression of CD74 in fibroblasts from striae was confirmed by flow cytometry and immunofluorescence staining.

CONLUSIONS: Our data start to elucidate the mechanisms mediating the formation of striae distensae and indicate that fibroblasts from striae exhibit increased pro-fibrotic and decreased anti-fibrotic signaling pathways. CD26 is a known marker of fibrogenic fibroblasts in mice and we show here its expression is increased in striae. CD74 is a known anti-fibrotic surface receptor. The significant up-regulation of CD26 and down-regulation of CD74 at the mRNA and protein level highlight these surface

markers as promising targets for development of effective treatment strategies of striae distensae.

Self-Propagating Autologous Skin Substrate for the Treatment of Cutaneous Defects: Clinical Series of the Utilization of a Novel Therapy for *in-Vivo* Full-Thickness Skin Regeneration

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Introduction: The rate of incidence of full-thickness chronic and acute dermal wounds is increasing and becoming a significant burden on healthcare systems. Large and complex wounds, which are unable to heal on their own, or reconstruction patient management strategies that have failed to fully close wounds are frequently treated by skin grafting, a procedure that is over two-millennia old and is still being used as a conventional treatment option. Split-thickness skin grafts (STSG) have not demonstrated neo-generation of dermal appendages (hair follicles, sweat and sebaceous glands, etc.) or full-thickness skin replacement and consequently are prone to contraction, fibrosis, infection, and morbidity. Skin grafting requires surgeons and an operating room, which inherently produces a barrier to patients and the wound care community, including non-surgical clinicians and mid-level providers. Here we investigate outcomes from a multi-institutional case series of early clinical use of a novel autologous homologous skin construct (AHSC) for complex wounds. A retrospective cohort study at nine institutions between December 1, 2017 and July 23, 2018, of fifteen patients (age range 7-72 years) with wounds which had failed the clinical standard of care, or complex wounds where modalities beyond skin grafting would have been required.

Methods: Biomedical manufacturing of a small full-thickness skin harvest into the AHSC cell-tissue product followed by application into a clean wound bed. Wound closure, AHSC % take, volume restoration, hair-follicle presence, two-point discrimination, bioimpedance, pigment propagation, Raman spectroscopy, and histomorphological assessment of regenerated skin was conducted on regenerated skin specimen when possible.

Results: The entire cohort of 15 patients had successful wound preparation and application of AHSC following full-thickness skin harvest. No repeat treatment with AHSC or STSG was required for AHSC-treated wounds. No donor site complications were reported. All patients had complete AHSC take and wound coverage at time of follow-up (average 4.0±2.9 months). Two-point discrimination, bioimpedance, Raman spectroscopy, and histomorphological analyses showed that AHSC-regenerated skin was analogous to native skin. Hair follicles were present in healed AHSC-treated wounds and were similar to native skin hair follicles on histomorphological and Raman spectroscopy analysis.

Conclusions: This novel treatment method demonstrated regeneration of full-thickness skin with minimal donor site morbidity and was able to cover exposed underlying structures in complex wounds. Due to the observed results, utilization of AHSC can be considered as a therapeutic option for patients suffering from burns, complex wound reconstruction, chronic wounds, and traumatic defects. Therapy utilizing AHSC can be performed by surgical and non-surgical trained clinicians and mid-level providers across a variety of care settings, including resource-poor areas. AHSC demonstrated safe and efficacious treatment for the complete closure of complex cutaneous wounds refractory to conventional therapies and cases involving open deep structures not amenable to reconstruction with split-thickness skin grafts alone.

Topical Alpha-Gal Nanoparticles Enhances Wound Healing in Radiated Tissue

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Background: Radiation is a common primary, adjuvant and neoadjuvant therapy in oncological patients. It is well known that surgery on radiated tissues is associated with significantly higher complication rates due to permanently compromised wound healing. It is thought that one cause of impaired wound healing is the aberrant inflammatory response that occurs in radiated tissues. Previous work has demonstrated that the topical application of naturally occurring antigen α-gal (Galα1-3Galb1-(3)4GlcNAc-R) nanoparticles (AGN) onto wound surface accelerates macrophage recruitment. As we have already observed accelerated wound healing in both normal and diabetic wounds treated with topical AGN, we hypothesized that

application of this natural antigen would similarly enhance healing of the wounds in irradiated tissue.

Methods: To simulate human physiology, α-1,3galactosyltrasferase knockout mice (KO), which do not produce the antigen and therefore can be stimulated to produce antibodies against it, were used. KO were exposed to the antigen to produce anti α-gal antibodies at titers comparable to those seen in humans. Ten days prior to wounding dorsal skin was isolated using a low-pressure clamp as previously described and was irradiated with one session of 40Gy. Bilateral 6-mm dorsal splinted full thickness wounds were created and treated with AGN in a 2% carboxymethyl cellulose (CMC) carrier, immediately after wounding and again on postoperative day 1. Control knocked out group underwent similar irradiation and wounding protocols but were treated with phosphate buffered saline (PBS) in 2% CMC. Wild type mice (WT), which are indolent to the antigen, went through the same radiation and wounding to eliminate confounding factors other than immunogenic response to AGN. Wounds were harvested from all animals up to 21 days after the wounding for histological and IHC measures. The extent of keratinocyte migration, neovascularization, and macrophage recruitment was assessed.

Results: Full closure of all wounds by day 9 in the non-radiated control compared to no completely closed wounds in the radiated group confirmed the known inhibitory effects of irradiation on wound healing. In addition, histological changes such as increased epidermal thickness in the skin surrounding the wound further confirmed the effects of irradiation on the skin. Histologic analysis demonstrated enhanced keratinocyte migration in the AGN treated KO wounds, which was significantly improved in comparison to PBS treated KO wounds noted by day 15 and until the end of the study ($p<0.01$). On day 21, ~63% of all α-gal treated wounds were completely healed as opposed to only ~17% in the PBS treated group. In WT, treatment with AGN showed no improvement in keratinocyte migration or time to full closure.

Conclusions: Topical application of AGN onto radiated wounds significantly ameliorate the delayed wound healing in radiated tissue resulting in faster wound closure. We believe this naturally occurring agent has great promise for clinical translation as it has demonstrated efficacy in not only normal wounds but pathologic (diabetic, radiated) ones as well.

Characterizing Nipple Biomechanics: In Search of an Ideal Tissue Substitute

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Introduction: Following total mastectomy, nipple reconstruction is an essential, often last step of breast reconstruction. The positive psychological effect is critical to the recovery process and patients report increased satisfaction, with increased happiness in sexual behavior and their nude appearance. As is the case for most reconstructive surgeries, use of autologous tissue is the ideal reconstructive methodology, eliminating the possibility of rejection, minimizing infection, and maximizing tissue integration and permanence. Autologous costal cartilage (CC) grafts have been used to maintain neo-nipple projection, but this technique is suboptimal due to difficulty of controlling the size and shape of the neo-nipple and stiff biomechanical qualities of resultant neo-nipple. We have previously shown the efficacy of minced CC in preservation of neo-nipple projection when integrated with external biodegradable scaffold. Herein, we assess simple and reliable methodologies for mechanical processing of CC to achieve desired biomechanical characteristics that mimic the human nipple more closely.

Methods: Excess CC, from patients undergoing deep inferior epigastric (DIEP) flap procedure, was mechanically processed by either shredding or mincing in sterile fashion. Mechanically processed cartilage was either packed into a custom designed 3D-printed external scaffolds (made from polylactic acid); or an equal volume was wrapped in Surgicel®. The constructs were implanted into nude rats by creating a subcutaneous pocket using CV flap technique. The constructs were explanted after 3 months for histological and biomechanical testing. Biomechanical testing was also performed on native human nipple and pre-manipulation/implantation CC. Confined compression testing performed by compressing the samples to 30% of their original height in 6 steps of 5% strain, with 10 minutes between steps to allow for full stress relaxation. Equilibrium modulus was calculated.

Results: After 3 months in-vivo, mechanical analysis demonstrated that mincing of the cartilage changed the equilibrium modulus and hydraulic permeability of implants to values closer to native human nipple regardless of presence of the external scaffold. The minced CC possessed almost 4 times smaller modulus than the pre-manipulation/implantation CC on average (702kPa vs. 2723kPa, $p=0.0036$). The average human nipple had lower, but not statistically significant, equilibrium modulus than the minced cartilage (257kPa vs. 702kPa). Hematoxylin/eosin staining and LIVE/DEAD assay showed the presence of healthy and viable cartilage in all groups. There was evidence of fibrovascular tissue invasion resulting in consolidation and incorporation of the implants.

Conclusions: We demonstrate that autologous CC, usually discarded during a DIEP flap procedure, can be used as a viable implant for nipple reconstruction. Because the original CC is firm and non-malleable, mechanical processing of the CC reduces stiffness and allows for incorporation of individualized engineered constructs tailored to patient desire (sizes/levels of projection). We demonstrated that the mincing of CC resulted in constructs with more similar biomechanical properties to that of the native human nipple without the loss of projection or topography seen with traditional approaches to nipple reconstruction.

A Novel Xenografting Model to Explore the Mechanisms Mediating Acute and Chronic Fibrosis in Human Skin Fibroblasts

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INTRODUCTION: Human scar formation and fibrosis are difficult to accurately recapitulate using mouse models, given the significant anatomical and physiological differences between mouse and human skin. Xenografts of human skin on immunodeficient mice provide an accessible means of assessing human skin's physiology and response to wounding or fibrosis-inducing conditions *in vivo*. However, current xenograft models are limited by poor engraftment rates and inability to specifically explore the mechanisms mediating fibrosis in human fibroblasts.

OBJECTIVE: We describe a novel skin xenografting model to investigate the response of human dermal fibroblasts to different fibrosis-promoting conditions.

METHOD: Full-thickness circular 8-mm human foreskin samples were sutured into the dorsum of P2 immunocompromised (NSG) mice as subcutaneous grafts (n=30), and surgically exposed after 7 days to produce cutaneous grafts. Successful engraftment and preservation of normal skin physiology were confirmed by histology. Machine learning-based assessment of collagen fiber networks from stained skin histology specimens was achieved using a novel computational algorithm developed by our laboratory. To study the acute fibrotic response, 4-mm partial-thickness wounds were created within the xenografts using a biopsy punch; wounds were monitored until closure. To explore the chronic fibrotic response, xenografted skin was irradiated with 30 Gy fractionated into six 5 Gy doses delivered every other day for a total of 12 days. Following radiation, chronic fibrotic changes were allowed to

develop over an interval of 4 weeks. At the respective endpoints, xenografted skin was harvested for histology. Human fibroblasts were isolated using flow cytometry with a negative gating strategy to exclude mouse and human hematopoietic cells ($CD45^-$/$Ter\text{-}119^-$/$CD235a^-$), endothelial cells ($CD31^-$), and epithelial cells ($CD326^-$ (mEpCam)/$mCD324^-$(E-Cadherin)), and a positive gate to include only human fibroblasts ($CD90^+$). Microarray analyses were used to compare gene expression of human fibroblasts isolated from scarred/irradiated xenografts to those from unwounded/non-irradiated xenografts.

RESULTS: Xenografted foreskin was structurally similar to native (un-grafted) foreskin on histology. Collagen fiber network analysis confirmed that xenografted skin was more like foreskin than to scarred adult human skin. Wounds created in xenografted skin exhibited slower wound closure compared to stented mouse wounds, indicating healing primarily via formation of granulation tissue (akin to human skin) rather than contraction (typical of mouse skin). Irradiated skin was significantly indurated on histological assessment, consistent with chronic irradiation damage/fibrosis. Immunofluorescence staining confirmed successful xenograft vascularization and survival of human skin cells as well as human origin of granulation tissue. Gene expression analysis of fibroblasts isolated from acutely and chronically fibrosed xenografts revealed upregulation of the Wnt and FAK pathways and increased expression of the CD26 surface antigen.

CONCLUSIONS: We present a novel foreskin xenografting model and demonstrate its utility in specifically investigating the *in vivo* human fibroblast response in acute and chronic fibrosis. This model provides an accessible and informative tool to aid in elucidation of fibroblast-driven mechanisms responsible for scarring and fibrosis. Ultimately, this work may enable the discovery of novel cellular and molecular targets to reduce skin scarring and fibrosis.

Understanding the Mechanism of in Vitro Chondrogenesis Using a Co-Culture System for Generating a Tissue-Engineered Cartilage Construct

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Introduction: Microtia is a congenital condition that results in external ear deformities of varying degrees, of which, the most extreme form is anotia. The current surgical reconstruction techniques all require a multi-stage approach and have other

intrinsic disadvantages. Cartilage engineering is an alternative treatment approach in the field of external ear reconstruction. Typically, this method uses chondrocytes isolated from the remnants of auricular cartilage from the patient, which are cultured in the laboratory with the aim of creating bioengineered cartilage matrices. However, cartilage engineering is plagued with a variety of challenges, including the difficulty in culturing sufficient chondrocytes and the production of cartilage that does not possess the proper mechanical properties. To overcome these difficulties, we created a novel cartilage engineering model that involves co-culturing chondrocytes with adipose-derived stem cells (ADSCs). These cells are seeded onto a three-dimensional (3D) allograft adipose-derived extracellular matrix scaffold (AAM) at a defined ratio, stimulating chondrogenesis. However, the mechanism of how this happens in unclear. We hypothesized that the ADSCs have a trophic effect on the chondrocytes, making them more chondrogenic compared to the culturing of chondrocytes alone.

Materials and Methods: Auricular chondrocytes (ACs) were isolated from porcine ear and ADSCs were isolated from human lipoaspirate. ACs and ADSCs were co-cultured either directly or via a trans-well system at the defined ratio. In addition, the cells were cultured alone. The supernatants from these cultures were collected, and a secretome analysis was performed to assess the differential secretion of proteins under these conditions. The experiment was also conducted in the presence of AAM.

Results: The secretome analysis revealed that the cells in the co-culture conditions produced more chondrogenic factors compared to the chondrocytes alone. In addition, we validated that the factors important for chondro-induction were being secreted by the ADSCs.

Conclusion: These data revealed that the ADSCs provided paracrine support to induce chondrogenesis, which supports cartilage engineering when the number of ACs available is limited. Furthermore, uncovering the mechanism of chondrogenesis in this setting provides clues for improving cartilage engineering in order to ultimately utilize a patient's own chondrocytes and adipose derived cells for the creation of a customized ear framework that could be used for further surgical reconstruction.

Keratinocyte Sheets Prepared Using Temperature-Responsive Dishes Enhance the Survival Rate on Artificial Dermis

Presenter: Hajime Matsumine, MD, PhD
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Purpose: For severe burn injury or traumatic skin defect, cultured epithelial-keratinocyte-sheet therapy has been used in clinical practice since the 1980s. However, the survival rate of epithelial keratinocyte sheet on dermal-like tissue constructed with the artificial dermis is extremely low. Enzymatic treatment is typically used for obtaining epithelial keratinocyte sheets, but it tends to break the adhesion and basement membrane proteins, and this effect is directly linked to decrease in the survival rate of epithelial keratinocyte sheet on artificial dermis. On the other hand, a temperature-responsive culture dish require no enzymatic treatment to harvest cell sheets, and the basal membrane proteins and intercellular adhesion proteins can remain in epithelial keratinocyte sheets prepared by temperature-responsive culture dishes. This study investigated the potential to enhance the survival rate of human epithelial keratinocyte cell-sheets prepared by temperature-reducing treatment on the dermis-like tissue and compared the rate with that of the cell sheets harvested by enzymatic treatment with rat full thickness skin defect model.

Materials and Methods: Under inhalation anesthesia with isoflurane, a standardized 9 cm^2 full-thickness skin defect was created in the back region of nude rats (n = 9/group). Artificial dermis was cut to the same size as the defect and implanted by 5-0 nylon suture. The silicone sheet of artificial dermis was removed at 2 weeks after the initial operation, and the dermis-like tissue regeneration was confirmed. An epithelial keratinocyte sheet prepared from human epidermal cells in a normal culture dish by dispase treatment (DT sheets group) or a temperature-responsive culture dish (TR sheets group) was grafted on dermis-like tissue. One week after transplantation, the engrafted section was observed to measure the survival rate of epithelial keratinocyte sheets.

Results: The survival rate of epithelial keratinocyte sheets was in the TR group was significantly higher than that of the control DT group (120 ± 49 vs. 63 ± 42 mm^2 ; $p < 0.05$). Epidermis thickness of epithelial keratinocyte sheets in the TR group was significantly thicker than that of the control DT group (165 ± 79 vs. 65 ± 54 μm; $p < 0.01$).

Conclusions: This study showed that the epithelial keratinocyte sheets prepared with temperature-responsive culture dishs remarkably improved the survival rate on the dermal-like tissue after artificial dermal implantation as compared with the conventional sheet. This result suggested that the further possibility of reconstruction with artificial dermis and cultured epidermal sheet for full thickness skin defect in clinical situations.

Integrating 3D-Printed Models for Soft Tissue Applications in Craniofacial Surgery

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Background: Three-dimensional (3D) technology, such as patient-specific 3D-printed models and virtual surgical planning, is becoming routine for many craniomaxillofacial procedures. To date, applications of three-dimensional technology focused on planning and executing osseus reconstruction, while soft tissue applications are less established. The following abstracts reports our experience with 3D-printing for soft-tissue applications in craniofacial surgery.

Methods: 3D surgical planning and patient-specific 3D-printed models were applied in craniofacial procedures that alter the overlying soft tissue over a 1-year period (2018-2019). All patients had 3D-printed surface models of their baseline image as well as simulated ideal result that served as an adjunct to standard 2D photographs for reference during surgery. 3D printed contour guides were sterilized and available intra-operatively to fit on the patient and establish the ideal soft tissue contour.

Results: 3D models and guides were applied in 43 cases involving soft tissue changes: rhinoplasty (n=28), facial feminization (n=8), fat grafting (n=7). Baseline 3D printed facial models served as an intraoperative reference and replaced standard 2D photographs in all cases. Virtual surgical planning of the ideal soft tissue contour was performed pre-operatively in all cases. Intraoperative guides based on these simulations were printed and sterilized to guide surgical decision-making and assessment of adherence to the surgical plan. In rhinoplasty, nasal dorsum contour guides were used intra-operatively to guide dorsal reduction and tip projection, as well as dorsal width after osteotomy. Patient specific 3D printed nasal splints were placed and used in the postoperative period. Simulation for facial fat grafting calculated the amount and location of fat needed to obtain facial symmetry and pleasing contour. For fat grafting cases, a 3D printed shell of the ideal result was used as a reference in reconstructive cases to correct facial asymmetries.

Conclusion: 3D printing technology is a useful adjunct for soft tissue planning and execution in craniofacial surgery. Applications of this technology extend beyond the current application limited to skeletal elements. 3D printed models based on pre-operative virtual simulation replaced traditional 2D photographic reference, and assisted in creating a surgical plan and establishing aesthetic and reconstructive goals. Patient-specific 3D printed guides were useful intra-operatively to assess the

adherence to the surgical plan and establish the target contour. With recent advances that allow for low-cost and seamless 3D surface photographs, we believe 3D printing applications for soft tissue will gain popularity in the coming years.

PARP1 Inhibition as a Novel Therapeutic Target for Keloid Disease

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Objective: Inactivation of poly (ADP-ribose) polymerase 1 (PARP1) has been found to have protective effect in several fibrotic diseases. But the effect is not studied yet in keloids. Herein, we evaluated the therapeutic effect of PARP1 inhibitor, rucaparib, for keloids.

Methods: The protein expressions of PARP1 and smad3 were evaluated with western blotting in keloids and controls. The effect of rucaparib was evaluated using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay and migration assay. We further analyze the effect of rucaparib on patient derived keloid xenograft murine model.

Results: The protein expressions of PARP1 and smad3 were significantly higher in keloid tissue. Rucaparib (20 μM) significantly suppressed the proliferation of keloid fibroblasts. Moreover, the combination of rucaparib (20 μM) and triamcinolone (50 μM) showed additive suppressive effect on keloid fibroblasts. Migration assay showed rucaparib (10 μM) significantly suppressed the migration of keloid fibroblasts. Fibrosis markers in keloid fibroblasts significantly decreased after rucaparib treatment (20 μM). In patient-derived keloid xenograft model, rucaparib significantly reduced the size of keloid tissue.

Conclusion: The study data suggest PARP1 might be a novel therapeutic target for keloid disease. Rucaparib might be a promising therapeutic drug for the treatment of keloid disease.

Differential Gene Expression in Nerves Repaired Under Low and High Tension

Presenter: Jacqueline S. Israel, MD

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Purpose: Tension has been shown to be detrimental to nerve regrowth and reinnervation after primary nerve repair, likely via local ischemia and aberrant wound healing. We hypothesize that an improved understanding of the mechanisms underlying pathologic nerve healing may provide insight into potential targets for optimizing outcomes after nerve repair. The purpose of this study was to use RNA sequencing to identify differentially expressed genes in nerves repaired under minimal and significant tension.

Methods: Sciatic nerve transection was performed in male Lewis rats. The nerve was repaired via either a minimal-tension, interrupted epineural repair with 9-0 Nylon sutures, or a repair under tension for which a 9-millimeter segment of nerve was excised prior to interrupted epineural repair. The contralateral nerve served as each subject's matched control. Nerve specimens were harvested at 14 weeks postoperatively. Following RNA extraction, sequencing was performed using Illumina HiSeq 2500. Reads were mapped back to the genome and differentially expressed genes were identified using EBSeq. All analyses were conducted using R (R Development Core Team, 2012), a publicly available platform.

Results: Nerve repair was performed in 17 subjects (n=8 minimal tension, n=9 tension). Accounting for outliers and using the hypothesis that that all three groups (control, minimal tension, and tension) were different, 37 differentially expressed genes were identified. Many of the identified gene's code for transcription factors and/or are involved in cell-signaling pathways. Col10a1, Crebzf, Prr34, Rsl1, and Setd4 were all found to be differentially upregulated in the tension group. Tfrc, a transferrin receptor upregulated in immunodeficiency syndromes, was downregulated in the tension group. For some genes, such as Bl6 and Naf1, expression in the tension group was more like that in the uninjured group. Heat maps allowed for for qualitative visual comparison between uninjured control, minimal tension, and tension groups.

Conclusions: To our knowledge, this is the first study to compare molecular signatures of nerves repaired using minimal and significant tension. Further study of these up- and downregulated genes could help identify targets for optimizing nerve healing and regeneration. Similar methodologies using RNA-Seq could be applied to studying neuroma in continuity and other nerve pathology that often requires intervention.

Gender Disparity in Academic Rank and Industry Payments to Plastic Surgeons

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Introduction: Despite increasing representation in surgery, women continue to lag behind men in important metrics. Little is known on how industry funding may also contribute to this ongoing disparity. This paper seeks to quantify industry payments to academic plastic surgeons by gender and examine the relationship between funding and academic achievement.

Methods: We conducted a cross-sectional analysis of industry payments disbursed to academic plastic surgeons in 2017. Faculty were identified using departmental listings of ACGME plastic surgery residency programs. Payments were identified via the CMS open payment database. Academic achievement was assessed using rank (e.g. assistant professor), leadership designation (e.g. division head), and Scopus H-index, then controlled for time in practice.

Results: Of the 805 academic plastic surgeons identified, 147 (18%) were female and 658 (82%) were male ($p<0.0001$). Significant gender differences emerged in average yearly industry contributions (men: $3,202 vs women: $707, $p<0.0001$). Across all academic ranks, men received significantly higher payments than women ($p<0.05$). Men constituted 93% of full professors and were almost twice as likely to hold additional leadership positions compared to women (OR 1.82, $p=0.0143$). After adjustment for time in practice, there was no difference in H indices between male and female academic plastic surgeons, although payment disparity persisted ($p<0.0001$).

Conclusion: Substantial gender-based disparities exist among academic plastic surgeons' academic rank and leadership attainment. A three-fold difference in the amount of industry contributions men and women receive (regardless of time in practice) may be an underrecognized component of these academic achievement gaps. Increased transparency in how industry payments are disbursed is needed.