1 Smoking and Its Complications Generate Additional Healthcare Charges after Outpatient Plastic Surgery Procedures

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PURPOSE: Although smoking is associated with postoperative complications, the frequency of complications occurring that require acute hospital care is unknown. We conducted this study to determine whether patients with a history of smoking experience a higher rate of hospital-based acute care and greater healthcare charges after common outpatient plastic surgeries.

METHODS: By using state-level ambulatory surgery data from 4 states, we identified adult patients who underwent common facial, breast, or abdominal contouring procedures from January 2009 to September 2013. Our primary outcomes were hospital-based acute care encounters (inpatient admissions and emergency department visits), serious adverse events, and cumulative healthcare charges within 30 days. Multivariate regression models were used to compare outcomes between smokers and nonsmokers.

RESULTS: The final sample included 214,761 patients with 10,426 (4.9%) patients having a smoking history. Compared with patients without a smoking history, those with a smoking history are more likely to have a hospital-based acute care encounter [3.4% vs 7.1%; AOR = 1.36 (1.25–1.48)] or serious adverse event [0.9% vs 2.2%; AOR = 1.38 (1.18–1.60)] within 30 days. On average, these events added $1744 more per case for patients with a smoking history. These findings were consistent when stratified by procedure.

CONCLUSIONS: Patients with a smoking history undergoing outpatient plastic surgery more frequently require hospital-based acute care and generate higher healthcare charges postoperatively. This information may augment surgeon’s discussions of perioperative risk in this population.

2 Secondary Breast Surgery after Single-Stage Augmentation–Mastopexy compared with Augmentation or Mastopexy Alone: A Multiinstitutional Analysis of 59,934 Patients

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PURPOSE: Published revision rates for simultaneous augmentation–mastopexy are as high as 20% leading to trepidation with regards to simultaneous augmentation–mastopexy. We conducted this study to evaluate the rate of secondary breast surgery after augmentation–mastopexy in a large, multi-institutional cohort of patients, to compare this rate to patients undergoing augmentation or mastopexy alone, and to determine whether procedural volume contributes to outcomes.

METHODS: By using ambulatory surgery center databases from 3 states, we identified adult women who underwent single-stage augmentation–mastopexy, breast augmentation alone, or mastopexy alone from January 2008 to June 2013. Our primary outcome was secondary breast surgery including mastopexy, implant removal/replacement, or capsulectomy, through December 2013. Multivariate cox proportional hazards regression modeling was used to compare outcomes between groups while accounting for differences in patient characteristics and follow-up times.

RESULTS: The final sample included 59,934 women who underwent augmentation–mastopexy (11.0%), breast augmentation alone (73.2%), or mastopexy alone (15.8%) across 754 ambulatory surgery centers. Secondary breast surgery most often occurred within 3 years and was more common among patients undergoing mastopexy–augmentation [6.0%; AOR = 1.69 (1.51–1.89)] when compared with augmentation (3.7%; reference) or mastopexy [5.2%; AOR = 1.29 (1.15–1.45)] alone. Specifically, subsequent mastopexy (2.7%) or capsulectomy (2.0%) was more common in the augmentation–mastopexy group compared with the augmentation (0.4%/1.7%; P < 0.001) and mastopexy groups (1.9%/1.0%; P = 0.05).

CONCLUSION: Secondary breast surgery is more common after single-stage augmentation–mastopexy compared with either procedure in isolation. However, secondary breast surgery is common in all groups, and the absolute difference in rates across groups is not as great as previously reported.
3

The Relationship of Aesthetic Procedure Volume and the US Economy: A National Study

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PURPOSE: Aesthetic procedure volumes have seen an 82% increase in surgical procedures and a 508% increase in nonsurgical procedures since 1997. Although it is frequently assumed that there is a correlation between economic prosperity and the demand for aesthetic procedures, the relationship remains unclear, particularly at a national level. This study aims to identify macroeconomic trends relevant to plastic surgery practice management.

METHODS: Procedure volume was abstracted from The American Society for Aesthetic Plastic Surgery’s comprehensive databank of cosmetic surgery for the years 1997 to 2014. Economic data were abstracted from publically available Standard & Poor’s (S&P) 500 information. Pearson correlations were used to measure relationships between the S&P 500 market index monthly/annual closing averages and aesthetic procedure volume data.

RESULTS: Fifteen surgical and 10 nonsurgical procedures from the database fit study criteria. Both total surgical and total nonsurgical procedure volume significantly correlated with S&P 500 performance ($r = 0.68$, $P = 0.002$ and $r = 0.73$, $P < 0.001$, respectively). Sixty-six percent (10/15) individual surgical procedures showed correlation with S&P performance. Conversely, only 30% (3/10) of individual nonsurgical procedures correlated with the S&P 500.

CONCLUSIONS: This study reveals a positive correlation between the economy and aesthetic procedure volume. Plastic surgeons should complement their traditional surgical practices with the adoption of nonsurgical interventions to minimize the effect of economic variability on their practice and remain competitive in the everchanging economic environment.

4

What Do Our Patients Truly Want? Conjoint Analysis of an Aesthetic Plastic Surgery Practice Using Internet Crowdsourcing: A Pilot Study

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PURPOSE: Inadequate evidence exists regarding which aesthetic surgery practice attributes are most important to patients. Conjoint analysis is a technique to identify what is most important to consumers, by requiring simultaneous trade-offs among multiple product attributes. Its application in aesthetic surgery practices has not been well studied.

METHODS: Anonymous participants from an academic teaching hospital were asked, via electronic survey, to pick a surgeon for facelift surgery based on 5 attributes (pricing, photographs, testimonials, reputation, and training), each with 3 levels (ie, low, medium, and high pricing). Attribute importance (difference each attribute could make in the total utility of the product) and attribute preference (after trading-off other attributes) were calculated using empirical Bayes modeling.

RESULTS: With a 69% (179/261) completion rate, mean age was 43.1 years; 86% were women, 78% white, 54% married, 95% college educated, and 63% with annual household incomes more than $45,000. Without trade-offs, surgeon pedigree was ranked most important. With trade-offs, excellent testimonials, excellent photographs, and top tier training were preferred over national reputation and lowest price.

CONCLUSIONS: Participants placed higher relative importance on training pedigree. Conjoint analysis revealed excellent testimonials, excellent photographs, and top tier training were preferred over national reputation and lowest price. This discrepancy revealed actual behaviors compared with stated preferences. Future directions include conjoint analysis in breast augmentation and combined breast–abdominal surgery cohorts using an Internet crowdsourcing service.
The Association between Resident Involvement and Postoperative Short-Term Surgical Morbidity in Immediate Breast Reconstruction: A NSQIP Study of 24,005 Patients

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PURPOSE: The aim of this study was to assess whether resident involvement (RI) in immediate breast reconstruction (IBR) is associated with increased 30-day surgical morbidity.

METHODS: The American College of Surgeons National Surgical Quality Improvement Program database was used to identify patients undergoing IBR between 2005 and 2012. Preoperative demographics, intraoperative variables, RI in surgery, and 30-day postoperative surgical morbidities were identified. Chi-square test and multivariable logistic regression were used to estimate the effect of RI on surgical complications.

RESULTS: Twenty-four thousand five patients underwent IBR (17,840 with RI). Thirty-day surgical morbidity was observed in 5.25% [95% confidence interval (CI), 4.92%–5.58%] of cases with RI and 5.12% (95% CI, 4.59%–5.58%) of cases without RI. Odds of surgical complications were not statistically different between groups [unadjusted odds ratio (OR), 1.03; 95% CI, 0.90–1.17, \( P = 0.690 \)] even after controlling for confounding with multivariable logistic regression (adjusted OR, 0.97; 95% CI, 0.85–1.11; \( P = 0.652 \)). Subgroup analysis by type of reconstruction showed that RI was not associated with surgical complications in implant-based reconstructions but was associated with lower odds of surgical complications in autologous reconstructions (OR, 0.70; 95% CI, 0.53–0.91; \( P = 0.008 \)). However, operative time and reoperation rates were significantly higher with RI across all types of reconstruction (both \( P < 0.001 \)). Postoperative length of stay was statistically significantly longer with RI in autologous reconstruction (mean = 3.94, SD = 2.42 vs mean = 3.73, SD = 1.78, respectively; \( P = 0.015 \)) but not in implant reconstruction (\( P = 0.765 \)).

CONCLUSIONS: Although this study found no statistically significant evidence for increased postoperative surgical morbidity in IBR patients for whom residents were involved, RI statistically significantly increased operative time, postoperative length of stay, and reoperation rates.

Does Postgraduate Research Training While in Residency Lead to Academic Success? A Comprehensive Analysis of US Academic Plastic Surgeons

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PURPOSE: Currently, it is unknown whether formal research training has an impact on academic advancement in plastic surgery. The purpose of this study was to determine whether formal research training was associated with higher research productivity, academic rank, and procurement of extramural National Institutes of Health (NIH) funding in plastic surgery, comparing academic surgeons who completed research training with those without.

METHODS: This was a cross-sectional study of full-time academic plastic surgeons in the United States. The main predictor variable was formal research training, defined as completion of a postdoctoral research fellowship or attainment of a PhD. The primary outcome was scientific productivity measured by the h-index (the number of publications h that have at least h citations each). The secondary outcomes were academic rank and NIH funding. Descriptive, bivariate, and multiple regression statistics were computed.

RESULTS: A total of 607 academic surgeons were identified from 94 ACGME-accredited plastic surgery training programs. One hundred seventy-nine surgeons (29.5%) completed formal research training. The mean h-index was 11.7 ± 9.9. Fifty-eight (9.6%) surgeons successfully procured NIH funding. The distribution of academic rank was the following: endowed professor, 5.4%; professor, 23.9%; associate professor, 23.4%; assistant professor, 46.0%; and instructor, 1.3%. In a multiple regression analysis, completion of formal research training was significantly predictive of a higher h-index and successful procurement of NIH funding.

CONCLUSIONS: Current evidence demonstrates that formal research training is associated with higher scientific productivity and increased likelihood of future NIH funding.
The Impact of Resident Participation on Surgical Efficiency and Outcomes in Plastic Surgery

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PURPOSE: Our goal is to evaluate the growing pressures for surgeons to (1) be efficient, (2) decrease complications, and (3) teach residents.

METHODS: The American College of Surgeons National Surgical Quality Improvement Program database was queried to identify 5 isolated surgical procedures by CPT code. These were muscle flap trunk, abdominoplasty, unilateral breast tissue expander ± dermal substitute, unilateral breast reconstruction with abdominal free flap, and bilateral breast reduction. Cases were categorized based on presence or absence of a resident. Means and proportions were compared using the t test with P < 0.05 representing a significance.

RESULTS: A total of 1913 cases met inclusion criteria. Patient demographics did not significantly differ in 22 of the 25 parameters tested. For muscle flap trunk and unilateral breast reconstruction with abdominal free flap, operative times were significantly longer for cases performed with residents. For abdominoplasty and unilateral breast tissue expander ± dermal substitute, there was no significant difference in operative times based on resident participation. For bilateral breast reduction, the operative times were significantly shorter for cases performed with resident participation. The rate of complications did not differ based on resident participation in 4 of the 5 selected cases.

CONCLUSIONS: For complicated cases, resident involvement is associated with longer operative times. For basic procedures, resident involvement is not associated with longer operative times. The concept of valued resident education in opposition with surgical efficiency and safety requires discussion to optimize conflicting interests.

Ex Utero Rescue of Cleft Lip by Exogenous Reactivation of Craniofacial Developmental Programs

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PURPOSE: Cleft lip/palate (CLP) is the most common congenital craniofacial anomaly, with a high global incidence. We previously developed a unique compound Pbx-deficient murine model with fully penetrant CLP and demonstrated genetic rescue strategies to reconstitute Wnt signaling and correct midface clefting. We now seek to restore Wnt-mediated craniofacial development programs in our Pbx-deficient embryonic murine model using microsurgical intervention ex utero.

METHODS: After implantation of Wnt-9b soaked type 1 collagen microspheres at the midface lambdoidal (λ) junction, a novel whole embryo culture method was used to grow mouse embryos ex vivo after gestation day E11.5 for 24 hours in culture. Titration assays were conducted to optimize the dose of Wnt by assessing protein content, release kinetics, and its range of action in the embryonic face with regard to space and time. Correction of CLP was assessed by gross morphology, histology, and evaluation of the restoration of apoptotic programs.

RESULTS: After implantation of Wnt-soaked microspheres, X-gal staining showed the increased expression of Wnt-9b at the λ junction, and Pbx-deficient embryos showed restored formation of the midface λ junction when compared with the untreated contralateral side.

CONCLUSIONS: The ex vivo microsurgical correction of CLP via a collagen microsphere-based protein delivery system is a promising and innovative strategy, which may lead to prenatal surgical correction of CLP and as well as other congenital head and neck disorders.
Primary Cleft Lip and Nasal Repair with and without Nasoalveolar Molding: A Prospective Multicenter Study

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PURPOSE: We present a prospective, multicenter study comparing outcomes of primary cleft lip and nasal reconstruction with and without nasoalveolar molding (NAM).

METHODS: One hundred ten infants with cleft lip/palate were prospectively studied through 6 high-volume cleft centers. Study participants were nonrandomized to undergo NAM before primary repair (n = 62) or NO-NAM (n = 48). Caregivers rated the severity of their child’s deformity using the Extent of Difference scale preoperatively and at 1 year of age. Standardized photographs of 54 randomly selected study patients were rated by a blinded expert surgeon using the Extent of Difference scale.

RESULTS: Caregivers of NAM patients reported greater improvement in their child’s appearance compared with caregivers of NO-NAM patients (P < 0.05). This improvement was most apparent in the nose: the NO-NAM group showed no significant improvement in the nose over time (B = −0.19, P = 0.299), whereas the NAM group showed a 3-fold greater improvement over time (B = −0.58, P = 0.007). Expert clinician ratings indicated that NAM-treated infants had facial deformities of greater severity at pretreatment (P < 0.05). In addition, there was greater improvement in appearance after surgery in NAM-treated patient. This difference was most evident in the nose (B = −0.52, P = 0.025). There was no statistical difference in postoperative appearance between the NAM and NO-NAM group by clinician rating.

CONCLUSIONS: NAM provides significantly greater improvement in facial appearance after primary cleft lip and nasal repair compared with patients who undergo NO-NAM.

Intrinsic and Extrinsic Dental Predictors for Maxillary Hypoplasia and Le Fort I Advancement in Cleft Patients

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PURPOSE: Severe maxillary hypoplasia in cleft patients is caused by a combination of pathogenic and iatrogenic factors. In this study, we evaluated the anatomic deficiencies and manipulation of dentition for predicting Le Fort I maxillary advancement surgery for severe maxillary hypoplasia in cleft patients.

METHODS: Cleft lip/palate and cleft palate patients older than 15 years at 2 institutions (University of California Los Angeles and the Los Angeles Orthopaedic Hospital) were retrospectively reviewed. Chi-square tests, t tests, and multivariate logistic regression analyses were performed to delineate the contribution of quantity and position of dental agenesis to maxillary advancement surgery.

RESULTS: In the 214 patients reviewed (mean age, 19.7 years), 61.5% had dental agenesis, and 49.6% required Le Fort I advancement. In patients without dental agenesis, 22.4% required Le Fort I advancement versus 70.1% of patients with dental agenesis (P < 0.0001). When dental agenesis was treated with canine substitution, Le Fort I advancement increased to 81.1% (P < 0.0001). Both SNA (P = 0.02) and ANB (P = 0.004) measurements were decreased in patients missing dentition. Multivariate logistic regression analyses demonstrated that both dental agenesis and orthodontic canine substitution are independent predictors for Le Fort I advancement surgery (odds ratio, 3.5; confidence interval, 1.55–7.90, P = 0.003; and odds ratio, 3.5; confidence interval, 1.56–7.68; P = 0.002, respectively).

CONCLUSIONS: Dental contributions to maxillary hypoplasia in cleft children stem from intrinsic and extrinsic factors. Dental agenesis, as an anatomic readout of intrinsic growth deficiency, and canine substitution, as an extrinsic maneuver to correct cleft spaces, were both strongly associated to maxillary hypoplasia–predicted subsequent Le Fort I advancement.
11 Soft-Tissue Reduction and Fixation: The Missing Link in the Correction of Traumatic and Congenital Interorbital Deformities: A Single Surgeon’s 30-Year Experience

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PURPOSE: Management of the medial canthi and adjacent soft tissue in traumatic and congenital interorbital deformities are often disappointing requiring secondary canthopexies and soft-tissue revisions. The purpose of this article is to describe techniques refined over 30 years of management of the medial canthi and adjacent soft tissue in an effort to improve results and reduce revisional procedures.

METHODS: The author’s 30-year experience in the treatment of more than 650 interorbital reconstructions, 500 complex nasoethmoid orbital fractures, 54 congenital orbital hypertelorism patients, and more than 100 posttraumatic interorbital reconstructions, is the basis of the surgical techniques described.

RESULTS: The following soft techniques and principles are described: (1) wiring techniques with medial canthi reinforcement versus reinsertion, (2) the inadequacy of the simple canthopexy, (3) the amount of over reduction needed, (4) dermal fixation using the concept of progressive tension, (5) the importance of nasal height restoration, and (6) soft-tissue compression bolsters of the medial canthal area. Using these techniques revisional medial canthopexies were required in 7% of congenital deformities and 2% of traumatic deformities.

CONCLUSIONS: Successful management of traumatic and congenital interorbital deformities must include meticulous medial canthi and soft-tissue fixation and contouring that are often overlooked. Application of the surgical technologies described has enhanced aesthetic outcomes, has reduced revisional surgery, and can be the key to improving results of this complex area.

12 Impact of Fronto-Orbital Advancement on Frontal Sinus Morphology and Disease in Craniosynostosis

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PURPOSE: Fronto-orbital advancement (FOAR) potentially injures frontal sinus buds, leading to poor pneumatization and rhinosinusitis. This study aims to measure frontal sinus volume and incidence of sinusitis in craniosynostosis patients who have undergone FOAR and to compare them with controls.

METHODS: We conducted a retrospective review of all craniosynostosis patients treated with FOAR in infancy at our craniofacial center. Frontal sinus morphology and volume were assessed with Mimics. Sinus disease was defined as mucosal thickening or sinus fluid. Unaffected age-matched controls were identified from a facial trauma database.

RESULTS: We included 100 craniosynostosis and control subjects. The rate of frontal sinus pneumatization was 81% in syndromic craniosynostosis, 94% in nonsyndromic craniosynostosis, and 95% in control subjects ($P = 0.172$). Average volume was 4.46 ml in syndromic craniosynostosis, 4.13 ml in nonsyndromic craniosynostosis, and 4.38 ml in control subjects ($P = 0.9311$) and was significantly correlated with the age at which the computed tomography scan was performed ($P = 0.0034$). Pneumatization rates and volume did not significantly correlate with age of initial FOAR, number of frontal surgeries, or age at most recent surgery. Evidence of frontal sinus disease was highest in the syndromic group ($P = 0.002$), with 3 syndromic patients requiring surgical intervention for frontal sinus disease.

CONCLUSIONS: Although syndromic patients demonstrated lower pneumatization rates and higher sinus disease rates, FOAR does not significantly impact frontal sinus development and pathology.
13 Optical Coherence Tomography Can Noninvasively Detect Elevated Intracranial Pressure in Children

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PURPOSE: Detecting elevated intracranial pressure (ICP) in patients with craniosynostosis may enable timely intervention to prevent neurocognitive impairment, but it is challenging with conventional methods. This study employed spectral-domain optical coherence tomography (OCT) to noninvasively quantify retinal laminae and sought to determine both the diagnostic validity of this modality and the patterns of elevated ICP among children with craniosynostosis.

METHODS: Quantitative retinal parameters were assessed using perioperative OCT in 106 subjects (age, 0.2–18 years). OCT findings in 30 patients with intracranial pathology (craniosynostosis or hydrocephalus) who also underwent direct intraoperative ICP measurement were compared with 31 age-matched negative controls. Cut-points of pathology were derived from the 95% confidence interval of negative controls and receiver operating characteristic curves. These diagnostic parameters were then applied to the overall cohort of 71 craniosynostosis patients to determine the patterns of elevated ICP among children with craniosynostosis.

RESULTS: ICP correlates significantly with OCT parameters: maximal retinal nerve fiber layer thickness, maximal retinal thickness, and maximal anterior retinal projection (r ≥ 0.38, P ≤ 0.04). OCT-measured retinal parameters demonstrated 93% sensitivity and 73% specificity for detecting elevated ICP. OCT parameters had high intereye agreement [intraclass correlation coefficient (ICC), 0.83–0.93] and high intragrader and intergrader agreement (ICC ≥ 0.94). When applied to all craniosynostosis subjects, 22 (47%) of 47 undergoing initial cranial vault expansion had elevated ICP. Median age at initial expansion trended toward being greater among those with elevated ICP (11.4 vs 7.8 months, P = 0.06).

CONCLUSIONS: OCT is both sensitive and specific at noninvasively detecting elevated ICP in craniosynostosis patients and may alter treatment patterns in this population.

14 Computer-Aided Design and Manufacturing in Nonsyndromic Cranial Vault Reconstruction Is Not Associated with Improved Surgical Outcomes: A Single Institution’s Experience

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PURPOSE: The surgical correction of pediatric cranial deformities has in the past 2 decades undergone a large paradigm shift. The development of computer-aided design and manufacturing (CAD/CAM) has the potential to revolutionize craniofacial reconstruction. Although the adoption of CAD/CAM has rapidly expanded, there is a paucity of data exploring whether its use improves surgical outcomes over conventional methods.

METHODS: A retrospective cohort with matched design was conducted for patients with nonsyndromic craniosynostosis who underwent primary cranial vault remodeling from 2009 to 2015. Patient demographics and characteristics were recorded. Postoperative outcomes were assessed by assigning each procedure to a Whitaker category. Secondary postoperative outcomes were recorded including complications, operative time, and length of stay. We used parametric and nonparametric statistical tests for matched data to assess the association between use of CAD/CAM and surgical outcomes.

RESULTS: A total 40 patients were identified in this study period. CAD/CAM cases (n = 20) and matched controls (n = 20) did not differ in baseline characteristics. Whitaker scores of 2 or more were more common in CAD/CAM cases (25%) than controls (5%), which was statistically significant (P = 0.046). However, among secondary outcomes, we found no difference in intraoperative and postoperative complications between CAD/CAM cases and controls. Although the use of CAD/CAM was associated with shorter length of stay (P = 0.016), there was a trend toward longer operative time with the use of CAD/CAM (P = 0.052).

CONCLUSIONS: Our findings provide evidence that CAD/CAM may not improve the efficiency of craniofacial reconstruction and help optimize surgical outcomes.
Deoxycholic Acid for Correction of Submental Convexity

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PURPOSE: In 2015, the Food and Drug Administration approved deoxycholic acid as a treatment of submental convexity. However, clinical trials have reported that what we feel is an unacceptable complication rate. This study sets out to analyze the complications reported. Also, we review the anatomy and present injection techniques to avoid complications associated with administering deoxycholic acid.

METHODS: Results from clinical trials were evaluated, and the reported adverse reactions were assessed. A review of the anatomy was conducted, and technical considerations to minimize complications were outlined.

RESULTS: A total of 1019 patients were enrolled in 2 double-blind placebo-controlled clinical trial. Adverse reactions lasting more than 30 days occurred in 10% of enrolled subjects. Major complications included injuries to the marginal mandibular nerve and were seen in 4% of patients. This could be compared with less than 1% of patients treated with placebo. Paresthesia was present for up to 298 days (median of 44 days). Two percent of patients complained of dysphagia lasting for 1 to 81 days. Minor complications, such as edema, swelling, or hematoma formation, were seen in 87% and 72% of patients.

CONCLUSIONS: Deoxycholic acid introduces an additional therapeutic option for patients with excess submental fat. However, the rates of major and minor complications, such as marginal mandibular nerve injury and dysphagia, are unacceptably high. Screening patients for other potential cases of submental fullness, as well as reviewing the anatomic landmarks, can improve the efficacy and safety of treatment of submental convexity with deoxycholic acid.

Risk Factors for “Melasma-Like Hyperpigmentation” Induced by Intense Pulsed Light Therapy in Asians and Its Prevention: A Retrospective Clinical Case-Control Study

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PURPOSE: It was reported that IPL-induced melasma-like hyperpigmentation (MLH) would eventually lead to melasma. The study investigated the manifestation, influence factors, and preventive techniques of MLH.

METHODS: Six hundred seventy-five Asian patients with Fitzpatrick skin types III to IV treated with IPL were retrospectively studied.

RESULTS: Symmetric MLH was identified in 20 of 675 cases (2.96%; 2 male, 18 female). The mean age of 20 patients was 32.25 ± 5.79 years. The number of IPL treatment sessions was 2.20 ± 0.08. Twelve of the 20 cases were diagnosed as photoaging (60%) and 8 as freckles (40%). The pigmentary lesions of 14 of the 20 cases (70%), including 8 of the cases with prior photoaging and 6 with prior freckles, were characterized by multiple and widespread pigmentation with unclear edges and fusion trends that were diagnosed as “melasma trend” skin lesions. Six of the 20 cases with MLH (30%) had “strong” reactions after IPL treatment. Six (6/20, 30%) in the MLH group were not regular users of sunscreen. The non-MLH 655 subjects were aged from 15 to 65 years (mean, 34.48 ± 8.89 years), comprised 21 male and 634 female subjects, and had undergone 2.24 ± 0.13 IPL treatment sessions. Influence factors including freckles, “melasma trend” lesions, and strong post-IPL reactions were found to be statistically significant risk factors (P < 0.05).

CONCLUSIONS: MLH is an adverse event of IPL therapy in Asians. To avoid this complication, IPL users should be aware of the age, skin condition, and parameters setting of IPL.
A Comparison of \( \beta \) Receptor Specificity on Infantile Hemangioma Gene Expression and Microvascular Density

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PURPOSE: Infantile hemangiomas demonstrate involution after oral and topical \( \beta \) blockers. We sought to determine (1) administration route on tumor involution, (2) \( \beta \) receptor selectivity on gene expression, and (3) effect of mesenchymal cell type on gene expression.

METHODS: Human infantile hemangioma endothelial stem cells (HemESCs) and endothelial cells were grown to 90% confluence, and media was exchanged to 50 \( \mu \)g/\( \mu \)l and 100 \( \mu \)g/\( \mu \)l concentrations of metoprolol (\( \beta \)-1 blocker) and propranolol (nonselective \( \beta \) blocker), respectively, for 72 hours. Reverse transcription polymerase chain reaction was used to assess gene expression of HIF-a, VEGF-a, VEGF-a1 receptor, VEGF-a2 receptor, and PDGF-\( \beta \). The dorsum of 8-week-old nude athymic mice were injected with 200 \( \mu \)l of HemESCs and human infantile hemangioma endothelial cells in matrigel at 1 \( \times \) 10^6 cells/\( \mu \)l per cell line. Six mice per \( \beta \) blocker per route were treated with 0.2 mg/kg oral, local injection of 0.2 mg/kg, or 1% topical preparations twice daily for 2 weeks during when tumors were explanted. Differences in tumor volume and microvascular density were analyzed.

RESULTS: HemESCs exposed to propranolol had a 1.5-fold reduction in expression of HIF-a and VEGF-a in a dose-dependent manner (\( P = 0.05 \)). There were no differences in tumor volume between administration routes; however, oral administration trended toward greater reduction in microvascular density (\( P = 0.08 \)).

CONCLUSIONS: Nonselective \( \beta \) blockade leads to greater inhibition of HIF-a and VEGF-a compared with selective \( \beta \) blockade, particularly in HemESCs. Oral administration of \( \beta \) blockers appears to produce greater reduction in microvascular density.

Orthognathic Consequences of Sphincter Pharyngoplasty in Cleft Patients: A 2-Institutional Study

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PURPOSE: Understanding long-term sequelae of cleft treatment is paramount in the refinement of treatment algorithms to accomplish optimized immediate and long-term outcomes. In this study, we reviewed sphincter pharyngoplasties as a method of velopharyngeal insufficiency (VPI) treatment in relationship to orthognathic surgery.

METHODS: Cleft lip/palate and cleft palate patients, 15 years of age and older, were reviewed for demographics, VPI surgery, revisions, and subsequent orthognathic surgery at 2 institutions. Chi-square, Student’s \( t \) test, and logistic regression analyses were performed.

RESULTS: In 214 patients reviewed (mean age, 19.5 years), 61.7% were male, 18.2% had isolated cleft palate, 61.5% had unilateral cleft lip and palate, and 20.7% had bilateral cleft lip and palate. A total of 33.6% were diagnosed with VPI and received a sphincter pharyngoplasty (mean age, 11.9 years). When subsequent orthognathic surgery was examined, sphincter pharyngoplasty was not associated with maxillary advancement (\( P = 0.59 \)), but did correlate with an increase in mandibular surgery from 2.8% to 11.1% (\( P = 0.02 \)). The indications for mandibular surgery in the pharyngoplasty population were related to congenital micrognathia. When cephalometric analyses were evaluated, sphincter pharyngoplasty resulted in a decreased SNB angle (mean, 79.0–76.3 degrees, \( P = 0.02 \)) and a higher incidence of normal to class II maxillomandibular relationships as defined by ANB angles >0.5 (\( P = 0.02 \)).

CONCLUSIONS: Sphincter pharyngoplasty decreases anterior mandibular growth and the discrepancy between maxillomandibular skeletal relationships because of the frequent predisposition of cleft patients to maxillary hypoplasia. In patients with congenital mandibular micrognathia, a small increase in mandibular surgeries may occur.
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Speech, Language, and Cognitive Delays in Patients with Nonsyndromic Single-Suture Craniosynostosis

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PURPOSE: Nonsyndromic craniosynostosis (NSCS) patients are at risk of neurodevelopmental delay. Although many metrics have been analyzed, few have directly examined early language acquisition and speech development. Our purpose was to determine whether infants with NSCS have normal language acquisition and speech development.

METHODS: Patients with NSCS presenting from 2000 to 2014 were queried. Those with identified syndromes were excluded. Data elements included age, gender, Pittsburgh Weighted Speech Score, evaluation for anatomic motor delay, language/speech delay, articulation/phoneme deficiency, hypernasality, velopharyngeal insufficiency or borderline competency, and whether speech therapy was recommended. Diagnosis of a submucous cleft palate (SMCP) was noted. All patients were evaluated by a certified speech and language pathologist.

RESULTS: One hundred sixty-five patients met our criteria. A total of 58.2% were male. Average age at time of most recent speech evaluation was 6.2 years (range, 1.3–17.95). A total of 48.5% had normal speech/language metrics. A total of 51.5% had 1 or more abnormalities, including anatomic motor delay/disorder (20.6%), speech/language delay (21.2%), articulation/phoneme deficiency (6.1%), hypernasality (12.1%), and velopharyngeal insufficiency or borderline competency (20.0%). A total of 27.9% (n = 31) of patients were recommended to have speech therapy. A total of 17.6% were diagnosed with a SMCP. Of those patients for whom speech/language therapy was prescribed, the average Pittsburgh Weighted Speech Score at most recent follow-up was 2.9 (range, 1–5). Two patients were documented to have global cognitive delay.

CONCLUSIONS: We find that almost 1 in 5 patients with NSCS carry a diagnosis of SMCP. Defective speech and language development necessitating therapy occurred in 1 in 4 patients with NSCS, a prevalence 2 to 3 times higher compared with the general population.

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Assessing Risk Factors for Hospital-Based Acute Care within 30 Days of Craniosynostosis Surgery using the Healthcare Cost and Utilization Project

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PURPOSE: The purpose of this study is to identify risk factors for hospital-based acute care (HBAC) in the perioperative period in craniosynostosis patients.

METHODS: By using 4 state-level databases, we conducted a retrospective cohort study of patients younger than 3 years who underwent surgery for craniosynostosis. The primary outcome was the use of HBAC (emergency department visit or hospital readmission) within 30 days of discharge. Multivariate logistic regression modeling was used to identify patient-level factors associated with the outcome.

RESULTS: The final sample included 1120 patients. Patients were an average of 4.6 months old; 68.1% were male, 42% white, 25% Hispanic, and 6% African American. Ninety-nine patients (8.8%) had at least 1 HBAC encounter within 30 days. The most frequent indications for HBAC were surgical site infection, fever, or nausea/vomiting, and most encounters occurred in the emergency department without inpatient admission (59.3%). Average charge per encounter was $16,752. In univariate analysis, older age, race, insurance status, and longer initial hospitalization were significantly associated with HBAC. In multivariate analysis, only African American race [AOR = 5.98 (1.49–23.94)] and Hispanic ethnicity [AOR = 5.31 (1.88–14.97)] was associated with more frequent HBAC encounters.

CONCLUSIONS: These data reveal that HBAC occurs in approximately 10% of craniosynostosis patients perioperatively and that race and socioeconomic status are independent risk factors. Developing strategies to mitigate these disparities will be the focus of future research.
Whole-Proteome Analysis and Immunohistochemical Staining of Craniosynostotic Tissue Suggest a Link between Inflammatory Signaling and Osteoclast Activation in Cranial Suture Patency

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PURPOSE: Nonsyndromic craniosynostosis can be associated with developmental delay, hearing and visual impairment, and craniofacial asymmetries. Despite its relatively high prevalence, the pathophysiology remains poorly understood. We previously identified proteins differentially expressed in patent and fused cranial sutures by comparing their respective proteomes. Here, we analyze these proteins using immunohistochemistry.

METHODS: Fused and patent suture samples were obtained from 5 craniosynostotic patients (age, 3–12 months) undergoing cranial vault reconstruction at a single academic medical center. Protein was extracted from samples and interrogated using mass spectrometry. Differential protein expression was determined using the maximum likelihood-based G-test with q value cutoffs of 0.5 after correction for multiple hypothesis testing. Immunolocalization of lead protein candidates was performed in patent and fused sutures.

RESULTS: Proteins differentially expressed in patent versus fused sutures included the proinflammatory mediator FMOD and multiple collagen proteins including Col6A1. Maximum likelihood-based G-test suggested that Col6A1 and FMOD are highly expressed in patent sutures compared with fused. Immunohistochemical staining of sutures demonstrated Col6A1 up-regulation in patent sutures (A) compared with fused (B).

CONCLUSIONS: These results suggest that Col6A1 may aid in the regulation of suture patency. Previous reports linking Col6A1 with the RANK-RANKL osteoclast activation pathway in rheumatoid arthritis suggest a link between osteoclast and inflammatory signaling inactivation and premature cranial suture fusion. These preliminary findings may have considerable therapeutic implications, although additional validation studies are required.

Empirical Validation of the Operative Entrustability Assessment Using Resident Performance in Autologous Breast Reconstruction

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PURPOSE: Evaluating resident skill acquisition is challenging, particularly for surgical specialties. The required ACGME Next Accreditation System documentation increases evaluation burden to individual training programs. In 2013, we developed the Operative Entrustability Assessment (OEA) to facilitate compliance with ACGME-mandated changes and to document resident operative performance at point of care. This web-based tool allows real-time and transparent operative skill evaluation. The aim of this study was to evaluate the construct validity of OEA, as reflected by associations with clinical process indicators.

METHODS: We reviewed autologous-based breast reconstructions since implementation of OEA. We assessed associations between self-assessment and evaluator OEA scores and operative time using analysis of variance and multivariable linear regression.

RESULTS: From September 2013 to July 2015, 94 OEAs were completed for autologous breast reconstructions. Average OEA scores were 4.28 (±0.85) for self-assessment and 4.06 (±0.95) for attending evaluations. Self-assessed OEA was significantly associated with shorter operative time (32.64 minutes per OEA level; P = 0.047), even after adjusting for confounding (P = 0.008). We found weak evidence for an association between evaluator OEA scores and operative time (28.33 minutes per OEA level; P = 0.055), which was significant after adjusting for confounding (P = 0.018).

CONCLUSIONS: OEA demonstrates construct validity as increasing competency level is negatively correlated with operative time, adding evidence to the usefulness of this tool through which programs and residents can evaluate real-time progress while complying with ACGME requirements.
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Gender and Ethnicity Disparities within Plastic Surgery Leadership: A Role for Enhanced Mentorship

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PURPOSE: Mentorship plays a vital role in the career development of young surgeons. We aim to evaluate gender and ethnicity representation in plastic surgery (PS) leadership compared with the field as a whole in an effort to improve structured mentorship avenues.

METHODS: Sixteen national PS organizations were reviewed for gender and ethnicity (self-identified) data within their leadership and for structured mentorship pathways. Resident and student data were compiled from publically accessible ACGME and AAMC data.

RESULTS: Although women represent increasing proportions of both training and practicing plastic surgeons, they are underrepresented in many leadership roles; 4 of 16 boards and 10 of 14 presidential ascensions contain no women. African Americans and Hispanics are severely underrepresented in leadership across the field. Nineteen percent of programs offered structured mentorship programs, in which less than 7% of active members participated.

CONCLUSIONS: Based on the 16 major PS organizations: (1) There remains a discrepancy in female representation in executive leadership. (2) Leadership by self-identified African Americans or Hispanics was absent within our major organizations, with African Americans represented by a single Program Director. (3) Formal mentorship programs are meager and have limited participation, particularly by those groups who are most severely underrepresented in PS leadership. We recommend that each major organization reexamine its ascension to leadership and develop structured programs by which future leaders are identified and mentored.

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Positive Margins after Mohs Excision: Incidental Findings of 144 Reconstructions in the Head and Neck

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PURPOSE: Mohs excision of cutaneous malignancies reportedly assures complete circumferential peripheral and deep margin assessment. Therefore, when assessing a patient after Mohs resection, the reconstructive surgeon accepts that there is no residual tumor. Is this assumption correct?

METHODS: During a 4-year period (2010–2013), a single surgeon (P.N.M.) performed 144 reconstructions of head and neck Mohs defects. Referrals came from 3 different Mohs surgeons. At the time of reconstruction, approximately 1 mm of surrounding peripheral and/or deep tissue was routinely excised to create a virgin wound bed. These additional margins were sent for permanent pathology.

RESULTS: Reconstructive surgery was performed after Mohs resection of 116 basal cell carcinomas, 19 squamous cell carcinomas, and 9 melanomas. The average defect size was $5.7 \pm 7.9 \text{ cm}^2$. Defects were most commonly reconstructed with local flaps (56%), followed by wide undermining and primary closure (38%). Only 5 defects (3%) required skin grafts. Additional permanent peripheral and/or deep margins were sent in 82% of cases. In 7 (5%) of these cases, these margins were positive for persistent malignancy. All positive margins occurred after basal cell carcinoma resection.

CONCLUSIONS: Pathologic analysis of additional margins after completed Mohs resection occasionally reveals persistent tumor. The clinical impact of these findings is unclear, but the reconstructive surgeon should be aware that Mohs excision does not guarantee clear margins.
Optimizing Outcome of Pharyngoesophageal Reconstruction and Neck Resurfacing: 10-Year Experience following 294 Cases

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PURPOSE: Pharyngoesophageal reconstruction is challenging. This series examines factors impacting the need for additional neck skin resurfacing and evaluates the impact of reconstructive modalities on outcomes.

METHODS: A review identified 294 patients who underwent pharyngoesophageal reconstruction from 2002 to 2012. Patients were divided based on neck skin resurfacing requirements. Patients undergoing neck resurfacing were further subdivided into reconstructive technique, including a second skin paddle or muscle component from the same free flap pedicle, a pectoralis major flap, or a second free flap. All groups were compared by comorbidities, complications, and functional outcomes.

RESULTS: Of 294 patients, 179 patients (60.9%) required neck skin resurfacing. In the resurfaced group, there were 90 (50.3%) circumferential defects and 89 (49.7%) partial defects. In the resurfaced group, 110 (61.4%) were reconstructed with a second skin paddle from the same free flap pedicle, 21 (11.7%) were reconstructed with a muscle component from the same pedicle, and 25 (13.9%) received a pectoralis major flap. There were 5 external paddle flap losses in the resurfaced group (2.8%). There were no internal flap losses. Overall complications were similar among groups. The resurfaced group had a lower pharyngocutaneous fistula rate (4.5%) compared with the primary closure group (11.3%, P = 0.026). Previous neck surgery and radiation therapy were strong predictors of neck skin resurfacing (P < 0.001). Tracheoesophageal speech quality and post-operative diet were similar.

CONCLUSIONS: Neck resurfacing is often required in pharyngoesophageal reconstruction. Providing additional vascularized tissue over the neo-conduit is predictive of lower pharyngocutaneous fistula rates. An algorithmic approach is presented.

Aesthetic Outcome and Quality of Life after Breast Reconstruction: What Positively Influences Patient’s Satisfaction?

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PURPOSE: This study aims to establish factors influencing aesthetic outcomes and patient-reported quality of life after breast reconstruction.

METHODS: From 2009 to 2011, patients who underwent any type of reconstruction received postoperative BreastQ® questionnaires. Answers were compared according to patient and surgical related factors influencing breast-related quality of life. Postoperative photographs from patients who answered the questionnaire were graded by a 6-member blinded panel with a multiparameter breast-specific scale (scored 1–5).

RESULTS: Two hundred sixty-one of 820 patients answered the questionnaires. Median length of follow-up was 48 (38–60) months. Satisfaction with breasts was higher in autologous reconstruction (ABR; P < 0.05), bilateral reconstructions (BiRs; P < 0.01), and patients with body mass index (BMI; 25–29.9 vs >30 kg/m²; P < 0.05). Sexual well-being was higher in patients with nipples either preserved or reconstructed (P < 0.05). Radiation therapy (RT) was associated with lower satisfaction with outcome (P < 0.05) and physical well-being (P < 0.01). Psychosocial well-being was higher without RT (P < 0.01), and BMI was 25 to 29.9 vs >30 kg/m² (P < 0.01). One hundred forty-seven postoperative photographs were evaluated. Superior aesthetic outcomes were observed for ABR versus implant-based reconstructions, no-RT versus RT, and BiR versus unilateral. There was a correlation between the aesthetic outcome and patient satisfaction with breasts (r = 0.32, P < 0.001).

CONCLUSIONS: Overall, patient satisfaction with breasts and aesthetic outcomes are highest with ABR, BiR, and without RT. The presence of lower BMI and nipple reconstruction positively influence satisfaction. An aesthetically pleasant breast does not guarantee patient satisfaction.
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Breast Cancer in the Previously Augmented Breast: Do Implants Delay Detection?

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PURPOSE: Patients considering breast implant augmentation (IA) fear that implant placement may impair the early detection of breast cancer and lead to worse prognosis. This study assessed whether breast IA is associated with more advanced breast tumors at the time of therapeutic mastectomy.

METHODS: Breast cancer stage distribution at diagnosis was retrospectively analyzed for 90 women with previous IA who underwent therapeutic mastectomy at a single institution from 1993 to 2014 (mean follow-up, 3.6±3.6 years). Comparison was made with all women without IA undergoing therapeutic mastectomy at the same institution in 2010 (n = 171). Subanalyses were performed according to implant characteristics.

RESULTS: Ninety women with previous IA underwent mastectomy for 96 breast cancers at a mean interval of 15.4±10.8 years after IA surgery. Mean age at cancer diagnosis was 52.4±10.7 years. Compared with non-IA women, women with previous IA were leaner (P<0.01) and more commonly white (P<0.01). Breast cancer stage at diagnosis was similar for both groups (P=0.28). Among IA patients, subglandular implants were associated with later stage breast cancers (P<0.01) and detection by self-palpation (P=0.04), compared with subpectoral implants.

CONCLUSIONS: This institutional study is the largest to assess breast cancer detection among women with previous IA according to implant characteristics. Breast cancer stage distribution did not differ for women with and without IA. In the IA cohort, women with subglandular implants presented with more advanced breast tumors in palpable form.

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Objective Effects of Breast Reduction Surgery on Physical Fitness

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PURPOSE: Reduction mammoplasty is a procedure known for excellent outcomes and patient satisfaction. Several studies subjectively document improvement in pain, weight loss, and exercise. However, objective data on physical fitness benefits are limited.

METHODS: By using the Stanford Military Data Repository, 105 US Army active duty women undergoing reduction mammoplasty from 2011 to 2014 were identified. Paired t tests were used to compare the means of preoperative versus postoperative Army Physical Fitness Test (APFT) scores including total score, push-ups, sit-ups, and a timed 2-mile run. The relative differences in each individual’s preoperative and postoperative scores were also analyzed.

RESULTS: Of the 105 women with complete APFT records before and after surgery, 65% percent of patients improved in total scores. The means for the patients’ total APFT scores increased (236 preoperative vs 243 postoperative, P = 0.014). Significant differences are seen for the 2-mile run (75 preoperative vs 78 postoperative, P = 0.022) and sit-up test (77 preoperative vs 80 postoperative, P = 0.007). For the 33 subjects with at least 2 scores before and after surgery, 73% showed an improvement in total score after surgery. The difference in means was significant (235 preoperative vs 246 postoperative, P = 0.004), and the individuals demonstrated an average 5.2% relative improvement in scores (SD, 9.3; P = 0.005).

CONCLUSIONS: Objective improvements in physical fitness were demonstrated by US Army active duty women after reduction mammoplasty. Standardized testing in active duty soldiers can be used to objectively measure physical fitness after breast reduction surgery.
Fat Graft Protocol for Total Autologous Reconstruction after Nipple-Sparing Mastectomy in Irradiated and Nonirradiated Breasts

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PURPOSE: Rate of fat grafting take may depend on several issues including irradiated recipient beds. Its use in reconstruction of previously irradiated nipple-sparing mastectomy (NSM) needs further clarification.

METHODS: Between 2008 and 2014, 42 NSMs, mean weight of 358 g (range, 220-470 g; 29 patients), were prospectively enrolled in fat grafting reconstruction and stratified into group A (28 nonirradiated) and group B (14 irradiated). Fat tissue was dry harvested with 2/3 mm cannula and 10-ml syringe, centrifuged at 3000 rpm/3 minutes, and injected with a blunt cannula and 1-ml syringe in subcutaneous and submuscular layers. The injected fat volume for each session was equal to one third of the mastectomy weight. The rule of 30% more was applied from the second to the last session for the incomplete graft taking. Variables were analyzed using the Student t test and Kruskal-Wallis test considering P ≤ 0.05 as significant.

RESULTS: The 2 groups were homogeneous regarding demographics (P > 0.05), whereas number of sessions, mean volume of first 2 treatments, and overall injected showed significant difference (P = 0.003, P = 0.004, and P = 0.005, respectively). Volume, shape, breast mound position, inframammary fold, scar location subscales, and global score had high evaluation in both groups (P > 0.05), whereas skin texture and total subscales scored less in group B than in group A (P = 0.006 and P = 0.003).

CONCLUSIONS: The first prospective fat transfer reconstruction series, with systematic approach, showed overall pleasing aesthetic outcomes but needs more fat transfer sessions in irradiated NSMs.

The Impact of Neoadjuvant and Adjuvant Chemotherapy on Immediate Tissue Expander Breast Reconstruction

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PURPOSE: Delayed wound healing or infection leads to premature tissue expander (TE) explantation after immediate postmastectomy breast reconstruction. A large study with sufficient duration of follow-up focusing on the impact of chemotherapy on premature TE removal after immediate breast reconstruction is lacking.

METHODS: A retrospective review of patients undergoing immediate TE reconstruction was conducted. Multivariate analyses identified factors contributing to premature removal of TEs including neoadjuvant and adjuvant chemotherapy, specific chemotherapeutic regimens, and other factors like cancer stage, body mass index, smoking, radiation, and age. Kaplan-Meier curves were plotted to study the timing of premature TE removal.

RESULTS: Of 899 patients with TEs, 256 received no therapy, 295 neoadjuvant, and 348 adjuvant chemotherapy. Premature removal occurred more frequently in the neoadjuvant (17.3%) and adjuvant (19.9%) cohorts than the no chemotherapy (12.5%) cohort (P = 0.056). Premature TE removal occurred earlier (P = 0.005) in patients who received no chemotherapy than those with adjuvant chemotherapy. Radiation in patients receiving neoadjuvant chemotherapy prolonged the mean time to premature removal (P = 0.003). In the absence of radiation, premature removal occurred significantly sooner with neoadjuvant than adjuvant chemotherapy (P = 0.035).

CONCLUSIONS: Premature removal of a TE occurs more commonly in patients treated with neoadjuvant or adjuvant chemotherapy and is most commonly observed 2 to 3 months after placement—well after the follow-up period recorded by the National Surgical Quality Improvement Program database. These findings can be used to aid preoperative counseling and guide the timing of follow-up for these patients.
31 Percutaneous Mesh Expansion: A New Wound Closure Alternative

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PURPOSE: Puncture wounds less than 2 mm heal without scars. Stacking rows of 2-mm punctures offers a scarless method to generate tissue by mesh expansion. We describe percutaneous mesh expansion (PME) and present our experience with PME for wound closure.

METHODS: We applied PME to 43 consecutive patients aged 58 to 101 years (mean, 72 years) with 44 full-thickness calvarial defects 2.5 × 3 to 6 × 7 cm (mean, 3.5 × 4.0 cm) that would have all required flaps. Twenty-nine were still anticoagulated, and 18 had previous scalp resections. After tumescent epinephrine anesthesia, we temporarily approximate the wound by placing it under strong tension. By using 1.2-mm cutting point needles that selectively sever tissue under tension, we inflict rows of staggered alternating punctures over an area 5 × the defect size. This results in 20% expansion of the meshed area, generating the tissue necessary for defect coverage. When the tension is completely released, closure is done with simple sutures or staples. We avoid overmeshing, especially close to the wound edges, and performed no undermining and no additional incisions.

RESULTS: Defects healed with only a straight resection scar. However, of the 6 defects of >5 × 5 cm, 2 required a small skin graft. Aside from 4 cases of delayed wound healing, there were no other complications.

CONCLUSIONS: Contrary to standard flaps, relaxing incisions, and galea scoring techniques, this novel procedure harnesses the body’s natural regenerative capabilities to achieve a minimally invasive closure of complex wounds without additional scars.

32 Is Methodologic Quality Influenced by Industry Support? An Analysis of the Plastic Surgery Literature

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PURPOSE: Conflicts-of-interest (COI) are an emerging area of discussion within the field of plastic surgery. Recently, several studies have found that studies that disclose COI are associated with publication of positive outcomes. We hypothesize that this association is driven by industry’s funding of higher quality studies. This study aimed to investigate the association between industry affiliation and study methodological quality.

METHODS: We reviewed all entries in Plastic and Reconstructive Surgery, Annals of Plastic Surgery, and Journal of Plastic, Reconstructive, and Aesthetic Surgery within a 1-year period encompassing 2013. All clinical original research articles were analyzed. Studies were evaluated blindly for study methodology quality based on a validated scoring system. A logistic regression model was used to examine the association between methodology score and COI.

RESULTS: A total of 1474 articles were reviewed, of which, 489 met our inclusion criterion. These underwent methodologic quality scoring. COI were reported in 29 articles (5.9%). Although the prevalence of higher study methodology scores differed in studies that disclosed COI when compared with those that did not (P = 0.0042), there was no significant association between articles with COI and higher methodologic score (P = 0.8139) after adjusting for article characteristics such as plastic surgery subspecialty.

CONCLUSIONS: Plastic surgery clinical studies that disclose COI are not associated with higher methodologic quality when compared with studies that do not disclose COI. These findings suggest that although articles with COI are associated with the publication of positive findings, this association is not necessarily driven by higher quality studies.
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EZH2 Mediates Regulation of Mechanotransduction and Skin Regeneration for the Treatment of Skin Defect

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PURPOSE: For massive skin defect, skin tissue expansion has been demonstrated to be an effective and predominant treatment by inducing skin regeneration through mechanical stretch. However, the mechanotransduction in interfollicular epidermal stem cells (IFESCs) and the mechanism controlling the organized growth of IFESCs under stretch have not been explored.

METHODS: By using the mechanical stretch model of humans, mice in vivo, and IFESCs in vitro, we examined the proliferation status, mechanotransduction [the expression and location of yes-associated protein (YAP) and its target genes], and epigenetic status (DNA methylation and histone methylation) of epidermal stem cells during a long-term stretch.

RESULTS: Here, we report that mechanical stretch promotes short-term skin cell growth followed by long-term cell growth arrest. In patients undergoing long-term skin tissue expansion, the levels of histone H3 lysine 27 trimethylation and its histone methyltransferase, EZH2, are significantly elevated with suppressed Jagged-1 (JAG1), a proproliferation target gene of mechano sensor YAP, in the epidermal basal cells of patients’ skin. Under long-term mechanical stimulation, EZH2 is elevated and recruited to the nucleus where it competes with YAP for the binding of TEAD3, a DNA-binding protein facilitating the binding of YAP to the promoter region of JAG1 under short-term stretch, and forms repressive histone H3 lysine 27 trimethylation suppressing JAG1 transcription. Small-molecule inhibitor of EZH2 significantly rescues the long-term stretch-induced cell growth control in IFESCs.

CONCLUSIONS: These findings reveal for the first time the involvement of an EZH2-mediated feedback mechanism underlying temporal mechanotransduction in IFESCs and provide a strategy for promoting skin regeneration.

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Identification of Novel Gene Mutations in Lymphatic Malformation Patients

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PURPOSE: Lymphatic malformations are rare, sporadic congenital lesions found in lymphatic-rich tissues. Lymphatic channels become fluid filled and disconnect from the lymphatic system. Although lymphatic remodeling is done constantly in utero, 1 in 250 infants show nuchal translucency, an indicator of aberrant lymphatic development; however, 1 in 5000 newborns have lymphatic malformations. Thus remodeling must occur in utero. This article examines the genes associated with the lymphangiomas and classifies subsets of genes that may be important in downstream regulation.

METHODS: Eight lymphangioma samples with matching blood underwent whole-exome sequencing (WES) to identify somatic driver mutations. Data were preprocessed with MarkDuplicates (Picard) and BaseQualityScoreRecalibration (GATK). Variant calling was performed with HaplotypeCaller (GATK) and annotated using Annovar. The results of this discovery cohort were validated in an independent group of 30 samples using molecular inversion probe sequencing. This provided high-coverage targeted reads of genomic areas of interest identified in WES.

RESULTS: WES identified recurrent alterations to the PIK3CA gene in 3 of 8 samples. PI3K is an intracellular signaling pathway important for regulating cell cycle and cell proliferation. High-coverage targeted resequencing confirmed the variants and identified 10 additional samples with PIK3CA mutations. Twenty-three percent had the amino acid mutation at E542K and another 23% at E545K. The H1047R mutation occurred in the majority (54%) of patients.

CONCLUSIONS: We have identified 3 novel mutations in lymphangioma patients in the PIK3CA protein.
35 Free Tissue Transfer for the Reconstruction of Recurrent Incisional Hernias: An Alternate Approach to an Increasingly Common Problem

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PURPOSE: Ventral incisional hernias represent a common surgical challenge. Fascial defects lacking adequate overlying soft tissue represent the most complex cases, frequently requiring local or remote flaps for reconstruction. We reviewed our experience in the management complex abdominal wall defects using free tissue transfer.

METHODS: We performed a retrospective review of all recalcitrant ventral incisional hernias managed by free tissue transfer over the last 5 years. In our study, we included patients who were treated with a free muscular or a musculocutaneous flap containing vascularized fascia. In all identified cases, we collected information regarding patient demographics, previous hernia repairs, type of flap used, and long-term outcome.

RESULTS: A total of 7 patients with recurrent ventral incisional hernias treated with free tissue transfer were identified. All patients had an average of 5 or more previous abdominal operations or hernia repairs before free flap reconstruction. Five patients were treated with an anterolateral thigh flap with vascularized fascia lata used to bridge the fascial defect. Two patients were treated with a free latissimus dorsi muscle flap over biologic mesh. In all cases, the inferior epigastric artery and vein were used as recipient vessels. Albeit minor wound complications, all patients achieved excellent long-term outcomes with no recurrences more than a year postoperatively.

CONCLUSIONS: We propose an alternate approach to abdominal wall reconstruction in the setting of recurrent ventral incisional hernias; free flaps provide healthy, well-vascularized, autologous tissue that can restore abdominal wall contour and cover full-thickness defects in a single stage.

36 Wound Complications after Plastic Surgeon Closure of Index Spinal Surgeries

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PURPOSE: The role of plastic surgery in wound closure after complications from previous spinal surgery is well established. This study evaluates wound complications after plastic surgeon closure of the index spinal case.

METHODS: Spinal surgeries performed by a single spinal surgeon and closed by a single plastic surgeon at a large academic hospital were reviewed. Outcomes were compared with published National Surgical Quality Improvement Program outcomes.

RESULTS: Five hundred twenty spinal surgeries were reviewed, of which 310 (60%) were lumbar and 210 (40%) cervical. One hundred twenty-six patients (24%) had prior spinal operations. The average patient age was 55 years, and the average body mass index was 30 kg/m². Forty-one percent of patients had body mass index above 30 kg/m². One hundred ninety-one patients had hypertension, 78 had diabetes mellitus, 42 had coronary artery disease, and 10 had COPD. Postsurgery, there were 2 superficial wound infections, 2 deep wound infections, and 1 wound dehiscence requiring reoperation. There were 12 reoperations within 30 days and 7 readmissions during the same period.

CONCLUSIONS: Although plastic surgeon involvement in spinal surgery is often after the development of complications, plastic surgeon closure of the index spinal case lead to decreased wound complication, readmission, and reoperation rates when compared with outcomes published from National Surgical Quality Improvement Program in similar populations. Given the cost consciousness of today’s healthcare climate, these improved complication, readmission, and reoperation rates may translate into higher value care and should be examined further.
Antibiotic Prophylaxis in Abdominal Wall Reconstruction: Does It Decrease Surgical Site Infections? A Review of 5000 Cases

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PURPOSE: The use of antibiotics for prophylaxis for elective surgeries is a common practice among surgeons in an effort to prevent surgical site infections (SSIs). In many cases, the use of antibiotics is not only unnecessary but also dangerous resulting in serious complications. This study aims to assess the impact of antibiotic prophylaxis on SSIs.

METHODS: The Michigan Surgical Quality Collaborative Database was queried for patients undergoing elective abdominal wall reconstruction from 2013 to 2015. A logistic regression was performed to identify the independent predictors for SSIs development, and a composite score was created. The study population was divided into groups based on their score, and the impact of preoperative antibiotics was examined.

RESULTS: A total of 4983 patients were identified. The incidence of SSIs was 3.35% (n = 167). Based on the scoring system, 2 groups were identified regarding the development of SSI (low risk (<12), 0%–4% vs high risk (≥12), 7%–24%, P < 0.05). Preoperative antibiotics had no impact on the development of SSIs for the low-risk group [AOR (95% confidence interval), 2.04 (0.64–6.50)]. Interestingly, preoperative antibiotics reduced the probability of SSIs development by 50% [AOR (95% confidence interval), 0.51 (0.24–0.78)].

CONCLUSIONS: The proposed scoring system accurately predicts the development of SSIs in patients undergoing elective abdominal wall reconstruction. The use of the scoring system could guide the surgeon’s decision regarding administration of preoperative antibiotics.

Upper Extremity Lymphedema after Elective and Trauma Hand Surgery in Breast Cancer Survivors

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PURPOSE: To evaluate the risk of developing “late-onset” upper extremity lymphedema after hand surgery among breast cancer (BC) survivors who had ipsilateral axillary lymph node dissection (ALND), sentinel lymph node biopsy, and/or radiation therapy (RT).

METHODS: A retrospective cohort of BC survivors treated with ALND, sentinel lymph node biopsy, and/or RT was identified between 1997 and 2012. Survivors with ipsilateral hand surgery with ≥1 year of follow-up were included. The primary outcome was documented lymphedema after hand surgery (defined as requiring intervention). Demographic data and clinical information pertaining to hand surgery and BC treatment were compared between patients with and without lymphedema.

RESULTS: Of the 142 survivors included, 12 (8.4%) developed lymphedema after hand surgery. BC survivors with and without lymphedema were similar in age, body mass index, and tourniquet use. Average tourniquet time was greater among women with lymphedema (63 vs 34 minutes, P = 0.02). On univariate analysis, lymphedema was associated with a surgery for hand trauma (75% vs 23%, P = 0.002), RT (91% vs 50%, P < 0.01), ALND (75% vs 34%, P = 0.01), number of nodes removed (15 vs 7, P = 0.002), and chemotherapy (91% vs 34%, P = 0.02).

CONCLUSIONS: These data suggest that BC survivors, particularly after more extensive nodal dissection and adjuvant therapies, who have hand surgery for trauma may benefit from prophylactic antilymphedema modalities. Larger population studies of this high-risk population are needed to further address this question.
39 Oncologic Safety of Autologous Fat Grafting in Reconstructive Breast Surgery

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**PURPOSE:** Autologous fat grafting (AFG) is used in breast reconstruction to address contour deformity and improve radiation fibrosis. The purpose of this study was to review our experience with fat grafting in breast reconstruction with a focus on oncologic safety.

**METHODS:** We retrospectively reviewed our central database for patients who underwent AFG to the breast after mastectomy or breast conservation therapy between 2001 and 2014 and for matched patients with breast cancer who did not have AFG. The primary outcome of interest was local regional recurrence (LRR).

**RESULTS:** We found 719 patients who underwent AFG after breast cancer treatment versus 670 controls who did not have AFG. Average follow-up was 52 months. The majority of patients had mastectomy (640/719 AFG vs 597/670 controls). Overall, we found no difference in LRR rate between patients with AFG (1.3%) versus controls (2.4%; \( P = 0.45 \)). AFG did not affect the risk of LRR in subgroups including pathological stage, mastectomy type, hormone receptor status, or chemotherapy/radiation therapy. However, AFG patients treated with adjuvant hormonal therapy showed a slightly higher rate of LRR (1.4% vs 0.5%; \( P = 0.38 \)). We found no difference in systemic recurrence rate (2.4% vs 3.6%; \( P = 0.51 \)).

**CONCLUSIONS:** This represents the largest single-institution study that looks at the safety of AFG in breast cancer reconstruction. We demonstrate no significant difference in LRR or systemic recurrence between fat grafted cases and controls. Overall, we believe that these data support the oncologic safety of AFG in breast reconstruction surgery.

40 Reconstruction of the Radiated Breast: A National Claims-Based Assessment of Healthcare Resource Use

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**PURPOSE:** The complication and failure rates in radiated patients undergoing prosthesis-based breast reconstruction are high. We hypothesized that there is higher use of healthcare resources among radiated patients with prosthesis-based reconstruction compared with autologous reconstruction. We compared utilization of healthcare resources between radiated patients who underwent autologous and prosthesis-based reconstruction

**METHODS:** By using the MarketScan Claims database, we selected radiated patients who underwent mastectomy and breast reconstruction from 2009 to 2012. We tallied the costs of the use of healthcare services related to complications of reconstruction including emergency room visits, secondary admissions, and treatment of reconstruction failures. We used Wilcoxon rank-sum test to test our outlined hypothesis.

**RESULTS:** There were 4781 patients in the study. A majority of patients (n = 3846, 80%) had prosthesis-based reconstruction. Forty-five percent of prosthesis-based patients used healthcare services for complications compared with 31% for autologous patients. The mean cost of readmissions because of complications of reconstruction was $4842 for prosthesis-based patients compared with $2651 for autologous patients (\( P < 0.01 \)). In addition, 29% of prosthesis-based patients had failures compared with 4% of autologous patients. The mean cost of treating reconstruction failures for prosthesis-based patients was $2900 compared with $442 for autologous patients (\( P < 0.01 \)).

**CONCLUSIONS:** Prosthesis-based reconstruction remains more common than autologous methods for radiated patients. It is imperative to rethink the common use of prosthesis-based reconstruction methods in radiated patients because this study shows they are 7 times more likely to fail and cost 6 times more to reattempt reconstruction compared to autologous reconstruction.
One-Year Outcomes of the Mastectomy Reconstruction Outcomes Consortium Study Part I: Complications

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PURPOSE: In postmastectomy reconstruction, procedure choice is heavily influenced by the relative risks of the various options. We evaluated complications in a large, multicenter population of breast reconstruction patients.

METHODS: Eleven sites enrolled women undergoing first time, immediate, or delayed reconstruction after mastectomy for cancer treatment or prophylaxis. Procedures included implant-based latissimus dorsi, pedicle TRAM, free TRAM (FTRAM), and DIEP reconstructions. Clinical and demographic data were gathered preoperatively and postoperatively from medical records. Separate logistic regressions were conducted for all complications and major complications (requiring rehospitalization and/or reoperation) within 1 year. Odds ratios (ORs) were calculated for procedure, controlling for site, demographic, and clinical variables.

RESULTS: Complication rates for 1895 patients are summarized below. Regression indicated that compared with implant-based reconstruction, latissimus dorsi (OR = 2.02, P = 0.032), pedicle TRAM (OR = 1.96, P = 0.028), FTRAM (OR = 2.24, P = 0.004), and DIEP (OR = 2.19, P < 0.0001) procedures were associated with higher risks of complications. Significantly higher risks were also associated with older age, higher body mass index, immediate reconstruction, bilateral procedures, and radiation. For major complications, regression showed significantly greater risks for FTRAM (OR = 2.07, P = 0.016) and DIEP (OR = 1.76, P = 0.011) compared with implant-based reconstructions. Significant effects were noted for age, body mass index, laterality, and radiation.

CONCLUSIONS: In this multicenter study, procedure choice and other patient variables were significant predictors of 1-year complications. These findings should be considered in counseling patients on breast reconstruction options.

Late Surgical Site Infection in Immediate Implant-Based Breast Reconstruction

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PURPOSE: Surgical site infection (SSI) can cause devastating reconstructive failure in implant-based breast reconstructions. Many large national database studies have offered insights into complication rates but only captured early outcomes within 30 days postoperatively. This study evaluates both early and late SSI in immediate implant-based reconstruction and identifies predictors.

METHODS: By using a multicenter, prospective cohort, 863 implant-based breast reconstructions in 525 patients were evaluated. Early SSI was defined as infection occurring postoperatively within 30 days and late SSI as new infection occurring 31 to 365 days postoperatively. Minor infection required oral antibiotics only, and major infection required hospitalization and/or surgical treatment. Direct-to-implant (DTI) patients had 1-year follow-up, and tissue expander (TE) patients had 1-year postexchange follow-up.

RESULTS: Among 733 TE and 130 DTI reconstructions, overall SSI rate for TE was 7.2% in first stage, 2.0% in second stage, and 10.8% for DTI. More than 50% to 86% of SSI complications occurred as late SSI. Multivariate analysis identified radiotherapy with TE [odds ratio (OR) = 4.1, P < 0.01], breast cancer (OR = 3.1, P = 0.02), and body mass index (OR = 1.1, P = 0.01) as significant predictors of late SSI.

CONCLUSIONS: The majority of SSI among implant-based reconstructions occur later than 30 days after both first- and second-stage procedures. Radiotherapy, breast cancer, and body mass index are significantly associated with late-onset SSI. Current studies limited to early complications may not present an accurate assessment of infection complications for implant-based reconstructions or their long-term outcomes.
One-Year Outcomes of the Mastectomy Reconstruction Outcomes Consortium Study Part II: Patient-Reported Outcomes

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PURPOSE: The goal of postmastectomy reconstruction is to minimize deformity and optimize quality of life as perceived by the patient. This study prospectively evaluates patient-reported outcomes for breast reconstruction patients.

METHODS: Eleven sites enrolled women undergoing first time, immediate, or delayed reconstruction after mastectomy. Procedures included implant-based latissimus dorsi, pedicle TRAM, free TRAM, and DIEP reconstructions. Patients completed the BREAST-Q and PROMIS-29 preoperatively and at 1 year postsurgery. For each outcome, separate linear mixed-effects models were used to test for within-patient 1-year outcomes and to compare outcomes across procedure types. Both models were weighted for nonresponse and used site as random intercepts, and the latter was adjusted for baseline covariates.

RESULTS: One thousand five hundred fifty-two Mastectomy Reconstruction Outcomes Consortium patients were included, and 1130 (73%) responded to 1-year questionnaires. Across procedure types, immediate reconstruction patients experienced satisfaction with their breasts and psychosocial well-being equal to or better than preoperative status. Physical well-being of the chest was not fully restored (P < 0.001 implant patients; P = 0.02 autologous), nor was physical well-being of the abdomen for autologous patients (P < 0.001). Autologous patients reported greater satisfaction with their breasts compared to implant patients, adjusting for covariates (P < 0.001).

CONCLUSIONS: One year after surgery, patients experience satisfaction with their breasts equal to or greater than their preoperative status; physical well-being, however, is not fully restored. Patients who choose autologous reconstruction are more satisfied with their breasts than implant patients.

A Longitudinal (10-Year) Assessment of Abdominal Wall Strength and Health after Autologous Breast Reconstruction

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PURPOSE: The purpose of this study is to provide long-term, subjective, and objective functional data on patients undergoing autologous breast reconstruction using abdominal tissue and to assess factors impacting functional differences.

METHODS: Patients participated in this prospective study between 2005 and 2015, completing preoperative, early, and late subjective and objective evaluations. Objective examination included an assessment of upper abdominal and lower abdominal strength and functional independence. Patient-reported outcomes included the Short-Form 36 (SF36) and the Breast Q. Scores were compared by laterality and flap type, and a logistic regression was performed to determine the factors influencing function.

RESULTS: Fifty-one patients completed long-term follow-up, averaging 6.9 years (range, 5–10 years). Overall, 78.8% of patients had stable or improved scores across the upper abdominal and lower abdominal strength and functional independence, with no significant differences based on laterality or flap types. Subjectively, 90% demonstrated improvement in SF36 physical health component. Obesity and comorbid conditions were risk factors for scoring in the lowest third of SF36 physical health component scores (P = 0.012). Further, obesity was determined to negatively impact both the mental (P < 0.005) and the physical (P < 0.001) components as well as change in mental health score (P < 0.026).

CONCLUSIONS: Abdominally based autologous breast reconstruction does not appear to cause long-term strength or functional impairment. However, obese patients may be at risk for long-term subjective physical and mental health impairment.
Are All Acellular Dermal Matrices Created Equal? Results from a Multicenter Prospective Study

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PURPOSE: Acellular dermal matrix (ADM) has allowed for significant advances in immediate breast reconstruction. With its increasingly widespread use, different types have become available. In a single-center, retrospective cohort study, we previously demonstrated important outcome differences across brands of ADM. Specifically, patients reconstructed with FlexHD had higher rates of major infection than those with AlloDerm. In this study, we used a multicenter, prospective cohort to compare complication rates across common types of ADM.

METHODS: With patients recruited from 11 sites, we compared complications of immediate reconstructions using AlloDerm, FlexHD, and other products (ie, AlloMax, SERI Scaffold, SurgiMend, Biodesign, and Vicryl). Complications including hematoma, seroma, mastectomy flap necrosis, wound infection, wound dehiscence, and reconstructive failure were analyzed using hierarchical logistic regression models, accounting for study centers and controlling for a range of demographic and clinical variables.

RESULTS: Of the 810 patients included in our cohort, 507 patients (62.6%) were reconstructed with AlloDerm, 128 patients (15.8%) with FlexHD, and 175 patients (21.6%) with another type of material (ie, AlloMax, SERI Scaffold, Biodesign, SurgiMend, or Vicryl). Patients with FlexHD were significantly more likely to suffer an infection [odds ratio (OR), 2.79; 95% confidence interval (CI), 1.07–7.26; \( P = 0.036 \)], reconstructive failure (OR, 3.3; 95% CI, 1.40–7.56; \( P = 0.006 \)), and any complication (OR, 2.80; 95% CI, 1.63–4.80; \( P = 0.000 \)) than those patients reconstructed with AlloDerm.

CONCLUSIONS: Patients undergoing immediate implant-based breast reconstruction with FlexHD had significantly increased odds of developing infection, reconstructive failure, and any sort of complication compared with those reconstructed with AlloDerm.

Health-Related Quality of Life Throughout the Breast Reconstruction Process: A Prospective Cohort of 200 Patients with Long-Term Follow-Up

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PURPOSE: With increasing breast reconstruction rates, questions remain on the impact of shifting modalities of reconstruction on quality of life (QoL) and their interaction with concurrent treatments, particularly postmastectomy radiotherapy (PMRT). This study aimed to track QoL in breast reconstruction patients according to reconstructive modality and PMRT.

METHODS: We prospectively tracked patients undergoing breast reconstruction at our institution from 2010 to 2013 using the Breast-Q survey preoperatively, after tissue expander placement, and 6 and 12 months after final reconstruction. We used Paired \( t \) test, analysis of variance, and multiple linear regression to estimate associations between QoL, reconstruction type and timing, and PMRT.

RESULTS: Of the 200 patients followed up, 75 (37.5%) underwent implant-based, 118 (59%) autologous, and 7 (3.5%) pure fat grafting reconstructions. Thirty-three (16.5%) reconstructions were immediate, 146 (73%) staged, and 21 (10.5%) delayed. Fifty-one patients (25.5%) received PMRT. Autologous reconstruction was associated with higher satisfaction with breasts (\( P = 0.001 \)) and trended toward higher physical well-being of chest (\( P = 0.073 \)). Delayed reconstructions were associated with higher satisfaction with breasts (\( P = 0.005 \)), psychosocial well-being (\( P = 0.033 \)), and sexual well-being (\( P = 0.014 \)). After adjusting for confounding, PMRT was associated with lower psychosocial well-being (\( P = 0.040 \)) and sexual well-being (\( P = 0.036 \)). PMRT showed significant interaction with type of reconstruction, wherein autologous reconstruction mitigated the negative impact of PMRT on satisfaction with breasts (\( P = 0.032 \)) and physical well-being of chest (\( P = 0.034 \)).

CONCLUSIONS: Autologous and delayed reconstructions are associated with higher QoL. Importantly, autologous reconstruction performed after PMRT may mitigate its negative effects. These findings are important in an economic environment driving trends toward implant-based and immediate reconstructions.
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Guideline-Compliant Enoxaparin Doses Are Insufficient in the Majority of Plastic Surgery Patients: An Examination of Enoxaparin Metabolism

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PURPOSE: Despite guideline-compliant enoxaparin prophylaxis, 1 in 25 highest risk patients has a VTE event. We examined the pharmacokinetics of standard enoxaparin doses in plastic surgery patients with an emphasis on total body surface area surgically injured (TBSI) as a predictor of enoxaparin metabolism.

METHODS: The Plastic Surgery Foundation funded this ongoing prospective interventional study, which recruited adult plastic surgery patients receiving postoperative enoxaparin (40 mg once daily). Steady-state peak and trough anti-Factor Xa (aFXa) levels, which marks enoxaparin effectiveness and safety, were drawn. Patients with out-of-range aFXa levels had real-time dose adjustment based on a written protocol.

RESULTS: Fifty-three patients have been recruited, and 39.6% had in-range peak aFXa levels. A total of 61.5% of patients had nondetectable aFXa levels at 12 hours. Patients with increased TBSI were less likely to have in-range aFXa levels. Among out-of-range patients who received dose adjustment, 58.3% achieved in-range peak aFXa levels.

CONCLUSIONS: Enoxaparin 40 mg once daily provides adequate prophylaxis in less than 40% of patients. A total of 61.5% of patients had nondetectable aFXa levels at 12 hours. Thus, the majority of patients are protected for less than 12 hours per day. Individualized TBSI-based enoxaparin dosing regimens and real-time aFXa monitoring deserve further study.

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Industry Financial Relationships in Plastic Surgery: Analysis of the Sunshine Act Open Payments Database and Comparison with Other Surgical Subspecialties

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PURPOSE: Limited data exist regarding industry financial relationships in plastic surgery. The Sunshine Act Open Payments Database currently represents the largest repository of these data, but is limited primarily to queries of individual providers. The purpose of this study was to analyze these data and present it in a manner that better delineates these relationships in the field of plastic surgery and to compare plastic surgery with other surgical subspecialties.

METHODS: A review of the Sunshine Act Open Payments Database was performed for the time period from January 1, 2014, to December 31, 2014. These data were analyzed with respect to types of payments, characteristics of plastic surgeons, characteristics of companies, and comparison with other surgical subspecialties.

RESULTS: A total of 49,053 payments from 274 companies were identified that were made to 4812 plastic surgeons, which represents 54.5% of all plastic surgeons. Food and beverage represented the most common type of payment (82.2%). The total value of payments was $17,901,077, with the highest valued type of payment related to royalties and licensing ($6,109,678) that comprised 35.7% of the total, although these were received by only a minority of plastic surgeons (0.5%). A substantial proportion (82.6%) of the total value of payments originated from only 10 companies. Plastic surgery exhibited the lowest prevalence of industry financial relationships compared with otolaryngology (57.9%), orthopedics (62.4%), neurosurgery (87.8%), and urology (63.1%).

CONCLUSIONS: Approximately half of all plastic surgeons have industry financial relationships. The prevalence of these relationships is comparatively less than other surgical subspecialties.
Facial Nerve Axonal Analysis and Anatomic Localization of Donor Nerve—Optimizing Axonal Load for Cross Facial Nerve Grafting in Facial Reanimation

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PURPOSE: Donor nerve axonal count more than 900 is associated with improved outcomes in facial reanimation with free functional muscle. We measured axonal counts of facial nerve zygomatic branches at multiple points to determine the ideal location for optimizing axonal load.

METHODS: Twenty-eight fresh unpreserved cadaveric hemifaces were dissected to expose the extracranial facial nerve branches. Zygomatic branches were harvested in 2-cm sections from the pes anserinus distally, noting their position relative to the zygomatic arch, posterior border of ramus, lateral border of zygomaticus major, and anterior border of parotid gland. Nerves were fixed, sectioned, stained with SMI-31 antineurofilament stain, and digitally analyzed for axonal counts.

RESULTS: The mean number of axons in the facial nerve at the pes anserinus was 4220. All specimens had 1 or more intraparotid zygomatic branches with more than 900 axons, and 96% had an extraparotid branch with more than 900 axons. The likelihood that a zygomatic branch would have more than 900 axons at its last intraparotid point (mean, 6 mm posterior to parotid border) was 92%. By contrast, this likelihood was only 61% when sampled at the first extraparotid point (mean, 14 mm anterior to parotid border). The cross-sectional area of a branch was positively correlated to its axonal count ($R^2 = 78\%$, $P < 0.0001$), with nerve diameter more than 0.6 mm predicted to have more than 900 axons.

CONCLUSIONS: Branches with adequate axonal load were found in all specimens. The likelihood of selecting an adequate branch improved from 61% to 92% when dissected intraparotid. Nerve diameter positively correlated with axonal load.

Aesthetic Correction of Temporal Hollowing: A Review of the Literature and a Novel Algorithm for Management

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PURPOSE: The temporal fossa is defined by bone and soft tissue. The hollowing deformity can arise from defects in bone and/or denervation, devascularization, and wasting of the overlying muscle and fat pad. We present an algorithm to analyze and treat this common entity.

METHODS: A retrospective review was performed of all patients treated for temporal hollowing over the past 10 years. Data concerning aesthetic outcomes and complications were collected. A directed treatment algorithm replacing the affected structures using fillers, fat grafts, bone, soft tissue, and alloplastic grafting was created.

RESULTS: On the basis of our experience in treating more than 150 surgical patients with temporal hollowing during a 10-year period, we have designed a paradigm based on the underlying etiology of the presentation. In a large and comprehensive series, there were no major complications, and we had good to excellent correction of the deformity based on independent review of the results and magnetic resonance imaging studies.

CONCLUSIONS: We present an innovative algorithm that predictably corrects the temporal hollowing defect. The analysis and corrective methodology are easily learned and effectively applied by the average surgeon. Furthermore, our algorithm can be predictive and utilized in the primary treatment plan of craniofacial, skull base, and wasting disorders cases obviating secondary correction. Analysis and treatment of the temporal hollowing deformity using our paradigm belong in the armamentarium of all surgeons who see these deformities.
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Use of Magnetic Resonance Angiography to Better Define the Supraclavicular Lymph Node Flap

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PURPOSE: The ideal donor site for vascularized lymph node transfer is one that is easily accessible, has little risk of donor-site lymphedema, has sufficient nodes and pedicle length, and has a concealable scar. The supraclavicular (SC) lymph node flap meets all of these requirements; however, it has not yet achieved popularity because of concern over its reliable anatomy and sufficient number of lymph nodes. We use magnetic resonance angiography (MRA) to delineate number, size, and location of SC nodes in reference to the transverse cervical artery (TCA).

METHODS: A retrospective review of neck MRAs performed at our institution from January to September 2014 was performed. Thirty studies met inclusion criteria. The right TCA was identified, and the diameter at its origin was measured. Size and distance of SC nodes in 3 dimensions in relation to the TCA origin were measured.

RESULTS: A total of 142 lymph nodes were identified with an average of 4.7 ± 2.2 nodes per patient and mean length of 5.3 ± 2 mm. Average diameter at the TCA origin measured 2.7 ± 0.8 mm. With respect to the TCA origin, all nodes were lateral, 96% superior, and 78% posterior. Average distance from the TCA origin was 37 ± 13 mm, with nodes 19.2 ± 11.8 mm superior, 27.7 ± 11.3 mm lateral, and 23.1 ± 11.8 mm posterior to TCA origin. Twenty-three percent of patients had a separate origin of the TCA from the subclavian artery.

CONCLUSIONS: The SC lymph node flap is ideal for vascularized lymph node transfer. MRA demonstrates sufficient and consistent number of nodes to be transferred, better delineates the anatomy of this flap, and provides useful guidelines for identifying targeted nodes more efficiently.

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Evaluation of Optic Nerve Morphology and Aqueous Humor Dynamics in a Vascularized Whole Eye Transplantation Model

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PURPOSE: Vision loss because of degenerative diseases and ocular trauma affects millions of people worldwide. Whole eye transplantation would provide a solution for those with irreversible vision loss. The purpose of this study is to evaluate the viability, structural integrity, and function of our orthotopic whole eye transplant model by assessing aqueous humor dynamics using gadolinium (Gd)-enhanced magnetic resonance imaging (MRI), optic nerve structural integrity with diffusion tensor MRI (DTI), and retinal ganglion cell (RGC) viability with manganese (Mn)-enhanced MRI.

METHODS: Syngeneic transplants were performed in 5 Lewis (RT1l) rats. Four animals were scanned at 3 weeks, and 1 animal was scanned at 10 weeks after transplantation. After Gd-enhanced MRI imaging, the initial rate of Gd increase, peak %Gd signal enhancement, time to peak, fractional anisotropy, axial diffusivity (λ2), and radial diffusivity (λ3)
were calculated. DTI parametric maps were computed using DTIStudio. Mn-enhanced MRI was used after whole eye transplantation.

RESULTS: Limited Gd-enhancement was observed in the vitreous with no significant difference between eyes (two-tailed paired t tests, \( P > 0.05 \)). T2-weighted images revealed comparable optic nerve morphology, whereas in the prechiasmatic optic nerves, DTI quantitation showed significantly lower fractional anisotropy and \( \lambda// \) by 54\% \( \pm \) 6.1\% and 24.9\% \( \pm \) 5.7\%, respectively, and a significant increase in \( \lambda\perp \) by 83\% \( \pm \) 29.5\% in comparison (two-tailed paired t tests, \( P < 0.05 \)). Mn-enhanced MRI data suggest RGC viability.

CONCLUSIONS: Aqueous humor dynamics and blood-ocular barriers are preserved, and preliminary data suggest that RGCs may be viable after transplantation. Future studies will examine approaches for regaining neuronal structure and function of our whole eye transplant model.

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Total Human Eye Allotransplantation from Experimental Model to Clinical Reality

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PURPOSE: Development of a reliable animal model for testing immunomodulation and neuroregeneration strategies and development of human surgical protocols are vital in realizing eye transplantation.

METHODS: Syngeneic orthotopic transplants were performed in Lewis rats (n = 20). Anastomoses between common carotid arteries and external jugular veins and optic nerve coaptation were performed. Slit lamp examination, optical coherence tomography, histology, and magnetic resonance imaging confirmed structural integrity, viability, and aqueous humor dynamics. Human cadaveric heads (n = 8) donor procurement involved an orbital, endonasal, and transcranial approach. Sequential arterial and venous anastomoses and cranial nerve II to VI coaptations to recipients were performed.

RESULTS: Rat survival was 75\% (15/20), graft survival 87\% (13/15), mean ischemia time 1.98 hours, mean donor 1.15 hours, and mean recipient 2.28 hours. Slit lamp examination, histology, and OCT revealed structural integrity. There was retinal blood flow, normal blood-aqueous barrier, and blood-retinal barrier. Transplants had normal intraocular pressures. Feasibility of cadaveric transplantation was established. Mean donor ophthalmic artery length and caliber were 13.5 and 1 mm, respectively, but with a stem of paraclival internal carotid artery were 33 and 2 mm. Mean optic nerve length was 25 mm from apex to annulus of Zinn and 14 mm from annulus of Zinn to chiasm. Cranial nerves III to VI lengths were 10 to 14 mm. Candidate recipient vessels required vein grafting.

CONCLUSIONS: This animal model and surgical protocol serve as a benchmark for ongoing investigation, ultimately potentiating the possibility of vision restoration transplantation surgery.
54 False Negative Rate: SPY-Elite–assisted Sentinel Lymph Node Biopsy in Consecutive Cutaneous Melanoma Patients

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PURPOSE: Despite the advances in the management of cutaneous melanoma, the false negative sentinel lymph node biopsy (SLNB) rate is still 5.2% to 22.0%. Indocyanine green SPY-Elite navigation for SLNB is a novel technique shown to be effective in this population. The aim of this study is to determine the false negative rate of SLNB using indocyanine green SPY-Elite navigation.

METHODS: Consecutive cutaneous melanoma patients who underwent radioisotope and indocyanine green SPY-Elite SNLB by the senior author (B.G.) from 2011 to 2014 were prospectively studied. Patient inclusion criteria were as follows: (1) meeting the National Comprehensive Cancer Network criteria for SLNB and (2) a negative SLNB. The outcome variable was false negative SLNB (regional nodal recurrence in previously sampled negative SLN basin). Follow-up time was date of surgery to the date of last follow-up/death. Predictive variables included age, sex, Breslow thickness, mitotic index/mm², tumor-node-metastasis staging, and tumor and SLNB location.

RESULTS: The study composed of 100 subjects: 56.0% males and 44.0% females. Tumor locations were as follows: trunk (35.0%), upper extremity (25.0%), head/neck (23.0%), and lower extremity (17.0%). Most common SLNB locations were the axilla (46.5%), followed by the groin (21.0%). Mean follow-up time was 18.9 (±8.4) months. Mean Breslow thickness and mitotic index/mm² were 1.2 (±0.8) cm and 2.0 (±2.6), respectively. Ulceration was observed in 16.7% of patients. No false negative SNLBs were observed. This technique exhibited a specificity and negative predictive value of 100%.

CONCLUSIONS: Indocyanine green SPY-Elite–assisted SLNB exhibits high specificity and negative predictive value; it is an effective and reliable technique. This is an ongoing study with continuous patient enrollment.

55 Diverse Roles for WNT Pathway Genes in Regulation of Axial Patterning and Convergent Extension in Palate Morphogenesis

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PURPOSE: Genetic regulation of cells to organize into higher ordered structures is a central question of craniofacial biology. Wnt signaling is a key pathway that regulates tissue morphogenesis and convergence extension (CE) cell movements. We hypothesize that palate formation requires Wnt regulation of CE, and when this process is disrupted, orofacial clefts result.

METHODS: CRISPR-Cas gene editing was used to generate mutants representing components of the Wnt pathway: Wls (chaperon for Wnt secretion), Wnt9a, Wnt5b (ligands), Frzb, and Gpc4 (receptors). Double mutants were generated to determine relative contribution of each gene to palatogenesis. Detailed cellular and molecular analyses were performed.

RESULTS: Gene expression analysis localized Wnt signal originating from oropharyngeal epithelium, regulating juxtaposed palate chondrocytes expressing receptors frzb and gpc4. CE behaviors of cell intercalation and directional proliferation were revealed by multispectral clonal analysis in the mutants. Genetic studies showed that wls and gpc4 are required to impart anteroposterior and dorsoventral cues, wnt5b is required for anteroposterior extension, wnt9a is required for dorsoventral extension, and frzb regulates cell orientation.

CONCLUSIONS: Systematic genetic analysis revealed the central role of the oral epithelium to generate the Wnt gradient, imparting positional cues to developing chondrocytes. Different Wnt genes contribute differently to axis cues that regulate chondrocyte behavior. Elucidating Wnt regulated cell behavior is a key to understanding normal palate development and cleft pathogenesis when this process is perturbed.
Controlled Randomized Double-Blinded Prospective Study on the Role of Surgical Decompression of Lower Extremity Nerves for the Treatment of Patients with Symptomatic Diabetic Neuropathy with Chronic Nerve Compression

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PURPOSE: An estimated 50% of 74.8 million prediabetic and diabetic patients in the Unites states suffer from painful diabetic neuropathy (PDN), approximately one-third prone to nerve compression. Previous studies suggest that surgical decompression alleviates pain; however, the American Neurological Association considers available evidence level U (unproven). We present a 7-year National Institutes of Health and institutionally funded, controlled randomized double-blinded prospective study to determine the long-term effect of nerve decompression in patients with PDN.

METHODS: A multidisciplinary neurology, endocrinology, PM&R, pain, and surgery group performed baseline pain examinations (Likert: 0–10, Neuropathy scores). Patients were randomized into surgical and nonsurgical control groups (2:1 ratio, respectively). Surgical patients underwent surgery bilaterally with each side randomized to nerve decompression or sham surgery. Patient and final evaluators were blinded to side. Quarterly, final 1-year, and 4-year evaluations were performed.

RESULTS: Of 2987 screened patients, 138 enrolled for the study: 92 randomized to surgery and 46 as controls. Forty surgical and 27 controls completed the study. At 1 year, the surgical group experienced a mean pain reduction of 5.70 in the surgical leg (SD = 2.09; \( P < 0.0001 \)) and 5.25 (SD = 2.79; \( P < 0.0001 \)) in the sham leg, whereas the control group had no statistically significant reduction of pain. A 54.5-month follow-up of 36 surgical patients revealed a mean pain reduction of 7.47 in the surgical leg (SD = 2.54; \( P < 0.0001 \)) and 5.97 (SD = 2.43; \( P < 0.0001 \)) in the sham leg.

CONCLUSIONS: Surgical decompression in patients with PDN unequivocally reduces bilateral pain with statistical significance at 1 year and continued bilateral improvement at 4 years, yet demonstrates more statistically significant pain reduction in the decompressed side at 4 years.
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A National Study of the Impact of Delayed Flap Timing for Treatment of Patients with Deep Sternal Wound Infection

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PURPOSE: This study aims to evaluate the impact of delayed flap closure on mortality and associated outcomes for treatment of deep sternal wound infection (DSWI).

METHODS: We analyzed the Truven MarketScan Databases from 2009 to 2013 to identify adult patients who developed DSWI after open cardiac surgery and received flap closure for treatment. A multivariable logistic regression model was created to evaluate the relationship between mortality and flap timing. Multivariable Poisson regressions were utilized to evaluate the relationship between flap timing and number of procedures, number of hospitalizations, and length-of-stay outcomes. A multivariable log-linear regression model was created for cost analysis. All analyses were adjusted for patient risk factors and treatment characteristics.

RESULTS: One thousand three hundred thirty-five patients were identified with DSWI and received surgical treatment. Of patients receiving surgical treatment, 46% (n = 612) underwent flap closure. The timing of flap closure was >3 days after diagnosis of DSWI in 61% of patients and >7 days in 39% of patients. Delayed time to flap closure >3 days after diagnosis of DSWI was associated with higher mortality odds (4–7 days: odds ratio, 2.94; >7 days: odds ratio, 2.75; P < 0.03), greater additional procedures (4–7 days: IRR, 1.72; >7 days: IRR, 1.93, P < 0.001), up to 43% longer hospital length of stay, and 37% greater costs compared with patients having earlier flap closure.

CONCLUSIONS: Delay in flap closure was associated with greater mortality and resource utilization. Prompt involvement of reconstructive surgeons can improve quality and efficiency of DSWI care.

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Cost-Utility Analysis of Ventral Hernia Repair with a Bridging Biologic Mesh

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PURPOSE: The economic burden of ventral hernia repair with a bridging biologic mesh is substantial. The aim of this study is to examine the cost utility of ventral hernia repair with a bridging biologic mesh.

METHODS: We designed a decision tree model to compare ventral hernia repair with bridging biologic mesh versus no repair. Health state probabilities were determined from literature review. Costs were obtained from National DRG reimbursements. To determine quality-adjusted life years, a prospective survey was administered to 300 nationally representative individuals for 14 ventral hernia repair-specific health states. We performed 1-way univariate, 2-way multivariate sensitivity analysis, threshold analysis, and Monte Carlo simulations.

RESULTS: Ventral hernia repair with bridging biologic mesh compared with no repair is highly cost effective with Incremental Cost Effectiveness Ratio of $3860.93/quality-adjusted life year. One-way sensitivity analysis showed repair with biologic mesh remained cost effective. Threshold analysis showed the rate of hernia recurrence need to reach 96% or the cost of hernia repair with bridging biologic mesh to be at least $216,256 in order for repair not to be cost effective. Monte Carlo simulations showed greater than 98.6% of cases recommending repair with biologic mesh as a cost effective option.

CONCLUSIONS: Despite the high cost of biologic mesh, bridging biologic mesh ventral hernia repair is cost effective, and these findings may facilitate clinical decision making and support its continued use.
Concurrent Panniculectomy in the Obese Ventral Hernia Patient: Assessment of Short-Term Complications, Hernia Recurrence, and Healthcare Utilization

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PURPOSE: Soft-tissue interventions such as panniculectomy (PAN) are often performed concurrently with ventral hernia repair (VHR) in the obese patient. However, the effectiveness and safety profile of this common practice have not been fully established in part because of paucity of comparative effectiveness studies. Presented herein is a comparative analysis of early complications, long-term hernia recurrence, and healthcare expenditures between VHR-PAN and VHR-only patients.

METHODS: From the Healthcare Cost and Utilization Project database, obese patients who underwent VHR with and without concurrent PAN were identified. Multivariate cox proportional-hazards regression modeling was performed to compare outcomes between the 2 groups.

RESULTS: The final cohort included 1013 VHR-PAN and 18,328 VHR-only patients. The VHR-PAN patients experienced a longer adjusted length of hospital stay (6.8 days vs 5.2 days; \( P < 0.001 \)), a higher rate of in-hospital adverse events [29.3% vs 20.7%; AOR = 2.34 (2.01–2.74)], and a higher rate of 30-day readmissions [13.6% vs 8.1%; AOR = 2.04 (1.69–2.48)]. The 2-year rate of hernia recurrence, however, was lower in the VHR-PAN group [7.9% vs 11.3%; AOR = 0.65 (0.51–0.82)]. Both groups generated significant costs of care ($104,805 VHR-PAN vs $72,206 VHR-only, \( P < 0.001 \)).

CONCLUSIONS: Performing a concurrent PAN in the obese hernia patient is associated with a higher rate of early complications and greater healthcare expenditures, but a lower incidence of hernia recurrence in the long term. The literature review presented here also highlights a significant need for further comparative effectiveness studies to create the needed framework for evidence-based guidelines.

Neosphincter Constructed with a Prelaminated Human Primary Muco-Keratinocyte Lining in the Rat

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PURPOSE: Our long-term goal is to return dependable, self-controlled, anal function with a neoanal sphincter. This study in the rat combines a prelaminated, tissue-engineered human muco-keratinocyte lining with a rat latissimus dorsi muscle flap that is constructed into a neosphincter. The purpose is to determine the impacts an acellular dermal matrix (ADM) and ADM with cells have on the contraction (squeezing) of neosphincters.

METHODS: Human muco-keratinocytes were prelaminated on an ADM in culture before rat implantation. Then, neosphincters were constructed on the shoulders of athymic rats using a latissimus dorsi muscle flap with an intact neurovascular pedicle. Three experimental groups were as follows: neosphincter (muscle only, \( n = 5 \)), neosphincter with ADM (\( n = 4 \)), and neosphincter with prelaminated mucosa (\( n = 7 \)). Neosphincters were evaluated for contractile force across the lumen diameter 14 days after implantation.

RESULTS: All neosphincters were well vascularized, contractile, and with an open lumen. Muco-keratinocytes continued to divide with the mucosal layer increasing in thickness. Muscle fibers remained healthy, whereas ADM became vascularized. Sphincter maximal isometric forces were similar across groups.

CONCLUSIONS: By confirming the functioning and health of neosphincters constructed with prelaminated human muco-keratinocytes, this technology is moved closer to human implementation.
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A Free Superficial Palmar Branch of the Radial Artery Flap for Finger Soft-tissue Reconstruction

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PURPOSE: Functional and aesthetic reconstruction for digital soft-tissue defects can be challenging for plastic surgeons because there may not be enough remaining skin to harvest local flaps around the defect. The aim of this study is to present a clinical case series of free superficial palmar branch of the radial artery (SPBRA) flaps for soft-tissue reconstruction of the finger.

METHODS: Free SPBRA flaps were harvested for 11 fingers of 10 patients. The injured fingers included 5 index, 3 long, 2 ring, and 1 small finger. All the flaps were vascularized by the SPBRA, usually bifurcates from the radial artery. There were 2 types of venous drainage systems in the flaps: the concomitant vein of the SPBRA and the subcutaneous vein.

RESULTS: All the flaps survived completely, except for 2 cases of partial necrosis. All the donor sites were closed primarily. Most of the fingers involved achieved a full range of motion and showed a good contour and color/texture match. Two-point spatial sensory discrimination was recorded for all patients, and adequate protective sensation was attained.

CONCLUSIONS: The SPBRA flap is large enough to cover large finger defects without sacrificing the major vessels. Providing a thin, pliable, hairless, and well-vascularized skin cover with a perfect color match, the SPBRA flap seems to be a useful solution to overcome the skin coverage dilemma in patients with finger defects.

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Evaluation of Percutaneous First Annular Pulley Release: Efficacy and Complications in a Perfused Cadaveric Study

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PURPOSE: Despite percutaneous trigger finger release (PTFR) success rates more than 94%, controversy remains over fear of neurovascular injury. We assessed the safety of blind versus sonographically guided [ultrasound (US)] first annular (A1) pulley releases performed on a perfused cadaveric model.

METHODS: On hundred twenty-four fingers/thumb percutaneous A1 pulley releases were performed on perfused un-embalmed cadavers (65 female, 90 male) and an 18-gauge needle. Forty-five fingers/thumbs were completed with US versus 110 without. Each digit was evaluated for A1 pulley release and neurovascular, flexor tendon, A2 pulley injury.

RESULTS: One hundred fourteen (74%) A1 finger and thumb pulleys were effectively released, and only 3 digits (one long, ring, and small finger each) were completely missed (2%). On average, 93% of A1 pulley length was released for all fingers. No significant flexor tendon injury was seen in any digit, although longitudinal scoring was found in 35 fingers (23% overall). No digital, radial or ulnar, artery or nerve was injured. The use of US for PTFR was not more likely to result in a complete pulley release compared with Blind PTFR (80% vs 72%; P < 0.26).

CONCLUSIONS: Both blind and ultrasound-assisted percutaneous releases of the A1 pulley can be performed safely and effectively for all fingers including the thumb. Perfusion of cadaver digits enhances surgical simulation for PTFR training, especially for in vivo identification of structures by US with Doppler flow.
MicroRNA Expression Profile of Human Lymphatic Malformations

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PURPOSE: Lymphatic malformations (LMs) are dilated lymphatic vessels that are disconnected from the rest of the lymphatic system. The underlying etiology of LMs are still at large. MicroRNAs (miRNAs) are short, noncoding, single strands of RNA that posttranscriptionally repress protein expression and are involved in a majority of human physiology. By characterizing the miRNA expression profiles of LMs, we seek to better understand the disease.

METHODS: RNA was extracted from human LM specimens and control human lymphatic endothelial cells for microarray analysis. miRNA bioinformatic databases were used to predict miRNA regulators. Pathway analysis was performed using Qiagen Ingenuity Pathway Analysis (Redwood City, Calif.).

RESULTS: Two of these—miR-181b-5p and miR-551b-3p—are predicted to regulate genes involved with LMs and lymphangiogenesis, respectively. Pathway analysis of the miRNA data shows inhibition of the CD36 pathway. CD36 has a thrombospondin-1 receptor that functions to inhibit lymphangiogenesis through the inhibition of VEGF-c and VEGF-d expression in lymphatic channels.

CONCLUSIONS: We have identified miRNAs that may play a role in pathogenesis and in identifying a pathway that could serve as a novel drug target.