



The Midwestern Association of Plastic Surgeons

The Midwestern Association of Plastic Surgeons
In Conjunction with Trinity Iowa Health Services



Presents

51th Annual Educational Meeting

Saturday – April 21, 2012

Sunday – April 22, 2012

Northwestern Memorial Hospital
Feinberg Pavilion – 3rd Floor Conference Center
251 East Huron Street
Chicago, Illinois

MIDWESTERN ASSOCIATION OF PLASTIC SURGEONS
51th Annual Educational Meeting

Educational Purpose and Intended Audience

- Incorporate a new approach to migraine headache treatment using injection and surgical techniques
- Understand and utilize the critical points in executing a rhinoplasty
- Discuss current challenges in patient safety and implement changes in practice to minimize complications
- Establishment of best practice model to ensure patient safety in plastic surgery
- Acquire the latest research in both academic and clinical setting to apply to improve patient outcomes
- Presentations from invited experts in the field on expertise for specific difficult patient conditions including lectures and panel discussions.

Experience with different approaches to clinical problems in plastic surgery will be shared between practicing plastic surgeons in both private practice and university-based practice. The meeting will present different approaches to these problems to address gaps in knowledge among meeting attendees and recognize best practice models for patient safety and favorable outcomes. Presentations in basic science and clinical research will demonstrate how these projects translate to plastic surgeons' individual practices and how they impact patient care.

Registration Fees:

The registration fee is \$125.00 for members; \$75.00 for fellows, residents & medical students. A late fee will be added after March 15, 2011 making the registration fee as follows: \$175.00 for members; \$100.00 for fellows, residents & medical students. These fees cover registration, instruction, educational material, Saturday lunch, Welcome reception and Awarding of CME credits.

Due to the small staff and very reasonable fees, Refunds are not available for the MAPS Conference except under special or unusual circumstances or hardship.

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ACCREDITATION STATEMENT

This activity has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education through the joint sponsorship of Trinity Medical Center and Midwestern Association of Plastic Surgeons. Trinity Medical Center is accredited by the Illinois State Medical Society to provide continuing medical education for physicians.

Trinity Medical Center designates this live activity for a maximum of **11.5** *AMA PRA Category 1 Credit(s)*[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

The Midwestern Association of Plastic Surgeons acknowledges exhibitor sponsorship from _____ for this activity.

The following MAPS CME planning members involved with this activity have no significant financial relationships to disclose:

Karol Gutowski, MD
Benjamin Van Raalte, MD
Robert Whitfield, MD
Iliana Sweiss, MD

Reuben A. Bueno, MD
John Hijjawi, MD
Anuja Antony, MD

We gratefully acknowledge our exhibitors:

SATURDAY April 21, 2012

- 06:30 **REGISTRATION OPEN**
- 07:20 – 07:30 **WELCOME REMARKS**
Karol Gutowski, MD - President
- SESSION I WOUND HEALING, BURNS, BASIC SCIENCE, PATIENT CARE**
- Time Keepers: Raphael Lee, MD, ScD and John Hijjawi, MD**
- Block A: Wounds and Burns**
- 07:30 – 07:35 **Cocaine Induced Full Thickness Tissue Necrosis**
Ashley Amalfi, MD, Michael W. Neumeister, MD,
Reuben A. Bueno, MD, Nicole Z. Sommer, MD, Nada N. Berry, MD
Southern Illinois University School of Medicine
- 07:36 – 07:41 **Efficacy of Serum Nutritional Measurements as a Predictor of Wound
Healing Complications in Bariatric Patients Undergoing
Panniculectomy: A Multi-Institutional Study**
John R. Barbour, MD,¹ Patrick J. O’Neill, MD,² Thomas H. Tung, MD¹
Washington University School of Medicine¹
Medical University of South Carolina²
- 07:42 – 07:47 **Multidrug-Resistant Acinetobacter in a Burn Intensive Care Unit:
Epidemiology, Progression, and Containment Protocol**
Megan Henderson, MD, Theresa Hegge, MD, Alyssa Moore, PA,
Reuben A. Bueno, MD, Michael W. Neumeister, MD
Southern Illinois University School of Medicine
- 07:47 – 07:52 **Questions and Discussions**
- Block B: Wounds and Burns**
- 07:53 – 07:58 **Human Bites Resulting in Hand Infections: Is Eikenella a Bug of the
Past?**
Victor J. Hassid, MD^{1,3}, Simple Banipal, MD², Benjamin Liliav, MD^{1,3},
Mansour V. Makhoulouf, MD³, Orhan Kaymakcalan, MD³
¹ University of Illinois at Chicago, Chicago, IL; Department of Surgery
² Mount Sinai Hospital, Chicago, IL
³ Mount Sinai Hospital, Chicago, IL
- 07:59 – 08:04 **Indirect Diagnosis of Osteomyelitis: A Dilemma**
Ashesha Mechineni, Victor L. Lewis Jr, MD
Kamineni Institute of Medical Science

- 08:05 – 08:10 **Retrospective Review of Octogenarian Burn Patient Mortality**
Cedar Helen Malone, MD, Michael W Neumeister MD,
 Reuben A. Bueno, MD, Nichole Z. Sommer, MD, SJ Markwell,
 Jennifer L. Koechle
 Southern Illinois University School of Medicine – Springfield, IL
- 08:10 – 08:15 **Questions & Discussion**
- Block C:** **Basic Science**
- 08:16– 08:21 **How Many Bacteria Does it Take? The Host Immune Response Fails to Prevent Even Low Numbers of Bacteria from Rapidly Establishing Biofilm Infection in Wounds**
Anandev Gurjala, MD, Matt Geringer, Robert Galiano,MD
 Thomas Mustoe, MD, Kai Leung
 Northwestern University Feinberg School of Medicine – Chicago, IL
- 08:22 – 08:27 **Immunoregulatory and regenerative properties of adipose stem cell – hydrogel constructs**
Summer E. Hanson, MD, PhD; Suzanne King, MA; Susan L. Thibeault, PhD,
 Michael L. Bentz, MD, Peiman Hematti, MD
 University of Wisconsin School of Medicine and Public Health
- 08:28 – 08:33 **Adipose-derived stem cell to skin stem cell transdifferentiation: a mechanism to improve understanding of fat grafts’ skin regenerative potential**
Brian M. Derby, MD, Hui Dai MD, PhD, Joel Reichensperger,
 Carrie Harrison, Lisa Cox, Reuben A. Bueno, MD,
 Michael W. Neumeister MD
 Southern Illinois University School of Medicine
- 08:34 – 08:39 **Evaluating the Effects of Subclinical, Cyclic Ischemia-Reperfusion Injury on Wound Healing Using a Novel Device in the Rabbit Ear**
Jordan P. Steinberg, MD, Ph.D., Anandev N. Gurjala, MD, MS,
 Shengxian Jia, MD, PhD, Seok Jong Hong, Ph.D, Robert D. Galiano, MD,
 Thomas A. Mustoe, MD
 Northwestern University Feinberg School of Medicine
- 08:39 – 08:44 **Questions and Discussions**
- Block D** **Patient Care**
- 08:45 – 08:50 **Bactericidal surgical drain development**
Andrew D. Navarrete, MD, Samuel O. Poore, MD, PhD
 University of Wisconsin Hospital and Clinics

- 08:51 – 08:56 **Postoperative Nausea and Vomiting: Guidelines for the Plastic Surgeon**
Sara Yegiyants, MD, Iliana Sweis, MD, Mimis Cohen, MD
 University of Illinois Chicago
- 08:57 – 09:02 **On the Shoulders of Giants: Plastic Surgery History and Our Connection to It**
Donald W. Buck, II MD
 Northwestern University, Feinberg School of Medicine
- 09:02 – 09:07 **Questions & Discussions**
- 09:07 – 09:30 **Break**
- 09:30 *Keynote Address*
Rhinoplasty: Cardinal Points
Bahman Guyuron, MD
- 10:30 *Keynote Address*
Botox Injection & Surgical Treatment of Migraine Headaches
Bahman Guyuron, MD
- 11:30 – 12:15 **Lunch**
 Residents & Medical Students:
Q & A Luncheon with Leroy Young, MD
 Location: Conference Room F
- SESSION II** **Selected Topics in Plastic Surgery**
- Time Keeper:** **Reuben A. Bueno, MD**
- Block A**
- 12:15 – 12:20 **Single Stage Nipple-Areolar Complex Reconstruction: Outcomes and Patient Satisfaction**
Benjamin Liliav, MD, Jennifer Loeb, MS, Anuja K. Antony, MD, MPH
 University of Illinois Chicago
- 12:21 – 12:26 **Herpes Simplex Virus Type 1 Infection in Burn Patients**
Kelli N. Webb, MD, Alyssa N. Moore, PA-C, Nicole Z. Sommer, MD,
 Reuben A. Bueno, MD, Michael W. Neumeister, MD, FRSCS, FACS.
 Southern Illinois University School of Medicine
- 12:27 – 12:32 **A Comparison of Outcomes between Alloplastic and Autologous Breast Reconstruction: 2005-2010 Data from the National Surgical Quality Improvement Program (NSQIP)**
Sahil Kapur, MD, Victor Rajamanickam, MD, Samuel Poore, MD, PhD
 University of Wisconsin

- 12:33 – 12:38 **Patient Safety in the Operating Room: A Review of Perioperative Risks and Methods to Minimize Risks**
Nyama M. Sillah,¹ MD, Samuel O. Poore,¹ MD, PhD,
 Ashish Y. Mahajan,¹ MD, Karol A. Gutowski,² MD
¹University of Wisconsin Hospital and Clinics
²Northshore University Health System
- 12:38 – 12:43 **Questions & Discussions**
- 12:44 – 01:30 **Surgeons in Practice Panel I**
Breast Augmentation Panel: Selecting the Right Implant
 Moderator: Karol Gutowski, MD
 Panelists: Peter Geldner, MD, Otto Placik, MD, Clark Shierele, MD
- 01:30 – 02:30 *Keynote Address*
Update on Patient Safety in Plastic Surgery
Leroy Young, MD
ASAPS Traveling Professor
- 02:30 – 02:50 **Break**
- 02:50 – 03:50 **Surgeons in Practice Panel II**
Breast Reconstruction Panel: Perforator Flap Breast Reconstruction
 Moderator: Mark Sisco, MD
 Panelists: Anuja Antony, MD, MPH, John Hijjawi, MD, David Song, MD, MBA
- SESSION III BREAST AND COSMETIC**
- Time Keepers:** **Anuja Antony, MD, MPH, Iliana Sweiss, MD**
- Block A Breast**
- 03:50 – 03:55 **Technique of Inframammary Fold Reconstruction (IMFR) in Two-Stage Tissue Expander/Implant (TE/I) Breast Reconstruction (BR)**
Karina Laura Paulius Quinn, MD, Anuja Antony, MD, MPH
 University of Illinois
- 03:56 – 04:01 **Deep Inferior Epigastric Perforator Flap for Breast Reconstruction after Abdominoplasty**
Jonathan Bank, MD*, Lucio A. Pavone, MD+, Michelle C. Roughton, MD+, Loren S. Schechte, MD+
 *University of Chicago Medical Center,
 +University Plastic Surgery
- 04:02 – 04:07 **Patient Satisfaction with 3D Imaging Technology in Cosmetic Breast Augmentation: A Pilot Study**
Cedar Helen Malone, MD, Ashley Amalfi, MD, Nichole Z. Sommer, MD,

- Michael W. Neumeister, MD
Southern Illinois University School of Medicine
- 04:07 – 04:12 **Discussion & Questions**
- 04:13 – 04:18 **Comparison of delayed and immediate tissue expander breast reconstruction in the setting of post-mastectomy radiation therapy**
Hayley R. Silver, BS, Akhil K. Seth, MD, Elliot M. Hirsch, MD,
Neil A. Fine, MD
Northwestern University
- 04:19 – 04:24 **Breat Aesthetics: The Golden Ratio**
Ramasamy Kalimuthu, MD, Sara Yegiyants, MD, Barbara Krueger, MD
University of Illinois Chicago
- 04:25 – 04:30 **Oncoplastic Breast Reduction: A Safe and Aesthetically Acceptable Option for Breast Conserving Therapy in the Treatment of Breast Cancer in large Breasted Women**
Laura Bonneau, MD
University of Wisconsin - Madison
- 04:30 – 04:35 **Discussions and Questions**
- Block B** **Cosmetic**
- 04:36 – 04:41 **Revisitng Browpexy As An Adjunct to Blepharoplasty: Introduction of the Lateral Brow Retaining Apparatus**
Trang Q. Nguyen, MD, Julius W. Few, MD
University of Chicago Medical Center
- 04:42 – 04:47 **Near-fatal Complication Following Injection of poly-L-lactic acid (Sculptra)**
Sonya P. Agnew, MD, Victor Lewis, MD
Northwestern University, Division of Plastic and Reconstructive Surgery
- 04:48 – 04:53 **The Lateral Brow Lift under Local Anesthesia: A Simplified Technique**
Jennifer Cheesborough, MD , Thomas A. Mustoe, MD
Northwestern Memorial Hospital
- 04:53 – 04:58 **Discussions & Questions**
- 04:59 – 05:30 **Surgeons in Practice Panel III**
Family Feud: Management of the Mangled Hand
Moderator: Reuben A. Bueno, MD
Panelists: Jeffrey Weinzweig, MD, Norman Weinzweig, MD

05:30 – 06:00

Surgeons in Practice Panel IV
Hand Surgery Update

Different Approaches to Thumb CMC Arthritis
Reuben A. Bueno, MD

Current Therapy and Concepts for the Dysvascular Hand
Ginard Henry, MD

To Follow Program Welcome Reception
Location: Krumlovsky Atrium

SUNDAY April 22, 2012

06:30 am	Registration Opens
07:30 – 08:00	MAPS Business Meeting (members only)
Session IV	CRANIOFACIAL, NERVE, GENERAL RECONSTRUCTION
Time Keeper:	Michael Bentz, MD, Reuben Bueno, MD, Anuja Antony, MD, MPH
Block A	Craniofacial
08:00 – 08:05	CAD/CAM Designed Surgical Positioning Guides: The Link Between Virtual and Actual Surgery <u>Troy Pittman, MD</u> , Christina Tragos, MD, John W. Polley, MD, Alvaro Figueroa, DDS Rush University Medicine Center
08:06 – 08:11	Critical Age: Objective, patient-specific timing of helmet therapy in treatment of positional plagiocephaly and brachiocephaly Roshni Rawlani, <u>Vinay Rawlani, MD</u> , Caitlin Connor, BS, Frank Vicari, MD. Northwestern University
08:12 – 08:17	Endoscopically assisted release of sagittal craniosynostosis: a meta-analysis Pravin Patel, MD, <u>Mazen S. Harake, MD, MS</u> University of Illinois
08:18 – 08:23	Predicting airway compromise in the infant with Pierre Robin Sequence <u>Carolyn R. Rogers, MD</u> , Delora L. Mount, MD, University of Wisconsin
08:24 – 08:29	Questions & Discussion
Block B	Nerve
08:30 – 08:35	Cortical remodeling observed on BOLD fMRI over a 10 month period in a rat survival model of brachial plexus avulsion and cross C7 nerve transfer <u>Nicholas Flugstad, MD</u> , J.B. Stephenson, R. Li , J.G. Yan, J.S. Hyde, H.S. Matloub, MD Medical College of Wisconsin

- 09:29 – 09:34 **Outcomes of secondary sternal fixation using rigid plates for infected and dehiscd sternotomy wounds**
Eugene Park
Northwestern University Feinberg School of Medicine
- 09:35 – 09:40 **Twenty Year experience with Microsurgical Reconstruction of Hemifacial Atrophy and Linear Sclerodema**
Daniel Schmid, MD
University of Wisconsin Madison
- 09:40 – 09:45 **Discussions & Questions**
- 09:45 – 10:15 **Break**
- 10:15 – 11:15 **Surgeons in Practice Panel V**
Management of Cleft Lip & Palate Patient
Moderator: Michael Bentz, MD
Panelists: Timothy King, MD, PhD, Russell Reid, MD, PhD,
Pravin Patel, MD
- 11:15 – 12:30 **Surgeons in Practice Panel VI**
- New Concepts in Plastic Surgery**
- Update on Cutaneous Melanoma**
 William Dzwierznski, MD
- The Versatile Thoracodorsal Flap: A Valuable Tool in Breast Reconstruction**
 Thomas Lawrence, MD
- Aesthetic Surgery of the Chin**
 Joseph Daw, MD, DDS
- Brachioplasty**
 Victor Makhlof, MD
- Anterolateral Thigh Flap Reconstruction after Laryngopharyngectomy**
 Wei Chen, MD
- 12:30 – 12:45 *Awards and Adjournment*

ABSTRACTS

SESSION I

WOUND HEALING, BURNS, BASIC SCIENCE, PATIENT CARE

Block A & B

Wounds & Burns

Cocaine Induced Full Thickness Tissue Necrosis

Ashley Amalfi, MD Michael W. Neumeister, MD,
Reuben A. Bueno, MD, Nicole Z. Sommer, MD, Nada N. Berry, MD
SIU School of Medicine

Introduction: We report a series of cocaine-induced full-thickness tissue necrosis of 10-20% total body surface area. Wound management included serial, aggressive surgical debridement and split-thickness skin grafting.

Methods: A retrospective review was performed of patients presenting with cocaine- induced skin necrosis. IRB approval was obtained to review patient demographics, past medical history and social history. Skin histology, serum immunology, and the patient's clinical course were compared. Laboratory evaluation was performed on the drug paraphernalia from one patient to help identify the various contaminants in the cocaine.

Results: Four patients with cocaine-induced skin necrosis presented to our Regional Burn Center between December 2010 and February 2011. All patients had positive toxicology for cocaine use. Each presented with constitutional symptoms and a prodrome of purpura that progressed to full thickness necrosis within 4-6 weeks. Three of four patients had a known autoimmune disease and all demonstrated circulating autoimmune antibodies. All patients required aggressive surgical treatment of their wounds including serial excisional debridements, temporary xenografting, and definitive split-thickness skin grafting. Facial involvement was allowed to heal by secondary intent. One patient spontaneously eviscerating through her necrosis and required emergent surgical correction and hernia repair.

Conclusions: An adulterant is something that is added to cocaine to increase the bulk and weight of the cocaine, and to potentiate its effects. The adulterant levamisole has been implicated in the literature to cause purpuritic lesions that mimic a systemic vasculitis. These lesions reportedly dissipate with abstinence from cocaine. Our series represents the first cases that evolved into full-thickness necrosis necessitating surgical and reconstructive management. Levamisole is now detected in over 82% of cocaine transported into the US according to the DEA. Historically used to treat nephrotic syndrome in children, levamisole was removed from the market due to side effects including agranulocytosis and purpura of the auricular helices. It is now used solely in veterinary medicine as an anti-helminth to deworm livestock. We were able to successfully identify levamisole on the drug paraphernalia of our patient. With its historic side effect profile, and the abundance of similar precursor lesions in the literature, we have evidence to suggest levamisole in cocaine as the *most-likely* causative agent. As reconstructive surgeons, we must have a heightened awareness of this emerging entity both to aid in prompt diagnosis and surgical management of cocaine-induced full thickness tissue necrosis.

Efficacy of Serum Nutritional Measurements as a Predictor of Wound Healing Complications in Bariatric Patients Undergoing Panniculectomy: A Multi-Institutional Study

John R. Barbour, MD¹ Patrick J. O'Neill, MD² Thomas H. Tung, MD¹

Division of Plastic & Reconstructive Surgery,
Washington University School of Medicine¹ Medical University of South Carolina²

Introduction: Hypo-proteinemia and nutritional deficiencies are common following bariatric surgery, and while massive weight loss patients experience increased wound complication rates, the association has not been causatively determined. Structured follow-up and multi-disciplinary emphasis on supplementation in bariatric patients has shown improvement in traditional nutritional markers. This study investigated the relationship between pre-operative nutritional parameters and wound complications in massive weight loss patients (post-bariatric and diet-controlled) undergoing panniculectomy at two academic institutions.

Methods: One-hundred sixty-one consecutive patients undergoing elective panniculectomy, either following bariatric surgery or diet-controlled weight loss, were identified. Patient demographics, total and percentage weight loss, time from surgery, and nutritional measures (serum protein, albumin, and micro-nutrient levels) were analyzed. Complications including wound separation, infection, and subsequent debridements were compared between groups. Post-hoc comparisons tested for correlation between complications and nutritional markers.

Results: Post-bariatric patients lost an average of 151 pounds and presented at an average of 32 months following gastric bypass. Diet-controlled weight loss patients lost an average of 124 pounds, and all patients were weight-stable prior to surgery. Despite massive weight loss, albumin levels were higher in the bariatric group (3.8 gm/dL vs 3.4 gm/dL, $p < 0.05$). Conversely, bariatric patients experienced increased wound complications (27% vs 14%; $p < 0.05$). Factors which were found to correlate to increased risk of wound dehiscence and infection were elevated BMI at time of panniculectomy and amount of tissue removed. Multi-variate analysis did not show serum albumin nor percent weight loss to independently predict complications.

Conclusions: Bariatric patients presenting for elective operations are at risk for protein and micro-nutrient deficiency. Despite aggressive replacement and normalization of nutritional markers, bariatric patients experience increased wound complications when compared to non-bariatric patients. Traditional measures of nutritional evaluation for surgery may be insufficient in bariatric patients, and additional studies investigating the cellular etiology of wound complications are warranted.

Multidrug-Resistant *Acinetobacter* in a Burn Intensive Care Unit: Epidemiology, Progression, and Containment Protocol

Megan Henderson MD, Theresa Hegge MD, Alyssa Moore PA,
Rebuen Bueno MD, Michael Neumeister MD
SIU School of Medicine

Introduction: Recent rising rates of Multidrug-resistant *Acinetobacter* (MDRAB) infections have presented particular challenges to intensive care units due to lack of treatment protocols and immune compromised status of patients. The purpose of this study was to retrospectively evaluate a recent outbreak of this bacteria strain in the Memorial Medical Center burn unit to help provide guidance for future containment efforts.

Methods: A retrospective chart review done by MMC Infection Control examining a 2010 outbreak of *Acinetobacter* involving eighteen patients.

Results: Mean days from admit to infection was 13.5 days. Common positive culture sites included: sputum(61 %), blood(38%), wound(27%), and urine(27%). Seventy-two percent of patients were on mechanical ventilator during hospitalization. Investigations included cultures of all ventilators, sinks, and beds. If identified, patients were placed on strict contact isolation, and room decontamination was completed using both a bleach solution and a UV light.

Discussion:The overall prevalence of MDRAB has increased from only 1.3%-2.4% in 2004 to as high as 25% in some settings. Multidrug-resistant *Acinetobacter* infections are difficult and costly to eradicate. Aggressive infection control practices, antimicrobial sensitivity testing, and appropriate antibiotic treatment are keys to preventing and managing MDRAB associated infections. First line antimicrobial treatment includes imipenem, meropenem, tigecycline or polymyxins.

Acinetobacter's ability to survive harsh conditions for lengthy periods of time precludes traditional decontamination methods, necessitating the use of newer, more effective techniques such as UV light. At the Memorial Burn Unit, the use of UV light, traditional decontamination, multidrug therapy, cohort isolation and strict contact precautions have become mainstay practices. In addition, we find it necessary to examine patient factors, infection types, bacterial characteristics, transmission routes and treatment outcomes to further delineate causative factors that can be addressed in future prevention plans.

Human Bites Resulting in Hand Infections: Is Eikenella a Bug of the Past?

Victor J. Hassid, MD^{1,3}, Simple Banipal, MD², Benjamin Liliav, MD^{1,3}, Mansour V. Makhlof, MD³, Orhan Kaymakcalan, MD³

¹ University of Illinois at Chicago, Chicago, IL; Department of Surgery – Division of Plastic, Reconstructive and Cosmetic Surgery

² Mount Sinai Hospital, Chicago, IL; Department of Surgery

³ Mount Sinai Hospital, Chicago, IL; Department of Surgery – Division of Hand Surgery

Background: Human bites and other wounds contaminated with oral flora are common and result in frequent visits to emergency rooms. Successful management depends on timely diagnosis, appropriate cultures, early administration of broad spectrum empiric antibiotics and tailoring based on culture results, thorough emergent surgical debridement and irrigation, and close follow-up. Traditionally, hand infections as a result of clenched-fist injury have been associated with *Eikenella corrodens*. The purpose of the current study is to identify the incidence of cultured microorganisms as a result of human bites, which would contribute to the initiation of a more accurate antimicrobial empirical therapy.

Methods: A retrospective chart review of patients who were evaluated by the Hand Surgery service at Mount Sinai Hospital as a result of human bite to the hand during the time period between April, 2007 and October 2011 was performed. Patients without culture results were not included in the study population. In order for these patients to be identified the ICD-9 codes E928.3 and E928.7 were used, which represent "human bite" and "accidental, environmental causes", respectively.

Results: A total of 46 patients were identified who met the inclusion criteria. Of those, 40 hand infections were the result of clenched-fist injury, 4 of human bite, and 2 of nail biting. The most frequently isolated micro-organisms were Gram-positive aerobes (58%), of which 32.4% belonged to *Streptococcus* species. More than half (57.1%) of *Staphylococcus aureus* isolated was resistant to methicillin (MRSA). *Eikenella corrodens* was isolated in 6.7% of specimens.

Conclusions: Timely surgical debridement and accurate broad spectrum antibiotic therapy initiation are of significant importance in the treatment of hand infections resulting from human bites. Gram-positive aerobes are the most frequently isolated micro-organisms from such wounds, followed by Gram-negative anaerobes. *Eikenella corrodens* remains an important micro-organism related to human bites. The empiric antibiotic regimen chosen should be effective against both these groups of pathogens, including MRSA, and tailored appropriately based on final culture results.

Indirect Diagnosis of Osteomyelitis: A Dilemma

Ashesha Mechineni – medical student Kamineni Institute of Medical Science
Victor L. Lewis Jr., M.D

Standard infectious disease practice bases the decision to treat bony changes about the pelvis radiographically consistent with chronic osteomyelitis as diagnosed by the findings observed on the MRI. Laboratory results such as sedimentation rate, white blood cell count, and alkaline phosphatase generally do not need to be abnormal for the institution of a two to six week course of antibiotics. Subsequently, then the reconstructive surgeon must decide whether chronic osteomyelitis was ever present, is still present, and whether the wound can be safely closed.

Clinical Case: In September 2010, a 43 year-old man requested our evaluation for a recommendation for right hemipelvectomy for chronic osteomyelitis. His long complex history began at age 18 with right hip trauma from a motor vehicle accident. His problem progressed to hip arthritis, hip joint replacement, infection and removal of the prosthesis, long-term Girdlestone defect, and eventual chronic open anterior thigh wound, ischial pressure sore, and non-ambulatory status.

Following successful ischial wound closure in 2008, the patient received multiple courses of parenteral antibiotics for the chronic anterior thigh wound with a radiologic diagnosis of chronic osteomyelitis of the pelvis. In all the records we have reviewed, no fever or elevated white blood cell count was documented. Bone biopsy in September 2011 was negative for osteomyelitis. Repeat multiple biopsies of all areas of the wound in January 2012 were negative for chronic osteomyelitis. Bone cultures by standard techniques grew nothing.

Discontinuation of all antibiotics in January 2012 resulted in no fever, elevated sedimentation rate, or leukocytes. Wound appearance did not change. There were factors in the wound which could contribute to poor healing including scar, heterotopic calcification, and muscle atrophy. The last imaging study in 2011 still showed the changes interpreted as chronic osteomyelitis. We estimate antibiotic costs at over \$100,000, but do not know if anything was ever treated or if anything such as biofilm is present now. We estimate the financial cost of the last four years of therapy. We propose an algorithm to limit empiric antibiotic therapy, and perhaps direct effective treatment.

Retrospective Review of Octogenarian Burn Patient Mortality

Cedar Helen Malone, MD, MW Neumeister, RA Bueno, NZ Sommer, SJ Markwell, JL Koechle

Southern Illinois University School of Medicine

Introduction: Historically poor outcomes in the elderly burn population have encouraged a bias toward comfort measures only treatment. Advances in burn management over the past 50 years have improved mortality rates for patients with burn injuries. There are only a few studies of the octogenarian burn population, and most studies of this age group institute comfort measures only care in the majority of these patients.

Methods: We performed a retrospective review of 72 patients admitted to the Memorial Medical Center burn unit from 1997 to 2011. Data collection included patient age, percentage total body surface area (%TBSA) burn, percentage total body surface area full thickness (%FTSA) burn, presence of inhalation injury, disposition, and comfort measures only care. We examined our results both including and excluding comfort measures only patients. Univariate and independent predictors of death were identified, and the optimal cut-off for %TBSA burn to predict patient death was determined.

Results: Our study population had a mean age of 84.7 years of age. The mean %TBSA burn and %FTSA burn was 22.1% and 15.4%, respectively. Comfort measures only care was instituted in 15.3% of the study population. The overall mortality rate was 36.1% and 26.2% when patients with comfort measures only care were included and excluded, respectively. The only independent predictor of death was %TBSA burn. Patients with greater than a 26% TBSA burn were considerably more likely to expire, OR=59.71 (95% CI 11.34-314.38), p=0.0001.

Conclusion: The mortality rates in our study compared favorably with current literature reports, and we employed comfort measures only care less often. Treatment of burn injury in the octogenarian burn patient should no longer be viewed as a futile endeavor, and comfort measures care should be used sparingly. Aggressive resuscitation and early surgical treatment of elderly burn patients appear to yield better outcomes especially in patients with less than 26% TBSA burns.

SESSION I

WOUND HEALING, BURNS, BASIC SCIENCE, PATIENT CARE

Block C

Basic Science

How Many Bacteria Does it Take? The Host Immune Response Fails to Prevent Even Low Numbers of Bacteria from Rapidly Establishing Biofilm Infection in Wounds

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The establishment of bacterial biofilm in wounds is a key event: once biofilm is present, it is extremely difficult to eliminate, and proven to impair wound healing leading to the development of chronic wounds. The objective of this study was to determine how many bacteria it takes to establish biofilm in wounds. Full thickness dermal punch wounds were created in the ears of New Zealand white rabbits, and inoculated with increasing concentrations of planktonic *Klebsiella pneumoniae* bacteria, ranging from 10^2 through 10^7 bacteria per wound. It was hypothesized that lower bacterial concentrations would be eliminated by host defenses, and that higher bacterial concentrations would overcome the host immune response. Imaging of the wound surface by electron microscopy, quantification of bacterial number by viability counts and qPCR, and analysis of neutrophil counts, however, yielded opposite than expected results. By 96 hours post inoculation, even the lowest 10^2 concentration of bacteria had proliferated to a level of 10^7 CFU/ml per wound, forming fully mature biofilm. Higher inocula, however, proliferated only minimally, peaking at between 10^7 and 10^8 CFU/ml. Neutrophil response was minimal to lower inocula, increasing in accord with bacterial proliferation, but ultimately proving inadequate to eliminate the infection. Neutrophil response to higher inocula on the other hand was more rapid, and appeared to limit proliferation to a ceiling of 10^8 . Repetition of these experiments in a compromised ischemic rabbit model yielded a higher bacterial ceiling of 10^9 CFU/ml per wound. These results provide new insight into the interaction between host and bacteria, demonstrating the surprising ease with which even extremely low numbers of bacteria can rapidly establish in wounds, and that although unable to eliminate biofilm formation, the host response is able to contain it. These findings challenge the conventional 10^5 paradigm, and further support the clinical significance of biofilms in the pathogenesis of chronic wounds.

Immunoregulatory and regenerative properties of adipose stem cell - hydrogel constructs

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There is increasing interest in regenerative medicine to combine mesenchymal stromal cells (MSCs) with biomaterial scaffolds for tissue engineering or repair of injured tissues. Macrophages play a pivotal role in the initiation, progression, and resolution of tissue injuries, as well as in the host defense against biomaterial scaffolds or implants. Given the known immunomodulatory effects of MSCs *in vitro*, combining these cells with biomaterials may provide not only a tissue construct but an approach for suppressing macrophage-induced foreign body response against such constructs. The objective of the current investigation was to analyze the *in vitro* immunoregulatory and regenerative properties of adipose MSCs (AMSCs) in a hyaluronic acid (HA) hydrogel co-cultured with macrophages during a seven day culture period. Cytokines and growth factors were measured using a Bio-plex assay from the cell culture supernatants. Extracellular matrix (ECM) gene expression was analyzed using real-time PCR. Overall, we found higher concentrations of inflammatory cytokines IL-1 β , MIP-1 α , TNF- α , IFN- γ , IL-10, and IL-12 in the AMSC-constructs compared to hydrogel only conditions which plateaued over time. Additionally, significant increases in expression of ECM proteins (pro-collagen, collagen-I and -III, and MMP-9) were found compared to hydrogel alone. As proof of concept, constructs implanted on the backs of nude mice demonstrated neoadipogenesis at 4 weeks. Our results indicate both immunomodulatory and regenerative roles of AMSC-biomaterial constructs important in cell-based tissue engineering.

Adipose-derived stem cell to skin stem cell transdifferentiation: a mechanism to improve understanding of fat grafts' skin regenerative potential

Brian M. Derby MD, Hui Dai MD, PhD, Joel Reichensperger, Carrie Harrison, Lisa Cox,
Reuben A. Bueno MD, Michael W. Neumeister MD, FRCSC, FACS
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Goals/Purpose: Facial soft tissue augmentation, using autologous fat, also reportedly affects texture, porosity and appearance of overlying skin. Investigators suggest that adipose-derived stem cells (ADSCs) are key contributors to this process through growth factor production. We sought to explore an alternative mechanism of ADSC influence on overlying skin – cellular transdifferentiation. In vivo evidence of ADSC transdifferentiation into epithelial cells is sparse, and focuses on colocalization of ADSCs with epithelial cell surface markers. But, with stratified epithelial cells in a constant state of turnover, we question the sustainability of engrafted ADSCs' impact on overlying skin if they transdifferentiate solely into simple parenchymal skin cells. Identifying ADSC transdifferentiation into skin-derived *stem* cells, through colocalization of engrafted ADSCs with the epithelial *stem* cell marker *p63*, may offer insight into how ADSC transdifferentiation contributes to lasting skin improvements after fat grafting. Such findings may help refine techniques for ADSC application to aesthetic and reconstructive skin tissue engineering. We aim to provide in vivo evidence of ADSC dermal-epidermal migration, and transdifferentiation into epithelial *stem* cell lineages after fat harvest, refinement, and subdermal fat grafting.

Methods/Technique: Twelve male, GFP (green fluorescent protein) producing mice served as adipose tissue donors. Twenty-four nude mice served as recipients. Recipients were subdivided into four arms (6 mice/each arm). Experimental arms included nude mice that received whole inguinal adipose specimen (unrefined fat + ADSCs) (Group 1), ADSCs alone (Group 2), 1ml of refined adipose specimen + ADSCs (Group 3), or 1ml of refined adipose specimen without ADSCs (Group 4) engrafted, respectively, into the left parascapular subdermal plane. The right parascapular subdermal plane was subjected to one of two control parameters (1ml of phosphate buffered saline or sham surgery). Tissue was harvested at 8 weeks, sectioned, and subjected to confocal microscopy for identification of GFP producing ADSC migration within overlying dermal-epidermal layers. We anticipated co-localization of GFP with p63, an epidermal cell marker used to demonstrate ADSC differentiation towards epidermal cell lineages. Real time polymerase chain reaction (RT-PCR) was used for quantification of p63 expression for each experimental group (n=6 each group). The statistical significance of the difference between group mean values was evaluated using the Student's t-test. *p<0.05; ** p<0.01

Results/Complications: At tissue harvest, whole fat tissue specimens (Group 1) were noted to have subjectively increased blood vessel formation overlying engrafted specimens, suggestively supporting the known contribution ADSCs make towards neovascularization (Figure 1). Confocal microscopy of Group 1 (Figure 2) and Group 2 (Figure 3a) sections demonstrated ADSC cell migration into overlying dermal architecture. P63 co-localized to the GFP producing donor cells seen migrating through the dermis of recipient skin specimens (Figure 3b). Statistical analysis of RT-PCR for p63 demonstrated significantly increased levels of p63 expression in the refined fat + ADSC experimental group (Group 3), when compared to groups 1 and 4 (Figure 4). Group 2 was not included in this analysis as its ADSC cell population had been expanded in vitro, prior to implantation, which would have confounded the comparison.

Conclusion: We offer direct evidence of ADSC migration into overlying skin architecture after fat grafting. Previous studies demonstrated ADSC transdifferentiation into cells possessing one of the many epithelial cell surface markers. To the best of our knowledge, we offer the first account of ADSC colocalization with p63 (at 8 weeks after fat grafting in our model.) This find suggests ADSCs' potential for in vivo transdifferentiation into epithelial stem cells after fat grafting. P63 is considered essential for normal stratified development of epithelium, and as a marker for epithelial stem cells. As cell and tissue-engineered regenerative therapies for skin injury and aesthetic medicine are developed, these findings may help direct such research efforts.

Deep Inferior Epigastric Perforator Flap for Breast Reconstruction after Abdominoplasty

Jonathan Bank*, Lucio A. Pavone⁺, Michelle C. Roughton⁺, Loren S. Schechter⁺

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Case Description A 49-year-old female with a T1N0M0 invasive ductal carcinoma of the left breast presented seeking immediate autologous reconstruction. Her surgical history included an abdominal hysterectomy through a Pfannensteil approach as well as an abdominoplasty. Physical examination revealed large breasts with grade 2 ptosis, a low transverse abdominal scar extending between the anterior superior iliac spines, and a periumbilical scar. A moderate abdominal pannus was noted, sufficient for a unilateral reconstruction.

Methods A preoperative CT angiogram identified a single suitable medial row perforator on both sides of the hemi-abdomen and confirmed patency of the deep inferior epigastric systems bilaterally. The patient underwent uncomplicated skin-sparing mastectomy and sentinel lymph node biopsy simultaneous with flap elevation. The location of the radiographically-identified perforators was confirmed via Doppler auscultation and the flap was centered at this location, placing the inferior incision at the previous lower abdominal scar. The perforators were isolated and laser-assisted indocyanine green imaging (SPY) confirmed adequate flap perfusion based on the single left-sided perforator alone.

Results The flap was harvested based on this perforator and anastomoses to the internal mammary system were performed in the usual fashion. The early postoperative course was complicated by a kink at the venous anastomosis, which required revision. The remainder of the patient's postoperative course was unremarkable.

Conclusion In this case, preoperative CT angiography confirmed: 1) presence of perforators 2) perforator communication with the deep inferior epigastric system and 3) perforator location acceptable for flap design. Additionally, laser-assisted indocyanine green angiography: 1) facilitated perforator selection and 2) provided intra-operative assessment of flap perfusion. Utilization of these modalities allowed safe completion of an operation considered to be contraindicated by conventional algorithms and highlights their role in complex perforator flap reconstruction.

SESSION I

WOUND HEALING, BURNS, BASIC SCIENCE, PATIENT CARE

Block D

Patient Care

Bactericidal surgical drain development

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Background: Surgical site infections continue to plague surgeons and patients alike following a vast array of operations. In breast reconstruction with tissue expander placement, reported infection rates vary from 5.3% to greater than 15.6%. Surgical drains are one purported entry site for bacteria causing these infections, and prophylactic antibiotics are given by many surgeons while these drains are in place. Central venous catheter-related bloodstream infections have been significantly reduced utilizing chlorhexidine dressings and various antibiotic and silver coatings. Utilizing such a strategy in surgical drains may lead to a similar reduction in expander and surgical site infections.

Methods: A Blake-type silicone surgical drain was designed in conjunction with Biomedical Engineering colleagues, incorporating both silver coating and a chlorhexidine-impregnated sponge at the skin level. Initial microbiologic testing of various foam types and densities was performed against five bacteria commonly associated with expander infections. *Staphylococcus aureus* (MSSA), methicillin-resistant *S. aureus*, *S. epidermidis*, *Streptococcus pyogenes*, and *Pseudomonas aeruginosa* were plated using standard methods. Both chlorhexidine-treated and control sponges were placed on these plates, and zones of inhibition were measured at 24 hours. The sponges were then moved to new inoculated plates. This was repeated daily for 14 days to assess for continued release of chlorhexidine.

Results: After 6 foam types were tested for activity against MSSA, three foam types with the greatest duration of activity and largest zones of inhibition were selected for further testing. Of these, all had activity for the full 14 days against all bacteria, with the exception of *P. aeruginosa*, against which activity ceased at 7 days.

Conclusions: We have developed a prototype for a surgical drain which has bactericidal properties, utilizing a silver coating and a chlorhexidine-treated sponge. Initial microbiologic testing of chlorhexidine-treated sponges reveal that these properties are retained at 14 days, with the exception of *P. aeruginosa*, against which silver has previously been shown to be active. Further studies are needed to evaluate the effect of silver drain coating, as well as prototype testing in an animal model.

Postoperative Nausea and Vomiting: Guidelines for the Plastic Surgeon

Sara Yegiyants MD, Iliana Sweis MD, Mimis Cohen MD

The peri-operative course of surgical patients can have a tremendous impact on the surgical outcome and patient satisfaction. One significant issue is postoperative nausea and vomiting (PONV) which despite being a common side effect of general anesthesia has received very little attention in the plastic surgery literature.

Incidence and potential consequences of PONV are frequently underestimated and consequently the need for prophylaxis is often overlooked. There are significant consequences to this seemingly minor morbidity that extend beyond patient discomfort and dissatisfaction. These include hematoma formation from mechanical forces involved in retching and vomiting, disruption of skin grafts, and muscular strain, which can be problematic in delicate cases such as rhytidectomy or blepharoplasty. In addition to being considered a significant undesirable outcome by patients severe cases of PONV may necessitate unplanned hospital admissions following outpatient procedures. In this presentation we overview etiology, pathophysiology, risk factors for PONV and provide a comprehensive algorithmic approach to the management of PONV.

On the Shoulders of Giants: Plastic Surgery History and Our Connection to It

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Feinberg School of Medicine, Chicago, Illinois, USA

Purpose: Much has been written about the history of Plastic and Reconstructive Surgery. Rich in creativity and innovation, our specialty was borne out of general surgery and propelled forward by a few incredible individuals. Thanks to their mentorship and willingness to pass the torch to those that followed, these founding fathers fostered the development of many more pioneers who were responsible for further advancement in our field. As Morain rightly stated, the “future of Plastic Surgery remains deeply tied to its origins.” While not related by blood, instead by creativity and a fondness for human form and function, I have often wondered what connections I have with the pioneers of our field. With this thought in mind, I embarked on a journey through our history to uncover the roots to my Plastic Surgery family tree.

Methods: Beginning two of the faculty members most responsible for my plastic surgery education, I traced backward mentor to mentor, or chairman to chairman, to find the earliest influences to my surgical training. Through personal discussion and the assistance of technological advances including Google®, PubMed®, electronic journal archives, and electronic historical libraries, I was able to trace my lineage and develop a Plastic Surgery Family Tree.

Results: Much to my surprise and excitement, I uncovered many direct connections to our founding fathers and other important pioneers in our history – some closer than I expected. Likewise, I discovered how truly small and connected the plastic surgery community is, as there were many shared branches to my tree.

Conclusion: Through this discovery, I have realized that I was handed an invaluable torch that I will pass on to others, with the hope they will carry this flame with pride, before passing it on to those who follow them. Although I was not born into Plastic Surgery, my surgical roots are deep, reaching back to the founding fathers. And as I continue in my career, I too, will carry these spiritual genes to the next generation of Plastic Surgeons.

SESSION II
SELECTED TOPICS IN PLASTIC SURGERY
Block A

Single Stage Nipple-Areolar Complex Reconstruction: Technique, Outcomes and Patient Satisfaction

Benjamin Liliav MD, Jennifer Loeb MS, Anuja K Antony MD, MPH
University of Illinois Chicago

Background Nipple-areolar reconstruction (NAR) is usually the final phase of the breast reconstruction process and is associated with increased patient satisfaction. NAR is typically done in two stages, with tattooing performed before or after nipple construction. Two-stage NAR lengthens the time to completion of the reconstructive process, increases the time burden experienced by the patient and can result in irregular tattoo uptake (decreased uptake along suture lines and difficulty tattooing the 3D construct). To alleviate these issues, we recently introduced a novel method of single stage NAR, which combines creation of a local flap and medical tattooing in one session with predictable outcomes and high patient satisfaction.

Methods /technique A retrospective chart review of a prospectively-maintained database was conducted to identify patients who underwent single stage NAR at our institution between September of 2010 and November of 2011. Nipple reconstruction was carried out in one stage with tattooing of the outlined CVV flap, followed by elevation and construction of the nipple, and then remarking and tattooing of the areola. Patient demographics, complications, and outcomes were reviewed. Additional parameters assessed included necessity for additional procedures such as touch-up tattooing and patient satisfaction with their new NAC in terms of size, shape, nipple projection and color.

Results Seventeen single stage nipple-areola reconstructions were carried out in eleven patients; five patients underwent unilateral NAR and 6 patients underwent bilateral NAR. Mean age was 44_ years old (range 34-60); 2 were Caucasian, 4 were AA, 2 were Hispanic, and 3 were Other Ethnic background. No major complications (dehiscence, infection, nipple loss or implant exposure) were identified. Only one patient underwent repeat tattooing to touch up the areola. Nipple projection was good to excellent, comparable to reported results of CVV flap for nipple reconstruction. Tattoo color uptake was good (n=4) to excellent (n=13) with improvement of uptake noted with a change from #7 to #5 (Permark) needle. Patient satisfaction was high in all patients.

Conclusion Our study demonstrates that single stage NAR is a safe procedure with good clinical results with virtually no need for revisions. This method is cost-effective, convenient for the patient, and shortens patient recovery time with high patient satisfaction.

Herpes Simplex Virus Type 1 Infection in Burn Patients

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SIU School of Medicine – Springfield, IL

Background: Herpes simplex virus type 1 (HSV1) is common with reports that 85% of adults have serologic evidence of exposure. Although it is standard of care to provide antiviral prophylaxis prior to facial resurfacing procedures and to transplant patients, there is no recommendation for antiviral prophylaxis in burn patients who are at risk for HSV1 reactivation because of both direct trauma and immunosuppression.

Methods: A retrospective chart review was performed of adult intubated burn patients admitted to Memorial Regional Burn Center from 2005-2010. Data collection included HSV1 presentation, diagnosis, complications, length of hospitalization, and mortality. Data was analyzed using independent t-test & chi-square test of independence.

Results: 134 adult intubated burn patients (103males&31females, mean age 48) were admitted during the review period. 23 of these patients (17%, 16males&7females, mean age 49 years) developed HSV1 infection. 19 of 23 patients had positive HSV1 viral culture, while 4 patients had negative culture but were treated based on clinical diagnosis. Mean burn size was 29%TBSA(range 5-65%). Herpetic rash presented on average post burn day 13(range 9-27 days). Bronchial lavage viral culture was positive in 5 patients, and presented earlier than facial lesions(day 8vs13,p=0.028). Patients with HSV1 infection had prolonged length of hospitalization(31vs17 days,p=0.0001). Complications of HSV1 infection included discomfort, prolonged wound healing, ophthalmic involvement, & disseminated herpetic rash.

Conclusion: This study represents the largest review of burn patients with HSV1 infection and found an incidence of 17%. Burn patients with HSV1 infection had a 2 week longer hospitalization, which has profound financial implications in the intensive care setting. Based on this study, we have developed a multicenter, prospective, randomized clinical trial to investigate whether burn patients may benefit from antiviral prophylaxis. This could have a significant impact on both patient care as well as cost savings if length of hospitalization is shortened.

A Comparison of Outcomes between Alloplastic and Autologous Breast Reconstruction: 2005-2010 Data from the National Surgical Quality Improvement Program (NSQIP).

Sahil K. Kapur, Victoria Rajamanickam, Samuel O. Poore

Introduction: The American College of Surgeons National Surgical Quality Improvement Program is a risk-adjusted data collection mechanism that collects and analyzes clinical outcomes data. We analyzed this data to search for a difference in the return to operating room (OR) rate and flap/implant failure rate between alloplastic and autologous breast reconstruction. Furthermore, we indentified risk factors that are significant to these procedures and adjusted for them to look for a difference in outcome.

Methods: Univariate and multivariate methods were performed on 2005-10 data to analyze the association of alloplastic vs. autologous breast reconstruction procedures with the outcomes of return to operating room (OR) and flap/implant failure rate.

Results: From 2005-10, 13,309 alloplastic and 3,905 autologous reconstruction procedures were performed. There was a 9.19% return to OR rate and a 2.64% flap failure rate reported in autologous reconstruction cases and a 6.24% return to OR rate and a 0.9% implant failure rate reported in alloplastic reconstruction cases. The risk factors significant for both, an increase in return to OR rate, and an increase in flap/implant failure rate included: BMI: >30, history of smoking, history of recent operation, severe/life threatening ASA score, operative time > 4hours. When a multivariate analysis was performed after adjusting for the above risk factors, no significant difference in return to OR rate was found for either type of reconstruction. This analysis, however, showed a 67% higher likelihood of flap failure in autologous reconstruction cases compared to implant failure in alloplastic reconstruction cases ($p<0.02$).

Conclusion: Specific risk factors stated above significantly impact flap/implant failure. After we adjust for these factors, we find a 67% higher rate of flap failure compared to implant failure. Future analyses will model a one-to-one interaction between each risk factor and the type of reconstruction to elucidate the risk of flap vs. implant failure.

Patient Safety in the Operating Room: A Review of Perioperative Risks and Methods to Minimize Risks

Nyama M. Sillah¹ MD ; Samuel O. Poore¹ MD, PhD; Ashish Y. Mahajan¹ MD; Karol A. Gutowski² MD ¹University of Wisconsin Hospital and Clinics
²Northshore University Health System

Background: Beyond the controlled trauma of surgery, the operating room can be a hazardous place for patients and healthcare workers alike. Modern plastic surgery requires a thorough knowledge of various perioperative risks and methods to minimize these risks. As the importance of teamwork becomes more evident, clear communication skills preoperatively, intraoperatively, and postoperatively become equally critical. To facilitate an improvement in perioperative patient safety, we will present aspects of communication, including crew resource management, root cause analysis, and surgical site verification. In addition we will present other intraoperative and postoperative risks, and techniques to decrease these risks.

Methods: The authors reviewed the literature regarding operating room safety, both primary research and secondary reviews, via multiple PubMed queries and literature searches. Topics most relevant to inpatient plastic surgery were included in the final analysis and summarized, as a full review of each topic is beyond the scope of this presentation.

Results: Several preoperative, intraoperative and postoperative risks were identified, in addition to methods designed to decrease the incidence of those risks, complications, and other adverse events amongst plastic surgeons and their patients.

Conclusion: There are ample opportunities for the reduction of preventable adverse events in plastic surgery. We plan to present tools to research adverse events, and a basic education in avoiding specific preoperative, intraoperative, and postoperative events.

SESSION III
BREAST AND COSMETIC
Block A
Breast

Technique of Inframammary Fold Reconstruction (IMFR) in Two-Stage Tissue Expander/Implant (TE/I) Breast Reconstruction (BR)

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University of Illinois - Chicago

Introduction: Implant-based breast reconstruction offers many advantages, including shorter recovery, minimal donor site morbidity, and varying implant sizes and shapes. However, creating an aesthetically pleasing shape with ptosis of the lower pole and definition of the inframammary fold(IMF) remains a difficult task. We describe our preferred technique for second stage IMFR with capsulotomy, anterior fat release/abdominal flap recruitment, and suture suspension of the IMF.

Methods: Consecutive patients who completed the second stage of TE/IBR at the University of Illinois at Chicago and Mt Sinai Medical Center Chicago by a single surgeon between 05/2010 and 01/2012 were identified. Medical records and photographs were then reviewed retrospectively. The operative results were analyzed using a two-reviewer technique to assess breast shape, inferior pole ptosis, and overall aesthetic results.

Results: During the 18-month study period, 35 second-stage TE/IBR were completed in twenty patients. Mean age was 43yrs(range 24-60); mean BMI was 29(20-43). All of the patients were reconstructed with silicone gel implants and 75% of the reconstructions utilized alloderm lower pole support and coverage at the initial stage. Twelve breasts were previously radiated, of which 5 underwent latissimus flap coverage of the TE/I. In our practice, the permanent implants are routinely upsized at the time of exchange, with mean TE volume of 586ml, while the mean permanent implant volume was 622ml. All patients were noted to have satisfactory breast shape with improved ptosis of the lower pole post-exchange and sharp definition of the IMF.

Conclusions: IMFR using a suture-based technique can be safely performed during second stage TE/IBR. Notwithstanding implant upsizing, improved lower pole ptosis can be achieved with capsulotomy, anterior fat release/abdominal flap recruitment and suture suspension of the IMF. All patients had satisfactory outcomes with greatly improved IMF definition and lower pole ptosis, without the need for extensive capsulectomy or bolster reinforcement.

Deep Inferior Epigastric Perforator Flap for Breast Reconstruction after Abdominoplasty

Jonathan Bank*, Lucio A. Pavone⁺, Michelle C. Roughton⁺, Loren S. Schechter⁺

*University of Chicago Medical Center, Chicago, IL

⁺University Plastic Surgery, Morton Grove, IL

Case Description A 49-year-old female with a T1N0M0 invasive ductal carcinoma of the left breast presented seeking immediate autologous reconstruction. Her surgical history included an abdominal hysterectomy through a Pfannensteil approach as well as an abdominoplasty. Physical examination revealed large breasts with grade 2 ptosis, a low transverse abdominal scar extending between the anterior superior iliac spines, and a periumbilical scar. A moderate abdominal pannus was noted, sufficient for a unilateral reconstruction.

Methods A preoperative CT angiogram identified a single suitable medial row perforator on both sides of the hemi-abdomen and confirmed patency of the deep inferior epigastric systems bilaterally. The patient underwent uncomplicated skin-sparing mastectomy and sentinel lymph node biopsy simultaneous with flap elevation. The location of the radiographically-identified perforators was confirmed via Doppler auscultation and the flap was centered at this location, placing the inferior incision at the previous lower abdominal scar. The perforators were isolated and laser-assisted indocyanine green imaging (SPY) confirmed adequate flap perfusion based on the single left-sided perforator alone.

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**Patient Satisfaction with 3D Imaging Technology in Cosmetic Breast Augmentation:
A Pilot Study**

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Southern Illinois University School of Medicine

Introduction: Breast implant selection is a largely subjective decision requiring significant patient input. Traditional methods of implant size selection provide a limited ability to demonstrate postoperative outcomes. Three-dimensional imaging technology provides a unique opportunity for improved patient evaluation, surgical planning, and evaluation of postoperative breast stability.

Methods: A retrospective review of patients presenting to Southern Illinois University Division of Plastic Surgery for bilateral breast augmentation from January 1, 2008 to July 1, 2011 was performed. All patients presenting after January 1, 2010 had preoperative three-dimensional imaging, and all patients presenting before this date did not have three-dimensional imaging. Eligible patients received a BREAST-q questionnaire designed for postoperative evaluation of breast augmentation patients. They also received a second survey that evaluated expected versus actual breast outcomes, confidence in implant size selection, and surgeon-patient communication.

Results: A total of 120 surveys were mailed and 56 patients returned the survey for a response rate of 46.7%. The group that received preoperative three-dimensional imaging had improved BREAST-q scores regarding satisfaction with breasts, satisfaction with outcome, sexual well-being, and satisfaction with surgeon. The group with preoperative three-dimensional imaging also had higher size correlation scores, shape correlation scores, overall breast correlation scores, confidence in implant size selection scores, and communication with surgeon scores. The differences between the two groups did not reach statistical significance for either survey.

Conclusion: Three-dimensional imaging is a valuable tool in breast surgery for patient evaluation, surgical planning, surgeon-patient communication, and patient satisfaction. Although our study showed improvement in patient satisfaction and predicted outcome scores, our results were not statistically significant. A larger sample size would be needed for an adequately powered study.

Comparison of delayed and immediate tissue expander breast reconstruction in the setting of post-mastectomy radiation therapy

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Purpose Despite the continued demand for immediate prosthetic breast reconstruction, some suggest that delayed reconstruction may reduce complications, particularly in the setting of post-mastectomy radiation therapy (PMRT). However, with limited comparative data available, the extent of this benefit is unclear. This study evaluates outcomes following mastectomy and delayed (DTER) or immediate (ITER) tissue expander reconstruction.

Methods A retrospective review of 956 consecutive patients (1276 breasts) that underwent mastectomy with DTER or ITER at one institution from 4/1998-10/2008 was performed. Relevant patient factors, including complication rates, were recorded. For PMRT breasts, radiation therapy was given either before (DTER) or after (ITER) reconstruction. Complications were categorized by type and end-outcome, including non-operative (no further surgery), operative (further surgery except explantation), and explantation. Statistics were done using Student's t-test and Fisher's exact test.

Results There were no differences in clinical factors between ITER (n=1202 breasts) and DTER (n=74 breasts) patients. DTER breasts had lower rates of mastectomy flap necrosis ($p=0.003$), and non-operative ($p=0.01$) and operative ($p=0.001$) complications relative to ITER. In ITER breasts, PMRT increased operative complications ($p=0.02$) and explantation ($p=0.0005$), resulting in a decrease in overall, two-stage success rate ($p<0.0001$). In contrast, there were no differences in outcomes between PMRT and non-PMRT DTER breasts.

Conclusion This comparative study, the largest to date, suggests that DTER is a viable reconstructive alternative that may improve outcomes over ITER, particularly in patients needing PMRT. However, unlike with ITER, surgeons can evaluate patients' potential for success with DTER based on skin flap appearance after both mastectomy and possibly PMRT. As a result, the benefits of DTER may be due to a careful patient selection process preoperatively. The choice of DTER should therefore be balanced against both individual patient risk factors and the psychological appeal of immediate reconstruction.

Breast Aesthetics: The Golden Ratio

Ramasamy Kalimuthu MD, FACS, Sara Yegiyants MD, Barbara Krueger MD

Objective: The purpose of this study was to assess the proportions of the aesthetic breast.

METHODS 50 breasts were analyzed in patients who were seen in consultation for breast augmentation, breast reconstruction, ptosis correction and breast reduction. The following measurements were collected: Sternal notch (SN) to upper pole (UP), UP to nipple (N), SN to N, transverse diameter (TD), N to inframammary fold (IMF), and the UP slope angle off the chest wall measured on the lateral view.

The ratios of the following relationships were calculated: SN to N/UP to N, UP to N/SN to UP.

RESULTS The following ratios were noted to be present in the aesthetic breast.

SN to Nipple/UP to Nipple	1.618
UP to Nipple/SN to UP	1.618
Upper pole slope angle	Sin 38-39 degrees = 0.618
SN to UP/Nipple to IMF	1
Transverse diameter/ Nipple to UP	1

CONCLUSION Breast shape stays within the aesthetic proportions that follow the golden ratio and the golden angle. This will aid in more precise evaluation and analysis of preoperative breast patient to achieve a more aesthetic outcome.

Oncoplastic breast reduction: A safe and aesthetically acceptable option for breast conserving therapy in the treatment of breast cancer in large breasted women.

Laura Bonneau, MD

University of Wisconsin- Madison

Background The challenges of achieving aesthetically acceptable results after lumpectomy has led some women to choose mastectomy, rather than breast conserving therapy, for the treatment of breast cancer. For large breasted women, concurrent lumpectomy with reduction mammoplasty (oncoplastic breast reduction) has been shown to provide a safe and aesthetically acceptable form of breast conserving therapy.

Methods A single institution, retrospective chart review was conducted of breast cancer patients who underwent oncoplastic breast reduction concurrently with lumpectomy. Complications and recurrence of breast cancer were recorded. Post-operative photographs and patient remarks were reviewed to assess patients' satisfaction with aesthetic outcomes.

Conclusions For large breasted women who are candidates for breast conserving therapy, oncoplastic breast reduction is a safe and aesthetically acceptable form of treatment.

SESSION III

BREAST AND COSMETIC

Block B

Cosmetic

Revisiting Browpexy As An Adjunct to Blepharoplasty: Introduction of the Lateral Brow Retaining Apparatus

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University of Chicago Medical Center – Chicago, IL

Goals/Purpose: Increasing investigation of the surgical anatomy of the periorbital region has resulted in increasingly varied and sophisticated surgical techniques for periorbital rejuvenation. Since McCord and Doxanas in 1990 first described the surgical technique of transpalpebral browpexy through the blepharoplasty incision, the importance of addressing eyebrow position in aesthetic blepharoplasty surgery has evolved to considerations of the eyebrow and upper eyelid as irrevocably connected, as shown by the increased use of neurotoxins. The authors describes long term experience with a combined upper blepharoplasty and browpexy procedure, as well as modifications which enhance this technique for periorbital rejuvenation.

Methods/Technique: The authors retrospectively reviewed the case records of 73 patients who underwent combined upper blepharoplasty with transpalpebral browpexy performed by the senior author (JWF). Review of the data reveals two technical modifications which consisted of release of the lateral brow retaining ligament for effective redraping of the periorbital tissues and lateral wedge excision of the preorbital orbicularis oculi to efface lateral crow's feet. Inclusion criteria included a minimum of 24 months follow up.

Results/Complications: The average age of patients was 54.7 years, of which 84% were female and 16% male. The average length of follow-up was 35 months. Data from the entire series revealed absence of revisions and no cases of frontal branch nerve injury, hematoma, or post-operative asymmetry.

Conclusion: The common goal of periorbital rejuvenation procedures is to provide a long-lasting and natural aesthetic result. The combined upper blepharoplasty with browpexy procedure yields excellent long-term results with minimal complications and downtime. The authors' modifications of browpexy in combination with blepharoplasty provides a technique which enhances the results of upper eyelid surgery by augmenting the longevity of the blepharoplasty and addresses lateral brow ptosis by providing a mechanism for decompression of lateral hooding.

Near-fatal Complication Following Injection of poly-L-lactic acid (Sculptra)

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Introduction: PLLA (Sculptra) is soft tissue filler widely used for the treatment of facial atrophy. Reported side effects from injection of soft-tissue fillers for facial rejuvenation range from mild (injection site bruising, cellulitis and nodule formation) to more severe (HSV outbreak, foreign-body granulomatous reaction, dermal necrosis and retinal artery occlusion). We describe a patient who suffered a massive myocardial infarction following subdermal injection of poly-L-lactic acid (PLLA, Sculptra) in the malar region to treat HIV-lipodystrophy.

A 65 year-old man was evaluated in the senior author's office for the ongoing management of malar lipodystrophy related to anti-retroviral therapy for HIV. He had been treated over the past several years with subdermal injection of Sculptra with good results. His past medical history was also significant for hypercholesterolemia and hypertension. He did not relate that the day before treatment he had experienced crushing chest pain, sweating and weakness, or that his partner had tried to bring him to the emergency room. The patient underwent deep dermal injection of 6 cc evenly divided between the bilateral malar region with the usual technique, including a dilution of PLLA with 2 cc of 1% lidocaine with 1:100,000 epinephrine. Within the next ten minutes, the patient collapsed and was pulseless, breathing agonally. CPR was begun immediately. The patient was transported to the emergency room, where an ECG revealed a myocardial infarction. He was transported to the cardiac catheterization lab within 1 hour, where a complete occlusion of his LAD artery was diagnosed and stented successfully. After a prolonged hospital stay the patient was discharged to rehabilitation and is alive and well today. This untoward event was filed with the FDA.

In the post-hoc analysis, several questions were raised: Did our use of lidocaine with epinephrine as a diluent compound the event? Was our usual history and physical pre-screening sufficient? Given that many of these fillers are administered in a spa-type setting, should there be a standard minimum evaluation required for all patients undergoing injections? The case should give pause to all practitioners that even seemingly innocuous aesthetic procedures can have potentially disastrous consequences.

The Lateral Brow Lift under Local Anesthesia: A Simplified Technique

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Background: Several authors have promoted a limited incision lateral brow lift as an alternative to the cumbersome endoscopic brow lift or the maximally invasive bicoronal incision. The particular angles of tension most necessary for a rejuvenating lateral brow lift can be attained through small temporal incisions, while the medial depressors can be reached through a complementary upper blepharoplasty incision.

Methods: 80 consecutive patients undergoing a lateral brow lift by the senior author were retrospectively evaluated. To allow for maximal patient convenience and safety, the senior author (TAM) has simplified his approach to the brow lift such that it can be performed in the office with readily available instruments under local anesthesia and minimal oral sedation. Three centimeter bilateral temporal incisions are carried down through the temporalis fascia and the dissection proceeds inferomedially in a subperiosteal plane along the oblique line. The forehead is also released in the subperiosteal plane to allow for optimal redraping after the lateral lift. An upper blepharoplasty incision allows for release of the orbital ligament and selective resection of orbicularis oculi, corrugator supercilii, or procerus muscles.

Results: The senior author's experience with 80 consecutive limited incision lateral brow lift procedures between January 2008 and July 2010 has demonstrated that this is not only a technically successful procedure, but that it is safe even in the office. Over an average of 422 days of follow up, there were few complications and only one temporary neuropraxia of the frontal branch of the facial nerve.

Conclusions: The limited incision lateral brow lift as described by the senior author allows for judicious elevation of the lateral brow with a few readily available instruments. When complemented by the upper blepharoplasty, this technique can provide excellent and natural-appearing rejuvenation of the upper face.

SESSION IV

CRANIOFACIAL, NERVE, GENERAL RECONSTRUCTION

Block A

Craniofacial

CAD/CAM Designed Surgical Positioning Guides: The Link Between Virtual and Actual Surgery

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Purpose: Computer-aided design and modeling (CAD/CAM) technologies have revolutionized preoperative planning in orthognathic and craniofacial surgery. CAD/CAM preoperative technologies have replaced the traditional evaluative technique of 2D cephalometry and articulated model surgery. 3D virtual surgery enables the surgeon to reposition the skeletal segments and gain an exact understanding of the bony and soft tissue consequences before entering the operating room with the patient. Despite this advancement in pre-operative planning, translation of this advanced technology into the operating room is lacking.

We address the gap between CAD/CAM preoperative planning and its translation into the operating room with the introduction of occlusal-based intraoperative surgical positioning guides (SPG). SPG are CAD/CAM designed intraoperative acrylic guides that, through initial and final guides, accurately translate the virtual preoperative plan to the OR. SPG are designed by the surgeon during virtual surgery and are created through stereolithographic techniques. Not only do the occlusal based guides precisely translate the virtual plan to the OR, they also eliminate the many traditional intraoperative steps: 1. Eliminating intraoperative intermaxillary fixation; 2. Eliminating intermediate splints in double-jaw surgeries; 3. Eliminating manual guessing of proximal segment condylar positioning; 4. Eliminating the need for external reference landmarks.

Methods and Materials: We present three skeletally mature patients with maxillofacial deformities that have been treated utilizing surgical positioning guides and virtual preoperative planning for the following cases: 1. single-piece LeFort I osteotomy; 2. LeFort I osteotomy with mandibular sagittal split osteotomy; 3. reconstruction for post-ablative enophthalmos and orbital dystopia, secondary to orbito-zygomatic trauma.

In these patients, CAD/CAM technology was used in pre-operative planning based on a 1mm cut CT scan. The scan was obtained with the head in neutral position and the mandible in centric relation. This was achieved by a published technique utilizing a registration bite and a gyroscope. The scan data was manipulated with proprietary software to obtain accurate 3D digital representations of the skull. Based on the clinical examination and record evaluation the surgical treatment plan was executed digitally in three-dimensions. A custom single occlusal splint secured to the maxillary dentition was created through additive stereolithographic techniques. Digital registration skeletal landmarks were created in the maxilla and mandible or segments to be mobilized. Surgical positioning guides are digitally designed and manufactured through stereolithography to assist the surgeon in recording the skeletal landmarks that will be used as a reference. Based on the skeletal references and the desired skeletal movements, final positioning guides are manufactured in a similar fashion. At surgery the guides are used to create the reference skeletal landmarks and for precise guidance of the desired skeletal movements to their desired positions after osteotomy.

All three patients had successful treatment outcomes with their single surgical approach. Virtual planning, virtual design and intraoperative application of SPG are illustrated through a step-by-step approach of this technique, which will be presented and illustrated with case reports of these three patients.

Conclusion: We present three patients in which CAD/CAM preoperative planning and surgical execution of those plans using surgical positioning guides was performed. All patients presented had successful outcomes with their single surgery. The patients presented represent the functional and aesthetic success of this novel evolution in orthognathic and craniofacial surgery.

“Critical Age:” Objective, patient-specific timing of helmet therapy in treatment of positional plagiocephaly and brachiocephaly”

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Background: While numerous reports have demonstrated the efficacy of cranial helmet molding in infants with severe positional plagiocephaly and brachiocephaly, there is minimal strong evidence regarding the age at which initiate helmet therapy. Current recommendations to start helmet therapy at 4-6 months of age appear to be based upon biased, uncontrolled, or small-scale clinical trials that may lack reliable and validated objective outcome measures or appropriate follow up. We have developed a method to objectively calculate the “critical age,” or age which helmet therapy must be initiated to achieve complete correction, of infants based upon individual volumetric cranial data.

Methods: Utilizing a 3D surface scanner, the “critical age” is calculated by determining the volume of deficiency created by deformational forces. Understanding that helmets direct all cranial growth in the area of deficiency, one can calculate the amount of time needed to fill a volume void by extrapolation from a modified head growth curve. If the age by which complete correction is desired as known, the “critical age” can be determined by subtracting the time need for correction from this age. We conducted a retrospective review of a prospectively maintained database of all infants treated for positional plagiocephaly or brachiocephaly between 2000-2010 at Children’s Memorial Hospital to test this concept. All enrolled infants underwent either physical therapy or helmet therapy and were followed till cure or for a minimum of 18 months. Data was gathered using 3D laser surface scanning and complete correction was objectively defined as a cranial ratio of <0.85 and/or diagonal difference of 5 mm. The “critical age” was calculated for all infants as described. The age by which complete correction was desired was set at 18 months (upper age limit of FDA approved use for cranial helmets)

Results: In total 3,995 infants were included in the study. Of these, 1,531 infants ultimately underwent helmet therapy. Complete correction was achieved in 98% who initiated helmet therapy prior to their individual “critical age,” compared to a 44% complete correction rate in those who started helmet therapy after the critical age. ($p<0.005$) Of the 3,995 infants, 2,998 underwent physical therapy. 508 of these infants had moderate-severe deformation and were between 4-6 months of age; an additional 289 patients were between 6 months of age and their “critical age.” (According to current recommendations, all these infants should require helmet therapy). With physical therapy, 78% of the infants between 4 and 6 months and 62% of infants between 6 months and their critical age achieved complete correction without a helmet.

Conclusion: Current recommendations to initiate helmet therapy between 4 and 6 months of age may be overly aggressive and based upon previously published biased data. The “critical age” allows one to objectively calculate the infant-specific age at which helmet therapy must be initiated to achieve complete correction with a helmet. Prior to the “critical age,” physical therapy may be highly beneficial and does not prevent complete correction if helmet therapy is ultimately required.

Endoscopically assisted release of sagittal craniosynostosis: a meta-analysis

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Background: Two decades ago the endoscopic approach to the management of sagittal synostosis was introduced as an alternative to the conventional open approach. Studies in the literature have shown extensive craniotomies through the conventional open approach were required to ‘normalize’ the cranial vault morphology. Is there now sufficient evidence in the literature to be able to substantiate the initial claim that an endoscopic approach is a viable alternative? This study investigated the morphologic outcomes including efficacy, safety, and complications utilizing the minimally invasive endoscopic strip craniectomy technique for sagittal craniosynostosis repair.

Study Design and Methodology: A meta-analysis of the literature was conducted. Endoscopically assisted repair of sagittal craniosynostosis studies published between 1990-2012 were identified (Medline/PubMed), and included if they were reported in the English language and a clinical human study. Of 462 articles identified of sagittal craniosynostosis, 8 articles were used in the meta-analysis: a total of 480 patients of endoscopically assisted release of sagittal craniosynostosis.

Results: Data collected included nonsyndromic status, age at operation, duration of procedure, need for perioperative blood transfusions, length of hospital stay, preoperative and postoperative head circumference percentile and cranial index. Mean Age at endoscopic release under 4 months, length of hospital stay 1-1.5 days, estimated blood loss less than 45 milliliters, mean operative time 45-96 minutes with the majority under 60 minutes, average perioperative transfusion rate (intra and post operative) <9%, perioperative complications <2%, head circumference and index percentile mean within normal limits (>75th percentile).

Conclusion: The operative time, blood loss and hospitalization were decreased with an endoscopic approach. Using cephalic index as a single dimensional outcome measure, the literature suggests that endoscopically assisted release of sagittal craniosynostosis is comparable to the conventional open approach when there is post-operative guidance with a cranial molding helmet. However, there is insufficient data that compares the effectiveness in terms of the three-dimensional cranial vault shape.

Predicting airway compromise in the infant with Pierre Robin Sequence

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A distressing feature of Pierre Robin Sequence (PRS) is the episodic airway obstruction that can lead to feeding difficulty, cor pulmonale, and death. The protocol at our institution is to attempt conservative management with repositioning techniques initially, and proceed with either tracheostomy or mandibular distraction osteogenesis when conservative management fails. Retrospective review of our experience with PRS from 2000 to 2011 is underway. Preliminary data demonstrates high risk time points in the early post-natal course of PRS infants. By identifying high risk time points during the PRS infants' early post-natal course, families and health care providers can have a heightened awareness of when to watch for impending airway compromise and will be better be able to predict when definitive surgical intervention will be needed.

SESSION IV

CRANIOFACIAL, NERVE, GENERAL RECONSTRUCTION

Block B

Nerve

Cortical remodeling observed on BOLD fMRI over a 10 month period in a rat survival model of brachial plexus avulsion and cross C7 nerve transfer

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Total brachial plexus nerve root avulsion results in severe functional deficit of the upper extremity. Contralateral C7 nerve root transfer is shown to improve limb function outcomes in total brachial plexus avulsion. In this study, a rat survival model for brachial plexus avulsion injury with and without contralateral C7 nerve transfer surgery was implemented. Blood oxygen level dependent (BOLD) fMRI was used to detect remodeling of the primary sensory cortex of the forepaw (S1FL) over 10 months' time.

24 Sprague-Dawley rats were divided into three groups: control, injury, and injury & repair. The control group underwent sham surgery with electrode placement on both median nerves. The injury group underwent complete brachial plexus root avulsion on the right forelimb and electrode placement on both median nerves. The injury & repair group underwent complete brachial plexus root avulsion on the right forelimb followed by left C7 nerve root transfer to the right median nerve via an ulnar nerve interposition graft across the chest followed by electrode placement on both median nerves. Using a 9.4 Tesla MRI scanner, the rats then underwent BOLD fMRI imaging with electrode stimulation at 0, 3, 5, 7, and 10 months.

Figure 1 shows BOLD fMRI images of 2 representative rats from the injury & repair group during right median nerve stimulation. At 0 months, there is no sign of cortical activation. At 7 and 10 months, with varying speed of recovery, both rats display native, contralateral activation. The S1FL region displays a progression of cortical plasticity as recovery takes place in each rat. Initially, the neural pathway follows the transferred nerve and stimulation activates the ipsilateral cortex. Over time, it appears that the cortex remodels to more closely restore the native contralateral somatotopy. A better understanding of cortical remodeling following nerve injury and repair may lead to improved outcomes.

Management of Peripheral Nerve Pathology in the Lower Extremity: A Review of the Literature and Case Series

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Introduction: Peripheral neuropathies in the lower extremity are commonly encountered in clinical practice. Due to their multifactorial etiologies, they often present a diagnostic and therapeutic challenge. To date, there are few comprehensive reports encompassing the broad spectrum of lower extremity peripheral neuropathies. Here we present a review of the literature, with emphasis on the relevant anatomy, pathophysiology, and management of the most common lower extremity peripheral neuropathies. In addition, by highlighting a surgical experience with these challenging problems, we have developed a useful algorithmic approach to the patient with lower extremity peripheral nerve complaints.

Methods: A comprehensive electronic literature search was performed to identify original articles in the English language relating to the diagnosis and treatment of lower extremity peripheral neuropathies. In addition, a retrospective review 55 consecutive patients undergoing operative treatment for lower extremity peripheral nerve complaints by a single surgeon from 2005-2010 was performed. Objective data, including demographic information, clinical characteristics of nerve pathology, diagnostic modalities employed, treatment modality, complications, and length of follow up were recorded and outcomes assessed.

Results: A review of the existing literature on the relevant lower extremity peripheral nerve pathologies is presented. Our algorithmic approach provides the surgeon with a framework for diagnosing and treating the patient who presents with lower extremity peripheral nerve complaints.

We present a series of 55 consecutive surgical interventions by the senior author (GAD) for lower extremity peripheral neuropathy complaints. The nerves most commonly requiring operative intervention in our series were the peroneal nerve (20), the tibial nerve (14), the sural nerve (8), and the common plantar nerves (7). The most common etiology of symptoms was extrinsic compression requiring surgical release. Both operatively, and at long-term follow up, the complication rates remained low with a significant percentage of patients experiencing complete resolution of their symptoms.

Conclusions: Lower extremity peripheral neuropathies are commonly encountered by the peripheral nerve surgeon. In order to optimally manage these challenging problems, a thorough knowledge of the anatomy, pathophysiology, diagnostic and therapeutic options is imperative. In appropriately selected patients, surgical exploration and/or decompression is safe and results in significant improvement in symptoms.

The Effects of Folic Acid on Peripheral Nerve Recovery in a Rat Sciatic Nerve Model

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Background: In humans the peripheral nervous system (PNS) is capable of a remarkable degree of healing. However, functional recovery after PNS injury is rarely fully achieved. Folic acid (FA) has been linked to improved central nervous tissue regeneration, however there are no studies examining its effects on peripheral nervous system.

Method: For the *in vivo* study 18 rats were placed into two groups. One group received FA 80 micrograms/kg for 3 days prior to the crush injury. The other group did not receive FA. The crush injury was made to the left sciatic nerve in all rats, leaving the contralateral leg as a control. On post-injury day 7 a fluorescent tracer was injected distal to the crush site. Bilateral dorsal root ganglia (DRG) were harvested, cross sectioned and placed on slides. The numbers of fluorescent cell bodies were counted. For the *in vitro* study, 12 rats were also placed into the same groups, one group received FA and the other did not. Three days after the crush injury the DRGs were harvested, cell bodies isolated, and placed in a culture medium. The axon growth was measured using computer software at 5, 10, 13, and 17 hours following DRG harvest.

Results: The *in vivo* study revealed that the DRGs from non-treated rats contained 30% actively regenerating cell bodies. The FA group is still being analyzed, however we expect an increase in cell bodies comparatively. The *in vitro* study showed that neuronal cell bodies from the FA group averaged a length of 98, 203, 410, and 498 um respectively. In the non-treated group they averaged 54, 200, 196, and 267 um respectively.

Conclusion: These findings indicate that FA may enhance peripheral nerve regeneration following a crush injury in the rat sciatic model. Further investigation into functional recovery outcomes and mechanism is warranted.

A Side-to-Side Nerve Bridge Preserves Muscle Viability Following Peripheral Nerve Injury

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Background: High peripheral nerve injuries are a difficult clinical problem and often lead to long-term disabilities. Despite recent advances in nerve transfer, transplantation, tendon transfer, and tissue engineering, much improvement is still needed (1-2). This study utilizes a novel side-to-side nerve bridge to link an injured nerve with an adjacent healthy nerve distally as a means of preserving muscle viability following repair of a proximal nerve injury.

Methods: The sciatic, tibial and peroneal nerves were isolated in 21 Sprague-Dawley rats, which were divided equally into 3 groups: 1) tibial nerve transection only, 2) transection + end-to-end repair, and 3) transected + repair + collagen nerve bridge between tibial and peroneal nerves distally. Functional gait assessment was performed every 2 weeks (3). At 90 days postop, animals were sacrificed and gastrocnemius mass, gastrocnemius nuclear density, sciatic, tibial, and peroneal nerve nuclear density, and axonal infiltration into the conduit were quantified.

Results: All three groups showed alteration in gait with steady improvement over time but no significant differences between groups. Group 3 lost significantly less gastrocnemius muscle mass and showed less histologic muscular degradation than groups 1 and 2. The tibial nerve had greater nuclear density, both proximal and distal to the nerve repair site in group 2 compared to group 3. Creation of the epineurial window in the peroneal nerve of group 3 showed no signs of long standing nerve injury as evidenced by no difference in nuclear density between groups. Five of the seven collagen conduits had evidence of neuronal sprouting within the lumen.

Conclusion: This study demonstrated better muscle preservation when a side-to-side nerve bridge is performed distally along with traditional end-to-end repair of an injured nerve. This technique may lead to better outcomes in high peripheral nerve injuries.

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SESSION IV

CRANIOFACIAL, NERVE, GENERAL RECONSTRUCTION

Block C

General Reconstruction

Technical Considerations for the Free Fibula in Mandible Reconstruction: Virtual Surgical Planning Systems and Osteointegrated Implants

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Purpose: Free fibula flap(FFF) reconstruction of mandibular defects has become the modern standard of care due to superior functional and aesthetic outcomes. With introduction of osseointegrated(OI) dental implantation, the fibula proved to provide a good denture-bearing surface to achieve complete dental rehabilitation after mandible reconstruction. Contouring, and accurate placement of FFF, although traditionally performed with a free-hand approach, is now being performed with more accuracy using preoperative virtual surgical planning(VSP) systems. The purpose of this study is to review technical aspects of mandibular planning, including VSP-designed fibular osteotomies, positioning, and planning strategies for OI.

Methods and Materials: Consecutive patients who underwent FFF reconstruction between October,2009 and January,2012 at a single institution were identified. Patient demographic, reconstructive and complication data were obtained from a prospectively-maintained clinical database. Medical records were then retrospectively reviewed to further characterize co-morbid conditions and modifications employed to optimize results.

Results: Over the 28 month study period, 10 patients underwent FFF reconstruction. Identified tumors included: Squamous cell carcinoma, Mucoepidermoid, Ameloblastoma, and Osteochondrosarcoma. Osteotomy of the FFF (and mandibular resection) was typically done at the parasymphysis, body, angle and top of ramus. Of these, 4 patients have completed OI placement. 2 patients did not require radiation postoperatively and FFF design using VSP was simulated with a higher location on the mandible to facilitate OI placement. 2 patients requiring radiation postoperatively, the fibula was VSP-designed lower on the mandible to minimize post-radiation complications. For these patients, OI implants were placed on a platform to obtain adequate height of the implants.

Conclusions: VSP is the new frontier in craniomaxillofacial surgery. Preoperative planning offers potential for high success rates, improved operative efficiency and reduction in medical error. Awareness of full oral restoration requires incorporating new updates in the technology with planning of fibular design and inset, and use of osteointegrated implants.

Synthetic vs Bioprosthetic Utilization in Chest Wall Reconstruction 35 year Meta-Analysis

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Purpose: Bioprosthetics are becoming more prominent in surgical reconstruction of the breast, abdomen and chest wall. The purpose of this study is to review the literature identifying the various synthetic and bioprosthetic meshes that have been used for chest wall reconstruction over the past 35 years and to examine the advantages and disadvantages of each material.

Methods: A meta-analysis of the medical literature published between 1975-2010 is performed to review all reported cases of synthetic and bioprosthetic mesh utilization in chest wall reconstruction. Chronological and basic statistics are utilized. Advantages and disadvantages of each material based on published literature is documented and addressed.

Results: Polytetrafluorethylene (275 cases), Polypropolene (199), Prolene (32), Marlex (44), Mersiline (77), Silastic (10) and Vicryl (31) meshes are the synthetic materials that have been reported in chest wall reconstruction. Bioprosthetic meshes reported for these reconstructions are human acellular dermis-AlloDerm® (16), cross-linked porcine acellular dermis-Permacol® (1), porcine acellular submucosal matrix-Surgisis® (28) and acellular bovine pericardium-Peri-Guard® (9). In the year 2000, 83% of published cases used synthetic mesh and 17% used bioprosthetic materials. In 2005, 51% of cases used synthetic mesh and 49% used bioprosthetic materials. In 2010, 43% of cases used synthetic mesh and 57% used bioprosthetic material.

Conclusions: The study indicates that over the past decade there has been a transition from synthetic to bioprosthetic utilization in chest wall reconstruction. Synthetic meshes place significant tension over the defect with minimal stretching, but foreign body reactions may result in infection, erosion, and fistula formation. Polytetrafluorethylene is the most widely used synthetic mesh in chest wall reconstruction. Early tissue in-growth, rapid revascularization and reabsorption are among the characteristics that make bioprosthetics favorable in thoracic wall reconstruction. AlloDerm® was among the first meshes utilized for chest wall reconstruction but its use has decreased with the introduction of porcine derived acellular dermis which have a decreased propensity to stretch. These materials have demonstrated success in recent literature. Due to the increased bioprosthetic utilization in reconstruction of the chest wall, further research into the use of these materials for this indication is warranted.

Assessing surgical skill in plastic surgery residency training: Developing and implementing a low-cost online video assessment system to document proficiency

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Background: Assessment of surgical skill during training is an important component of resident surgical education. Verification of proficiency of a surgical skill in a laboratory setting is being used more frequently in training programs to allow residents to develop the skills necessary to perform a surgical procedure in a non-clinical setting and demonstrate proficiency before attempting in a clinical setting. A video recording system and an on-line evaluation tool may facilitate faculty assessment of resident surgical skill by providing a convenient and cost-effective method that documents resident proficiency in a specific skill.

Purpose: The purpose of this project is to develop a convenient and low-cost online system for evaluation of video-recorded performance of surgical skill.

Methods: This evaluation system contains two components: a video recording system and an evaluation form. To minimize costs, an in-house video server was used with a widely-available response instrument, Survey Gizmo. Custom web programming was used to combine both elements onto a single web page, allowing the evaluator to watch the video and complete the evaluation form simultaneously.

Result: A convenient, easy-to-use, and low-cost system to assess and document resident surgical performance in the laboratory setting has been developed. This system can be used by training programs to provide valuable feedback to residents in training and allow residents to demonstrate proficiency in a surgical skill in a non-clinical setting before moving to a clinical setting.

Modification of Pectoralis Myocutaneous Advancement Flap for Sternal Wound Reconstruction

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Objective: The purpose of this study was to assess the results and applicability of a modified chest closure technique employing bilateral pectoral myocutaneous advancement flaps after sternal re-approximation without internal fixation for postoperative sternal wound infection.

Methods: The study population is of a single surgeon's experience (n = 50). Three cases with deep sternal wound complications underwent anatomic sternal wound reconstruction supported by the modified corset technique of pectoralis myocutaneous advancement flaps. One patient with macromastia underwent dermoglandular sling reinforcement to the contralateral chest wall. Follow up was completed by outpatient record review and with telephone interviews.

Results: All three patients presented with type II sternal wounds following coronary artery bypass surgery. Following anatomic chest wall reconstruction with the modified corset technique, all patients had resolution of wound infection, with no wound healing complications and no mortality at one year follow up.

Conclusions: Anatomic sternal reconstruction supported by bilateral pectoral myocutaneous advancement flaps (corset modification) is a good technique for recalcitrant sternal wounds to stabilize bony framework. Additionally, medial breast dermoglandular slings to contralateral chest wall can be utilized to further stabilize and reduce sternal retraction forces in patients with macromastia.

Outcomes of secondary sternal fixation using rigid plates for infected and dehiscenced sternotomy wounds

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Background: Median sternotomy is generally well-tolerated by patients undergoing cardiac surgery, but it is not without risk of complications. Sternal wound infection and bony nonunion occur in 0.4-5% of cases, and are associated with high mortality rates. Increased sternal stability during healing helps minimize complications, as tight apposition of the cut edges of the sternum facilitates bony ingrowth and healing by primary intention. Recently, fixation of the sternum using rigid plates has been used for primary closure of the sternum after cardiac surgery with high rates of success and minimal complications. The use of rigid plates for secondary sternal fixation in salvage procedures for infected and dehiscenced sternotomy wounds has been described in the literature, but data regarding outcomes remains scarce.

Methods: We retrospectively reviewed our experience with all patients who underwent secondary sternal fixation at our institution using rigid titanium plates from 2008 to 2011.

Results: In all, ten patients underwent secondary sternal fixation, and we achieved bony union of the sternum in all but one patient. The median time to discharge after sternal fixation was 6.5 days. There were no deaths. Three patients with multiple medical comorbidities were readmitted for sternal wound infection, and two of these patients required removal of sternal hardware. Two patients developed seromas, both of which were successfully evacuated in the outpatient setting. One patient developed a hematoma, which was detected two hours post-operatively and successfully cauterized.

Conclusion: Secondary sternal fixation with rigid plates for infected and dehiscenced sternotomy wounds is a safe procedure which allows for a short length of hospital stay and minimal complications.

Twenty Year experience with Microsurgical Reconstruction of Hemifacial Atrophy and Linear Sclerodema

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Romberg's Disease and Linear Scleroderma (Coup de Sabre) are progressive, usually unilateral facial atrophies of unknown etiology. The gold standard treatment for these patients has been microsurgical reconstruction following the "burning out" of the facial atrophy and stable contour for two years. In our experience, patients treated early in their disease course have immediate and sustained correction of the deformity, with slowing or in most cases cessation of the disease process upon microsurgical transfer. No disease process has recurred to date even in cases with severe progressive disease. Equally impressive is the apparent improvement of underlying skeletal growth seen in young children with severe disease who in previous experience would have gone on to have much more severe skeletal deformities. We report our experience with 130 patients involving 133 free tissue transfers with a minimum of 1 year follow up who were treated from July of 1989 to July 2009.

All cases had severe atrophy. There were 62 males and 68 females in the series. Distribution of disease was coup de sabre or segmental in 28 patients whereas 102 patients had a hemifacial distribution typical of Romberg's. 128 patients had unilateral disease and 2 patients had bilateral atrophy without diagnosed systemic collagen vascular disease such as lupus erythematosus. The average age of onset of disease was 12.5 years. The average duration of atrophy was 6.3 years. Average age at operation was 29.2 years with a range from 4 to 69 years. Follow up ranged from 1 to 20 years. Complications included hematoma in 9 patients, one partial flap loss, 1 patient with partial facial skin slough treated with local wound care, and cellulitis in 1 patient. One flap was lost at two weeks following surgery when the patient began smoking heavily. A second free flap was successfully preformed six months later with a stable reconstruction now four years later. Flap revisions performed at 6 months following free tissue transfer consisting of tissue rearrangement, debulking procedures, and resuspension when required were completed in nearly all patients and is now a standard for optimal results. Minimal autologous fat transfers of less than 5 cc of autologous fat were used as an adjunct in the periorbita, nasal alar rim, or minimal lip deficiencies. Recurrence of facial atrophy was not seen.

All patients rated improvement as excellent with follow-up as long as 20 years. Microsurgical correction of Romberg's disease and linear scleroderma produces long-lasting, sustained results, and may slow progression of the disease by transfer of healthy vascularized tissue to affected areas. Stable long-term results were found even in patients with active disease at the time of microsurgical free tissue transfer. In this article, we review the indications, choices, safety, efficacy, complications, and technical refinements derived from our twenty year experience.

