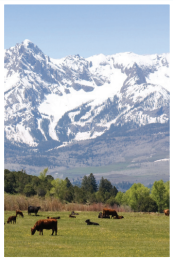
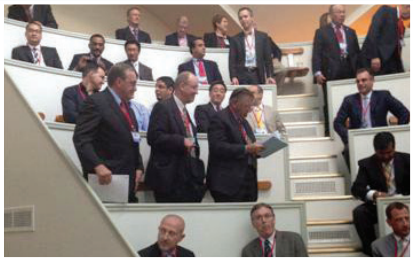
American Academy of CranioMaxilloFacial Surgeons

Abstracts





Challenges in the Viability of Dual Degree OMFS Training in the United States

Challenges to the Future of Dual Degree OMFS Training: Are we in an OMFS Education Cost Bubble?

Leonard B. Kaban, DMD, MD

A Bubble Market is created when assets are bought at ever increasing cost, which investors gladly pay because they anticipate selling at even higher prices in the future. Education costs in general and medical education costs in particular have skyrocketed during the last 50 years. Yet this has not produced a decrease in the applicant pool for medical and dental schools. Presumably this is because the earning potential of a trained physician/dentist/surgeon has traditionally far outweighed the cost of his/her education.

Oral and Maxillofacial Surgery education changed drastically beginning in 1969, with the start of the MGH/Harvard MD Oral and Maxillofacial Surgery Program. A similar program was introduced at University of Nebraska. The concept took hold and now approximately 44/100 OMFS programs are based on the MGH/Harvard model of at least 6 years of training at the end of which the resident has received the MD degree, at least 1 year of ACGME approved General Surgery to qualify for a medical license and 32-36 months of OMFS training.

Despite requiring the payment of 2 years of medical school tuition and other expenses, beyond the 8 years for college and dental school, dual degree programs have changed OMFS in the United States and the number of qualified applicants has remained strong.

In this presentation, the current sequence and format of dual degree programs will be outlined and 2 specific challenges will be presented: 1) Introduction of new medical school curriculae eliminating the sharp division between pre-clinical and clinical education, and 2) the requirement for 2 to 3 years of ACGME accredited post graduate training to qualify for a medical license.

Will these challenges finally burst the “bubble”?

OMS/MD Program – The Emory Experience

Steven M. Roser, DMD, MD, FACS

The Emory University School of Medicine, (SOM), implemented its new curriculum in 2007. The new curriculum focuses on small-group learning and increased interaction with faculty. The students are immersed in clinical experience from the very beginning. A multitude of clinical sites provide students with extensive training in patient care, including an Outpatient Experience that begins early in the first year. A 5-month Discovery period allows time for clinical or bench research, international experience, or other academic inquiry. The curriculum is divided into four phases, Foundations of Medicine, (18 months), Applications of Medical Sciences, (12 months), Discovery, (5 months) and Translation of Medical Sciences, (9 months). As the result of discussions with the SOM faculty, we were able to create a 25 month curriculum for the OMS/MD residency program track. The presentation will provide some of the details of this 25 month curriculum. We also modified the rotations for the OMS/MD residents during the CY-1 in general surgery. The current OMS/MD residents appear happy with the current track. By running concurrent four year track, we have some basis of comparison in looking at outcome Challenges with the OMS/MD track with possible solutions will be discussed.

Changing Medical School Curricula and the Challenges for Dual Degree OMS Training

Sean Edwards, MD, DDS, FRCD(C), FACS

Dual degree oral and maxillofacial surgery training programs represent approximately half of those in the United States. No program is identical in its structure with each evolving according to the curricula and the needs of their associated medical

school. Shared among all programs is an abbreviated course in medical school typically with some form of advanced placement. The University of Michigan Medical School is embarking on a major curriculum overhaul with an implementation goal of five years. This curriculum will be fundamentally different from the typical four year program in existence. It will vary in length from three to five years. It will be more integrated and hierarchical and will place greater emphasis on longitudinal learning with more frequent, lower stake assessments. This change will present significant challenges for integrating advanced placement students such as oral and maxillofacial trainees. These changes, their challenges and the opportunities that may lie within will be discussed from the perspective of an oral and maxillofacial surgery residency program director.

Challenges to the Future of Dual Degree OMFS Training: After "all that", are the MD degrees licensable?

Mark E. Wong, DDS

The expected pathway of oral and maxillofacial surgeons who complete an integrated OMS / MD program is for the individual to activate both their dental and medical licenses upon graduation in anticipation of future practice. The traditional OMS / MD curriculum includes one year of ACGME training in the form of a general surgery internship and this meets the licensing requirements of most states and US protectorates. However, in recent years, this model may be insufficient for medical licensure. Citing the need to augment and improve medical education and training, various state medical boards and their national association, the Federation of State Medical Boards, have recommended that the standard 4-year pre-doctoral curriculum be augmented by 3 years of ACGME or AOA approved clinical training. Currently, 14 states require a minimum of two years of ACGME training and one state, Nevada, requires three. Such requirements will potentially discourage those who enroll in an integrated OMS / MD program for the purpose of securing a medical license.

This challenge to the future of the dual degree OMS program is an important topic to explore. Some considerations include the importance of a medical license to the practice of oral and maxillofacial surgery and strategies that may be employed to overcome licensing obstacles. These topics will be introduced in this presentation as a foundation for a more extensive discussion next year at the 2015 AACMFS meeting in Houston.

Transition from a Division to an Independent Department: UF Jacksonville Experience

Tirbod Fattahi, MD, DDS, FACS

Purpose of this presentation is to describe the process involved in the creation of an independent oral and maxillofacial surgery (OMS) department within the College of Medicine at the University of Florida in Jacksonville.

Most OMS programs in our country are either Divisions or Departments within dental schools. Some are Divisions in various Surgery Departments in medical schools. While some benefits, such as shared expenses and decreased overhead, exist in being a division within a larger department, advantages of an independent department within the medical school far outweigh the benefits of division status. An independent department has greater autonomy within a medical center and a more direct communication with medical school leadership. Additional benefits include financial stability and control and ease of faculty recruitment.

This abstract is a case study of how OMS at the University of Florida in Jacksonville transitioned from a division within the Department of Surgery to an independent department in the College of Medicine. Evolution of this process will be highlighted in order to encourage other OMS programs in the country to pursue a similar path.

The *h*- Index in Academic Oral and Maxillofacial Surgery

Kevin Arce, DMD, MD; Samir Waris, DMD

Statement of Problem: Academic appointments and promotions are influenced by scholarly productivity, excellence in teaching, mentoring, service and patient care. Research productivity remains one of the most important factors in the evaluation of academic surgeons. An author's total number of publications fails to capture the author's impact and relevance to the specialty. A number of indexes have been proposed as a means of assessing academic productivity. The *h* index incorporates both the total number of publications and the citations of those publications and has been reported in a number of medical and surgical disciplines as an objective measurement of scholarly productivity. The purpose of this study is to evaluate the *h* index among US academic oral and maxillofacial surgeons.

Methods: A list of oral and maxillofacial surgery training programs was obtained from the AAOMS website. An online search was conducted for faculty listings. Non-surgeon faculty, non-academic faculty and faculty for which an academic rank could not be determined were excluded. Faculty members were categorized according to gender, academic tenure (assistant professor, associate professor, professor) and geographical location. The Scopus database was utilized for an automatically computed *h* index.

Data Analysis: The *h* index was compared among the academic ranks. A multivariate logistic regression analysis was also performed to determine if the number of publications, number of citations, *h* index, and number of citations per publication were predictors of academic rank. The geographical variations of the *h* index and gender were calculated.

Conclusions: An understanding of the typical *h* index for various academic ranks of oral and maxillofacial surgeons could help promotion committees in their assessments of surgeons. Its use also provides a greater understanding of the contribution to academic research by a particular author that is not reflected by the number of publications alone.

A Value Analysis Model to Calculate Averaged Fair Price of Medical and Dental Treatment Plans

Chase A. Pruitt, DDS, MD; Kevin Arce, DMD, MD, MCR; Thomas J. Salinas, DDS

Introduction: Healthcare expenditure represents nearly 20% of the United States GDP. Improvements can be made in healthcare systems to reduce healthcare burden on the United States economy.

Purpose: The purpose of this abstract is to present a method for healthcare systems to analyze prices to patients and insurance companies for various proposed treatment plans. An area of improvement for medical and dental professionals is the importance of calculating costs of treatment failure (CTF) and multiplying that figure by the percentage of likelihood of failure (PLF). When averaged with cost of treatment success (CTS) multiplied by the percentage of likelihood of success (PLS), healthcare systems can calculate the averaged fair price (AFP) based on value for individual treatment plans.

Methods: Along with the Mayo Clinic Center for the Science of Health Care Delivery, a value analysis model was engineered comparing endosseous implant reconstruction/restoration, endodontic treatment/restoration, and fixed dental prosthetic rehabilitation of a permanent first mandibular molar. The primary model constituents involved procedure success rates and associated national fee data. After consultation with several United States dental consulting firms, it was determined national fee data would best be collected from the American Dental Association. Success rate data was gathered from a review of the dental literature using MEDLINE, Cochrane Collaboration, and EMBASE pertaining to clinical success rates of the above treatment plans.

Data: CTF, PTF, CTS, and PTS were determined for each of the aforementioned treatment plans. Averaged Fair Price (AFP) was then calculated using the formula: AFP = [(CTF x PTF) + (CTS x PTS)]

Conclusions: Transparent data regarding treatment outcomes combined with comprehensive national fee data will allow health care providers the opportunity to calculate AFP and cater future research to treatment plans with high value potential.

Do the Science, Own the Field. Are We Doing the Science?

Steven M. Roser, DMD, MD, FACS

Surgical research has advanced our understanding of the mechanisms of disease which has improved our ability to care for our patients. Six surgeons have won the Nobel Peace Prize for their work. Oral and maxillofacial surgery struggles to attract bright young surgeons into research efforts. Lifestyle choices, long training programs, educational debt burden and lack of funding are the reasons offered to account for the lack of interest in research. How are we to effectively train the next generation of surgical scientists? Is protected research time (PRT) during residency training a viable solution? And does the performance of a resident research sabbatical correlate with future academic success? Of the seven largest specialties participating in the match, in only general surgery do a significant number of residents interrupt their training for one to three years in order to perform research. Although surgeons in training and new faculty present their research findings at national meetings on a regular basis, no one knows how many residents are engaged in research. Is the model of PRT effective? Surveys of residents who have had PRT show higher publication productivity during residency. They are also more likely to pursue an academic career, devote more time to research in their career and are more likely to obtain NIH support for research. Should OMS mandate PRT for all residents? Alternate pathways exist including DMD/PhD tracks, research during fellowships and research in parallel with residency. I recommend we quickly establish PRT as part of the culture of OMS training. Once the culture is established, various models can be pursued. Funding the research effort will be a challenge. NIH training grants, OMS Foundation funds and industry support are potential sources. A six year track with two years of PTR should be doable. To improve the effectiveness of the research experience for OMS residents thinking about serious research efforts during residency regardless of the track, early discussions about the goals and career path, concrete planning with a proper mentor and a research plan, including a structured universal curriculum plan for lab residents and ongoing career mentoring should be in place. Only those who want to spend one-two years in the lab should do it.

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Osteocutanous Radial Forearm Free Flap for Head and Neck Reconstruction

Siv Eftekhari, MD, DMD; Mark Wax, MD; Daniel Petrisor, MD, DMD

The osteocutaneous radial forearm free flap (OCRFFF) was a popular choice for maxillomandibular reconstruction in the 1980s and early 1990s. It then fell out of favor for reasons such as inadequate bone stock (length and quality) and donor site morbidity such as radius fracture. While, the fibular free flap (FFF) continues to be the workhorse for mandibular reconstruction it routinely results in up to 3 months of antalgic gait and can cripple the elderly population. Additionally, its use can be limited by peripheral vascular disease. This is not the case in OCRFFF, which makes it a good choice in certain patient populations. Here we will discuss our experience with OCRFFF including indications and outcome of its use in our patient population. Additionally, we will show that with proper treatment planning it is possible to successfully place endosseous dental implants in this bony flap for oral rehabilitation.

This is a retrospective chart review of all the OCRFFF reconstructive procedures performed in the last 3 years at Oregon Health and Science University, a tertiary referral academic hospital.

Based on this study, we have concluded that with prophylactic plating of the radius and proper treatment planning, OCRFFF flap provides a reliable reconstruction with a long pedicle which can be used in ipsilateral or contralateral neck with a very high success rate. It also provides excellent soft tissue with thin, pliable skin for oral cavity reconstruction. Additionally, the OCRFFF is less challenging to harvest compared to other free flaps. Data from this and other reports suggest OCRFFF is particularly useful for midfacial and short segment mandibular reconstruction with a very high success rate. Most common donor site morbidities include wrist weakness and stiffness, these do not impede with activities of daily living and, in our study, resolved in all patients with physical therapy.

Management of End-of-Stage Mandibular Osteomyelitis with Nerve Sparing Resection and Immediate Reconstruction

Brian Albert, DDS and George Kushner, DMD, MD

End-stage mandibular osteomyelitis is not an uncommon disease managed in tertiary care center. Pain, swelling, drainage, exposed bone and paresthesia unresponsive to antibiotics initiates the referral. Modern imaging confirms and end-stage condition not amenable to sequestrectomy, saucerization, lateral decortication or other techniques preserving mandibular continuity.

Over the years, we have managed these patients with resection, skeletal pin fixation and delayed reconstruction with non-vascularized bone grafts. When rigid internal fixation came along, we utilized reconstruction plates in place of external fixators but still delayed reconstruction.

Several years ago, based on our excellent experience with “Bone Grafts in the Presence of Pus”*, we began to do immediate reconstruction of these patients. Recognizing that resection in continuity was not necessary in these cases, we later evolved into nerve sparing resection whenever possible.

With success, this has further evolved from primary reconstruction with particulate marrow to the use of allografts and allograft/BMP.

Indications, technique and results of nine cases will be presented.

*J. Oral Maxillofac Surg. 64:122-126, Jan 2006

In-situ Tissue Engineering Re-grows a Mandible Equal to the Two Current Standards of Care

Robert Marx, DDS

Reconstruction of continuity defects of the mandible after tumor ablation is currently accomplished by either a graft of autogenous cancellous marrow or a free vascular fibula. However, within the past three years, the ability to harvest and concentrate multipotent stem cells, osteoprogenitor cells, and the entire chemical milieu from bone marrow together with recombinant human bone morphogenetic protein has equaled the bone replacements results of these two standards of care without the morbidity inherent in bone harvesting.

The combination of a bone marrow aspirate concentrate validated to contain CD34+, CD44+, CD 90+, and CD 105+ cells as well as cell adhesion molecules and activation factors together with rhBMP-2/ACS and cancellous allograft bone completes the classic tissue engineering triangle of cells, signal, matrix required to regenerate new tissue, bone in this case.

A three cohort study of over 150 cases identified in-situ tissue engineered reconstructions to equal the bone regeneration of a cancellous marrow graft and exceed that of the fibula, and also translated into an improved final result with implant retained prosthesis. Additionally, the in-situ tissue engineered grafts incurred a hospital stay of only 1.7 days and OR time of 3.7 hours as compared to a cancellous marrow graft of 4.2 days and 5.7 hours and 11.3 days and 10.4 hours for a free vascular fibula. This in turn reduced the cost of hospital care from $19,200 for an insitu tissue engineered graft to $41,300 for a cancellous marrow graft, and $67,700 for a cancellous cellular marrow graft and free fibula graft respectively.

Conclusion: Today, there are several methods available to surgeons that can reconstruct continuity defect of the mandible. In-situ tissue engineered grafts should be considered an additional standard of care alongside these other two.

Preliminary Oncologic Outcomes of Transoral Robotic Surgery for Oropharyngeal Squamous Cell Carcinoma: Towards developing a perioperative immunotherapy strategy for HPV-related disease

Ashish Patel, MD, DDS; Allen Cheng, MD, DDS; Rom Leidner, MD; Marka Crittenden, MD, PhD; Steven Seung, MD, PhD; Carlo Bifulco, MD, PhD; Tuan Bui, MD, DDS; Etern Park, MD, DMD; Eric J. Dierks, MD, DMD, FACS; Ryan Montler, PhD; Christopher Paustian, PhD; Zipei Feng; Hong Ming Hu, PhD; Andrew Weinberg, PhD; Bernard Fox, PhD; R. Bryan Bell, MD, DDS, FACS

Background: Transoral robotic surgery (TORS) has been advocated as a means of de-escalating or “personalizing” adjuvant treatment of oropharyngeal squamous cell carcinoma (OSCC) based upon known histopathological risk factors.

Purpose: The purpose of this clinical investigation is to: I) evaluate our early experience with TORS in the definitive treatment setting for OSCC; II) establish an HPV-related OSCC tumor bank from resection specimens; and III) determine the feasibility of perioperative immune profiling and modulation in HPV-related disease.

Methods: The study group consisted of a cohort of 55 consecutive patients with previously untreated, HPV-related T1-T2 OSCC (tonsil or base of tongue) who underwent TORS (with simultaneous neck dissection) followed by risk-adapted adjuvant therapy from February 2011 to March 2014. Demographic and staging information was analyzed and treatment outcomes described using the Kaplan Meier method. A tumor bank was created from 35 of these patients that consists of cryopreserved, enzymatically isolated viable cells from the primary tumor and metastatic lymph nodes of resection specimens as well as autologous blood samples. Immunohistochemical, flowcytometric and functional analyses of these specimens are being carried and expression of OX40 and other immune modulators in TIL and blood was characterized.

Results: Most patients were treated for pN2 disease (N0=9%; N1=12%; N2a=9%; N2b=53%; N2c=14%; N3=2%) and all but four patients underwent adjuvant radiation therapy with IMRT technique following TORS. Negative resection margins were achieved in 92% of the patients. Extracapsular extension was common, having occurred in about 40% of the cases and, with only 2 exceptions, these patients underwent concomitant chemoradiation. Disease free survival during the study period was 92%. Preliminary results have documented consistent staining and potential of the IHC and FACS-based systems to identify infiltrating cells. OX40 and other immune modulators are highly expressed in OSCC specimens.

Conclusion: TORS combined with risk adapted adjuvant therapy for oropharyngeal cancer provides excellent loco-regional control and may provide a feasible platform in which to monitor anti tumor immunity following immunotherapy.

OX40 and other immunoregulatory molecules are highly expressed on tumor infiltrating lymphocytes in oral, head and neck squamous cell carcinoma

Allen Cheng, MD, DDS; R. Bryan Bell, MD, DDS, FACS; Ryan Montler, BS; Rom Leidner, MD; Marka Crittenden, MD, PhD; Tuan Bui, MD, DDS; Ashish Patel, MD, DDS; Colin Thalhofer, PhD; Andrew Weinberg, PhD

Background: We hypothesize that the highly immune suppressed microenvironment and pervasive systemic immune suppression that characterizes oral, head and neck squamous cell carcinoma (OHNSCC) can be potentially reversed by a strategy that favors anti-tumor inflammatory responses and may be an ideal tumor site for immune modulation.

Purpose: The purpose of this preliminary investigation was to characterize the expression of OX40 and other immune modulators, including PD1, CTLA-4, CD103, and B7H3 in HNSCC tumor infiltrating lymphocytes (TIL) and blood.

Methods: TIL and autologous blood was isolated from a cohort of 31 patients undergoing surgery for OHNSCC. A sample of tissue was obtained from the resection specimen (either primary tumor, metastatic lymph node, or both) and sent to the laboratory with autologous blood. Tumor was minced and a 1.5 hour incubation with digestive enzymes was performed. Blood and tumor sample were separated over ficol gradient to enrich for lymphocytes. Surface and intracellular proteins were labeled with fluorescently labeled antibodies and analyzed by flow cytometry (FACS Analysis).

Results: A significantly higher percentage of Treg cells were seen in the tumor compared to autologous blood ($P<.0001$). In general, Treg cells isolated from the tumor had increased activation markers when compared to circulating Tregs or conventional CD4 T cells isolated from the tumor. There was a significant increase in expression of OX40 ($p<.0001$), PD1($p=.0003$), CTLA-4 (intracellular, $p=.0371$), and B7H3 ($p=.0004$) by intratumoral Tregs compared to circulating Tregs. Furthermore, PD1, CTLA-4 and OX40 were co-expressed by intratumoral Tregs of a significant percentage of subjects compared to circulating Tregs ($p<.0001$) and in contrast to intratumoral effector CD4 ($p=.0067$) and CD8 T cells ($p=.0892$).

Conclusion: These results demonstrate strong co-expression of OX40, PD1, and CTLA-4 within the TIL of OHNSCC but not in the blood, suggesting potential targets for future combination immunotherapy.

Four-Eyelid Skin Loss Reconstructed with Full Thickness Skin Grafts from Prepuce

Eric Dierks, MD, DMD; Sam Bobek, MD, DMD

Study Design: Unusual Case report

Necrotizing fasciitis is a devastating and well-known infection that potentially affects all aspects of the human body. Although the microbiology is varied, this is commonly referred to in the lay media as the “flesh-eating bacteria”. A rare variant of this destructive disease involves the eyelids and periorbita. A patient was recently treated at Legacy Emanuel Hospital for this condition which resulted in the loss of the entire skin of the upper and lower eyelids, bilaterally.

Destruction of the eyelid skin from whatever cause is potentially devastating, however, the use of the opposite eyelid as a donor site almost always results in a highly acceptable reconstruction. Eyelid skin is an ideal donor for full-thickness skin grafting due to its high dermis-to-epidermis ratio and due to the usual redundancy of upper eyelid skin commonly seen among middle age and older individuals. The loss of the skin of all four eyelids represents a reconstructive challenge with limited options. The prepuce (foreskin) has a high dermis-to-epidermis ratio as does eyelid skin, and ample graft material is available, especially among uncircumcised men.

This case report will describe this highly unusual situation of a rare variant of necrotizing fasciitis treated by means of a very uncommon grafting technique.

Conclusion: The prepuce is a viable full thickness skin graft donor site for eyelid reconstruction in this highly unusual situation and may have other applications.

Frequency of Synovial Cysts of the Temporomandibular Joint at Massachusetts General Hospital

Partridge J; Cipriani N; Faquin WC; Chuang SK; Keith DA; Lahey E

Purpose: The purpose of this study is to 1)determine the frequency of ganglion and synovial cysts of the TMJ compared to the extracranial skeleton at Massachusetts General Hospital (MGH), 2)review the demographic data of the study groups and 3)calculate the percent error, sensitivity and specificity of the original histological diagnoses via immunohistochemical (IHC) analysis.

Materials and Methods: The investigators conducted a retrospective cohort study and completed a chart review of all patients undergoing treatment of TMJ cysts at MGH between 2001 and 2013. A natural word search of the MGH pathology database for “synovial cyst” and “ganglion cyst” was used to determine total number of extracranial cysts treated during the same timeframe. IHC analysis was performed using the synoviocyte-specific dye (D2-40) suggested by Vera-Sirera et al. for the clear differentiation between ganglion and synovial cysts.

Results: There were 14 TMJ cysts (12 synovial; 2 ganglion) and 3,176 extracranial cysts (1506 synovial; 1670 ganglion). The cohort was predominantly female (13) with even age distribution (mean and median =52) and no side predilection (7 right and 7 left). IHC of 13 of the 14 cysts identified 2 false positive synovial cyst diagnoses resulting in 100% sensitivity and 50% specificity for the original histological assessment and a percent error of 22%. The frequency of TMJ versus extracranial synovial cysts is 0.60%, while the frequency of TMJ versus extracranial ganglion cysts is 0.24%.

Conclusion: This study represents the largest single-institution experience with synovial cysts of the TMJ and contrary to previous reports, TMJ cysts appear to be more frequently synovial than ganglion. IHC can be used to overcome the relatively poor specificity of histological diagnosis of synovial cysts.

Success of Zygomatic Implants for Maxillofacial Reconstruction: University of Michigan 16-year Retrospective Analysis.

Ehsan Y. Sharaf-Eldeen DMD, MD; Joseph I. Helman DMD; Brent B. Ward DDS, MD; Sean P. Edwards DDS, MD

Statement of the Problem: Zygomatic implants have long been used in the reconstruction of large defects of the maxilla as a result of traumatic, oncologic, atrophic, or congenital abnormalities. The advent of microvascular free tissue transfer in Oral and Maxillofacial Surgery in the past 2 decades has diminished the usage of zygomatic implants for maxillary reconstruction at various institutions. The purpose of this abstract is to highlight the continued utility of zygomatic implants in the reconstructive armamentarium of the Oral and Maxillofacial Surgeon.
Methods/Materials: A retrospective chart review of patients who received at least one zygomatic implant between the years of 1997-2013 was completed. The variables taken into consideration for this study included: patient age at placement of implant, disease state that necessitated implant placement, restoration modality (bilateral versus unilateral), whether the patient received radiation therapy or not, whether radiation was delivered before or after implant placement, success time, and the placement of additional dental endosseous implants.
Methods of Data Analysis: Excel spreadsheet was employed to analyze the data and raw data was analyzed by primary author.
Results: Overall success rate of zygomatic implant placement was 86.44% (51/59) with an average success time of at least 8.28 years with a group of patients >10 years success and counting. Radiated patients had a success rate of 82.35% (14/17 implants). Average age of placement was 52.32 years of age (range 15-81 years old). 59.45% of patients underwent bilateral zygomatic implant placement and 40.55% of patients underwent unilateral zygomatic implant placement. Additional average endosseous implant placement was 1.84 implants per case (range 0-6).

Conclusions: Zygomatic implants provide a formidable reconstructive option for maxillofacial prosthodontic rehabilitation after oncologic resection, trauma, congenital maladies, or atrophic maxillary ridges. Success rates approach 90% with almost a decade of longevity. A coordinated team of the Oral and Maxillofacial Surgeon and the Maxillofacial Prosthodontist is a precursor to providing this service to patients.

An Algorithm for the Treatment of Low-Energy ZMC Fractures

Edward Ellis, III, DDS, MS and Daniel Perez, DDS

Introduction: ZMC fractures are common facial injuries treated by OMSs. Interestingly, treatment of a given ZMC fracture varies considerably from one surgeon to the next. Often, the surgical approaches used to treat the fracture create more deformity than the displaced bones. This is especially the case for approaches to the orbital floor. The purpose of this presentation is to present an algorithm for treatment of low-energy ZMC fractures that has been used for the past 20 years by the author. The intent of the algorithm is to minimize the invasiveness of treatment and avoid approaches to the floor of the orbit whenever possible.

Methods: All patients treated by the authors for isolated, unilateral ZMO fractures from January 1991 to December 31, 2012 with adequate records were retrospectively analyzed. The following demographic information was collected and tabulated: age, sex, cause of the injury, and side of injury. The treatment provided was tabulated to determine where on the algorithm the patients fell. Simple descriptive statistics were applied.

Results: 758 patients with sufficient records to be included were treated by the algorithm. Of the 758 patients, 581 (76.6%) were male and 177 (23.4%) were female. The mean age was 29.6 years with a range of 12 to 88 years. The left side was involved in 463 cases (61%) and the right side in 295 (39%). Interpersonal violence was the cause in 549 (72.4%) of cases, followed by motor vehicle accidents (n=128; 16.9%), falls (31; 4%), sport injuries (22; 2.9%), and others (28; 3.7%). The main finding was that internal orbital reconstruction was deemed necessary and provided in only 35% of cases. Surgical

approaches to the floor of the orbit were therefore only provided in those cases requiring internal orbital reconstruction. Summary: The results of this retrospective audit indicate that most low-energy ZMC fractures can be treated with one or two surgical approaches and without internal orbital reconstruction in the majority of cases.

An Epidemic of Dog Bite Injuries

James W. Wilson, DDS

Dog bites represent a serious medical and public health problem afflicting 1.5% of US population annually. An estimated 4.7 million people are bitten annually and 19% require medical treatment. Children especially boys aged 509 represent the highest incidence of suffering dog bits. The face-head –neck are involved in 50-70% of injuries. The severity of injuries range from minor lacerations to death. Many victims develop post-surgical complications and require revision procedures. The purpose of this abstract is to evaluate the epidemiology of such injuries at Memorial Hermann Hospital in Houston Texas, the state statues that govern dog bites, a characterization of the wounds and administration of the acute care phase.

Maxillary Advancement Traction Osteotomy

Jeffrey S. Topf, MD

A significant number of patients with repaired cleft lip and palate exhibit maxillary horizontal deficiency. This deformity causes functional problems of mastication, breathing and speech and obvious esthetic issues.

These cases are routinely corrected by a Lefort I maxillary advancement osteotomy. When the need to advance the maxilla in a cleft patient is greater than 10mm and especially when the patient has undergone pharyngoplasty or pharyngeal flap surgery it becomes extremely difficult to mobilize the maxilla to this degree. This is due to soft tissue scaring from previous palatal surgery.

This can be overcome by a Lefort I maxillary distraction osteogenesis utilizing a rigid external distractor. The problem with this technique is patient compliance in wearing the RED. The typical patient is a teenager in school who refuses to wear the RED for 6-8 weeks.

Maxillary advancement traction osteotomy (MATO) can solve the problem of advancement of the cleft maxilla greater than 10mm and eliminate the patient's compliance issues.

The surgical technique is performed in two phases after pre-surgical orthodontics has been completed.

Phase I is a Lefort I maxillary osteotomy performed with mobilization and application of RED with 4 advancement traction wires placed on the lateral and anterior maxilla. The maxilla is rapidly advanced 2mm/day into the desired position in 7 days.

Phase II is performed 7 days after phase I surgery. The RED is removed and the Lefort I is exposed. The patient is placed in IMF utilizing a surgical splint and 4 rigid fixation plates to secure the maxilla.

The advantage of MATO is the patient only utilizes the RED for 7 days and the occlusion is as accurate as in the tractional Lefort I osteotomy.

The technique has been used on 15 patients over the past 5 years with excellent results and no apparent relapse or surgical complication.

Prevalence of Obstructive Sleep Apnea Syndrome in Symptomatic Patients with Syndromic Craniosynostosis

Presenter: Bonnie L. Padwa, DMD, MD; Co-Authors: Gino Inverso, BA; Katherine Brustowicz, BA; Eliot Katz, MD

Purpose: The reported prevalence of Obstructive Sleep Apnea Syndrome (OSAS) in patients with syndromic craniosynostosis (SCS) varies widely due to inconsistent definitions of OSAS, lack of uniform diagnostic testing, and different mixes of syndromic diagnoses. The purpose of this study is to determine the prevalence of OSAS in patients with SCS, and to determine whether this differs by syndromic diagnosis (Apert, Crouzon, Crouzon with acanthosis nigricans, Pfeiffer, and Muenke syndromes).

Materials and Methods: Retrospective review of patients with SCS presenting to Boston Children's Hospital between 2000 and 2014. Primary outcome variable was presence or absence of OSAS diagnosed by polysomnography. Patients were referred for polysomnography if they had snoring or restless sleep. OSAS severity was determined by the apnea-hypopnea index (AHI) and scored as mild (AHI > 1.5/hr and < 5/hr), moderate (AHI 5-10/hr), or severe (AHI > 10/hr) OSAS. The prevalence of OSAS in symptomatic patients was calculated and patients were stratified to compare differences in prevalence and severity among various phenotypic diagnoses.

Results: Seventy six of 145 patients (52%) with SCS were symptomatic and had polysomnography for evaluation of OSAS. Overall, the prevalence of OSAS was 85.7% in these symptomatic patients. Patients with Crouzon with acanthosis nigricans had the highest prevalence of OSAS (100%) followed by Pfeiffer, Apert, and Crouzon syndromes (92.9%, 84.8%, and 80%, respectively). Patients with Muenke syndrome had the lowest prevalence (50%). OSAS was most severe in patients with Pfeiffer syndrome (35.7%); patients with Apert and Crouzon syndromes were more likely to have moderate OSAS (27.3% and 20%, respectively)

Conclusion: The prevalence and severity of OSAS varies by phenotypic diagnosis and appears to parallel the severity of midfacial hypoplasia. The incidence of OSAS in asymptomatic patients with SCS (48%) is unknown but is an important area for future research.

The Cleft Mission Abroad "Goals and Pitfalls"

Vincent Carrao, DDS, MD, FACS

The organizing of a surgical mission begins with the identification of a site and an in country sponsor. Once a site visit is performed and the political details have been worked out, the planning for the mission gains momentum. The purpose for the site visit is to determine the surgical need and if there are facilities that will be functional to achieve our goals. This then begs the question; "What are the goals?"
This is a question that is truly multifactorial. The obvious primary goal is the surgical repair of the cleft patient. Using this as a platform we can produce a waterfall of goals and objectives that we can strive to achieve but not always meet.

Some of the possible opportunistic goals that can be realized through this cascade are learning, teaching, patient care, team work, empowerment, gratification, and future missions. This is a short list of broad stroke goals that does require examination. If we look closely at each of these categories we need to access the possible obstructions and pitfalls that may exist as they relate to a surgical mission abroad.

This careful inspection will hopefully lead to greater awareness and success of our future missions, thus allowing us to populate realistic goals and minimize the pitfalls.

Modified Lefort III Osteotomy

Timothy A. Turvey, DDS

In 1971 Josef Kufner published a seminal manuscript describing a maxillary-orbital osteotomy technique and he recorded his early experience involving 61 patients. Published prior to Tessier's English description of LeFort III osteotomy, the design was novel and the first written English description of a high level midfacial osteotomy other than Gilles' LeFort III osteotomy attempted in 1950. Gilles vowed never to repeat the operation because of the difficulties encountered.

Kufner's original operation was a hybrid design, not crossing the nasal bridge nor extending to the frontozygomatic suture. It did include the inferior orbital rim and floor as well as the entire maxilla. A description of the access was not included.

This author's first use of this procedure was in 1974. It was conducted through lower eyelid incisions and transoral incisions. Since that time the operation has been modified and tailored to meet each patient's periorbital and cheek esthetic needs. Access is through either the coronal incision or transconjunctival-lateral canthotomy with intraoral incisions. Simultaneous LeFort I osteotomy, rhinoplasty and mandibular osteotomies can also be performed. The major indication for the procedure is midface deficiency including exorbitism (excessive scleral show) with adequate nasal bridge projection. The results obtained with the procedure for improvement of exorbitism are superior to LeFort I osteotomy with onlay bone grafting.

The benefits and versatility of the procedure will be highlighted with case presentations.

Resorbable Metal Fixation for the Craniomaxillofacial Skeleton

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Background: There is a need for a load bearing grafting material that also resorbs, is amenable to biological activity and induces bone regeneration (inductive or conductive). The ideal materials for this regenerative construct do not exist as of yet. Our aim is to design a fully resorbable, load-bearing bone replacement for the craniomaxillofacial skeleton that would be customized and patient specific. We have three approaches for scaffolds in conjunction with novel resorbable metal fixation plates and screws. The objective of this animal study was to evaluate a newly fabricated resorbable magnesium alloy plate and screw system for use in a rabbit ulna fracture model.

Methods: A white New Zealand rabbit ulna fracture model was utilized to test the novel alloy. Magnesium alloy plates and screws with novel design features. We then analyzed histology of the specimens at various intervals of healing. Plain films and micro-CT with 3D renderings were utilized to evaluate the fracture healing and degradation of the devices.

Results: Fracture healing was observed over the titanium alloy plates and screws as well as over the Magnesium-based alloy. The data showed that Mg degradation does not inhibit fracture healing. We observed enhanced bone formation around the magnesium devices. New bone growth was observed over and around the magnesium plates and screws. Less bone proliferation was observed around the titanium screws. The histology showed bone maturing over time in an appropriate fashion for fracture healing. Our manufacturing methods worked for screws and plates with novel design features. We observed ongoing fracture healing in the presence of degradation of the devices.

Conclusions: Our study was successful for proof of concept that magnesium alloy plates and screws can indeed be utilized for fracture repair and do degrade. Our magnesium alloy does not inhibit fracture healing. The magnesium appears to have a mechanistic reason for causing bone proliferation in the area.

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Impact of Intraoperative Fluid Administration on Length of Postoperative Hospital Stay in Orthognathic Surgery

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Purpose: Within the past decade, there has been an increasing level of attention given to perioperative fluid management and its impact on surgical outcomes. At present there is no consensus as to whether liberal versus restrictive intraoperative fluid administration in major surgery correlates with improved outcomes and shortened hospital stays. The purpose of this study was to evaluate whether or not the volume of intraoperative fluids administered to patients during routine orthognathic surgery is associated with increased length of hospital stay for postoperative convalescence.

Materials and Methods: A retrospective cohort study design was utilized to identify 168 patients undergoing routine orthognathic surgery at Mayo Clinic from 2010-2014. The primary predictor variable was total volume of intravenous fluids administered during orthognathic surgery. The primary outcome variable was the length of hospital stay in hours as measured from the completion of the procedure to patient dismissal from hospital. Additional covariates were collected including patient demographic data, preoperative ASA score, type of intravenous fluid administered, complexity of surgical procedure, and duration of anesthesia.

Results: In univariate analysis total fluid was significantly associated with increased length of stay (OR = 1.82, 95% CI: 1.42-2.33, $p < 0.001$). After adjusting for surgical complexity and duration of anesthesia in multivariable regression analysis, the association of fluid level with length of hospital stay was no longer statistically significant (OR 0.86, 95% CI: 0.61-1.22, $p = 0.39$). Duration of anesthesia remained the only covariate that was significantly associated with increased length of hospital stay in the multivariable regression model (OR 2.21, 95% CI: 1.56-3.13, $p < 0.001$).

Conclusion: Among surgical complexity, duration of anesthesia, and total volume of intraoperative intravenous fluids administered for routine orthognathic surgery, the duration of anesthesia has the strongest predictive value for patients requiring prolonged hospital stay for postoperative convalescence.

The Habsburg Jaw – Re-examined

Zachary S. Peacock, Katherine P. Klein, John B. Mulliken, Leonard B. Kaban

Purpose: 'Habsburg Jaw' is a frequently used eponymous designation for patients with mandibular prognathism, hyperplasia or overgrowth. The purpose of this study was to evaluate portraits of the Spanish Habsburgs to determine the relative contributions of maxillary deficiency and mandibular prognathism to overall facial appearance.

Methods: Representative portraits of the Spanish Habsburgs were assessed by 4 investigators for the presence of 11 anatomic features of maxillary deficiency and 7 of mandibular prognathism. Each characteristic was given a binary score of 1 if present and 0 if absent. Thus, the maximum score would be 11 for maxillary deficiency and 7 for mandibular prognathism. A semi-quantitative scale was established to determine the likelihood of each diagnosis: Maxillary deficiency - 0-4.99 (unlikely), 5-7.99 (likely), 8-11 (very likely); mandibular prognathism - 0-2.99 (unlikely), 3-5.99 (likely), 6-7 (very likely).

Results: Six of 7 Habsburg rulers were considered either likely or very likely to have maxillary deficiency, whereas 3/7 were assessed as likely and 4 unlikely to have mandibular prognathism. Conclusion: The results of this study suggest that the primary deformity of the 'Habsburg Jaw' is maxillary deficiency rather than absolute mandibular prognathism.

Maxillary and Mandibular Osteotomies in a Pediatric Special Needs Population

David Wilson, DMD, MD and Sean Edwards, DDS, MD

Introduction: Orthognathic surgery has a long and positive track record at managing facial deformities, occlusal derangements and the functional problems that result. These procedures are most often accomplished in conjunction with orthodontics, a partnership that generally requires a high degree of patient cooperation and compliance. There is limited literature about the application of mandibular osteotomies procedures in the special needs, cognitively and/or physically impaired pediatric population where the indications, timing and participation of orthodontics may be altered compared to the more traditional surgical population. We sought to review our experience and outcomes of orthognathic surgical experience in this population.

Table:

Name	*Age (yrs)*	*Diagnosis*	*Morbities*	*Surgery*	*Hospital Stay (Days)*	*Outcome*
DG	*7*	*Lip Incompetence/Sialorrhea/ Apertognathia*	*Nemaline Rod Myopathy*	*Bilateral Inverted L*	*3*	*Reduced Sialorrhea, improved lip contact and speech, Improved appearance*
ST	*7*	*OSA, Mandibular Hypoplasia*	*Treacher-Collins*	*Bilateral Inverted L*	*9*	*Avoid Open Tracheostomy, Improved function*
TA	*6*	*OSA, Mandibular Hypoplasia, Lip Incompetence, Sialorrhea, Apertognathia*	*Prune belly-like syndrome*	*Bilateral Inverted L*	*7*	*Reduced Sialorrhea and Improved lip contact and appearance*
HG	*16*	*OSA, Mandibular hypoplasia*	*Tracheomalacia, Tracheostomy, Developmental Delay*	*BSSO*	*4*	*Decannulation*
KJ	*16*	*Apertognathia, Lip Incompetence, Drooling, Dysarthric speech*	*Charcot-Marie-tooth, Ventila-tor dependent, G-tube*	*BSSO*	*3*	*Improved Speech*
MH	*12*	*Mandibular hypoplasia*	*Cognitive impair-ment*	*BSSO*	*2*	*Improved Appearance, Speech*
VE	*7*	*OSA, Micrognathia*	*Robin Sequence, Sotos syndrome*	*Bilateral Inverted L*	*3*	*Avoid Tracheostomy*
SL	*12*	*Mandibular hypoplasia*	*Cognitive impair-ment*	*BSSO*	*1*	*Improve function*

Results: N=8. Age Range 6-16. All surgeries were treated by the main author, during dates of 11/2007 to 02/4014. All eight patients were included in the study due to multiple medical co-morbities and special needs with a goal to improve function. No preoperative orthodontics were done. Four patients were treated with BSSO and four patients were treated with inverted-L osteotomies. All patients were treated to aid in improvement of speech, lip competence, and reduction of sialorrhea. Consultation with speech pathology was typical during the treatment planning phase. By improving lip competence they were able to swallow their own secretions. No patient had complications. Length of stay ranged from 1-9 days.

Conclusion: Children and young adults can benefit greatly from orthognathic surgical procedures with a low risk of complications in spite of significant cognitive and physical impairments.