Abstracts

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RELATIONSHIP ANALYSIS OF THE TUMOR IMMUNE-ENVIRONMENT IN PATIENTS WITH ORAL SQUAMOUS CELL CARCINOMA

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Presenter: R. Bryan Bell

Background: Assessment of distribution of immune cells in the tumor using immunohistochemistry (IHC) is a powerful tool to predict patients' prognosis in various types of cancers [1, 2]. Oral squamous cell carcinoma (OSCC) is no exception; various reports have demonstrated that T cell infiltration is associated with prolonged survival [3, 4]. Many of the studies are performed in HPV-positive oropharyngeal population. However, the role of immune impact is less clear in the HPV-negative setting. Multiplex imaging and relationship analysis have emerged as powerful techniques to objectively study the various immune interactions taken place in the tumor and how these interactions may have an impact on the overall anti-tumor immune responses. We hypothesize that data from such analyses t may be used to direct immunotherapy treatment strategies.

Purpose: To apply multiplex immunohistochemistry (IHC) to identify immune biomarkers that correlate with prognosis and further explore relationship analysis to provide insights into immune tolerance.

Materials and methods: Samples from 162 patients with HPV-negative OSCC are included in this study. Slides were prepared from formalin fixed paraffin embedded (FFPE) samples of patients' primary tumor and stained for CD3, CD8, FoxP3, CD163, PD-L1, cytokeratin and DAPI using the PerkinElmer Opal system. Digital imaging and analysis were performed using PerkinElmer Vectra and inform software.

Results: Preliminary data from our discovery cohort indicate a brisker immune infiltrate at the invasive margin compared to the center of the tumor ($p<0.0001$). At the invasive margin, the number of total $CD3^{+}CD8^{-}$ T cell was positively associated with survival ($P<0.01$). Intratumoral CD8 and $FoxP3^{+}$ cells are positively associated with survival ($p<0.05$), as well as the ratio of CD8 to $FoxP3^{+}$ cells within 30 microns of CD8 cells ($p<0.05$). Relationship analysis demonstrates that $FoxP3^{+}$ T regs were more closely associated with $CD163^{+}$ macrophages expressing PD-L1 ($p<0.01$).

Conclusion: Preliminary conclusions from our discovery cohort suggest that interactions between effectors and suppressors may affect survival in HPV-negative OSCC. Interestingly, the expression of $FoxP3^{+}$ T regs did not negatively impact patients' prognosis.

Mr. Feng and Dr. Bethmann; and Drs. Seliger and Fox contributed equally to this work. Supported by the Harder Family, Lynn and Jack Loacker, Robert W. Franz, Wes and Nancy Lematta, the Providence Medical Foundation and the Oral & Maxillofacial Surgery Foundation (RBB, CBB, BAF).

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TRANSORAL ROBOTIC SURGERY AND CONCURRENT, THERAPEUTIC LEVEL II-IV SELECTIVE NECK DISSECTION IS SAFE AND EFFICACIOUS FOR THE TREATMENT HPV+ OROPHARYNGEAL SQUAMOUS CELL CARCINOMA

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Presenter: R. Bryan Bell, MD, DDS, FACS

Background: Transoral robotic surgery (TORS) has impacted the contemporary management of HPV+ oropharyngeal squamous cell carcinoma (OPSCC) by eliminating or de-escalating adjuvant therapy in selected patients. Comprehensive neck dissection (CND) has traditionally been advocated for management of the N+ neck, but this recommendation was based upon historical data in the pre-HPV era. Superior control rates with conventional treatment has prompted some surgeons to advocate selective neck dissection (SND), either as a concurrent or staged procedure. However, there is currently limited data surrounding the optimal timing or extent of therapeutic neck dissection in HPV+ OPSCC.
Purpose: The purpose of this investigation is to assess outcomes of a cohort of patients with T1/T2 HPV+ OSCC who were treated with TORS plus concurrent therapeutic SND clearing levels II-IV followed by risk adapted radiation therapy or chemoradiation therapy and compare them to a matched cohort of patients treated with comprehensive neck dissection.

Methods: The study group consisted of a cohort of 85 consecutive patients with previously untreated, HPV-related T1-T2 OPSCC who underwent TORS with simultaneous neck dissection followed by risk-adapted adjuvant therapy from February 2011 to January 2014. Patients were divided into two groups based upon the type of neck dissection they received (Group 1=CND; Group 2=SND). Differences in demographics, staging and recurrence was analyzed using a paired t test and treatment outcomes were described using the Kaplan Meier method.

Results: 2-year disease free survival during the study period was 96%. Two patients developed distant metastasis and died within one year of treatment. Most patients were treated for pN2 disease and all but seven 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 approximately 40% of the cases and, with only 3 exceptions, these patients underwent concomitant chemoradiation. One patient in group 1 had neck recurrence after refusing adjuvant radiation and one in group 2 had local recurrence, again after refusing adjuvant treatment for positive margins. Both patients were salvaged with radiation therapy. There was no recurrence in any the 7 patients with N0 or N1 disease who were planned for observation after surgery. Neither recurrence rates nor complication rates differed between the groups: intraoperative and postoperative fistula formation, infection, postoperative bleeding, hematoma and seroma rates were similarly low in the two groups.

Conclusion: TORS combined with risk adapted adjuvant therapy for OPSCC results in loco-regional control similar to historical non-surgical cohorts. Concurrent, therapeutic level II-IV SND appears to be safe and efficacious in the N+ setting but larger prospective cohorts are needed to validate these findings.

UTILITY OF THE ACS NSQIP SURGICAL RISK CALCULATOR AS A RISK STRATIFYING METRIC FOR MICROVASCULAR HEAD AND NECK RECONSTRUCTION.

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Presenter: Kyle S. Ettinger, DDS, MD

Purpose: To externally validate the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) Surgical Risk Calculator as a risk stratifying metric in microvascular head and neck reconstruction.

Materials and Methods: A retrospective cohort study of subjects undergoing head and neck microvascular reconstruction with fibular free flaps at a single institution was completed. The NSQIP Surgical Risk Calculator was utilized to compute complication risk estimates and length of stay (LOS) estimates for all subjects under study. Associations between complication risk estimates generated by the Surgical Risk Calculator and the actual rates of observed complications were evaluated using logistic regression models. Logistic regression models were also used to evaluate the Surgical Risk Calculator estimates for LOS duration relative to the actual observed LOS following surgery.

Results: In 153 subjects under study a total of 46 (30%) experienced a postoperative complication corresponding to those defined by NSQIP Surgical Risk Calculator. A total of 38 (25%) subjects experienced a postoperative complication that is categorized as severe within the parameters of the NSQIP Surgical Risk Calculator. None of the Surgical Risk Calculator complication estimates were found to be statistically significantly associated with the corresponding observed rates of complications. The mean LOS predicted by the Surgical Risk Calculator was found to be 8.0 day (median 7.5; IQR 6.5-9; range 5.0-18.5). The mean observed LOS for the study group was 9.6 days (median 7.0; IQR 6-9; range 5-67). Lin's concordance correlation coefficient to measure agreement between observed and predicted LOS was 0.10 indicating only slight agreement between the two values.

Conclusion: The ACS NSQIP Surgical Risk Calculator is not a useful risk stratifying metric among patients undergoing major head and neck reconstruction with microvascular fibular free flaps. The Surgical Risk Calculator also does not accurately predict length of hospital stay for this same patient population.

COULD ELECTROSURGERY HAVE A ROLE IN THE MANAGEMENT OF BENIGN BONY PATHOLOGY? A PRELIMINARY STUDY OF THE EFFECT OF COAGULATION ON BONE.

J. Caccamese; J. Murphy; A. Forest; R. Younis; B. Mostoufi
Presenter: J. Caccamese

Purpose: Keratocystic odontogenic tumor (KOT) is a benign aggressive tumor with recurrences ranging from 3-60%. A variety of adjuvant treatments have been used to reduce recurrence including Carnoy's solution and cryotherapy, affecting bone to a depth of 1.5mm. We aim to describe electrosurgery's effect on bone, testing the hypothesis that electrosurgery affects bone to an equivalent depth compared to Carnoy's solution and cryotherapy.

Materials and Methods: Three fresh pig heads in which an extraction socket was used as surrogate for a KOT cyst cavity were examined. Coagulation mode monopolar electrosurgery was applied to the sockets. One pass of electrosurgery in coagulation mode at one power setting was used per socket. Two negative controls and 6 treated specimens were evaluated.

Results: Negative controls from both jaws were noted to have intact soft tissue lining the socket along with intramedullary soft tissue and osteocytes in their lacunae. Electrosurgery exposed bone in maxillary and mandibular sockets lost its soft tissue lining, intramedullary soft tissue, and osteocytes from their lacunae with disruption of the Haversian systems. The depth of effect ranged from 0.2 - 2mm depending on the coagulation setting and the jaw treated.

Conclusion: The application of electrosurgery to bone resulted in comparable depth of effect when compared with the historical controls of Carnoy's solution and cryotherapy. The use of coagulation mode electrosurgery when treating KOT's could be of potential benefit.

WHAT IS THE ROLE OF ELECTIVE NECK DISSECTION IN THE MANAGEMENT OF PATIENTS WITH BUCCAL SQUAMOUS CELL CARCINOMA AND A CLINICALLY NEGATIVE NECK?

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Presenter: Jasjit K. Dillon, MBBS, DDS

Purpose: Buccal squamous cell carcinoma (BSCC) is an uncommon tumor location which in the United States, accounts for 10% of all oral cavity carcinoma. Studies have shown it to have high local and regional recurrence rates[1,2]. The role of the elective neck dissection (END) for patients with BSCC and clinically negative neck (N0) is unclear. The purpose of this study is to answer the following clinical question: "Among patients with N_0BSCC, do those who undergo END, when compared to those who do not undergo END, have better locoregional, and metastatic rates and better 2- and 5-year survival rates?

Materials and Methods: The investigators implemented a retrospective cohort study and enrolled subjects with BSCC treated at Universities of Washington, Tennessee, Michigan, and Minnesota and Head and Neck Surgical Associates (Portland, OR) between June 2001 and June 2011. The predictor variables were END status (yes/no). The outcome variables were locoregional, metastatic rates and survival rates. Other variables were grouped as demographic, operative, pathology, and treatments.

Results: The sample was composed of 64 subjects with a mean age of 67 years, 44% were male, and 43 (%) underwent END. Locoregional recurrence rates for END and no END were 26% and 52%, respectively. Metastatic rates of END and no END were 7.0% and 5.8%, respectively. The 2-year survival rates of END and no END were 88% and 79%, respectively. The 5-year survival rates, of END and no END were 76% and 67%, respectively.

Conclusions: Our study corroborates prior studies that BSCC is an aggressive cancer with a high recurrence rate. END had a therapeutic effect as evidenced by lower regional recurrence rates and better 2- and 5- year survival.

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IMMEDIATE TRANS-ORAL ALLOGENEIC BONE GRAFTING FOR LARGE CONTINUITY DEFECTS. LESS MORBIDITY, MORE BONE. A PARADIGM IN BENIGN TUMOR MANDIBULAR RECONSTRUCTION?

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Presenter: James C. Melville, DDS

Abstract: Reconstruction of hard tissue continuity defects caused by ablative tumor surgery has been traditionally reconstructed with autogenous bone grafts or microvascular free flaps. Although results have been predictable from both methods of reconstruction, the morbidity associated with bone harvest is quite significant for the patient. With the advances made in tissue engineering, successful and predictable results have been obtained with using a combination of 100% cadaver bone, Bone Marrow Aspirate Concentrate (BMAC) and rhBMP-2 in immediate reconstruction for benign tumor extirpations via extra-oral approach. In light of these successful outcomes the same combination was evaluated with an intraoral approach. This study aims to evaluate the success of immediate mandibular reconstruction via intra-oral approach without any autogenous bone harvesting.

Patients and Methods: The aim of this retrospective study is to share our experience with the use of 100% allogeneic bone in combination with BMP and BMAC via trans-oral approach for immediate reconstruction of continuity defects resulted from benign tumor surgery. The study reviewed patients treated at the UTHealth OMFS department from July 2014 to January 2016. All patients were presented to our service with biopsy proven benign tumors. All patients' were ASA I/II. All patients were determined to have adequate intraoral soft tissue for primary closure. Patients were offered the option of a vascularized free fibula vs. avascular autogenous bone graft vs. composite allogeneic tissue engineering. All patient chose composite allogeneic tissue engineering reconstruction citing less morbidity and hospital stay. Those with extensive soft tissue involvement were treated with a free flap or planned for delayed avascular/tissue engineering bone graft. All defects range from 4cm to 12cm. Our tissue engineering allogeneic graft consisted of the following, cortical cancellous bone, rhBMP-2/ACS and 120cc of BMAC obtained from the anterior hip. We used the traditional 10 cc of crushed cortical-cancellous bone for each 1 cm of defect. Out of the 5 patients, 4 had maxillomandibular fixation for 3 weeks.

Results: We report a 100% success rate. All patients demonstrated excellent bone quality both clinically as well as radiographically for endosseous dental implant placement. With the trans-oral approach and no autogenous bone harvesting the average operating time was 3.4 hours and hospital stay was 1.2 days. Patients reported they were physically able to return to work within 1 week but most defer to return after 3 weeks due to the edema from rh-BMP-2. No patients complained of any pain from the BMAC harvest sites.

Conclusions: With the advancement in tissue engineering, using only allogeneic bone and growth factors via trans-oral approach seems to have become reality. Composite allogeneic tissue engineering is effective and predictable technique for immediate reconstruction of continuity defects from ablative benign tumor surgery. Patient selection is imperative in using this method. Overall we had no donor site morbidity, less intraoperative time, fewer admission days and overall reduction in total costs compared to traditional methods. However, due to our limited subjects more comparative studies and randomized controlled clinical trials will help to determine the true efficacy of this technique.

IP3 RECEPTOR EXPRESSION IS ALTERED IN IRRADIATED SUBMANDIBULAR GLANDS

James M Roger, DDS, MS; Kamil Alzayady, PhD; David Yule PhD
Presenter: James M Roger, DDS, MS

Purpose: The primary purpose of salivary glands is to produce saliva; a fluid consisting of water, electrolytes and proteins which is essential to the well being and proper functioning of the oral cavity. Fluid flow is severely diminished in the patient receiving radiation as adjuvant therapy to head and neck cancer. Given that saliva secretion is closely tied to the concentration and flow of intracellular [Ca^{2+}], we aim to determine if the expression of the Inositol trisphosphate Receptor (IP3R) mediates these changes in intracellular [Ca^{2+}]. The following includes preliminary results and specifies future directions for a larger project

Methods: Submandibular glands of C57BL6 female mice were irradiated with a total of 15 Gy. After euthanasia, pieces of submandibular gland were rapidly lysed and homogenized over 30 minutes. The lysate was subject to western blot for the three IP3 Reception subtypes (R1, R2, and R3).

Results: In preliminary experiments at day 7, expression of the three IP3 receptor subtypes was enhanced in the irradiated glands. This unexpected early result is currently being evaluated at additional time points and further radiation dosages.

Conclusions: These early results suggest that regulation and the function of the IP3 receptor and calcium signaling may be more complicated in the context of radiation induced cellular damage. While calcium flow and intracellular concentration is a complicated mechanism, and other studies have shown diminished calcium signaling in irradiated glands, the difference in expression of IP3 receptor between healthy and irradiated glands here warrants further investigation. We continue to evaluate the expression of IP3 receptor in irradiated glands and other mouse models of inflammation.

OUTCOME OF IMMEDIATE ALLOGRAFT RECONSTRUCTION OF LONG SPAN DEFECTS OF THE INFERIOR ALVEOLAR NERVE

Salomon D; Miloro M; Haupt A
Presenter: David Salomon, Anastasia Haupt

Purpose: Contemporary management of ablative jaw defects includes not only bony and soft tissue reconstruction, but also addresses restoration of neurosensory function. The goal of this study is determine the outcome of immediate reconstruction of long span defects (≥5 cm) of the inferior alveolar nerve (IAN) following ablative mandibular resection using allogenic nerve grafts.

Materials and Methods: A retrospective cohort study of patients who underwent immediate reconstruction of an IAN gap of ≥50 mm with allogenic nerve graft (AxoGen Avance, Alachua, FL) at a single academic medical center by a single surgeon from September 2013 to March 2015 was completed. The demographic and clinical data was collected for each patient and analyzed using clinical neurosensory testing, and the outcomes were reported according to the Medical Research Council Scale (MRCS) classification for functional sensory recovery.

Results: Of 12 nerve repairs, a total of 6 subjects met the inclusion criteria. The average age was 37.5 years (range: 20 to 61) and 66.7% were male subjects. All IAN defects resulted from resection of mandibular pathology (5 benign, 1 malignant). 5 out of the 6 IAN defects were reconstructed with a 70 mm nerve allograft, while the remaining defect was reconstructed with a 50 mm graft. Mean follow up time was 17.1 months (range: 10 to 27.5 months). 83.3% of subjects displayed return of some superficial pain and tactile sensation without overresponse (S3) with 16.7% displaying good stimulation localization (S3+) using the MRCS classification. The subject that displayed S3+ functional recovery was the one that was reconstructed with the 50 mm graft. Only one of the six subjects had no neurosensory recovery (S0).

Conclusions: Immediate reconstruction of the IAN using allogenic nerve graft of long span defects (≥5 cm) is a viable option to achieve useful functional sensory recovery. This pilot study will continue to recruit subjects to determine the validity and reliability of these findings.

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PREOPERATIVE ENDOVASCULAR STENT PLACEMENT OF THE CERVICAL COMMON AND INTERNAL CAROTID ARTERY WITH TUMOR ENCASEMENT

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Presenter: Michael R Markiewicz, MD, DDS, MPH

Purpose: Tumor encasement of the common (CCA) and internal carotid arteries (ICA) in patients with tumors of the head and neck presents a substantial dilemma in surgical management. Recently, there have been multiple reports on the use of preoperative stenting in the management of vagal and tympanojugular paragangliomas, and bilateral body tumors with greater than 180-degree encasement. The purpose of this paper is to report the outcomes on a preliminary cohort of patients with tumor encasement of either, or both, the cervical internal (ICA) and common (CCA) carotid arteries following preoperative covered stent placement and surgical resection.

Materials and Methods: The investigators designed an institution review board approved, retrospective study, at the University of Florida College of Medicine, Jacksonville, FL, and enrolled a sample of subjects who received preoperative stenting of the cervical ICA/CCA prior to surgical resection of head and neck tumors between April 1st, and July 31st, 2015. The outcomes assessed were resectability of tumors after stenting, histopathological assessment of specimen margins, complications associated with stenting.

Results: Five subjects received preoperative covered stent placement of the ICA/CCA prior to surgical resection. The mean age was 65.2. Median follow-up was 3.5 months. Excision of the adventitia from the stent was performed in all subjects. No intraoperative complications occurred. One vascular-related complication occurred in one subject that suffered occlusion of the stent, sustaining a mini stroke. No involvement of tumor at the deep margin (inner surface of adventitia) of the resection was seen in any subjects.

Conclusions: Preoperative covered stent placement of the cervical ICA/CCA in the management of subjects with head and neck tumors with encasement may represent a safe and effective treatment.

BIOTECHNOLOGY IN THE IMMEDIATE RECONSTRUCTION OF BENIGN MANDIBULAR PATHOLOGY

Joseph E. Cillo Jr., DMD, MPH, PhD

Purpose: Surgical management of benign mandibular pathology may involve intraoral or extraoral resections that create defect with a large oral communication that precludes immediate osseous reconstruction due to concerns of infection and graft failure. The purpose of this case series is to highlight and detail the utilization of biotechnology, such as autogenous or synthetic growth factors and stem cell transplants, in the immediate reconstruction of benign mandibular pathology.

Subjects and Methods: This is a retrospective cohort analysis and case series of individuals who underwent immediate osseous reconstruction following removal of benign mandibular pathology with either an extraoral or intraoral resection with large oral communication (>4 cm). Intraoral communications were closed in layers with deep resorbable monofilament sutures and "water tight" nylon mucosal sutures. All mandibular defects were immediately reconstructed with a titanium reconstruction plate and autogenous/allogeneic bone grafts with addition of combinations of buffy coat un-activated platelet rich plasma (bcPRP), platelet rich fibrin (PRF), bone marrow stem cell aspirate concentrate (BMAC), and/or bone morphogenetic protein-2 on an acellular collagen sponge (BMP-2/ACS). Parameters evaluated radiographic evidence of osseous healing, clinical soft tissue healing, and rate of infection.

Results: A total of 4 individuals (2M; 2F) were included in this study. Average length of intraoral communication was 7.0 cm. Average length of osseous defect was 7.5 cm. Average follow-up was 8 months. All bone grafts went on to show evidence of radiographic healing (100%). There was 1 (25%) minor wound dehiscence that resulted in some loss of bone graft but still resulted in bone consolidation across the plate. There were no instances (0%) of infection or hardware failure. No secondary reconstructive surgeries were required. All subjects went on to heal uneventfully.

Conclusions: The use of biotechnology, such as BMP, BMAC, bcPRP, and PRF, help make the immediate hard and soft reconstruction of benign mandibular pathology more predictable with alleviation of potential complications from second surgery sites or additional surgery.

SCAPULA FREE FLAP RECONSTRUCTION FOR MAXILLOFACIAL DEFECTS IN PATIENTS WITH SIGNIFICANT VASCULAR AND MEDICAL CO-MORBIDITIES

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Presenter: Joshua E. Lubek DDS, MD, FACS

Purpose: The purpose of this study is to evaluate the effectiveness of the scapula free flap for use in patients with both significant peripheral vascular disease and medical co-morbidities and its potential improvements on quality of life.

Materials & Methods: This was a retrospective chart review on all patients who underwent reconstruction with a composite subscapular system vascularized free flap for reconstruction of a maxillomandibular defect within the Department of Oral and Maxillofacial Surgery, University of Maryland from July 2010 through May 2015. All patients with significant vascular disease/medical co-morbidities as identified by medical history, clinical exam and lower extremity imaging were included. Data collected included patient demographics, pathologic process, evaluation of vascular disease with imaging and medical co-morbidities (Charlson score), operative details, hospital course, surgical complications, donor site morbidities and quality of life outcomes (ie. speech, swallowing, post-operative performance status). Orthopantomogram and CT imaging was used to assess the quality of the bone reconstruction as it related to osseous integration at the osteotomies and adequacy to receive dental rehabilitation.

Results: There were 25 patients included in the study. Mean patient age was 67 years old (range 34-82 years). There were 20 male and 5 female patients of which 18 were Caucasian and 7 were African American. Squamous cell carcinoma was the most common pathologic diagnosis (n=15). Mean follow-up time was 14 months. The most common pre-operative Charlson score was 7 (n=8) (range 1-11). Computer tomographic angiography (CTA) was the most common imaging (n=13) followed by magnetic resonance angiography (n=4). There were 24 mandibular defects and 1 palatomaxillary defect reconstructed. Average bone defect length was 7.9 cm (range 4.5 cm – 11.5 cm). The parascapular skin paddle design was most common (n=18). Mean total operative time was 14 hours and 31 minutes. Average operative blood loss was 764 ml (range 300 ml – 1600 ml). Mean hospital length of stay was 15 days (range 7-44 days). Infection was the most common complication followed by wound dehiscence. Six patients required return to the operating room for management of infection or flap salvage. There were two post-operative deaths at 1 month secondary to cardiorespiratory events. Twenty-one patients are managing at least a puree diet. Donor site function had returned to baseline by 9 months (mean 2 months) in all but 1 patient. There were no flap failures. Baseline performance status (ECOG-PS) ranged from 0-2. Six patients dropped their ECOG-PS by 1 point post-operatively. Mean scapula bone height was 2 cm (1.3 -2.7 cm) and width was 1.1 cm (0.65 -1.42 cm). Complete bone healing was observed at all osteotomies. No patient has completed dental rehabilitation at the conclusion of the study.

Conclusions: The scapula is ideally suited for patients who are not candidates for other bone flap reconstruction secondary to peripheral vascular disease or medical co-morbidities. Despite significant medical co-morbidities patients can achieve improvements in quality of life. The scapula bone quality although not ideal appears to be suitable to accept dental implant rehabilitation.

VIRTUAL SURGICAL PLANNING IN HEAD AND NECK TUMOR SURGERY: A 10-YEAR REVIEW

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Presenter: R. Bryan Bell, MD, DDS, FACS

Background: In 2006, we began to utilize computer-aided design and computer aided modeling (CAD/CAM) software, combined with intraoperative navigation, to plan and implement head and neck tumor surgery. Our workflow process was significantly affected in 2009 by the development of 3rd party service providers that facilitate virtual surgical planning via on line web meetings organized by software engineers under the direction of an attending surgeon. The service provider prints the guide stents and cutting guides, as well as anatomical models when appropriate. The purpose of this investigation is to critically examine the evolution of this practice and explore our reconstructive outcomes.

Design: Prospective case series

Methods: Between December 2009 and December 2015 125 patients with a variety of benign and malignant tumors were managed utilizing a combination of CAD/CAM software for presurgical planning, stereolithographic models, and intraoperative navigation. Computed tomography (CT) data was obtained in all patients, providing a 3-dimentional rendering of the head and neck for purposes of visualization, orientation, and diagnosis. The images were analyzed with 2-D and 3-D linear and volumetric measurements and were virtually manipulated (surgical simulation) by mirroring, segmentation, or insertion of anatomic structures with the aid of a software engineer. Planning was performed under the guidance of the attending surgeon during an on line web meeting. The virtual surgical plan was transferred to the patient with guide stents and cutting guides and most recently with the use of custom plates and screws. Post treatment outcome was assessed with CT scan and compared to the virtual plan for accuracy

Results: All subjects included in the study underwent ablative surgery for a variety of benign and malignant head and neck tumors as well as immediate reconstruction using microvascular free tissue transfer. The computer-assisted surgery was successfully implemented in all but 3 patients and proved to be a useful adjunct for: 1) composite free flap inset during maxillo-mandibular reconstruction; 2) complex orbital reconstruction; 3) skull base surgery; and 4) dental implant-supported prosthetic rehabilitation. As the technology has evolved, we are increasing utilizing custom plates and screws to further refine the reconstructive process. Approximately 10 percent of this patient population received dental implant supported prosthetic rehabilitation.

Conclusion: Virtual surgical planning in head and neck tumor surgery has resulted in an efficient and accurate method of optimizing functional and esthetic reconstructive outcomes. The recent addition of custom plates has facilitated added predictability to the reconstructive procedures.

SQUAMOUS CELL CARCINOMA DURING PREGNANCY: A CASE REPORT AND REVIEW OF THE LITERATURE

James Murphy BDS, MB, MRCS, FFD; Deborah R. Berman, MD; Sean P. Edwards DDS, MD, FRD(C); Brent B. Ward DDS, MD
Presenter: James Murphy, DBS, MB, MRCS, FFD

Epidemiological data has demonstrated changes in the demographic profile of patients presenting with oral cavity squamous cell carcinoma (SCC) over the last four decades. In particular, there has been a marked increase in the number of young females, without a history of smoking, presenting with SSC of the tongue. This combined with the fact that females are delaying childbearing to an older age, have resulted in an increasing prevalence of cancer diagnosed during pregnancy. We present a case of a 29 year old female who was diagnosed squamous cell carcinoma of the tongue at fourteen weeks' gestational age. Following a discussion of the therapeutic options, in the context of pregnancy, the patient underwent a right hemiglossectomy, bilateral level I-IV neck dissections, a radial forearm free flap reconstruction and a tracheostomy which was performed at sixteen weeks' gestation. The patient's post-operative course and adjuvant treatment with chemoradiation will be discussed. Adjuvant therapy was completed at twenty-six weeks gestation with a total estimated fetal dose of 4.6cGy of radiation. A vigorous liveborn male was born vaginally at thirty nine weeks' gestation. At one year post-initial presentation, both mother and child are well with no evidence of recurrence with the child meeting all developmental milestones.

We identified twenty-four cases of pregnant patients with tongue SCC following a literature search as shown in the table below. We plan on discussing the evolution of treating pregnant patients with SCC of the tongue as well as the risks and benefits of the most commonly chosen therapies. As it is likely that SCC of the tongue seen in pregnant patients is likely to increase in incidence, we believe a discussion of the topic in merited.

Table1: SCC tongue cases during pregnancy reported in the literature.

First Author	Year	Age (yrs)	Week	Stage	Pregnancy	Treatment	Outcome
Merger	1958	25	Present prior	T4bNxMx	Emergency C/S	RT prior to pregnancy. Disease persisted	Death of mother carotid blowout Child survived
Shibuya	1987	32	28	T2N0M0	C/S 34 wk	RT during pregnancy Brachytherapy post delivery	Regional recurrence – MRND and chemo Mother and child well at 4 years
Shibuya	1987	29	26	T2N0M0	C/S 32 wk	RT during pregnancy Brachytherapy post delivery	Mother and child well at 4 years
Layton	1992	27	15	T2N1M0	Continued	RT	Local recurrence. Salvage surgery. Death 2 years later.
Lasaridis	1996	32	25	T2N1M0	Continued	Staged surgery - Partial glossectomy wk 25 RND wk 33 Adjuvant RT post delivery	Mother and child well at 2 years
Prado and Nuyttens	2000	29	16	T2N2bM0	Continued	Surgery – wk 16 Partial glossectomy + SND I-III Adjuvant RT	Mother and child well at delivery No long term F/U data
Lloyd	2003	36	14	T2N1M0	Continued	Surgery- Hemiglossectomy via lip split SND I – IV RFFF	Regional recurrence contralateral neck 6 months post op RND and adjuvant RT Child well at delivery
Koike	2005	35	27	T3N2bM0	C/S 27 wk	Intra-arterial chemo (Found to be pregnant 2 days into	Locoregional recurrence. Salvage surgery. Skin metastasis

						therapy)Continued post delivery Surgery – Hemiglossectomy via pull through, Ipsilateral RND Contralateral SND I-II RFFF Adjuvant RT	Death 28 months after diagnosis Child well at 2 years
Dumper	2005		1st trimester	T2N0Mx	Post partum	Surgery – post partum Partial glossectomy Ipsilateral SND I-III RFFF	Contralateral regional recurrence at 30 months during 2nd pregnancy. MRND, adjuvant chemoRT Well at 6 years
Atabo	2008	28	20	T2N2bM0	Miscarriage wk 27	Brachytherapy wk 24	Death at 15 months post diagnosis
Chow	2008	34	29	T2N0M0	Continued	Surgery – wk 31 Partial glossectomy SND I-III Post tibial free flap Adjuvant RT post delivery	Mother and child well post mothers rehabilitation Unknown F/U period
Cheung	2009	22	25	T4aN3M0	Continued C/S wk 32	Chemo during pregnancy ChemoRT post delivery	Persistent neck disease – salvage surgery (RND + hemiglossectomy) New contralateral tongue SCC Death 15 month post 1st diagnosis Child low weight at 13 months
Shen	2011	25	26	T3N0M0	Birth wk 30	Intra-arterial chemo post delivery Surgery – Hemiglossectomy via lip split MRND ALT free flap Adjuvant RT	Child and mother well at 1 year
Yokoshima	2012	29	30	T3N0Mx	Continued	Surgery – wk 34 Partial glossectomy and STSG	Mother and child well at 3years and 10 months
Yokoshima	2012	29	20	T2N0Mx	Continued	Surgery – wk 21 Partial glossectomy and STSG	Local recurrence – salvage surgery Subtotal glossectomy, Neck dissection, Rectus abdominus flap Adjuvant chemoRT Further local recurrence Death2 years after first diagnosis
Yokoshima	2012	26	27	T1N0Mx	Continued	Surgery – 1 month post delivery Partial glossectomy	Mother and child well 1 year

Eliassen	2013	26		T4aN2bM0	Termination	Surgery - Subtotal glossectomy Bilateral SND I-IV ALT free flap Adjuvant chemoRT	Regional recurrence 6 months post op Palliative chemo Death 1 year post diagnosis
Eliassen	2013	33	Term	T2N2bM0	Delivered	Surgery – post delivery Partial glossectomy Ipsilateral SND I-III Adjuvant radiation	Mother well at 12 years
Eliassen	2013	30	1st trimester	T2N0M0	Continued	Surgery – Hemiglossectomy Ipsilateral SND I-III Positive margin on path Excision Adjuvant RT declined	Local recurrence – ChemoRT Distant mets – Surgery and Chemo New primary larynx – Laryngectomy Distant metastasis - Death
Eliassen	2013	37	Term	T4aN2bM0	Delivered	Surgery – Partial glossectomy, Mandibular resection Ipsilateral SND I- IV Adjuvant radiation	Mother well at 1 years
Unsworth	2013	29	10	T2N0Mx	Continued	Surgery – wk 12 Partial glossectomy with lip split Ipsilateral SND I-IV RFFF	Both well at 5 years
Mhallem Gziri	2013	28	11	T4aN2bMx	Continued	Surgery- wk 12 Subtotal glossectomy with lip split Bilateral SND I-III RFFF Adjuvant chemoRT	Both well at 1 year
Mhallem Gziri	2013	26	24	T4N1Mx	Continued	Surgery- wk 25 Partial glossectomy Ipsilateral RND Lat dorsi free flap Adjuvant RT	Both well at 6 years
Mhallem Gziri	2013	29	10	T4aN2cMx	Continued	ChemoRT – wk 15 Ipsilateral RND post delivery Patient refused contralateral ND	Both well at 5 months
Mhallem Gziri	2013	34	2 +10	Recurrent T1	Continued	Surgery – 2wk(Pregnancy unknown) WLE and STSG Surgery – 10 wk Hemiglossectomy and STSG	3rd recurrence 7 months post delivery ChemoRT Both well at 18 months

IMMEDIATE TRANS-ORAL ALLOGENEIC BONE GRAFTING FOR LARGE CONTINUITY DEFECTS. LESS MORBIDITY, MORE BONE. A PARADIGM IN BENIGN TUMOR MANDIBULAR RECONSTRUCTION?

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Presenter: James C. Melville, DDS

Abstract: Reconstruction of hard tissue continuity defects caused by ablative tumor surgery has been traditionally reconstructed with autogenous bone grafts or microvascular free flaps. Although results have been predictable from both methods of reconstruction, the morbidity associated with bone harvest is quite significant for the patient. With the advances made in tissue engineering, successful and predictable results have been obtained with using a combination of 100% cadaver bone, Bone Marrow Aspirate Concentrate (BMAC) and rhBMP-2 in immediate reconstruction for benign tumor extirpations via extra-oral approach. In light of these successful outcomes the same combination was evaluated with an intraoral approach. This study aims to evaluate the success of immediate mandibular reconstruction via intra-oral approach without any autogenous bone harvesting.

Patients and Methods: The aim of this retrospective study is to share our experience with the use of 100% allogeneic bone in combination with BMP and BMAC via trans-oral approach for immediate reconstruction of continuity defects resulted from benign tumor surgery. The study reviewed patients treated at the UTHealth OMFS department from July 2014 to January 2016. All patients were presented to our service with biopsy proven benign tumors. All patients' were ASA I/II. All patients were determined to have adequate intraoral soft tissue for primary closure. Patients were offered the option of a vascularized free fibula vs. avascular autogenous bone graft vs. composite allogeneic tissue engineering. All patient chose composite allogeneic tissue engineering reconstruction citing less morbidity and hospital stay. Those with extensive soft tissue involvement were treated with a free flap or planned for delayed avascular/tissue engineering bone graft. All defects range from 4cm to 12cm. Our tissue engineering allogeneic graft consisted of the following, cortical cancellous bone, rhBMP-2/ACS and 120cc of BMAC obtained from the anterior hip. We used the traditional 10 cc of crushed cortical-cancellous bone for each 1 cm of defect. Out of the 5 patients, 4 had maxillomandibular fixation for 3 weeks.

Results: We report a 100% success rate. All patients demonstrated excellent bone quality both clinically as well as radiographically for endosseous dental implant placement. With the trans-oral approach and no autogenous bone harvesting the average operating time was 3.4 hours and hospital stay was 1.2 days. Patients reported they were physically able to return to work within 1 week but most defer to return after 3 weeks due to the edema from rh-BMP-2. No patients complained of any pain from the BMAC harvest sites.

Conclusions: With the advancement in tissue engineering, using only allogeneic bone and growth factors via trans-oral approach seems to have become reality. Composite allogeneic tissue engineering is effective and predictable technique for immediate reconstruction of continuity defects from ablative benign tumor surgery. Patient selection is imperative in using this method. Overall we had no donor site morbidity, less intraoperative time, fewer admission days and overall reduction in total costs compared to traditional methods. However, due to our limited subjects more comparative studies and randomized controlled clinical trials will help to determine the true efficacy of this technique.

RECONSTRUCTION OF MANDIBULAR CONTINUITY DEFECTS INVOLVING THE CONDYLE WITH A TOTAL JOINT PROSTHESIS FOR THE ARTICULATION AND AUTOGENOUS BONE FOR THE BODY

Daniel Perez, DDS

Reconstruction of the mandible following resection of pathologic lesions can be a challenging procedure. The anatomy of the mandible is complex, as it is a moveable bone, with two articulations to the cranium. In addition, the associated attached musculature and temporomandibular joint structures apply different force vectors. This makes controlling the segments in continuity defects a primary concern. Thus, restoration of the anatomy is critical. The main goals of reconstruction of the mandible are restoration of form and function, while regaining continuity.

When treatment planning for mandibular reconstruction, two very important questions must always be asked: 1.) Is there discontinuity of the mandible? 2.) Is there a useable condyle?
When reconstructing continuity defects of the mandible after resection of benign and aggressive lesions, autogenous bone has long been considered the gold standard. As long as all three criteria are present from the bone regeneration triangle (matrix, cells, signal) reconstruction can follow a relatively predictive course. If however, the segmental resection includes the mandibular condyle, the technique becomes more complex.

Modern treatment options such as vascularized flaps, either microvascular or pedicled, are often chosen for large defects. These function well for oncologic resections or for defects over 10 cm, and can often be performed primarily, at the time of resection. A paucity of soft tissue is another indication for vascularized tissue transfer. Historically, smaller defects, including defects that result from benign lesions or trauma defects, are reconstructed secondarily with free nonvascularized hard tissue. Mandibular continuity defects involving the condyle have typically been reconstructed secondarily, with one of the following: costochondral grafts, 4th metatarsal, autogenous/allogeneic bone graft to fossa, allogeneic mandible, or titanium plate with condylar device.

Another treatment option for reconstruction of continuity defects of the mandible, also involving the ramus-condyle unit is an artificial alloplastic mandible/tmj implant. At the University of Texas Health Science Center at San Antonio, we have reconstructed 8 patients following primary resection for benign, aggressive lesions. A unilateral total joint prosthesis (TMJ Concepts) was placed as a secondary procedure to simultaneously reconstruct the temporomandibular articulation, mandibular ramus, and inferior border with concomitant autogenous grafting of the body of the mandible.
Advantages of this method include avoiding an additional donor site (such as in costochondral grafting) and no maxillomandibular fixation with early return to function. In addition, because the prosthesis replacing the total joint, ramus, and inferior border is custom made, symmetry is maintained, early function is allowed, and ankylosis is not a sequelae.

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THE SPECTRUM OF MALIGNANCY IN AMELOBLASTOMA

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Presenter: Robert Ord

Purpose: Ameloblastoma is a controversial tumor which is usually regarded as a benign aggressive neoplasm, although some authorities have likened its behavior to a low grade malignancy. True malignant tumors displaying metastases are well reported and this study examines a series of these rare lesions, to display their diverse behavior and prognosis.

Materials and Methods: This is a retrospective study of 185 ameloblastomas treated in the OMFS department at the University of Maryland between 1990-2016. Six tumors were defined as malignant on the basis of their metastatic behavior (5) or malignant histopathology (1) and these form the basis for this study. The World Health Organization 2005 classification was used to sub-classify the six malignant ameloblastomas.

Results: The age range was 16-85 years with 4 male and 2 females. Three patients were black, 2 white and 1 of Middle Eastern origin. All 6 cases arose primarily in the mandible. Three patients had regional + distant metastases, one patient distant only, one patient regional only and one patient has not yet metastasized. Prognosis has been varied from rapid progression to death within 6 months to many years living with lung metastases. Two patients are dead of disease, one lost to follow up, one living with metastatic disease and 2 with limited (<1 year) follow up. It has proven difficult to reliably classify these cases but 3 appear to be metastasizing ameloblastoma, two ameloblastic carcinoma primary type and one ameloblastic carcinoma secondary type intraosseous.

Conclusions: Malignancy in ameloblastomas represents a diverse spectrum of disease. Due to the rarity of this condition it is unlikely that any single center will have enough cases to define the behavior of subtypes or investigate the genetic alterations that may be present. A multi-institutional study or database may provide a platform to answer some of these questions

ORBITAL RECONSTRUCTION USING SELECTIVE LASER MELTING CAD/CAM TECHNOLOGY

Edward Ellis DDS

Introduction: Orbital reconstruction after injury is difficult because of the confined space within the orbit, the presence of vital structures within the orbit, and the complex bony anatomy of the orbit. When orbital fractures are not treated or inadequately treated, enophthalmos, hypophthalmos, and diplopia can result. Such problems are difficult to correct with any degree of predictability. Virtual computerized planning can very accurately determine the desired position of the bony orbital walls. However, surgically reconstructing them with any degree of accuracy is difficult. Laser-melted titanium custom implants are now available that provide the surgeon the ability to accurately reconstruct the orbital defect. The proper position of the implant is assured by the overlap onto normal anatomy. This presentation will present a case of secondary reconstruction of an untreated orbital fracture to show the workflow involved.

Methods: A 31 year old female with a history of assault from domestic violence 2 months previously was referred to the Oral & Maxillofacial Surgery Department by her PCP. Her chief complaint was double vision and an abnormal appearance to her right eye. She denied pain but complained about "floaters" in her right eye and double vision with extraocular movements. She reported that she "can tell that her face is different" after the assault. By history, she was struck in the right eye by a fist. She never sought treatment immediately after the injury but only after the abnormal appearance and double vision became problematic. She requested surgery as her vision changes impaired her work. Physical exam showed significant right enophthalmos and hypophthalmos. EOMs were intact and her pupils reacted properly to light.

A CT scan revealed the presence of a large right orbital floor and medial wall fracture. The DICOM data was imported into a Brainlab workstation and segmentation of the facial skeleton was performed. The left orbit was selected and them a mirror image of it was positioned into the proper position on the right side using superimposition on normal anatomy surrounding the orbit. This mirror image became a virtual plan for the reconstruction of the right orbit. The outline of the orbital fracture onto the virtual plan was performed using appropriate Brainlab software tools and an STL file was created and sent to the KLS-Martin company in Germany where a selective laser-melted titanium implant was produced. This implant recreated the virtually planned orbital wall reconstruction and lapped over the infraorbital rim to assure accurate positioning. After surgical dissection of the orbit using a transconjunctival approach, the implant was inserted. It fit like a glove and was secured with bone screws.

Results: Postoperative imaging showed a perfect reconstruction. The patient's enophthalmos and hypophthalmos was corrected and her vision improved to normal.

Conclusion: The use of computerized virtual planning (CAD) and selective laser-melted titanium implant fabrication (CAM) is an extremely useful tool to reconstruct internal orbital fractures.

PRE-HOSPITAL AIRWAY MANAGEMENT: "AIRWAY ON ARRIVAL" DOES NOT PREDICT AIRWAY OR OTHER OUTCOME AT A LEVEL 1 TRAUMA CENTER

Tony T.L. Li, MD, DDS; Eric J. Dierks, MD, DMD, FACS, FACD; Juan Zhai, MD, MPH, PhD; Xianghua Pan, MD, PhD; Stuart K. Gardiner, PhD; Riyadh Karmy-Jones, MD, FACS; William Long, MD, FACS
Presenter: Tony T.L. Li, MD, DDS

Purpose: The establishment of an airway is straightforward in some trauma patients and very challenging in others. We seek to determine if there is an outcome difference between patients who require airway management in the pre-hospital setting versus the emergency department.

Materials and Methods: A retrospective chart review was conducted for consecutive level I trauma patients admitted to Legacy Emanuel Medical Center from January 1st, 2010 to December 31st, 2014. Subjects were separated into a pre-hospital (PH) group, and an emergency department management (ED) group. Supraglottic airway device (SAD) use, endotracheal intubations, and emergent cricothyrotomy data was collected. Fisher's exact test was used to compare the probability of surviving at least 24 hours and the need for airway modification within those 24 hours. We performed logistic regression analysis to assess the impact of TRISS on likely need of a tracheotomy during overall hospital course, and to determine whether this explained the difference between PH and ED groups.

Results: A total of 1223 subjects were identified, and 1038 subjects met the criteria for receiving a SAD; 404 (38.9%) in the PH group and 634 (61.1%) in the ED group. Cricothyroidotomy was required among 4 (1%) the PH group, and 1 (0.16%) in the ED group. In the initial 24 hours, 10 subjects in the PH group, and 12 subjects in the ED group received a tracheotomy. In the PH group, 181 were intubated and 56 (30.9%) required an eventual tracheotomy. In the ED group, 539 were intubated and 60 (11.1%) required an eventual tracheotomy. Increased probability of survival score (TRISS) was associated with lower rate of overall tracheotomy ($p < 0.001$). Adjusted for TRISS, airway management location is not predictive of overall tracheotomy rate ($p = 0.98$). Adjusted for TRISS, airway management location is also not predictive of airway modification to tracheotomy during the initial 24 hours ($P = 0.593$).

Conclusions: The overall need of a tracheotomy during a subject's hospitalization is thus not affected by the mechanism or location of initial airway management.

THE USE OF SOCIAL MEDIA TO FURTHER INTERDISCIPLINARY COLLABORATIVE EDUCATION

Gregg A. Jacob, DMD

Purpose: Upon completion of residency and fellowship, many clinicians find themselves faced with the task of managing patients while also sustaining a leadership position in the community by maintaining and demonstrating clinical excellence. Despite outstanding training, many find themselves alone in this challenge with very few if any outlets for advice and management recommendations, in particular for those who are not part of a training program or a group practice. Through the professional use of social media platforms, specifically closed Facebook groups, it is feasible to enhance surgical education while simultaneously optimizing patient outcomes. Modeled after the International Hernia Collaboration, a recognized leader in this field, we recently began the International Collaboration for Cranio-Oral and Maxillofacial Surgeons (ICCOMS) to create an arena for collaborative exchange and education.

Methods: The group initially formed in June 2016 and consisted of 5 members all of whom were trained at a common institution. ICCOMS has rapidly expanded and now consists of nearly 80 members from around the world. The Facebook group was chosen as a platform for this purpose for its ease of use and familiarity to many surgeons globally. The group is closed and private thus protecting the information from the general public in members Facebook profiles. Strict attention is paid to patient privacy and no identifying information is exchanged on the group.

Conclusions: ICCOMS was designed to offer a real time exchange of information and education for the clinician by a collaborative interaction and has provided its members with a neutral and non-competitive way of obtaining multitude opinions on case and patient management. This has provided real time interaction and education on the surgeon's behalf and is leading to more optimal patient management. The group is looking to create an international morbidity and mortality conference done through the network's platform as well as formal webinar type continuing education courses. Given the hectic and busy schedules that we all lead, this group provides a new avenue for furthering our education and patient management and has offered each of its group members the benefits of collaborative learning. We feel strongly that as we move further into the digital world, the opportunities offered by ICCOMS will continue to expand and strengthen our abilities as surgical and dental care givers.

THE POTENTIAL OF NCOMS – A NATIONAL (ONLINE) CURRICULUM FOR ORAL AND MAXILLOFACIAL SURGERY

Martin B. Steed, DDS

Purpose: To present the history of the current Surgical Council on Resident Education (SCORE) portal, its incorporation and correlated outcomes in an existing Oral and Maxillofacial Surgery Residency curriculum, and the advantages of a specialty specific national curriculum within the SCORE portal for Oral and Maxillofacial Surgery within the United States. The portal aims to reduce program variability in curricula, align teaching and learning with essential content, and improve resident study and performance.

Materials and Methods: The program began using SCORE during the 2013-2014 academic year. SCORE requirements were implemented and access to the site was discussed and promoted. In an attempt to incorporate the SCORE portal into the weekly educational conference, SCORE modules that corresponded to the current curriculum were assigned the month before the conference with the expectation of completion before the conference. Although completion of the modules was noted, no disciplinary action was taken for incomplete modules as long as residents were prepared to discuss the assigned material. Many topics in the current curriculum have corresponding SCORE modules, whereas most topics do not. When curriculum topics were not available as defined modules, the SCORE web portal assignment option was used to notify the residents of the upcoming conference topic and to refer to online resources available through the SCORE portal or other web-based resources.

Results: The portal appears to serve curricular resource needs and may better direct resident study.

Conclusions: The SCORE web portal offers a sophisticated platform to facilitate surgical education. SCORE has invested over 8 million dollars in the project since its inception. The web portal continues to expand and evolve with input from users. To maximize SCORE's potential for Oral and Maxillofacial Surgery Residency Programs an OMFS specific site within SCORE could house an evolving national curriculum.

MOVING VIRTUAL SURGERY PLANNING INTO ORAL AND MAXILLOFACIAL SURGERY RESIDENT EDUCATION AND TRAINING

Steven M. Roser, DMD, MD, FACS and Shelly Abramowicz, DMD, MPH
Presenter: Steven M. Roser, DMD, MD, FACS

Purpose: To stimulate interest in developing a virtual surgery planning curriculum for the education and training of oral and maxillofacial surgery residents.

Virtual surgery planning, (VSP), has made a significant impact on the practice of aspects of oral and maxillofacial surgery and dentistry. The accuracy of VSP has been established. Advances in software programs and technology have made VSP applicable in many areas and available to any practitioner with internet capabilities. Advances in software programs and hardware technology are merging to extend VSP into maxillofacial trauma, maxillofacial pathology, TMJ surgery, craniofacial and orthognathic surgery and implant surgery. Currently residents are being exposed to the various aspects of VSP based on the interest of the faculty, availability of patient and financial resources. In a letter to the editor of the Journal of Plastic and Reconstructive Surgery, Pfaff and Steinbacher called for the development of a VSP based curriculum for plastic surgery resident education.(1) Oral and maxillofacial surgery resident training and education requires familiarity with restorative dentistry and orthodontics. Both of those areas incorporate VSP into the delivery of patient services. As haptic technology is merged with VSP, operative simulation programs for oral and maxillofacial surgery procedures will be developed. (2) The following is an outline of model curriculum content incorporating a simulation approach for oral and maxillofacial surgery resident education and training.

I. Technology curriculum
   - A. Imaging basics: radiographic, MRI, navigation, optical and laser scanning, 3D photography
   - B. Imaging techniques: CT,CBCT, MRI, optical and laser scanning, 3D photography
   - C. Software development and capabilities: CAD, 3 dimensional modeling
   - D. Bioengineering principles: computational modeling of the human body, biomechanics
   - E. Manufacturing principles: 3D printing, custom hardware production.
   - F. Vascular studies

II. Clinical curriculum
   - A. Applications of VSP
     1. Maxillofacial trauma: pre operative and intra operative
     2. Maxillofacial pathology: resection and reconstruction
     3. Craniomaxillofacial and orthognathic surgery
     4. Temporomandibular joint surgery (total joint replacement)
     5. Implant surgery, intra and extraoral
     6. Facial cosmetic surgery
   - B. Surgical simulation (3)
     1. Case based planning session scenarios with bioengineers, dentists, colleagues
        - a. Video taped
        - b. All are learners or confederate in scenario
        - c. Debrief
     2. Case based perioperative scenarios
     3. Haptic technology merged with VSP for surgical skill set acquisition

III. Use of the curriculum for practitioners
   1. Continuing education
   2. Maintenance of Certification

Full development of the curriculum, in addition to problem identification, will require targeted needs assessment; development of specific goals and objectives; explication of educational strategies including faculty development; design of reliable and valid assessment tools and debriefing/feedback approaches; program evaluation; and infrastructure support and resources for implementation. (3, 4)

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INTERGRATING SURGICAL PHILANTHROPY INTO SURGICAL TRAINING

Shahid R. Aziz, DMD, MD, FACS

Purpose: As technology and ease of migration evolves, the importance of Global health and culturally competent surgeons increases. Having health care providers who have global health experience creates care givers who are more cognizant of cultural needs, differences, and improves overall sensitivity. This in turn allows health care providers to provide more productive and efficient care. UMDNJ/Rutgers IRB approval 0120110119.

Materials and Methods: An anonymous 26-question survey was electronically mailed to 45 individuals identified as having participated in a cleft lip/palate mission during residency. The survey was created and distributed, and the data were collected using the online survey engine Survey Monkey.

Results: Thirty-nine individuals (86.7%) completed the survey. Of these, 27 were men (69.2%) and 12 were women (30.8%). Thirty-two (82.1%) were oral and maxillofacial surgeons, 4 (10.3) were plastic and reconstructive surgeons, 1 (2.6%) was an otolaryngologist, and 2 (5.1%) were pediatric dentists. Twenty five respondents (64.1%) stated that, before their first mission, they had not operated on a primary cleft lip; 21 (53.8%) noted that they had not operated on a primary cleft palate before their first mission. Thirty-six (92.3%) noted that their mission experience improved their ability to repair facial clefts. Thirty-seven (94.9%) believed their mission experience improved their overall surgical skill. All respondents (n = 39, 100%) believed their mission experience improved their overall ability to evaluate patients with cleft. Thirty-six (92.3%) believed their experience in humanitarian missions made them more culturally sensitive/competent health care providers. Thirty-eight respondents (97.4%) believed these missions made them more socially aware of the differences in access/availability of health care globally. Thirty-eight (97.4%) believed that participation in a humanitarian mission was a high point of their residency. Thirty-seven (94.9%) planned to participate in humanitarian medical missions during their career after residency.

Conclusion: All respondents believed that participation in a humanitarian mission during residency was a positive part of their training. In addition, these missions allowed the residents to develop as surgeons and improve their awareness of global health care and cultural competence. Given these important educational aspects, participation in a humanitarian mission should be considered a required part of residency training.

PEDIATRIC CHRONIC NONBACTERIAL OSTEOMYELITIS OF THE JAW: CLINICAL, RADIOGRAPHIC, AND HISTOPATHOLOGIC FINDINGS

Bonnie L. Padwa, DMD, MD; Kelley Dentino, DMD; Caroline D. Robson, MB, ChB; Kyle Kurek, MD; Sook Bin Woo, DMD
Presenter: Bonnie L. Padwa, DMD, MD

Purpose: Chronic nonbacterial osteomyelitis (CNO) is a focal sterile inflammatory osteitis in children that most commonly develops in the long bones but can occur in any bone. The disease course can be variable ranging from acute and self-resolving isolated lesions to chronic recurrent multifocal disease (CRMO), which is frequently associated with extraosseous inflammatory disease and may be related to SAPHO syndrome in adults. The purpose of this study was to present our clinical experience with pediatric CNO of the mandible. The specific aims were to (1) document the clinical characteristics, radiographic findings and histological features and (2) distinguish mandibular CNO from other chronic inflammatory and fibro-osseous jaw lesions.

Patients and Methods: This is retrospective case series of patients with mandibular CNO. Medical records were reviewed for history, clinical features, imaging, and pathology. Descriptive data were summarized.

Results: The sample included 22 patients (13 females and 9 males) with disease onset at a mean age of 9.05 $\pm$ 2.4 years. On presentation all subjects reported mandibular pain with recurrent swelling, and 45% had trismus. All 22 patients had clinical features or radiographic findings of chronic recurrent multifocal disease (CRMO) and/or associated extraosseous inflammatory lesions consistent with synotivits, acne, pustulosis, hyperostosis, osteitis (SAPHO) syndrome. Twelve patients (54%) had a documented family history of associated auto-immune or auto-inflammatory disease and 15 (68%) had abnormal serologic findings of elevated ESR and/or CRP during a flare. CT examinations typically revealed expansion of the affected mandible with sclerosis of the medullary space, small foci of poorly defined lytic destruction with a lamellated periosteal reaction, and swollen muscles of mastication. Four distinct histological features were noted including striking parallel and interconnected osteoid seams, atypical osteoid, fibrous dysplasia-like areas and patchy nodular fibrosis.

Conclusion: Pediatric CNO of the mandible has characteristic radiographic and pathologic features that separate it from other inflammatory or fibro-osseous jaw lesions. Mandibular CNO lesions may present in the context of CRMO associated with multiple additional foci and a high likelihood of recurrence.

THE USE OF RHBMP- 2 COMBINED WITH ALLOGRAFT IN ALVEOLAR CLEFT GRAFTING. A REVIEW OF THE OUTCOMES OF 98 PATIENTS BETWEEN 2008 - 2016

Stephanie J. Drew, DMD

Purpose: The use of rhBMP- 2 as an alternative bone grafting enhancing material has been used in cleft lip and palate patients requiring bone grafting of the alveolar cleft defect. Its use has been often combined with autogenous bone, requiring a second surgical site to harvest the bone. This is a review of the outcomes of 98 patients that have received only Infuse® rhBMP-2 plus allograft (Puros®) between 2008- 2015.

Materials and Methods: Patient charts from 2008-2016 were reviewed. The patients were all grafted with a small rhBMP-2 kit (4.2mg) plus 1 gm of Puros for the Unilateral case and a Medium rhBMP-2 kit(8.4mg split evenly between sites) plus 2 gm of Puros (split evenly between sites) for the bilateral cleft patients. I CAT scans were used preoperatively, one week post operatively and from 3 months to 99 months of follow up changes were used to evaluate the eruption of the canine in the cleft site, the need for exposure of the canine, the Density change (in hounds field units) of the graft and the percentage of graft retained in the site. The height, width, and depth of the grafted bone were also measured and the change over time recorded.

Fifteen cases were chosen randomly to assess the ICAT cone beam scans changes in volume and density, height, width and depth of the grafts. Two were bilateral and 13 were unilateral. The engineers at 3D Systems used software to overlay the scans and assess then record these change.

Results: Of the 98 patients, 61 were males and 37 females. Ages ranged from 4 -48. There we 63 unilateral and 35 bilateral cases. For the purpose of this evaluation the right side was used in the bilateral cases to evaluate ICAT measurements for the volume studies. The canines were still developing in 48 patients, the canines erupted in 46 patients and the canines needed exposure in 4 patients.

The ICATS of the 15 patients showed the following changes and overall 5.76% increase in overall volume. A 6.89% increase in average height, a 17.19%decrease in average width, and a 7.39% decrease in average depth. The Density change was an 82.23% increase.

Conclusion: The use of rhBMP-2 demonstrated predictable results for maintaining enough volume and density to allow for development and eruption of the permanent canine in 46 out of 98 patients thus far. The remaining 48 patients will be followed and recorded. Only 4 patients have required exposure. The volume changes of the graft show an increase over time of 5.76 percent along with an 82.23% increase in density. The bone achieved has thus far provided stability of the dentoalveolar unit as well as adequate bone volume to support the dentition.

CONDYLECTOMY CONCOMITANT WITH ORTHOGNATHIC SURGERY

Timothy A. Turvey, DDS

Purpose: Orthognathic surgery is one of the more frequent procedures performed by oral and maxillofacial surgeons. Condylectomy is less frequently performed and is usually limited to those with pathology of the condyle head or neck, ankylosis, degenerative diseases, or post trauma to the condyle resulting in limitations of movement. Orthognathic surgery combined with condylectomy can be very useful when problems of the mandibular condyle occur in common with orthognathic conditions.

The purpose of this study is to examine the records of a cohort who underwent orthognathic surgery and to identify a subset who simultaneously underwent condylectomy. The study period was January 2010 through December 2015. The subset material was analyzed to include demographics, (age, gender, race) pathological diagnosis, side, diagnosis, the type of condyle reconstruction and outcome.

Material and Methods: The materials included a computer search of all patients undergoing orthognathic surgery at a single institution using CPT identifiers during this study period. The subset was identified from this same group using CPT identifiers for condylectomy. Comparative demographic descriptive statistics were performed. The type of condyle reconstruction was identified from the record as well as the clinical course and outcome. Outcome was judged by record review, assessing range of mandibular movement, facial symmetry, occlusion, and patient satisfaction.

Results: During the five-year study period 772 patients were identified who underwent orthognathic surgery at a single institution conducted by 3 surgeons. Of these, the subset who simultaneously underwent condylectomy numbered 42 (5%) and all were operated by a single surgeon. Of these 42, the preoperative diagnosis was unilateral condyle hyperplasia (35, 73%), rheumatoid arthritis (31, 13%), condyle resorption (3, 13%) and other pathology (1, 2%). The patients who had condyle hyperplasia included 29 (83%) of the elongation variety and 6 (17%) of the hypertrophy variety. The subset included 9 men (27%) and 33 women (73%). The mean age at the time of surgery was 20.5 years (range 15-40 years). The side of the condylectomy was right in 34 (81%) patients and left in 2 (5%) patients. Six patients (14%) had bilateral expression and underwent costochondral grafts to reconstruct the condyles and these were the 3 patients with rheumatoid arthritis and 3 with condyle resorption. All of these patients had bilateral rib grafts. The remaining 37 patients had reconstruction performed conducting a sagittal osteotomy of the mandible with repositioning of the condyle stump into the fossa. A splint was used in the majority of patients and no patient had wire intermaxillary fixation. All patients used intermaxillary elastics for a minimum of 6 weeks. By 2 weeks postoperative physical therapy was begun. All patients had preoperative and postoperative orthodontics. Fourty patients have reached at least 1 year postoperative follow up by the time of this report.

Results: At the longest follow, 41 patients had incisal opening greater than 40mm. All patients except 2 completed treatment with class I occlusion. The 2 that didn't were unable to complete orthodontic treatment. One patient experienced temporary frontal branch weakness which resolved by 4 months postoperative. Another patient developed gustatory sweating (Frei Syndrome) which persisted for several years. The patient elected to do nothing about this. No patient in this group experienced relapse of their condition and of those with overgrowth conditions, none experienced continuation of growth. The patients who had costochondral reconstruction have done well with the exception of 1 who could not complete postoperative orthodontics and she remains in the class II occlusal position.

Conclusions:

1. Metabolically active condylar growth or resorption conditions occurred in 5 % of an active orthognathic surgery practice.
2. Women were more effected than men (73% vs. 27%) but this was similar to the entire group of patients who underwent orthognathic surgery during the same time frame.
3. Right sided (81%) conditions were more common than left (5%) or bilateral (14%) expression.
4. High condylectomy with immediate reconstruction using either the condyle stump (86%) or costochondral grafting (14%) is effective in improving the facial symmetry and arresting the metabolically active process and allowing a functional TMJ reconstruction.
5. Close orthodontic follow up with physical therapy is a critical part of a successful outcome.
6. Carefully executed surgery minimizes the morbidity of treatment.

Morbidity and Mortality Rates after Maxillomandibular Advancement for Treatment of Obstructive Sleep Apnea

Passeri LP; Choi JG; Kaban LB; Lahey E
Presenter: Edward Lahey, DMD, MD

Purpose: To compare morbidity and mortality rates in obstructive sleep apnea (OSA) versus dentofacial deformity (DFD) patients undergoing equivalent maxillofacial surgical procedures.

Patients and Methods: Patients with OSA who underwent maxillomandibular advancement with genial advancement (MMA), at Massachusetts General Hospital Department of Oral and Maxillofacial Surgery, from December 2002 to June 2011, were matched to patients with DFD undergoing similar maxillofacial procedures during the same time period. They were compared with regards to demographic variables, medical comorbidities, perioperative management, intraoperative, early and late postoperative complications and mortality.

Results: A study group of 28 patients with OSA and a control group of 26 patients with DFD were compared. The patients with OSA were older (41.9±12.5 vs. 21.7±8.6years), had a higher ASA classification (2.0±0.5 vs. 1.3±0.6) and BMI (29.6±4.7 vs. 23.0±3.1kg/m^2). They also had a greater number of medical comorbidities (2.4±2.3 vs. 0.7±1.0). More OSA than DFD patients had complications (28, 100% vs.19, 73%, p=0.003) and the total number of complications in the OSA group was higher (108 vs. 33, p<0.001). In the OSA group, 13.9% and in the DFD group 3.0% of the complications were classified as major. The absolute risk of a complication for the OSA group was 3.9 vs. 1.3 for the DFD group. The relative risk of complications in OSA compared to DFD was 3.0. No difference in mortality was found.

Conclusions: OSA patients were older, had more comorbidities and ultimately had a greater number of early and late, minor and major complications than those in the DFD group. The incidence of mortality in both groups was zero. MMA appears to be a safe procedure with regards to mortality but OSA patients should be counseled preoperatively regarding the relatively increased risk of complications.

DOES THE AMOUNT OF SCREW FIXATION UTILIZED FOR THE TMJ CONCEPTS TOTAL TEMPOROMANDIBULAR JOINT RECONSTRUCTION PREDISPOSE TO HARDWARE LOSS OR POSTOPERATIVE COMPLICATIONS?

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Presenter: Kyle Ettinger, DDS, MD

Purpose: To determine whether the number of screws used to fixate a TMJ Concepts total joint prosthesis correlates with loss of hardware fixation or postoperative complications.

Materials and Methods: A retrospective cohort study of subjects undergoing total temporomandibular joint (TMJ) reconstruction with the TMJ Concepts custom prosthesis at Mayo Clinic between 2005 and 2015 was undertaken. The primary predictor variable was the percentage of screw fixation utilized in the condylar component. The primary outcome variable was loss of hardware fixation. Secondary outcome variables included postoperative wound infection, removal of hardware, and return to the operating room. Covariates abstracted included patient demographics, comorbidity indices, preoperative occlusion, contralateral TMJ reconstruction, performing surgeon, duration of procedure and anesthesia, intraoperative fluid administration, concomitant surgical procedures, perioperative antibiotics, prior TMJ surgeries, prior Proplast Teflon implant, prior head and neck radiation, and use of heterotopic ossification radiation protocol.

Results: The study sample was composed of 45 subjects representing 64 TMJ Concepts reconstructions. Mean age was 49.1 years (SD: 13.4; range 19-85). Gender distribution was 86% female. There were 15 simultaneous bilateral reconstructions, 26 unilateral reconstructions, and 4 staged bilateral reconstructions. Eighteen reconstructions (28%) were placed using 100% of the available screw holes in the condylar component. Forty-six reconstructions (72%) were placed using fewer than 100% of the available screw holes in the condylar component (range of percent screw fixation: 56%-89%). There was no postoperative loss of hardware fixation in any reconstruction under study. Six reconstructions experienced a postoperative complication defined by the secondary outcomes. Univariable/multivariable modeling was precluded for both primary and secondary outcomes due to the low frequency of observed complications.

Conclusion: Fixating the condylar component of the TMJ Concepts total joint prosthesis using less than 100% of the available screw holes does not predisposed the reconstruction to hardware loss, particularly if greater than 50% screw fixation can be achieved.

TREATMENT OF THE TEMPOROMANDIBULAR JOINT ANKYLOSIS WITH IMMEDIATE ALLOPLASTIC RECONSTRUCTION: IS THIS THE NEW GOLD STANDARD?

Daniel Perez, DDS

Temporomandibular Joint Ankylosis continues to be one of the most challenging problems faced by Oral and Maxillofacial Surgeons. The anatomy of the TMJ is difficult to reproduce, with many delicate and important structures all confined within a small space. To make matters worse and more difficult, the anatomy of the Ankylosed TMJ presents a special set of circumstances with a distorted joint that is unique to each individual patient. The treatment modalities have been described and heavily discussed in the literature but the results continue to be mixed and very few methods have proven long-term stability.

For treatment of ankylosed patients, gap arthroplasty with autogenous TMJ reconstruction has traditionally been considered the gold standard. Although this treatment modality has been successful there are many problems associated with this technique; unpredictable growth, donor site morbidity, need for multiple surgeries, reankylosis, need for maxillomandibular fixation, limited function and fractures.

Different classification systems have been used; (Sawhney, He, Raveh) but what's critical is to know is the difference between fibrous and bony ankylosis, adjacent vascular and nerve structures and their relationship with the ankylotic mass. Imaging (CT scan with or without contrast) and proper preoperative planning is key.

In this article we will discuss the treatment modality we use at the University of Texas Health Science Center at San Antonio in treating TMJ Ankylosis in the adult patient. We will discuss the steps involved in preoperative workup, diagnosis, surgical planning, surgical steps involved with resection and contouring of the fossa and rehabilitating the patients with a custom or stock alloplastic joint. Rehabilitation can be achieved with a one-stage or a two-stage surgery of immediate reconstruction or delayed reconstruction.

Advantages noted in this method include an immediate return to function, no maxillomandibular fixation, decreased risk of reankylosis, ability to perform concomitant orthognathic surgery, no donor site morbidity, and an average decrease in the number of surgeries needed.

A series of patients that underwent this procedure will be presented. At this point in their care, all of these patients have a much improved range of motion and function with no signs of reankylosis.

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PERIOPERATIVE CHARACTERISTICS OF ADOLESCENT PATIENTS UNDERGOING FREE TISSUE TRANSFER IN THE RECONSTRUCTION OF CRANIOMAXILLOFACIAL DEFECTS

Karen Z. Carver DDS MPH; Roderick Y. Kim DDS MD; Sean P. Edwards DDS MD
Presenter: Karen Z. Carver, DDS, MPH

Introduction: Free tissue transfer is often utilized in head and neck reconstruction for a variety of pathologic and traumatic defects. Within the field of oral and maxillofacial surgery, the use of this technique in pediatric populations has not been widely discussed in the literature. Therefore, we conducted a retrospective review of patients who underwent free flap reconstruction with the goals of characterizing the perioperative period and assessing this treatment modality in an adolescent population.

Methods: We conducted a single institution retrospective chart review of patients ages 10-18 who underwent free flap reconstruction between July 2007 and June 2015. Both benign and malignant diagnoses reconstructed with free tissue transfer were considered for inclusion. Standard descriptive statistical methods were used to analyze demographic, procedural, and surgical/donor site data and complications.

Results: A total of nine patients diagnosed with benign and malignant conditions were reviewed. The average length of stay was 7.44±2.96 days. In those patients available for follow up at 6 months (n=8), seven flaps (87.5%) remained without major complication. One patient (12.5%) had a major complication that resulted in partial loss of flap tissue. The most common follow up issues were minor and included donor site complications (n=5, 62.5%), wound complications (n=3, 37.5%), and infection (n=2, 25%). Several patients (n=5, 62.5%) also had cosmetic concerns, such as hypertrophic or hyperpigmented scars, lip incompetence, or flap bulk. One patient developed heterotopic ossification of the flap pedicle.

Conclusions: Reconstruction of large facial defects with free tissue transfer is a successful method in the pediatric population. Although there were some minor complications, patients in general tolerated the procedure well in the perioperative period. Additional studies and larger, standardized chart reviews and cohort studies are required to better characterize perioperative considerations and to associate them with long term outcomes.

UNCOMMON PRESENTATION OF A COMMON COMPLICATION OF ACUTE RHINOSINUSITIS, A CONTRALATERAL SUBPERIOSTEAL ORBITAL ABSCESS IN A TEENAGER

Mark A. Miller, MD, DMD; Barry Steinberg, MD, DDS, PhD, FACS; Nathan Ranalli, MD
Presenter: Mark A. Miller, MD, DMD

Introduction: Background: Orbital subperiosteal abscesses in pediatric populations typically present as a collection of fluid in the space between the periorbita and the medial and superior orbit adjacent to acute ethmoiditis[1]. While this complication is well reported as a condition associated with ipsilateral sinus disease, we encountered this complication on the contralateral orbital with no direct signs on imaging of extension across the midline.

Case Presentation: A previously healthy seventeen year old male presented to the emergency department after a four day history of worsening left orbital cellulitis with associated developing abscess, escalating headache, perforated right ethmoid sinus wall with pneumocephalus, associated frontal lobe cerebritis on CT and MRI, right sided ethmoid and paranasal sinusitis. The patient was stable in the emergency department and was admitted to the pediatric service with pediatric craniofacial, ENT, neurosurgery and infectious disease services as consultants.

Management and Outcome: The patient was taken to the operating room by our craniofacial team for drainage of his left subperiosteal superior orbital abscess. Our ENT colleague followed our procedure with a functional endoscopic sinus surgery finding right sided paranasal and ethmoid sinusitis with minimal disease noted on the left. The neurosurgical team was consulted for intracranial findings but no operative procedure was necessary. The patient remained afebrile with leukocytosis and elevated CRP while being medically treated with broad spectrum antibiotic coverage pending cultures and sensitivities. The remainder of his hospital course was included continued intravenous antibiotics, monitoring of CBC, ESR, and CRP with improvement of his condition. His clinical exam normalized one week post operatively and was discharged home in stable condition ten days later.

Discussion: There are many anatomic variances in children that can allow for spread of infection from the ethmoid sinuses to the orbit and children are at higher risk for intracranial abscess[2]. In publications, this is noted and discussed on the ipsilateral side of sinus disease[3]. In our patient we hypothesize that other anatomic variances allow for the spread via means other than direct extension or congenital dehiscence of the lamina papyracea which is standardly referenced.

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DO SIMULTANEOUS 3RD MOLAR EXTRACTIONS DURING ORTHOGNATHIC SURGERY INCREASE COMPLICATIONS?

Derek M. Steinbacher, DMD, MD, FACS, FAAP; Katrina L. Kontaxis, DMD
Presenter: Katrina L. Kontaxis, DMD

Purpose: Prior to orthognathic surgery, most surgeons recommend 3rd molar extraction. Espoused reasons include potential risk for infection, untoward osteotomies, and worsened postoperative discomfort. However, in addition to being another procedure for the patient, this may necessitate a longer pre-orthognathic surgery phase. The purpose of this study is to compare the outcomes of orthognathic surgery comparing staged versus simultaneous 3rd molar extractions.

Methods: This was a retrospective analysis of patients who underwent orthognathic surgery from 2013-2014, with at least a 1-year follow-up period. Patients were stratified into two groups: 1. Extraction of 3rd molars at the time of surgery and 2. Prior extraction of 3rd molars. Primary outcomes included the occurrence of unfavorable splits, infection, bleeding, malocclusion and hardware failure. Secondary outcomes were procedure time, post-operative pain and length of stay. Pearson's chi-squared tests and two tailed unpaired t-tests were performed to determine if there was an association between the simultaneous removal of third molars and the primary and secondary outcome measures, respectively.

Results: 100 patients were included in the study. 49 patients had third molars extracted at the time of surgery and 51 did not. Complications included unfavorable split, post-operative infection, mild post-operative bleeding, post-operative malocclusion and hardware failure. There was no significant difference in the incidence of complications in both groups. Procedure time was not considerably increased with extractions. There was no significant difference in post-operative pain or length of stay between both groups.

Conclusions: Removing 3rd molars concurrently with orthognathic surgery does not increase the risk of adverse outcomes, nor does it significantly influence hospital course.

CRANIOPLASTY TO REPAIR GROWING SKULL FRACTURE: A CASE REPORT

Ashley Manlove, DMD, MD; Barry Steinberg, DDS, MD, PhD; Nathan Ranalli, MD
Presenter: Ashley Manlove, DMD, MD

Background: Growing skull fractures, also known as leptomeningeal cysts, are rare and poorly understood complications of pediatric skull fractures. Growing skull fractures occur almost exclusively in children under the age of three, usually in infants less than one year old (Lende R, 1961). While growing skull fractures have been documented and well described, the pathophysiology is uncertain. The thought is the child sustained trauma to the head including a skull with underlying dural tear. As the brain and skull undergo normal rapid growth during infancy and early childhood, the dural tear enlarges as does the site of the skull fracture (Lende R, 1961) (Kingsley D, 1978). The dural edges often extend underneath the growing skull fracture, necessitating extensive craniectomy to permit duraplasty prior to cranial reconstruction.

Case Description: A humanitarian organization, while in Ethiopia, encountered an approximately 14–month old male at an orphanage with a visible and palpable right parietal cranial defect and associated soft tissue and fluid out pouching. The patient's story was provided by various caregivers, including his guardian from the orphanage in Ethiopia and members of the humanitarian organization.

The child was born in Ethiopia and found in a bed after his mother left him. Caregivers at the orphanage estimate the child was approximately 3-months of age when they assumed care. Immediately upon arrival to the orphanage, caregivers appreciated swelling at the right aspect of his skull; however the area did not seem to increase over time nor did it resolve. Arrangements were made for the child to have treatment at Wolfson Children's Hospital in Jacksonville, FL.

On physical exam, the patient was alert and interactive. His speech was delayed and he did have some left side neglect and left upper and lower extremity weakness. He had normal strength in the right upper and lower extremity. He had a CT and MRI which demonstrated a large right parietal skull defect with herniated brain and cerebrospinal fluid consistent with a leptomeningeal cyst or growing skull fracture.

The patient underwent surgical intervention of right parietal craniotomy for repair of dural laceration and cerebrospinal fluid leak with resection of leptomeningeal cyst and right parietal cranioplasty with harvesting of left parietal bone autograft.

Conclusion: Growing skull fractures are rare traumatic complications with a prevalence of approximately 1% of all children who present with skull fractures (Muhonen MG, 1995). In infants, calvarial defects are usually repaired with autologous grafts, as in this case, since the skull will continue to grow.

CATEGORY: CLEFT/CRANIOMAXILLOFACIAL SURGERY THE ACCURACY OF ULTRASOUND IN THE DIAGNOSIS OF CRANIOSYNOSTOSIS

David Wilson, DMD, MD; Pat Ricalde, DDS, MD; Tim Bondack, MD
Presenter: David Wilson, DMD, MD

Background: Craniosynostosis (CS) occurs 4-6 of 10,000 live births. Although the diagnosis of craniosynostosis is primarily based on clinical examination, there are instances where radiological evaluation is necessary to characterize the deformity and guide surgery. CT (computed tomography) is currently the "gold standard" in the United States to evaluate craniosynostosis. However, this modality is expensive and exposes the individual to ionizing radiation. Ultrasound is a non-invasive, available, low cost, and safe examination tool. However, the accuracy of ultrasound postnatal in the diagnosis of craniosynostosis is not well described. The purpose of this study is to evaluate ultrasound as a screening test for the patency of cranial sutures without the exposure of radiation associated with CT scans.

Methods: During the dates of July 2014 to July of 2015, five children under the age of one with the clinical diagnosis of CS were assessed with ultrasound of sagittal, coronal and lambdoid sutures. Informed consent was obtained from parents. The children underwent ultrasound examination by the same radiologist at St. Joseph Hospital in Tampa, Florida.

Results: Of the five patients, three girls and two boys. Age range from 3 months – 11 months. The correct diagnosis was provided in all five patients (100%). Two children were diagnosed with unicoronal, one with sagittal, one with bicoronal, and one with lambdoid craniosynostosis.

Conclusion: Based on our research, ultrasound is an accurate tool in the diagnosis of craniosynostosis under age one. The diagnosis of craniosynostosis cannot always be done on clinical examination alone. High-resolution ultrasound provides a modality that can be used first-line in the diagnosis of craniosynostosis without the untoward side effects of CT scans.

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TITLE: UPPER AIRWAY VOLUMETRIC ANALYSIS UTILIZING DOLPHIN IMAGING

Ron Caloss DDS, MD

Objectives: The primary purpose of this study was to assess the accuracy of Dolphin Imaging's semi-automatic tool for segmenting airway phantoms scanned with cone beam computed tomography (CBCT). Secondarily it was to assess the intra- and inter-observer variability among dental professionals of differing experience.

Methods: Three phantom airways of differing diameters and of known volume were fabricated to simulate upper airway and neck anatomy. The actual airway volumes were determined by water weight measurements. Phantoms were scanned with an iCAT CBCT. Volumetric analysis of each reconstructed airway was performed with Dolphin Imaging (DI) in order to assess accuracy of the software. CBCT digital imaging and communications in medicine (DICOM) data was imported into DI. It has a semi-automatic tool that allows segmentation and volumetric measurement of the airway structure. Twenty patients were then randomly selected from the University of Mississippi Medical Center Department of Oral and Maxillofacial Surgery (OMS) DI database. Patients previously had a CBCT performed for evaluation of a dentofacial deformity. Patient exclusion criteria included obstructive sleep apnea and craniofacial deformities such as cleft lip/palate. Patient DICOM data was imported into DI. Airways were segmented from the level of the hard palate to the superior aspect of the 4th cervical vertebra. Airway segmentation and volumetric measurements were performed in the same fashion as done for the phantoms. Examiners with different levels of experience performed the airway analysis to assess inter-observer variability and at three different time points to assess intra-observer variability. Examiners included a 1st year dental student, 3rd year dental student, 3rd year OMS resident and an OMS attending surgeon. All assessments were performed using the same desktop computer and monitor. Data was compiled on an Excel spreadsheet for analysis. Linear regression analysis was used to assess the precision and accuracy of the volumetric analysis of the phantom airways. Two Way Repeated Measures ANOVA (Two Factor Repetition) was used to assess intra- and inter-observer sources of variation.

Results: The examiners' accuracy and precision fell within a 95% confidence interval of the actual phantom airway volumes. Interestingly, precision did not improve with time. Significant inter-observer variability was noted for each data set and each time point (p value <.001). Significant intra-observer variability occurred for three of the four examiners (p value 0.012). Variability did not decrease with time.

Conclusion: DI software was accurate and precise in assessing airway volume in the simulated phantom airways used in this study. Significant inter- and intra-observer variability was present. DI seems to be a suitable tool to perform volumetric airway analysis clinically. Future studies might test accuracy of other commercially available software programs as well as more anatomically complex phantom airways.

DISCECTOMY IS THE PRIMARY SURGICAL OPTION FOR TMJ INTERNAL DERANGEMENT

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Presenter: M. McKnight; D. Haupt

Purpose: The management of internal derangement of the TMJ remains controversial. Non-surgical therapy has limited clinical success, while arthrocentesis and arthroscopy offer minimally-invasive options with lack of long-term benefit. Meniscal repair, repositioning, or replacement is not efficacious and may require additional procedures. Meniscectomy treats the anatomic problem without recurrence, but may represent an aggressive approach as first line surgical therapy. The study goal is to evaluate outcomes of patients who underwent TMJ discectomy without replacement following failure of non-surgical therapy.

Materials and Methods: 18 patients with TMJ internal derangement were treated with meniscectomy from 2008-2015 by one surgeon (MM) at the University of Illinois Hospital. 1 patient was excluded because of prior TMJ surgery. 17 patients were aged 21 to 68 years with 11 female and 6 male patients. Severity of disease included Wilkes stages III to V. Using a standardized Helkimo Anamnestic and Clinical Dysfunction Index, 17 patients (23 TMJs) were evaluated, with an average follow-up of 11.7 months (range 2 to 42 months).
Results: 14 of 17 patients (82%) postoperatively showed marked improvement in mandibular function, and facial pain. Their clinical dysfunction index was DiO or DiI, which represented either clinically symptom-free or small dysfunction. Dysfunction scale scores for Wilkes III (8 patients) average of 2.85, Wilkes IV (7 patients) average of 4.14 and Wilkes V (2 patients) average of 8. One patient improved to DiII and two patients remained DiIII. The two DiIII (one stage IV, one V) patients had poor function postoperatively, both with poor physical therapy compliance and compromised scenarios- multiple sclerosis and the other preoperative bilateral TMJ fibro-osseous ankylosis. Pre-surgery all patients had an anamnestic index of AiII, which represented TMJ locking, moderate to severe TMJ and/or masticatory muscles; this changed to AiO or AiI for 15 and AiII for 2 patients. However, the 2 AiII still had much reduced pain, but limited function. After evaluation of the Helkimo results and markedly lower postoperative facial pain values, there was a subjective success for 15 of 17 patients.

Conclusions: The findings of this study reinforce that TMJ discectomy significantly reduces pain and improves function on a short-term basis, and the literature shows overwhelming evidence that the long-term outcomes are equally positive. These outcomes are also shown in the previous study by author Miloro et al. (2010), the total number of significantly improved between the two studies being 35 of 41 patients. From a purely numeric standpoint earlier Wilkes stages on average had slightly better outcomes and all had reduced pain. It cannot be overstated that patient compliance with physical therapy is very important for long term functional success. Arthrocentesis and arthroscopy may be indicated in some situations, but disc repair or disc repositioning surgeries are generally followed by relapse and a future meniscectomy procedure. Therefore, due to the low complication rate and high short and long-term success rates, meniscectomy should be considered as the primary surgical option for patients with TMJ internal derangement.

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QUANTIFYING SYNOVIAL ENHANCEMENT OF TEMPOROMANDIBULAR JOINTS FROM MRIS OF PATIENTS WITH JUVENILE IDIOPATHIC ARTHRITIS

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Purpose: Juvenile Idiopathic Arthritis (JIA) is the most common pediatric rheumatic disease and often affects the temporomandibular joints (TMJ). The TMJ may be asymptomatic until irreversible changes occur. Synovitis is the most common early finding of inflammatory arthritis, and magnetic resonance imaging (MRI) with gadolinium is the most sensitive and specific diagnostic tool. Evaluation of synovitis on an MRI is subjective, however, resulting in inter-examiner variability in the assessment of disease. The purposes of this study were to develop a method to quantify TMJ synovial enhancement and to apply this technique to MRIs of TMJs affected by JIA and to controls in order to establish a disease threshold, sensitivity and specificity for synovial enhancement.

Materials and Methods: This is a multicenter case-control study of children (≤16 years) who had MRIs with gadolinium that included the TMJs from 2006-2014. Subjects were included in the 'JIA group' if had a diagnosis of JIA and their TMJ MRI subjectively demonstrated synovitis on at least one side. The 'control group' included subjects without JIA who had an MRI for other reasons. Coronal slices of a T1-weighted, gadolinium-enhanced MRI containing the TMJ were used to assess the ratio of signal intensity of a 0.2mm^2 region of interest (ROI) within the upper and lower joint space to a 50mm^2 ROI within the longus-capitus mucle, which controls for time after gadolinium infusion. A receiver operating characteristic (ROC) curve was used to determine the sensitivity and specificity of the ratio of enhancement. Independent 2-sample *t* test (2-tailed) was performed for each group with unequal variance assumed. Statistical significance was set at $p<0.05$.

Results: Sixty-eight subjects with JIA (79% female, mean age 15.3 ± 2.5 years) with 112 MRIs with clear visualization of 187 TMJs were included in the JIA group. The control group consisted of 141 subjects (56% female, mean age 11.6 ± 3.5 years) with 159 MRIs with clear visualization of 311 TMJs. The mean signal intensity ratio in the JIA group was 3.03 ± 1.4 compared to 1.23 ± 0.16 in the control group ($p<0.001$). The ROC analysis indicated a sensitivity of 91.4% and specificity of 98.1% in detecting synovitis with a signal intensity ratio cutoff value of 1.66.

Conclusions: Comparing signal intensity of TMJ synovium to the longus capitis muscle is a reliable method for assessment of synovial enhancement. A signal intensity ratio of 1.66 discriminates TMJs affected by JIA from unaffected controls with high sensitivity and specificity.