2020 AAO Resident Scholar Award

The AAO Resident Scholar Award program will be held on Saturday, May 2 in the Georgia World Congress Center Room B401-402 from 1:00pm-2:00pm. Clinicians will be at their posterboards during this time to answer questions about their research.

* Denotes financial interest or visual enhancement

Basic Science Research

A novel anabolic bone drug complex with a bioresorbable synthetic graft for enhanced bone regeneration
Mohamed Nur Abdallah
University of Toronto

Objective: To investigate whether synthetic monetite grafts loaded with a novel bone anabolic drug (C3) will promote greater bone regeneration in large jaw defects compared to monetite without this drug or to commercially available bovine bone graft (BioOss(R)). Methods: Critical-sized circular defects (4.3mm) in the mandibles of Sprague-Dawley rats were filled with BioOss(R) or monetite grafts with, and without C3 (n=12 defects/group per time point). After 2 and 4 weeks, post-mortem samples were analyzed using histology and electron microscopy to calculate the % bone formation and graft resorption. Results: All bone grafts integrated within the bone and new bone was demonstrated to have extended through the grafts. At 4 weeks, monetite with C3 showed higher bone formation and graft resorption % compared to the other two groups (p<0.05). Conclusion: Monetite granules appeared to be highly resorbable in a rat jaw defect and the addition of the C3 drug promotes greater bone formation.

Role of Gsα-dependent signaling in bone and teeth homeostasis
Khalid Alamoud
Boston University

The Dentin Matrix Protein (DMP1) is a critical regulator of bone and dentin mineralization and is highly expressed in osteocytes and odontoblasts. We and others demonstrated that mice lacking Gsα expression predominantly in osteocytes (DMP1-GsαKO) develop severe osteopenia and therefore a significant reduction of both trabecular and cortical bone in mice femurs. In this study, we have examined the role of Gsα in the craniofacial bones and teeth of DMP1-GsαKO mice by DEXA scan, μCT analysis and immunohistochemistry. Results showed that DMP1-GsαKO mice have decreased total bone mineral density (BMD), total mineral content (BMC), temporomandibular joint (TMJ) BMD and total teeth mineralization. In addition, overall skull size was smaller especially in the zygomatic region compared to controls and increased osteoclastic activity was observed. Collectively, our studies identified Gsα signaling in osteocytes and odontoblasts as important in maintaining normal bone and teeth homeostasis.

Secretory MiRNA-143,-145 and -223 in gingival crevicular fluid during orthodontic tooth movement
Sibel Altun
University of Illinois - Chicago

To study the expression profile changes in GCF of secretory miR-143,-145 and,-223, which play crucial roles in bone cell behaviors, and their correlation with a distance of tooth movement during 7-week canine retraction. The GCF samples from 12 healthy orthodontic patients (11-21 years old) were collected and intraoral scanning was performed during canine retraction with 150g force at 5 time-points of the study. Real-time PCR was performed for miR expression evaluation and 3D superimposition with Geomagic software was used for tooth movement measurement. Statistical analysis was performed at p=0.05. The results showed a significant tooth movement at rate 0.2mm/week. A significant expression profile change in miRNA-143,-145 and-223 with a moderate correlation (-0.486,-0.688 and-0.488) between their expression changes and distance of tooth movement were found respectively (p<0.05). These secretory miRNA profiles in GCF correlated with distance of tooth movement.
A neuropeptide and neurotoxin conjugate as a novel treatment for pain
Rosalie Brao
University of Florida

Pain is a national epidemic that affects more people than diabetes, heart disease and cancer combined. Unfortunately, long-term, effective alternative to opioids are lacking. We investigated a neuropeptide-neurotoxin conjugate (CGRP-BoTox) and its effect on chronic pain in rats. Animals had chronic constriction injury (CCI) of the infraorbital nerve bilaterally to induce neuropathic pain. Animals were then treated with CGRP-BoTox and tested for mechanical pain sensitivity using an operant behavioral assay. Animals treated with CGRP-BoTox had reversal of their pain, representing an analgesic response. This pilot study indicated promising findings regarding this novel analgesic therapy and further investigation is needed regarding CGRP-Botox has as a novel pain management alternative to opioids.

Effects of parathyroid hormone and bisphosphonate on cartilage of the temporomandibular joint
Po-Jung Chen
University of Connecticut

Objective: Our objective was to determine the effects of I-PTH and alendronate treatment on the microarchitecture of cartilage of the TMJ. Materials and Methods: Ninety-six, 4 to 5-week-old male and female triple transgenic reporter mice were used for this study. Mice were divided into 5 groups and equal number of males and female mice were used: (1) Control group: saline was injected (2) PTH group: PTH [1–34] was injected for 14 days; (3) Alendronate (ALN) group: alendronate was injected for 14 days; (4) Combined PTH and ALN group: PTH and ALN were injected. (5) PTH wait ALN group: subcutaneous injections of PTH were given daily for 14 days and the and ALN were given every alternate day for 14 days. All the mice were injected with mineralization labels and EdU. Results: MicroCT and histological analysis revealed gender differences within the group and between the groups. Conclusion: Our study suggests that PTH and ALN has diverse effects on the TMJ.

Molecular mechanism of vascular endothelial growth factor in osteoclast formation
Shariq Khan
Stony Brook University

Vascular endothelial growth factor A (VEGF-A) has been shown to accelerate orthodontic tooth movement by enhancing osteoclast formation through the osteoblasts. Osteoblasts have two types of VEGF-A receptors, VEGFR-1 and -2. In this study, we aimed to identify which receptor(s) in the osteoblasts mediate VEGF-A-induced osteoclast formation with the hypothesis that both receptors are responsible. Osteoblastic MC-4 cells were incubated with specific antagonist or agonist for the receptors for 4, 7, 14, and 21 days. The conditioned media were then used to treat pre-osteoclastic RAW 266.7 cells and assess osteoclast formation with TRAP staining. Our results showed that each specific agonist (PIGF, VEGF-E) significantly stimulated osteoclast formation, similar to VEGF-A. Specific antibody to either VEGFR-1 or -2 significantly inhibited osteoclast formation induced by VEGF-A. We concluded that both VEGF receptors are needed for the full effects of VEGF-A-induced osteoclast formation.

Relationship between cranial base development and cleft lip and palate
Victoria Lee
University of Pittsburgh

This study focuses on Prickle1 mutants which tend to have compressed and wide facial morphology. Prickle1 is a core component of Wnt/Planar cell polarity pathway and the Prickle1 mouse line has a missense mutation that disrupts the LIM1 domain in Prickle1. These mutants have approximately 50% chance of developing a cleft palate. Because cranial base size and shape determine the perimeter of growth for the lower 2/3 of the face, we examine the association between cranial base development and orofacial cleft. We found that Prickle1 with CL/P have wider, shorter, and less dense basisphenoid compared to wild type. Furthermore, mutants with both cleft lip and palate compared to mutants with only cleft lip, have shorter and less dense basisphenoid, but not wider. Our data supports the conclusion that
wide basal cranium has higher risk of developing orofacial cleft. However, the degree of orofacial cleft is not affected by width and is rather correlated with bone density.

**The effects of periodontal distraction on tooth vitality in hound dogs**
Parul Sangwan
Texas A&M University

Introduction: Most biologic effects of periodontal distraction remain unknown. Purpose: To evaluate whether rapid tooth movements cause loss of tooth vitality. Methods: 7 dogs were fitted with intraoral distraction devices. On the experimental side, the maxillary 2nd premolars were extracted and mesial bone was removed, sparing a thin layer distal to the 1st premolar. No procedures were performed on the control side. After a 5-7day latency, the 1st premolars were distalized at 1mm/day for 6 days. Results: Cast and intraoral measurements showed that the experimental teeth moved 4.7 and 4.8mm, respectively. Laser Doppler flowmetry showed change in heart rates but no significant differences in vitality between experimental and control teeth. µCT analyses showed newly formed less mature bone mesial to the 1st premolar and root resorption of the teeth that were moved. Conclusions: Periodontal distraction enables accelerated tooth movement without detriment to the tooth vitality.

**Bioinert bisphosphonate enhances pharmacokinetics of NELL-1-based systemic therapy for spaceflight-induced osteoporosis**
Jiayu Shi
University of California - Los Angeles

Background: NELL-1 is an osteogenic protein in which PEGylation significantly improved its half-life (NELL-PEG). Purpose: We aim to conjugate bioinert-bisphosphonate with NELL-PEG (BP-NP) to massively enhance its bone targetedness to treat spaceflight-induced osteoporosis in mice. Research Design: Forty 32-wk-old female BALB/c mice were flown to space with forty ground controls. Animals were injected with BP-NP or PBS (10/group) every-2-wks. Half of the animals were live-returned at wk5. All animals were harvested at wk9. Results: BMD and BV/TV decreased post space travel but increased enormously by treatment. Histology/IHC showed increased marrow fat by spaceflight but entirely reversed trend by treatment. BMSC culture revealed increased differentiation potential into both osteoblasts and osteoclasts by treatment. Conclusions: Systemic BP-NP successfully treated spaceflight-induced osteoporosis in mice and bioinert-BP is a potent bone-seeking molecule to enhance osteogenic therapies.

**Sutural deformation during bone-anchored maxillary protraction (BAMP)**
Taylor Vracar
University of Tennessee

Intro: Bone-anchored maxillary protraction (BAMP) is used to correct maxillary deficiency in young patients. Forces generated during BAMP are thought to result in more sutural separation and protraction than reverse pull headgear (RPHG). Sutural deformation and mandibular displacement during BAMP and RPHG were compared. Methods: Mini-plates were placed in the zygomatic process and mandible of 20 ex-vivo pigs to simulate BAMP. To model RPHG, a tube was bonded to the first molar and a screw placed in the mandible. 200gf were placed each minute until 1000gf was reached. Mandibular displacement and deformation of the ZMS and ZTS were compared. Results: Deformation at ZTS was 178µ€ (BAMP) and 71µ€ (RPHG) and at ZMS was 249µ€ (BAMP) and 63µ€ (RPHG). Condylar displacement was 2.3µm (BAMP) and 0.8µm (RPHG). Differences were statistically significant using Wilcoxon-signed rank test. Conclusion: BAMP was more effective in ZMS and ZTS separation as well as condylar posterior displacement.

**Functional characterization of ATF1, GREM2 and WNT10B gene variants on tooth agenesis**
Meredith Williams
University of Texas - Houston

The functional effects of variants associated with tooth agenesis (TA) remain largely unknown. We hypothesize that novel variants in ATF1, GREM2 and WNT10B affect gene/protein function.
Variant-specific constructs were designed and transfected into SHED cells for use in luciferase reporter gene assays, mRNA expression analysis of additional tooth development genes, and protein function assays. All variants tested resulted in changes in transcriptional activity of respective genes. Expression of PAX9, MSX1 and AXIN2 was significantly up-regulated with the GREM2 variant, whereas PAX9 and MSX1 expression was up-regulated with the WNT10B variant. Subcellular localization assays revealed encoded proteins remained in the expected locations. Cell migration and proliferation assays showed differential results based on the variant present. Our results suggest each variant tested had specific effects on gene/protein function, which may correlate with variable TA phenotypes.

Clinical Research

**Assessing changes in cranial base angle across different racial backgrounds**

Neelab Anwar
University of Rochester

The purpose of this study was to compare Hispanic (H), African American (AA) and Caucasian (C) populations in terms of their cranial base angle and how it relates to their skeletal classification from lateral cephalograms taken at the initial visit. This relationship was analyzed with particular reference to different racial backgrounds. Two-sided two-sample t tests were used to calculate the effect sizes detected with 80% power and a significance level of 5%. This sample will also have 80% power to detect an effect size of 0.54 comparing cranial base angle among the different racial groups. Based on our results, there was a significant difference in ANB angle among races P=.02. The cranial base angle was increased in Class II patients (mean= 133°) and has an association with a larger ANB. This is useful during diagnosis and treatment planning in order to predict the future skeletal pattern of a child from the value of the cranial base angle at an early age.

**Tridimensional assessment of skeletal and dental asymmetries on patients with Class II subdivision malocclusion**

Konstantinos Apostolopoulos
Case Western Reserve University

Objective: Assess skeletal and dental asymmetries in Class II subdivision patients using 3D analysis and colormap quantification. Methods: The sample had 25 patients with Class I malocclusion (control) and 25 patients with Class II subdivision malocclusion. Sample size calculation showed a power of 90%. The skull was segmented and mirrored resulting in a two right-side skull. Original and mirrored skulls were superimposed. Analysis included 4 skeletal, 4 dental, and colormap quantification. Results: Significant differences (p<0.002) were found between study and control groups for gonion, mandibular anterior region and for all teeth areas. The largest difference was in the maxillary canine with the Class II 0.64±0.56mm more anteriorly and outwards. No differences were found in any maxillary skeletal area. Conclusion: Asymmetries in Class II subdivision malocclusion patients are significant in dental and mandibular skeletal areas, and no significant differences were found in the maxilla.

**Class II malocclusion correction with clear aligners as compared to fixed appliances**

Shruti Bajaj
State University of New York - Buffalo

Background: Use of clear aligners has been an increasing trend in orthodontics as an alternative to fixed appliances. One strategy to correct Class II malocclusions with either treatment approach is Class II elastics. Purpose: To compare dental and skeletal changes in non-growing patients when treated with either clear aligners or fixed appliances along with Class II elastics. Research Design: In this retrospective study, 38 patients were treated with clear aligners and 27 with full-fixed appliances. Pretreatment and posttreatment lateral cephalograms were digitally traced and 11 angular and 6 linear dental and skeletal measurements were compared. Results: Lower incisor extrusion in clear aligners was 2.1 mm less than the fixed appliances. However, there was no difference in lower incisor inclination to mandibular plane, or
with the mandibular plane angle. Conclusion: Clear aligners were associated with less mandibular incisor extrusion than fixed appliances.

**Predictability of overbite control with the Invisalign® appliance**

Haylea Blundell  
University of Queensland

The aim of this study is to determine the accuracy of Invisalign® in correcting a deep overbite. A retrospective study was conducted using pre- and post-treatment intra-oral scans and predicted outcomes (ClinCheck®). STL files of 42 adult patients consecutively treated with Invisalign® from January 2014 and completed prior to July 2018. Patients included in the study were treated non-extraction with a minimum of 14 dual arch Invisalign® aligners using a two-weekly aligner change protocol. The pre-, post-treatment and predicted outcome. STL files were imported into Geomagic® Control X™ to measure overbite. The results found the deeper the patient’s initial overbite and the greater the amount of programmed reduction in overbite according to ClinCheck®, the greater the discrepancy in overbite expression post-treatment. ClinCheck® over-predicted overbite reduction in 95.3% of cases where on average, only 39.2% of the prescribed overbite reduction was expressed.

**Novel TAD guide decreases root proximity, reduces root damage, improves TAD angulation**

George Bork  
Harvard University

Background: A major risk factor for TAD failure is root proximity. A variety of guides have been proposed to decrease proximity, but many require customization prior to use, hindering their widespread adoption. Purpose: The aim of this study was to assess the effect of using a novel stock TAD guide on root proximity, root damage, and TAD angulation. Research Design: 93 inter-radicular TADs were inserted into 5 cadavers using a split-mouth approach. In the experimental group, guides were used. In the control group, guides were not used. Outcomes were compared between groups using CBCT. Results: Guided TADs were on average 0.5 mm from the nearest root while unguided TADs were on average 0.2 mm from the nearest root. Guided TADs were associated with lower odds for causing root damage and higher odds for acceptable TAD angulation. Conclusions: Use of the proposed guide may reduce root proximity, decrease root damage incidence, and improve angulation consistency during TAD implantation.

**Public perception of orthodontics & teledentistry; ethical implications**

Lesley Chu  
Mayo Clinic

This study aims to determine whether the general public perceives any difference in the quality of care between orthodontic treatment via office visits versus through teledentistry. Surveys were collected from 240 college students. 24% of the respondents chose teledentistry over office visits. Those who chose teledentistry were more likely to think that the quality of treatment and exam would be the same in both options (p < .001) and that the main differences between the two options is either cost (p < .001) or level of convenience (p=.01). Furthermore, if the cost between the two options was the same, the proportion of respondents who would change their preference from teledentistry to office visits was higher than the proportion of respondents who would change their preference from office visits to teledentistry (p <.001). Finally, previous orthodontic office treatment experience is a significant variable in influencing a preference for office visits (p=.008).

**Applicability of the Tanaka Johnston mixed dentition analaysis in black Americans**

Bianca Frederick  
Howard University

The aim of this study was to test the applicability of the Tanaka Johnston mixed dentition analysis in a black American population as the equations from the original investigation had several limitations for population of interest. Records of 109 patients were randomly selected from Howard University Orthodontic Clinic. The mesiodistal crown diameters of the permanent maxillary and mandibular canines,
Detachment force of CAD/CAM designed Yttria-stabilized zirconia and stainless steel wire as fixed lingual retainers
Ahmed Haj Hamdan
Manila Central University

Introduction: The detachment force and amount of deflection of two (2) different materials for bonded retainer were evaluated to find an alternative option for fixed retention. Conventional braided SS wire, and Yttria stabilized zirconia YTZP fixed retainers were tested. Methods: Sixty-eight lower premolar were embedded in thirty-four acrylic blocks. The SS and YTZP retainers were bonded at the same level on the lingual surface of the premolar and vertically directed force was applied to the retainer using an Instron testing machine at maximum load. Results: Independent t-test revealed that there is a significant difference in the detachment force and deflection between SS and YTZP. Conclusion: The present study showed that SS has a higher deflection, which resulted to inadequate retention. While the low deflection rate of YTZP is a breakthrough in orthodontic relapse problem. The study recommends the utilization of YTZP as a fixed retainer to stabilize corrected teeth position.

Is dual therapy better than monotherapy for obstructive sleep apnea?
Mona Hamoda
University of British Columbia

OBJECTIVES: To compare efficacy, symptoms and pressure on continuous positive pressure (CPAP) and mandibular advancement splint (MAS) versus dual therapy (simultaneous CPAP/MAS). METHODS: Double-randomized cross-over trial was conducted. Oxygen Desaturation Index(ODI), mean CPAP pressure, Epworth Sleepiness Scale(ESS), Functional Outcomes of Sleep Questionnaire(FOSQ) and blood pressure were assessed. RESULTS: 13 patients were assessed. Dual therapy reduced mean ODI. There was statistically significant reduction in CPAP pressure from mean of 12 with CPAP to 10cmH2O with dual therapy in high pressure group. Improvements in ESS and FOSQ mean scores by dual therapy were profound for patients who presented with baseline daytime sleepiness and fatigue. There were no significant changes in blood pressure. CONCLUSIONS: This study was the first to objectively measure adherence with dual therapy. Dual therapy is beneficial for patients on high CPAP pressure and for those symptomatic at baseline.

Prevalence of short root anomaly in new graduate orthodontic patients
Timothy Howarth
University of the Pacific

Introduction: The purpose of this study was to investigate the prevalence of Short Root Anomaly (SRA) in new patients at the Graduate Orthodontic Department using constructed panoramic radiographs from three-dimensional CBCTs. Methods: New patients from July 1, 2014 to May 31, 2019 at the Arthur A. Dugoni School of Dentistry, University of the Pacific (San Francisco) were included in this retrospective study. 1056 patients were evaluated for root length and etiologic characteristics. Four judges were calibrated to evaluate root structure. Crown to root ratio was used to assess root length, with a ratio less than 1:1 considered as having SRA. Panoramic radiographs were constructed from three-dimensional CBCTs, extracted and analyzed by the four judges. Results: SRA was seen in 17% of the sample. Of the 17% with SRA, 42% were Hispanic, 28% were Asian and 17% were unknown or other. Conclusions: The prevalence of SRA is highest in Hispanic, Asian and non-white populations.
Orthodontic correction of anterior open-bite with and without skeletal anchorage
Jason Johnson
University of Washington

Background: There remains a lack of studies comparing outcomes in anterior open bite (AOB) patients treated with and without skeletal anchorage in growing versus non-growing individuals. Purpose: This study compares success and stability of AOB treatment with fixed appliances (FA) with or without TADs in growing and non-growing patients. Research Design: Pre- (T1) and post-treatment (T2) cephalographs and photos were measured for 68 TAD and 42 non-TAD patients. Retention (T3) photos were also measured. Results: Mean T1 AOB was -3 mm and -2.1 mm for TAD and non-TAD patients respectively. OB correction was 3.9 mm and 3.1 mm for TAD and FA groups. Relapse was higher for growers than non-growers (52.4% vs 18.9%). TADs in both arches reduced incisor extrusion. Conclusions: Skeletal anchorage during AOB correction (especially in both arches) may aid in decreasing vertical skeletal relationships and in minimizing incisor extrusion. Growing patients are more susceptible to open bite relapse.

3D-analysis of collum-angles of mandibular anterior teeth and the Curve of Spee
Nicholas (Nick) Kelley
Jacksonville University

Background: Dental anatomy affects teeth 3D position and occlusion. Purpose: To determine the correlation between curve of Spee and collum angles of mandibular anterior teeth using CBCT. Research design: 100 CBCTs of patients IR were divided sagitally. 200 samples were analyzed. The collum angles of mandibular central incisor (L1), lateral (L2) and canine (L3) were measured along with curve of Spee using Dolphin Imaging. Data was analyzed using multivariate linear regression. Results: The mean curve of Spee was 2.09 mm. The mean collum angle of L1 was 6.50°, L2 was 7.19° and L3 was 7.03°. There was a statistically significant correlation between L1, L2 and L3 and the curve of Spee of low to moderate correlation with the collum angle of L1 being the most highly correlated to the curve. Conclusions: The curve of Spee accounts for some of the variability of the collum angles. More variables need to be studied to understand the variation in collum angles among the mandibular anterior teeth.

CBCT evaluation of skeletal and dental transverse dimension changes following maxillary expansion
Eugene Kim
Roseman University

Objective: This study evaluated short-term changes in maxillary skeletal and dental transverse dimensions in orthodontic patients treated with and without Hyrax-type palatal expanders followed by fixed appliances. Methods: Study included two equal age-gender matched groups (N=40). Maxillary skeletal and dental widths were measured from CBCTs taken at baseline (T0), after Hyrax-expander removal (T1), and post-treatment (T2). Realized (∆T1-T0), Short-term (∆T2-T1), and Net (∆T2-T0) Expansion were calculated. Results: The short-term change was -3.96±2.01mm in the expander group (EG) and 0.20±1.25mm in the non-expander group (NEG) (p=0.007). The higher dental net expansion noted in EG (2.98±2.72mm) was not statistically significant (p=0.09) than the NEG (0.14±2.01mm). Net skeletal width gain was 2.68±1.48mm in EG and 2.06±1.44mm in NEG (p=0.52). Conclusions: Statistically significant differences in short-term relapse were noted in all dental, but not in skeletal, transverse measurements.

Prevalence of white spot lesions and associated factors
Carli Loss
University of Kentucky

Background: Risk factors associated with White SpotLesions(WSL) are still unclear. Poor oral hygiene(OH) during fixed appliances(FA) increases the risk of developing WSL. Purpose: To determine association between WSL and Plaque index(PI), length of treatment, or OH in patients with FA. Design: Cross sectional controlled; 111 routine orthodontic patients from the University of Kentucky. PI and WSL
were analyzed using photographs and plaque disclosing gel. Subjects were surveyed to measure attitude toward treatment and OH practices. Result: 79% of subjects had at least one WSL. Duration of treatment in FA was significantly associated with increased PI. 81% of subjects believed OH had an important effect on health and they had an overall positive orthodontic experience. Conclusion: A higher prevalence of WSL exist for Kentucky residents when compared to the general population in the United States. Length of treatment has a negative impact on plaque accumulation for orthodontic patients.

**Comparative rate of OTM with interseptal bone-removal v/s MOP: a clinical trial**

Nikita Mohelay  
Rajiv Gandhi University

**Introduction:** The aim of the investigation was to evaluate/compare the rate of tooth movement with two minimally invasive surgical procedures: Interseptal bone removal & Micro-Osteo Perforations (MOPs).

**Methods:** A split mouth design was used in 20 subjects aged 14-30 years, whose maxillary first premolars were extracted. Interseptal bone removal was done in the right quadrant and MOPs were delivered in left quadrant after extractions, followed by canine distalization with a force of 150g. Rate of movement, tipping/rotations was recorded at an interval of 30 days for 3 months. Results: Interseptal bone removal increased canine movement (5.22±1.29mm; p<0.05) with a significant distopalatal rotation (11.65°±6.9; p<0.001) in 90 days when compared to canine at the site of MOP (4.38±1.31mm; p<=0.05) which revealed a significant distal tipping of crown by 3.70±1.63mm (p<0.001). Conclusion: Interseptal bone removal procedure provides a 50% faster tooth movement compared to MOPs.

**3D morphometric quantification of maxillae and palatal defects for patients with UCLP via image auto-segmentation**

Matthew Pastewait  
University of North Carolina - Chapel Hill

**Intro:** Accurate quantification of the complex 3D cleft defect structure is key for optimal tx planning & pt outcomes. The aim of this study is to characterize 3D morphometry of the maxilla & cleft defect in non-syndromic pts with UCLP. Methods: To test the hypothesis that the defect size is positively correlated with the affected maxilla half, CBCT images were acquired from 60 pts presenting with UCLP. The advanced machine learning program LINKS was used to segment the maxilla & defect. Results: The defect side demonstrated a significant decrease in maxillary length, anterior width, & volume with mean measurements of 34.31±2.56mm, 17.83±2.06mm & 21.26±3.33x103mm3, respectively, and an increased maxillary anterior height with a mean of 25.91±4.12mm as compared to the non-defect side. Conclusions: Complete 3D defect models were obtained, with structural parameters defined & quantified, to achieve an enhanced understanding of non-syndromic UCLP with potential for clinical applications.

**The Salzmann Index and Discrepancy Index correlation: determining a threshold discrepancy index score for medicaid approval**

Vivek Patel  
Seton Hill University

**Objective:** To compare patients’ Salzmann Index scores and ABODI (DI) scores for Medicaid orthodontic coverage in the state of PA to assess if there is a correlation between the scores. Methods: Salzmann, DI scores and Approval/Disapproval results for Medicaid orthodontic coverage were obtained from 104 subjects. A linear regression model was used to assess if there was a correlation between the Salzmann scores and DI scores. Results: A Pearson Correlation of .453 was calculated between the Salzmann scores and DI scores. With the lack of high prediction rates seen from the results, the current systems of Medicaid resources do not show a consistent assessment for the need for orthodontic treatment coverage. In order to refine the inconsistencies, the DI score could be considered the gold standard for Medicaid orthodontic coverage considering the DI assesses skeletal, dental and overall complexity factors while Salzmann Index falls short by encompassing only dental and occlusal factors.
CBCT analyses of maxillary sinus volume and maxillary size in subjects with and without dental impactions
Andrew Richter
University of Iowa

Subjects with maxillary sinus (MS) aplasia show reduced malar prominence suggesting that MS growth may play a role in determining maxillary size. The aim of this retrospective study was to compare the MS volume (MSV), maxillary size/sagittal position, and the association between the two in subjects with bilateral impacted teeth (n=38) and no impacted teeth (n=38). The MSV was calculated from CBCTs using Dolphin Software. The maxillary size/position were calculated from orthogonal Lateral Cephalograms. We performed Wilcoxon rank sum or signed rank test and Pearson’s correlation analyses. Though not statistically significant, the MSV showed a trend of smaller volume in the impacted group compared to non-impacted group. Also, there was a statistically significant association between MSV and maxilla size in the non-impacted group. Based on the study results we speculate that MS could play a role in determining maxillary size, however the study must be repeated with larger sample size.

Assessing reliability of Salzmann Index scoring amongst orthodontists in Pennsylvania
Alex Rosner
Temple University

Objectives: Pennsylvania uses the Salzmann Index as a qualifying criterion for patients to be covered for tax-supported orthodontic care. The aim of this study was to assess the reliability of the index scores amongst orthodontists in PA. Methods: 20 participants completed the indices for three sets of pre-treatment models: (a) A Class I malocclusion (b) A Class II malocclusion (c) A Class III malocclusion. Results: The Class II malocclusion had the largest variability in scoring (M=27.15, SD= 8.51), compared to the Class I (M=18.6, SD=5.86) and Class III (M=31.15, SD=4.11). Inter-rater reliability for the index scores as measured by ICC(3) were 87.9% (F(2,38)= 226.50, p<.000) for the Class I malocclusion, 40.9% (F(2,38)=15.90, p<.000) for the Class II, and 67.3% (F(2,38)=45.87, p<.000) for the Class III. Conclusions: Overall, there was moderate reliability in the Salzmann Index scores, with the Class II malocclusion scores having the poorest reliability.

Effects of reminders and motivational techniques on oral hygiene and gingival health
Jennifer Shim
Virginia Commonwealth University

The aim of this study was to determine if text message reminders and oral hygiene instructions improve hygiene compliance for orthodontic patients. For this prospective, randomized controlled trial, 60 patients were assigned to one of four groups. Group 1 served as a control. Group 2 received weekly text reminders. Group 3 received in-person oral hygiene instructions at each visit. Group 4 received both text messages and oral hygiene instructions. Oral hygiene was measured with Bleeding Index (BI), Modified Gingival Index (MGI), and Plaque Index (PI). Baseline measurements were obtained at the day of bonding (T0) and at the following 3 adjustment visits. The average patients’ age was 15 and 43% were male. Intervention groups were not associated with a significant change in PI (p=0.26) MGI (p=0.78), or BI (p=0.12). Interventions such as text reminders and oral hygiene instruction do not improve gingival health when compared to controls during the first 6 months of treatment.

Evaluation of effects of ALT-RAMEC protocol in UCLP with developing Class III malocclusion using CBCT and FEM
Shalvi Singh
Institute of Dental Studies and Technologies

Aim -To evaluate the amount protraction along with associated dental and skeletal change in craniofacial structures in complete Unilateral Cleft Lip and Palate (UCLP) patients treated with Alt-RAMEC protocol in vivo using CBCT and in vitro using Finite Element Modeling. Materials and methods-This study comprised of 15 unilateral Cleft Lip and Palate patients (UCLP) with developing Class III malocclusion having GOSLON Yardstick Index 3-5. Results -The amount of maxillary anterior displacement by using Alt-
RAMEC protocol was 3.26±2 mm. The mandibular plane rotated clockwise, there was a significant increase in overjet (5.2mm) and overbite (1mm) along with other dental and skeletal changes.

**Conclusion**

Alt-RAMEC can effectively protract the maxilla by the use of double hinge expander followed by protraction.

**ORTHO-30: a word recognition instrument to test orthodontic oral health literacy**

Korry Tauber
University of Oklahoma

Background: A caregiver’s orthodontic oral health literacy (OOHL) in relation to a patient who is planning to receive orthodontic treatment is incomplete. No current tool exists to measure OOHL. Purpose: Develop and validate an instrument to assess OOHL and determine the association between OOHL and perceived oral health related quality of life (OHRQoL). Design: Caregivers were given words to read on an iPad and were asked to make a determination as to which word or phrase had a similar meaning. Results: ORTHO-30 scores, Oral Health Impact Profile (OHIP) scores, and related sociodemographic information were collected. Correlations between ORTHO-30 scores and OHIP responses were evaluated. Conclusions: The ORTHO-30 instrument was validated to be used by dental professionals to assess a caregiver’s knowledge related to the field of orthodontics.

**Volumetric changes of oral cavity and tongue after orthognathic surgery: longitudinal study**

Airy Teramoto
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BACKGROUND: In orthognathic surgeries, the oral cavity capacity (OCC) changes due to jawbone displacement, which may influence the occlusal stability after treatment. PURPOSE: To analyze the volumetric changes of the OCC, the tongue volume (TV), the TV/OCC ratio, and the position of the tongue before and after orthognathic surgery in skeletal class III using Vinyl Polysiloxane Impression (VPI) method. METHOD: VPI of the palate, the dental arches and the tongue were taken from 15 subjects: before, as well as 1, 3 and 6 months after orthognathic surgery. We reconstructed the 3D images from the CBCT of the VPI. RESULTS: The OCC and the TV both decreased after orthognathic surgery. The OCC was positively correlated with the TV. The TV/OCC ratio was no significantly different before and 6 months after surgery. CONCLUSIONS: VPI is a simple method that enables analysis of the changes of OCC and TV at various stages of orthodontic/orthognathic treatment without any risk of radiation exposure.

**The learning styles and the preferred teaching strategies of contemporary orthodontic PG students and residents**

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In 2009, it was theorized that teaching effectiveness and efficiency are optimized when the course design and content closely match students’ learning preferences. We aim to assess if modern technological advances have altered the way we learn. 15 randomly selected Orthodontic programs to represent the US Orthodontic student resident population were emailed to complete the VARK learning styles and the learning preferences surveys. A majority of the PG students/residents have a multi-modal learning style (69%), with kinesthetic style being the highest (90%) followed by visual (67%). Also, majority of the students ranked Lectures as their preferred method of learning, followed by Treatment Planning, Chair-side discussions, and Case presentations. The least preferred method of learning are tests, independent and Distance Learning. This leads to conclusion that though students prefer certain methods of teaching, they may not understand the strongest approach to helping them learn.

**Patient experience comparison: Invisalign Teen with Mandibular Advancement® versus Twin Block**

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Purpose: Describe patient experience with Invisalign Teen with Mandibular Advancement® (ITMA) versus Twin Block appliance (TB). Methods: 45 ITMA patients (18M, 27F) and 23 TB patients (13M, 10F) completed a survey asking them to reflect on first impressions, side effects, management, discomfort, function and social impacts of their appliance. Results: More TBs agreed their appliance was noticeable (69.56% vs ITMA - 25%). More TBs expressed difficulty inserting their appliance (25% vs ITMA - 4.44%). TBs had more breakages (50%) compared to ITMAs (22.22%). TBs had an improvement in sleep after 2 mos (19.05%) while the majority of ITMAs reported no change in sleep (90.91%). More ITMAs (68.89%) noted visible changes in their facial appearance compared to TBs (52.17%). Conclusion: TB and ITMA patients had similar experiences for the majority of parameters measured but there were significant differences between the groups in relation to appliance management, patient discomfort and function.