

2016 AAO Annual Session Charley Schultz Resident Scholar Award

The Charley Schultz Resident Scholar Award program will be held on Saturday, April 30 in the Orange County Convention Center – West Room 105 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

Effect of Genetic Variation on Facial Growth during Puberty

Ashley Betz
University of Kentucky

Objective: Our aim was to determine whether genetic variations in the GHR and IGF1 genes were associated with differences in facial growth rates. **Methods:** Cervical Vertebral Maturation Stages (CVMS) were evaluated on initial radiographs by 3 clinicians; 182 subjects in CVMS3 (98F/84M) were studied. Subjects were genotyped for rs2972408, rs4130114, rs6180 (GHR) and rs10735380, rs1520220, rs2946834 (IGF1). Initial and final cephalometric radiographs were traced by one clinician. Differences in measurements were annualized over treatment time, and a stepwise multiple regression was performed. **Results:** Genetic variation in IGF1 rs1520220 was associated with changes in SNA. Changes in S-Go were associated with IGF1 rs1073530 and GHR rs4130114. Variation in GHR rs6180 was related to changes in mandibular length. **Conclusions:** Genetic variation in GHR/IGF1 explains some variability in facial growth, and aids in our understanding of the portion of growth influenced by growth modification.

Cellular and Matrix Response of the Mandibular Condylar Cartilage to Botulinum Toxin A

Eliane Dutra
University of Connecticut

Objectives: The cellular and matrix effects of botulinum toxin A (Botox) on mandibular condylar cartilage (MCC) and subchondral bone. **Materials and Methods:** Botox was injected into the right masseter of transgenic mice. Experimental and control side mandibles were examined by faxitron and micro-CT. Subsequently, MCC along with the subchondral bone was sectioned and stained with TRAP, EDU, alkaline phosphatase and toluidine blue. **Results:** Bone volume, tissue density and trabecular thickness were significantly decreased on Botox injected. There was no significant difference in mandibular length and condylar head length; however, condylar width was significantly decreased with injection of Botox. Our histology showed decrease in the number of Col10A1 expressing cells and injection of Botox resulted in decrease in mineralization and width of MCC. **Conclusion:** Injection of Botox in the masseter muscle leads to decreased mineralization and differentiation in MCC.

A Nano-scaffold with BMP2 Genetically Engineered Stem Cells Promotes Vascularized Bone Formation

Huiyan Guan
State University of New York, Buffalo

Background: There is an urgent need for bone reconstructions because of the bone defects are increasing medical problems. **Purpose:** To overcome the clinical disadvantages of conventional bone grafts for patients with craniofacial bone defects including cleft palate. **Research Design:** Sandwich-like 3D scaffold combined with nCS+M/B2 (injectable nano calcium sulfate to support the delivery and growth of BMP2 genetically engineered stem cells) to promote vascularized bone regeneration, and coated with VEGF- or/and FGF9- conjugated fibrin to increase the stability meanwhile slow down the release. **Implanted** into mice subcutaneously to test the osteogenic and angiogenic activity. **Results:** MicroCT, alkaline phosphatase activity assay and histological analysis demonstrated highly bone formation while immunostaining indicated newly formed vascular.

Evaluation of Aligner Cleaners on Reduction of Streptococcus Mutans and Candida Albicans

Ava Kamenshchik
Stony Brook University

Introduction: The purpose of this study is to compare the in-vitro reduction of a mixed biofilm formed by Streptococcus mutans(SM)/Candida albicans(CA) on removable thermoplastic aligners (RTA's) by commercial appliance cleaners. **Methods:** Preliminary Invisalign(R) tray sections(ITS) were incubated in biofilm medium inoculated with SM and CA at 37°C and one ITS was removed each day. When removed, ITS were fixed, dried, then stained with crystal violet(CV). To quantify the biofilm on each ITS, the CV was solubilized with ethanol, and quantified using a spectrophotometer. Studies show the amount of solubilized CV is proportional to the amount of biofilm formed on a surface. **Results:** Biofilms were formed on the ITS and the amount of biofilm increased linearly from 1 - 4 days ($R^2 = 0.987$). **Conclusions:** Using this quantitative method, we will assess the cleaning effectiveness of commercial appliance cleaners to remove biofilm, which can be used to make proper recommendations for RTA hygiene.

Anthrax Receptor 1 and Its Role in Craniofacial Growth and Development

Negin Katebi
Harvard School of Dental Medicine

The main manifestations of GAPO syndrome include growth retardation (G), alopecia (A), pseudo-anodontia (P), and in some cases, progressive optic atrophy (O). It is shown that loss of function mutations in Anthrax toxin receptor 1 is causative of GAPO syndrome. Antxr1 KO mice were used in order to study the role of ANTXR1 in bone tissue homeostasis. Growth retardation, a bone phenotype in GAPO patients, and impaired endochondral bone formation were observed in mutant mice. In addition, the mutants demonstrated a defect in synchondroses. The micro-CT and immunohistochemistry analyses revealed that mutant mice had higher and wider skull and shorter cranial base length, a premature perichondrial ossification and a reduction in the width of both sphenoid-occipital and pre-sphenoid synchondroses. The data suggest that ANTXR1 is a (1) negative regulator of VEGF and that (2) impaired VEGF signaling may, in part, result in accelerated chondrocyte hypertrophy and premature synchondrosis fusion.

Dexamethasone Regulates Gene Expression Induced by the Mechanosensitive P2X7 Receptor in Osteoblasts

Meena Na
Western University

Background: Orthodontic tooth movement involves activation of bone cells in response to mechanical forces. P2X7 receptors are ATP-gated channels implicated in bone mechanotransduction. Corticosteroids exhibit anti-inflammatory effects and their chronic use has been linked to serious side-effects such as osteoporosis. **Purpose:** To investigate the changes in anabolic gene expression following activation with BzATP (P2X7 agonist) in osteoblast precursor cells in the presence or absence of dexamethasone. **Design:** MC3T3-E1 cells were treated with BzATP or vehicle in the presence or absence of dexamethasone. Total RNA was isolated and gene expression was measured with Real-time PCR. **Results & Conclusions:** BzATP stimulation of Ptg2 and Dmp1 is indeed inhibited by dexamethasone. Intracellular events following P2X7 activation may be important in regulating osteoblast differentiation and eventual bone formation during orthodontic tooth movement and dexamethasone may adversely affect these processes

Osseous Boundaries of the Regional Acceleratory Phenomenon with Micro-osteoperforations (MOPs)

Lauren Van Gemert
Texas A&M University Baylor College of Dentistry

PURPOSE To qualify and quantify the extent of damage produced by micro-osteoperforations (MOPs). **METHODS** Using a split mouth design, 34 MOPs (PROPEL) were randomly placed in the furcal bone of 13 beagle dogs. μ CT, Vickers hardness microindentation, histologic and histomorphometric analyses

were performed. RESULTS Microfractures extended up to approximately 0.8 mm. Experimental bone density was significantly less up to 4.2 mm. Density differences were small (<5%) 1.5 mm or more from the MOP. Vickers hardness of the experimental bone was significantly less up to 0.75 mm. TRAP staining showed increased activity up to 2.5 mm from the MOP at 2-weeks, not after 4-weeks. Vital fluorescence staining showed diffuse bone deposition up to 1.5 mm from the MOP. H&E sections showed initial healing and a zone of acellular bone extending approximately 0.5 mm. CONCLUSIONS While the biologic effects of MOP placement extend further, the clinically significant effects are limited to approximately 1.5 mm.

Bone Loss Quantification Following Extraction: A Foundation for Grafting and Regenerative Studies

Emily Willett

University of Nebraska Medical Center

Background: Loss of the alveolar ridge width and height following extraction is well-documented. Purpose: To characterize the pattern of bone loss after extraction using μ CT. Design: 32 retired breeders underwent extraction of the right maxillary first molar and surgical defect creation under inhalation anesthesia. The left side served as control. Comparison of groups (n=8, ANOVA) was done at four time periods post-extraction for buccal, palatal and interproximal bone height and width. Results: The buccal bone loss was highly variable. Palatal bone height was significantly reduced compared to baseline (1.30 ± 0.31 mm vs 1.85 ± 0.12 mm) and controls (1.95 ± 0.12 mm). Palatal bone width also was reduced (0.11 ± 0.24 mm vs 0.41 ± 0.14 or 0.48 ± 0.12 mm). Interproximal bone loss was significantly increased compared to baseline or controls (1.97 ± 0.44 mm vs 0.56 ± 0.33 mm or 0.41 ± 0.22). Conclusions: This model shows promise for testing regeneration compounds to prevent crestal bone loss following extraction.

Clinical Research

A Prevalence Study of Dental Malocclusions in Children with Sleep Disorders

Jeremie Abikhzer

Universite de Montreal

Sleep-disordered breathing (SDB) ranges from snoring to sleep apnea. While adenoid/tonsil hypertrophy contributes to SDB, there are other obstruction sites. Early detection of SDB reduce the risk of developing the associated consequences with orthopedic dento-facial and orthodontic treatment. The objective of this prevalence study is to count the number of children (4-17 years old) who would benefit from an orthodontic dental evaluation among those with respiratory sleep disorders. The hypothesis of the study is that 10-20% of children with sleep disorders will also present craniofacial anomalies. To this date, 100 patients were seen and evaluated through questionnaires and a full orthodontic evaluation. Type 1 polysomnography data was also recorded for analysis. Statistical incidence of different types of malocclusions (narrow palate, skeletal relationship, open bite etc.) was also calculated. Pearson correlations were also analyzed between malocclusions and polysomnographic data.

Orthodontic Tooth Movement with Aligners Using the AcceleDent® Aura Device in Adults

Melissa Alfonso

University of Florida

The AcceleDent® Aura device was devised to accelerate orthodontic tooth movement (OTM) based on the premise that vibration can accelerate wound healing via angiogenesis and increase bone remodeling rates. OBJECTIVES: To investigate the effect of AcceleDent® Aura on OTM in an OTM model with aligners. METHODS: Prospective, single-center, randomized controlled crossover study. One mx central incisor was moved 1.98mm using Zendura® aligners. Subjects were randomly assigned to active or sham device and switched devices halfway through the study. RESULTS: 16M, 23F completed the protocol. A mean of 0.81mm (SD= 0.23) actual OTM occurred with the active device, and 0.90mm (SD= 0.22) with the sham device (p=NS). Race, sex, and age were not correlated with OTM while using the active device. No significant difference in subject pain was found between devices. CONCLUSIONS: The AcceleDent® Aura device was not found to accelerate the rate of OTM or alter pain perception using this OTM model.

CBCT Skeletal Maturation Assessment: A New Method Based on Spheno-Occipital Sychondrosis Fusion

Anwar Alhazmi

Case Western Reserve University

Objective: To test the hypothesis that fusion of spheno-occipital sychondrosis (SOS) is related to skeletal maturation events that occur during adolescence. **Methods:** The sample consisted of 22 male and 22 female subjects (10-17 years) who had obtained initial records. A total of 44 hand-wrist radiographs and 44 CBCT images were analyzed. Hand-wrist maturation stages were assessed using Skeletal Maturation Index (SMI) developed by Fishman. Fusion status of the SOS was scored as unfused, fusing, or completely fused on CBCT. **Results:** Spearman's rank correlation was 0.92 for males and 0.81 for females. These data confirmed a strong and significant correlation between SOS fusion and hand-wrist SMI system ($p < 0.001$). **Conclusion:** Active fusion of SOS corresponded to SMI 4-8, which is according to Fishman SMI analysis considered as high growth velocity period. This suggests that evaluation of SOS fusion from CBCT images might be clinically useful as an indicator of the pubertal growth period.

Treatment of Unilateral Cleft Lip and Palate Patient with Intraoral Tooth Tissue Borne Distractor and Facemask Therapy: A Case Report

Akansha Bansal

Rajiv Gandhi University

This case report demonstrates the successful use of intraoral distractor/HYRAX for rapid maxillary expansion in anteroposterior direction with an adjunctive use of face mask therapy for anterior orthopaedic traction of maxillary complex in a cleft patient with concave profile. The patient was 13 year old girl with a chief complaint of backwardly positioned upper jaw, therefore a treatment was chosen, in which acrylic bonded rapid maxillary expansion was done with tooth tissue borne intraoral distractor/HYRAX with a different activation schedule along with petit type of facemask. As a result cross bite got corrected and attained a positive jet of 4mm with no bone loss in cleft area and without any adverse effects in a period of 5 months followed by fixed mechanotherapy. Thus camouflaging the prognathic profile with reverse overjet by making the potential use of growth potential and minimizing the chances of surgery later in life.

Invisalign®: Case confidence and treatment management differences between orthodontists and general dentists

Alexandra Best

Virginia Commonwealth University

Background: Research has shown differences between orthodontists and general dentists (GDs) regarding use of Invisalign® to treat class I malocclusions, but more complex malocclusions, treatment management, and experience have not been investigated. **Purpose:** The purpose of this study was to investigate differences in case confidence, management, and Invisalign® training between orthodontists and GDs. **Research Design:** A paper survey was mailed to 2000 randomly selected Invisalign® providers. **Results:** Response rate was 30% ($n=603$). Orthodontists reported more experience and training, GDs were significantly more confident treating 3 of 6 cases ($p < 0.0001$), and utilization of all management techniques except IPR was significantly different ($p < 0.05$). **Conclusions:** Results show orthodontists and GDs have similar confidence treating malocclusions with Invisalign®, but different utilization of recommended auxiliaries, perhaps demonstrating a difference in treatment goals and esthetic results.

Cephalometric Analysis: Severe Class II Division I Malocclusions Treated Surgically and Non-Surgically

Patrick Brady

University of Iowa

Background- Orthodontists frequently treat Class II Div 1 malocclusions but, there is no consensus on the best treatment modality. **Purpose-** To examine end of treatment outcomes between severe Class II Div 1

patients treated surgically and non-surgically. Research Design- A retrospective study of consecutively treated severe Class II Div 1 patients. Initial and deband lateral cephalometric x-rays were compared for 45 non-surgical and 21 surgical cases. Multivariable regression analyses were used to examine differences in outcomes between treatment groups. Results- After controlling for (age, gender, and race), surgical patients had better end of treatment cephalometric outcomes. Those treated surgically had greater reduction in overjet, and improvement in SNB and ANB angle ($p < 0.05$). Those treated non-surgically had proclined mandibular incisors ($p < 0.01$). Conclusion- A surgical treatment plan leads to more ideal outcomes for patients with severe Class II Division I malocclusion.

A Comparison of Transverse Palatal Widths in Untreated Adult Sized Cleft Palate Patients with Normal Adult Sized Palates

Shenjuti Chowdhury
Rutgers School of Dental Medicine

This pilot study compared transverse palatal widths in untreated adult cleft palate patients with normal adult patients. The study consisted of 10 patients with adult sized untreated cleft palate (7 males, 3 females, mean age 17 ± 3.3 years) and 15 patients with normal adult sized palate (7 males, 8 females, mean age 31 ± 4.4 years). Intercanine, interpremolar and intermolar widths were measured to evaluate maxillary growth pattern in patients with untreated cleft palate. Due to small sample size independent T-test and Mann Whitney non-parametric tests were performed to analyze data. Both T-test and non-parametric test showed interpremolar width including first and second premolars were significantly smaller in the affected group (p values 0.003, 0.00 respectively). There was no significant difference in intercanine width between two groups due to variable canine position in cleft palate patients. Difference in intermolar width between two groups could not be established conclusively.

Intra-oral Scanning Devices Compared to Traditional Digital Impressions

Tepsithea Christou
University of Alabama, Birmingham

The aim of this study is to determine whether a commercial intra-oral scanner is as accurate as traditional impressions for orthodontic purposes. Records of 30 subjects were prospectively acquired and digital models were obtained using an intra-oral scanner, Lythos™ by Ormco, and an extra-oral scanner, GOM ATOS Triple Scan II by GOM. Predetermined linear measurements were analyzed. Paired t tests, Bland and Altman Analysis and color histograms were used to compare and evaluate measurements made from the study. The mean difference between the maxillary models ranged from -0.03 to 0.27 mm. The mean difference between mandibular models ranged from -0.03 to 0.08 mm. The results showed that the linear measurements obtained from Lythos models indicated a good level of accuracy when compared with GOM ATOS models. The accuracy was considered adequate for initial diagnosis and treatment planning in orthodontics.

The Economic Feasibility of Pursuing Post-Doctoral Education in Orthodontics

April Cole
Roseman University of Health Sciences

Introduction: This study assesses the economic return of orthodontics compared to general dentistry (GP) using advanced cost-benefit analysis. Methods: Median incomes of GPs and Orthodontists were used to determine their annual growth rate in earnings. Opportunity costs of orthodontic residency and projected lifetime career earnings were estimated. Financial analyses, including Net Present Value (NPV), Internal Rate of Return (IRR), and Break-even point were performed. Results: The mean group of orthodontists broke-even 10 years post-residency, provided a NPV of \$523,376, and an IRR of 19.3%. Orthodontists who incurred the higher opportunity cost of a private program broke-even at 11 years, with an NPV of \$402,638 and IRR of 15.9%. Conclusions: Under conservative economic conditions, NPV and IRR associated with post-doctoral training in orthodontics suggest the overall financial benefits exceed the costs of specialty training and provide a positive return on the additional investment.

Vertical Facial and Airway Adaptation Related to the TMJ

Amir Dadgar-Yeganeh

University of California, San Francisco

BACKGROUND: A damaging insult to the condyle affects mandibular growth. Reduced mandibular growth may limit airway dimension resulting in adaptational changes of mandibular structures.

PURPOSE: Evaluating such interactions by assessing condylar morphology and airway dimensions in individuals with different vertical facial types. **RESEARCH DESIGN:** A CBCT Study Case-control: 22 disease cases diagnosed radiographically by Dr. Hatcher and 242 controls, comparing odds ratio of different facial heights Cross-sectional: 22 disease cases and 22 long, 22 normal, and 22 short face controls, comparing airway, alveolar housing, condylar, ramus and mandibular body heights **RESULTS:** Currently generating data and will report on the incidence of adaptational changes of the mandible and airway dimensions in three different vertical facial types **CONCLUSION** No conclusions yet, but expecting to see airway and mandibular characteristics of long face cases being similar to those of diagnosed disease cases

Unilateral Premolar Extraction Treatment in Class II Subdivision Malocclusions

Ginu Dahiya

University of Illinois, Chicago

Objective: A retrospective study evaluating post-treatment maxillary arch forms and midlines for symmetry in Class II subdivisions treated with unilateral and bilateral maxillary premolar extractions. **Methods:** Best fit curves expressed as quadratic polynomials were generated to analyze variables. Significance level was set at $p \leq 0.05$. **Results:** The test group showed significant differences in arch form between right and left sides transversely in anterior, anterior-middle and middle segments of the arch, and all segments aside from the posterior segment in the sagittal dimension. Significant differences were found between groups in anterior and anterior-middle segments of the arch transversely, middle and middle-posterior segments sagittally, and in midline deviation. **Conclusions:** Unilateral maxillary extraction treatment generally results in a narrower and more posteriorly displaced arch form on the extraction side, with a deviated midline towards the extraction side of the arch.

Limiting Factors Affecting Stage I Treatment: A Biomechanical Perspective

Christopher Gibson

University of North Carolina, Chapel Hill

Background: Limiting factors to stage I orthodontic movement are poorly defined in the literature.

Purpose: Observe resistance to sliding (RS) in Stage I tooth movement and its relation with hyperelastic materials and malalignment geometry. **Design:** A device was fabricated to manipulate brackets into malocclusion scenarios. Straight wire segments were pulled through each configurations with an Instron and the RS was recorded. **Results:** Critical angles/deflections were defined as the point where a sudden increase in RS occurred. Using 0.016" CuNiTi wire, these points were observed for in-out, rotation, tipping, and vertical steps at 2.2mm, 4.8°, 2.6°, and 1.9mm, respectively. Both vertical step and tipping resulted in 1.4x higher RS than rotation and in-out ($p < 0.05$). 0.016" Nitinol produced similar response patterns with a consistently lower RS ($p < 0.05$). **Conclusions:** RS of differing malocclusions may have clinical implications and be utilized to better understand alignment mechanics.

Morphological Changes in Alveolar Bone Following Orthodontic Space Closure

Ninette Hacopian

Loma Linda University

The purpose of this study was to evaluate alveolar bone changes around maxillary incisors following orthodontic space closure. Before and after treatment CBCTs of adults with premolar extraction were reconstructed and the anterior cranial base segmented. The original and segmented cranial base volumes were superimposed using voxel based method. The distances from labial and palatal crest to CEJ were measured to evaluate vertical changes. Labial and palatal bone thicknesses were measured to evaluate morphological changes. Forty nine maxillary central incisors were studied. The crestal bone

showed significant resorption in the labial ($p = .038$) and palatal ($p < .001$) aspects. Significant losses in palatal bone thickness were observed ($p < .05$). Labial and palatal plates showed angular changes relative to palatal plane ($p < .05$). Alveolar modeling occurs in response to incisor retraction. The most adversely affected area is the palatal crest which might lead to periodontal consequences.

Mandibular Arch Perimeter Prediction Using Ramanujan's Equation for the Ellipse

Bridget Henn

Maimonides Medical Center

Introduction: The aim was to investigate a correlation between the perimeter of the mandibular dental arch as 1) measured on study models and 2) calculated using Ramanujan's equation for the perimeter of an ellipse. If correlated, Ramanujan's equation can be used to determine perimeter changes with posterior expansion and incisor proclination, and aid in determining extraction or non-extraction therapy. **Methods:** Correlation of measured vs calculated perimeter of the mandibular arch was evaluated with 31 untreated diagnostic casts. Linear and circumferential measurements were made directly on the diagnostic casts using a straight-edge ruler, caliper, and light-gauge wire. **Results:** Ramanujan's calculated perimeter has a Pearson correlation of 0.95 with measured perimeter of the mandibular arch. **Conclusion:** The ellipse is an accurate geometric model of the mandibular arch. Ramanujan's equation can be used to predict mandibular arch perimeter gained by expansion or incisor proclination.

Effective Radiation Dose of Positioning Scans for Five CBCT Instruments

Stona Jackson

Uniformed Services University of the Health Sciences

Objective: While 3D radiographs are commonly used in dentistry, little is known about the dose or frequency of use of preliminary scans used to position patients prior to a full Cone Beam Computed Tomography (CBCT) exam. **Methods:** Effective dose of positioning scans was measured with metal-oxide-semiconductor field-effect transistor (MOSFET) dosimeters for five instruments (iCAT FLX and Next Gen®, 3D Accutomo®, Carestream®, and Planmeca®). Instrument log files were examined to obtain information on the use of preview scans for the two highest dose instruments. **Results:** An effective radiation dose equivalent to a standard panoramic radiograph was measured for the 3D Accutomo 170® positioning scan (8 x 8 cm, 45 μSv). An average of 3.3 and 1.3 previews were required to position patients for the iCAT® and Accutomo® instruments, respectively. **Conclusion:** Positioning scans deliver a range of effective doses between $<1 \mu\text{Sv}$ and 45 μSv , depending on the instrument and the field of view.

Correlation Between Malocclusion and Diminished Psychosocial Well-Being

Omar Khatib

University of Manitoba

OBJECTIVE: Assess the correlation between malocclusion and psychosocial well-being from the perspective of younger patients, their caregivers, through the inclusion of normative criteria. **MATERIALS & METHODS:** A cross-sectional study with mean age of patients was 13.57 +/- 1.57 years. Data collection was undertaken through clinical exams, and each patient was assessed via the Index of Treatment Need. **RESULTS:** Patients' satisfaction with body image correlated with their caregivers' satisfaction with their children's' body image ($p < 0.05$). Caregivers' motivation, in comparison to their children's motivations to seek orthodontic treatment was the same ($p < 0.05$). No significant gender differences were found with regards to being bullied about dental appearance ($p > 0.05$). **CONCLUSIONS:** Bullying experiences was higher regarding dental appearance with no gender difference. Even patients with mild forms of malocclusion according to IOTN dental health and aesthetic components, suffer from bullying.

Alveolar Crestal Bone Loss in Older HIV Infected Women

Grace Kim

Columbia University

Intro: The advent of antiretroviral therapy has dramatically increased the lifespan of HIV-infected individuals but they are at greater risk of fractures, especially after menopause. The purpose of this study was to assess bone mineral density by using oral radiographs and the following measurements: alveolar crestal height, mandibular cortical width and tooth loss. Material and Methods: A retrospective chart review of existing panoramic x-rays and dental records was performed in HIV-infected women over age 40 and age and race/ethnicity matched uninfected controls from the same dental clinic in New York City. Using oral radiographs, the ACH, MCW, and number of teeth were determined. Conclusion: HIV-infected women appear to have greater loss of ACH than uninfected controls and is associated with tooth loss, especially women over age 50, after the menopausal transition. Further research using CBCT is necessary to determine effects of HIV and ART on alveolar bone density and tooth loss.

Comparative Effectiveness of Distinct Infant Orthopedic Approaches for Cleft Lip and Palate

Michelle Kornbluth
University of Toronto

Background: Infant orthopedic (IO) treatment aims to improve outcomes of cleft lip and palate (CLP) repair. Effects of these approaches on occlusion and nasolabial esthetics are unclear. Purpose: To compare the nasolabial esthetics and occlusal relationship of mixed dentition patients with complete unilateral CLP treated with distinct orthopedic approaches (Latham, modified McNeil, nasoalveolar molding (NAM), and no IO). Research Design: A total of 138 study models and 180 photographs were assembled from existing records at 5 cleft centers. Six trained, calibrated judges blindly rated dental arch relationships using the Goslon yardstick and nasolabial esthetics using the method of Asher-McDade. Results: The most favorable occlusal relationships were achieved at the center using no IO ($p < 0.001$). The most favorable nasolabial esthetics were obtained at centers using Latham or NAM ($p = 0.01$). Conclusions: Some aspects of CLP treatment may be enhanced, and others worsened by the use of IO.

Color Stability of White Spot Lesions Treated with Resin Infiltrant

Andrew Leland
University of Texas, Houston

BACKGROUND: Resin infiltration is a modern approach to treat white spot lesions. PURPOSE: To assess the effects of staining and accelerated aging on color of enamel treated with a resin infiltrant. RESEARCH DESIGN: Extracted teeth were exposed to: red wine, coffee, orange juice, combination, accelerated aging, control. Staining groups were immersed for one week and aging group was exposed to 450 kJ/m². Teeth were polished. Color was assessed at: baseline (T0), after staining/aging (T1), after polishing (T2). Color differences (ΔE^*) were calculated. RESULTS: The greatest ΔE^* between T0-T2 was red wine. All interactions were significant except resin infiltrated vs. non-resin infiltrated areas from T0-T2. CONCLUSIONS: Resin infiltrated and non-resin infiltrated areas stained with red wine showed significantly greater color differences between all time points ($p < 0.05$). There was no significant difference between staining of resin infiltrated and non-resin infiltrated areas.

Dental and Skeletal Effects with the Carriere Motion Appliance: A Prospective Clinical Pilot Study

Chia-Hung Lin
St Barnabas Hospital

Background: The Carriere Motion® appliance is designed to correct Class II molar relationship prior to the placement of fixed appliance. Purpose: To evaluate the dental and skeletal effects of the appliance. Research design: 8 patients (mean age 11.4 yrs) with bilateral Class II molar relationship were treated to a Class I position. Lateral cephalograms and dental models were obtained before and after molar correction. Results: 5 patients completed the study with a mean treatment time of 3.75 months. The mean molar correction was 4.73 mm. Maxillary molars derotated and distalized an average of 5.27 degrees and 1.37mm, respectively. The maxillary intercanine width increased while intermolar width decreased. Mandibular incisors proclined by a mean of 5.23 degrees. Conclusions: In this small sample, the Carriere Motion® appliance effectively established Class I molar relationship by a combination of maxillary molar derotation and distalization and lower arch mesialization.

Tooth Viability Following Distraction Osteogenesis in Patients with Maxillary Hypoplasia*

Mariana Muguerza

University of Washington

Craniofacial patients undergoing distraction osteogenesis often show disruptions in tooth development, affecting viability. This study evaluated the effect of osteotomy location & tooth development stage on long-term viability. 25 LeFort I & 25 LeFort III distraction patients were identified. Dermirjian's method was used to assess tooth formation on panoramic radiographs. Tooth position, development, & predicted functionality were used to develop a new tooth viability ranking. Results show that teeth in a more advanced stage of development at surgery have better viability scores than those at an earlier stage. The type of osteotomy may also influence viability. This study is the largest sample of tooth disruption associated with distraction. Early surgical events in the development of a tooth may decrease long-term viability. Delaying surgery is not often viable; the results of this study can help forecast surgical effects on the developing dentition.

Oral Health Quality of Life in Adult Orthodontic Patients

Martha Neely

Boston University

Objective: Examine Teen Oral Health-related Quality of Life (TOQL) for use in adults receiving orthodontic treatment and assess the validity and reliability by age-group. **Methods:** Teens and adults were asked to complete surveys at the Orthodontic Clinic at Boston University. The survey consisted of sociodemographic information, dental behavior questions, and the TOQL instrument. Malocclusion severity was assessed using the Index of Orthodontic Treatment Need (IOTN). **Results:** 161 teens and 146 adults participated. Scores overall and by domains were higher for adults, signifying a greater effect on the quality of life. Mean TOQL (17 items), emotional and social domain scores were greater in adults compared with teens ($p < .001$). The oral, physical and role domains were not statistically significant. **Conclusion:** Adults who come for orthodontic treatment are more affected by their malocclusion. Total score and the emotional and social domains are significantly higher for adults.

The Effect of Low-Level Laser Therapy on Orthodontic Root Resorption and Pain

Doreen Ng

University of Sydney

Background: Low-level laser therapy (LLLT) has been shown to accelerate orthodontic tooth movement by 30%, however the effect of LLLT on root resorption has not been extensively studied. **Purpose:** To investigate the effect of LLLT on orthodontically induced root-resorption and orthodontic pain. **Methods:** 20 patients requiring extraction of maxillary first premolars were selected for this split-mouth study. 150g of buccal tipping force was applied bilaterally to the maxillary first premolars for 28 days. Each patient's right and left premolars were randomly assigned a "laser" and "sham-laser" side. The experimental side received 808nm laser therapy on days 1, 2, 3, 4, 7, 14 and 21. Premolars were extracted on day 28 and were imaged using Micro-CT for root resorption analyses. Pain was assessed with visual analog scales. **Results and conclusion:** LLLT reduced root resorption by 23% ($p = 0.026$). LLLT tended to reduce orthodontic pain compared to the sham-laser.

A CBCT Evaluation of Coronal Condylar Position in Unilateral Class II Cases

Renee Nykolak

University of Detroit Mercy

Purpose: Utilize CBCT to compare coronal condylar position changes in unilateral class II cases before and after treatment. **Research Design:** CBCT records of 15 adolescent patients were obtained with unilateral class II corrected to class I. Coronal condyle-fossa position was analyzed with Anatomage software by measuring the distance from the medial pole to the glenoid fossa and the angle between the long axis of the condyle and the mid-sagittal plane (MSP). **Results:** The distance from the medial pole to the fossa was not statistically different between the class I and class II side or pre and post treatment. The angle between the long axis of the condyle and the MSP was statistically different between the class

I and class II side but not between pre and post treatment. The data was analyzed using repeated measure ANOVA and SPSS software. Conclusion: The correction of unilateral class II to class I did not produce statistically significant changes in coronal condyle-fossa positioning.

Evaluation of Existing and New Sagittal Parameters in Assessing Class II Correction in Growing Patients

Sreevatsan Raghavan
Kerala University

Objective: Evaluate the reliability of Class II correction using conventional & new sagittal cephalometric parameters Methodology: Lateral cephalograms of 35 patients measured 4 angular parameters (ANB, Beta, W, YEN angle), 4 Linear (Overjet & bite, Wits, Pi Linear) & 4 dental (Upper 1 to Palatal and N-A, Lower 1 to N-B, IMPA). Paired "t" test along with Pearson's correlation & regression was done to check for any dependency of the new parameters with other parameters. Analysis of Variance (ANOVA) & post-hoc Tukey test was done to check independent variability and reliability Results: The newer parameters placed most subjects in borderline Class II & showed significant correlations with conventional parameters especially incisor angulation ($p < 0.05$) Conclusion: If limited use of the ANB angle & Wits analysis is expected, the W & YEN angle and Pi Linear, respectively, maybe considered. The claims of the new parameters that they are not dependent on dental parameters can be questioned

Clinical Efficacy of BioAccelence™: A RCT to Evaluate Rate of Tooth Movement, GCF Markers and Patient Discomfort

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BioAccelence™ is a novel device delivering controlled and defined vibration in a cyclic manner. We aimed to compare the rate of OTM produced by BioAccelence™ as compared to OTM without mechanical stimulation. In this RCT, 45 patients were assigned to control (C) and experimental groups (E). Group E used the device for 20 minutes per day. The 1st use was immediately after the initial 0.014" NiTi wire that remained in place for 4-week time period. IO scans of the lower anteriors were made at 7, 15, 21 & 30 days. Little's irregularity index was calculated at each evaluation. The patients recorded discomfort level by marking on a 100 mm VAS. GCF collection was done at time intervals of 0, 1, 7, 15, 21, & 30 days. The statistics demonstrate greater rate of OTM in Group E ($p = 0.0069$) at 15 days and 21 days. ($p = 0.0446$). Group E also reported less pain. The mean PGE and IL-1b values of Group E were higher at 24 hrs. These results do indicate efficacy of BioAccelence™ for the time period evaluated.

Knowledge of Dental Students with Respect to Orthodontic Diagnosis and Clear Aligner Therapy

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Background: How prepared are dental students (DS) to diagnose orthodontic problems and provide clear aligner therapy (CAT)? Purpose: To investigate future plans and knowledge about aligners (AK) and orthodontic diagnosis (OK) in DS. Design: A 16 item questionnaire was administered to 163 3rd and 4th year DS to test if demographics including school year, future plans, and desire to provide CAT are associated with AK and OK. Maximum scores were 8 and 12 for AK and OK respectively. Results: DS planning to specialize in orthodontics had a significantly higher OK compared to DS planning to enter general practice (11 vs 8, $p = .01$). DS planning to refer all orthodontic cases to a specialist (35%) had a greater AK when compared to DS planning to provide CAT in general practice (5 vs 4, $p = .04$). Conclusion: DS with different plans for practice and providing CAT showed significant differences in AK and OK suggesting more dental education in orthodontics could improve practice decisions.

The Correlation Between Malocclusion and the Need for Speech and Language Therapy

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Background: Speech-sound disorders whether structural, motor, syndromic or sensory are common meeting grounds for Orthodontists and speech-language pathologists. Close cooperation with the two specialists is highly desirable to intervene in these cases. Purpose: To determine if there is a correlation between malocclusion & sound production. To develop a collaborative strategy for orthodontists and speech-language pathologists to diagnose & treat speech pathology. Research design: A chart review of 200 patients treated at Howard University Dept. of Orthodontics was conducted. The correlation between age, gender, habits, malocclusion and the need for speech-language therapy was recorded. Expected Results: There is a relationship between malocclusion and speech-language pathology. Specific types of malocclusion give rise to specific types of speech defects. Both parties will be able to recognize speech pathology & orthodontic problems and be able to refer patients across the specialties.

Detection of Hidden Enamel Demineralization Beneath Orthodontic Brackets Using Optical Coherence Tomography

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Background: Enamel demineralization (ED) manifested as white spot lesions around orthodontic brackets is a major risk factor. Purpose: To validate swept source optical coherence tomography (SS-OCT) as a non-invasive imaging modality for early detection of ED. Research design: Basal parts of clear brackets were partially bonded on rectangular bovine enamel blocks using a non-fluoridated orthodontic cement and pre-ED SS-OCT images were taken. Streptococcus mutans biofilms were formed on them in an oral biofilm reactor for 24 hrs followed by 3-days of incubation to induce ED. After completely removing the biofilms, post-ED SS-OCT images were taken. Gaps between bracket and enamel were analyzed using Image J and SPSS software's. Results: ED beneath the brackets and failure of bonding integrity were detected with mean gaps increasing from 12.7 μ m (pre-ED) to 18.1 μ m (post-ED). Conclusions: SS-OCT may be used as a non-invasive imaging device in clinical situations for early detection of ED.

Abrasion of Composite Materials Used for Orthodontic Bite Turbos

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Orthodontic bite turbos have been used for a variety of reasons including disocclusion of the dentition for alignment, classification, interferences, and bite opening. Typically, these bite turbos have been made from glass ionomer or bis-GMA resin banding cements already available in office. Additionally, these bite turbos experience wear over time making it necessary for periodic additions on existing turbos, which takes more clinical chair time. Thus, clinical efficiency potentially improves with use of a more abrasive resistant turbo material. Little or no research to date has examined the abrasion and wear characteristics of materials used to fabricate bite turbos. Therefore, the aims of this project were to determine if there was a difference between the abrasion and wear characteristics of three commonly used orthodontic bite turbo materials: Dentsply Triad® VLC, Ivoclar Vivadent Heliomolar® HB, Reliance Ultra Band-Lok®.

Managing Orthodontic Bracket Induced Plaque Formation and Associated Oral Diseases

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Orthodontic brackets alter tooth surface topology, cause heavy accumulation of plaque, leading to major orthodontic problems such as white spot lesion, gingival inflammation. The working hypothesis is that "polysaccharides and polypeptides on bacterial surfaces play major role in microbial adherence and biofilm formation during bracket-induced plaque formation, which could be potentially inhibited by specific sugar or amino acid monomers". The aim is to discover sugars /amino acids, formulate them and evaluate the safety and anti-plaque efficacy of the formula in vitro and in vivo. A panel of sugar/amino acids with inhibitory effects against in vitro biofilm formation has been found and formulated. The formula showed strong inhibitory effects against bracket-induced biofilm formation in vitro. A clinical study of the efficacy of this formula is now under evaluation in vivo. This finding would have positive impacts on reducing gingivitis and white spot lesions in orthodontic patients.

Impact of COMT Genotype on Pain Sensitivity in Healthy and TMD Patients

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Background: It's important to identify risk factors for chronic Temporomandibular Disorder (TMD). The Catechol-O-Methyl Transferase (COMT) gene may play a role in TMD patients' pain sensitivity. Purpose: To investigate the relationship of the COMT 158 met genotype on μ -opioid receptor (μ OR) activity and pain sensitivity in TMD patients and healthy controls. Design: 12 chronic TMD patients and 12 controls underwent a positron emission tomography (PET) scan with a saline pain challenge. Blood samples were collected. Results: TMD patients had significantly more pain ($p < 0.01$) and needed less saline to reach moderate pain levels compared to controls ($p < 0.03$). 72.7% of TMD patients had at least one COMT met allele. Even one met allele decreased the amount of saline required to reach moderate pain levels. Conclusion: The COMT 158 met allele represents a risk factor for increased pain sensitivity. With additional PET analysis, we expect to demonstrate μ OR mechanisms related to the COMT genotype.