

2015 AAO Annual Session Charley Schultz Resident Scholar Award

The Charley Schultz Resident Scholar Award program will be held on Saturday, May 16 in the Moscone Center Room 301 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

Global Burdens of Disease: Malocclusion and Caries vs. Oral Health Related Quality of Life

Kjeld Aamodt

University of California, San Francisco

Objective: This multi-center study aimed to assess how caries or malocclusion affect the Oral Health Related Quality of Life (OHRQoL) of Latino adolescents living in Latin America. Methods: A total of 2630 students (12 to 19y) were recruited from 6 different areas in Peru and Mexico. The Child Oral Health Impact Profile (COHIP) was used to assess OHRQoL. Caries were quantified utilizing the Decayed, Missing, and Filled Surface index (DMFS), and malocclusion using the Index of Complexity, Outcome, and Need (ICON). Results: Overall, the COHIP appears to be concurrently valid in each country ($P < 0.01$). A significant decrease in OHRQoL was detected in relation to malocclusion treatment need. Only Social/Emotional Well-Being appears to drive this decrease ($P = 0.04$). Rural indigenous Mayan samples do not exhibit this relationship. Conclusions: This sample shows an effect of caries and malocclusion on OHRQoL of Latino students. Demographic factors appear to mediate these effects.

Torsional Strength of Zirconia Brackets Fabricated in Extremely Low Profile

Najla Alrejaye

Boston University

Aim: To evaluate torsional strength of orthodontic brackets fabricated of zirconia in 2 sizes and compare it to those of conventional ceramic brackets. Methods: CAD/CAM was used to mill brackets of Zirconia in both low (0.05 inch) and standard (0.08 inch) profile. The brackets ($n = 10$ /group) were subjected to torque using a specially designed apparatus attached to an Instron. The average moments necessary to fracture the brackets were determined and compared to those of alumina brackets that have a profile of more than 0.075 inch: Mystique® and Resolve®. Results: Average torque at failure in gm.mm was for: YZ (U1)=11902(A); Mystique (L1)=9352(B); Mystique (U1)=8433(B); Low profile YZ=8138(B); Resolve (L1)=5405.9(C) (groups with different letters are significantly different, $P < 0.05$). Conclusion: Low profile zirconia brackets showed comparable or even statistically significant higher resistance to arch wire torsion than the larger alumina brackets.

General Dentists' Provision of Orthodontic Care and Training in Canada

Marc Olivier Aucoin

University of Manitoba

In order to obtain perspectives of Canadian dentists on the quality of the undergraduate education received in orthodontics and the extent of orthodontic services provided, a descriptive survey was created. An anonymous web-based survey using Survey Monkey® was distributed to registered Canadian dentists via links in newsletters and mass emails. There were 427 responders. 71% of dentists provide orthodontic treatment with 67% offering removable or fixed appliances. The undergraduate education was deemed good or excellent by 42% and 51% for their ability to diagnose in the mixed and permanent dentitions. These percentages decrease for their ability to treatment plan and provide treatment. The number of dentists providing orthodontic services is similar to the 76% reported in the

USA. The quality of orthodontic education provided has improved since the 1987 Canadian data, although some amelioration to the curriculum may be beneficial.

Saturation of Biological Response to Forces in Orthodontic Tooth Movement

Michelle Chou
Harvard School of Dental Medicine

Background: It is not clear if applying higher magnitude of forces (MF) increases expression of inflammatory markers (IM) and rate of orthodontic tooth movement (OTM). Purpose: To investigate the expression and activity of IM, and its correlated molecular and cellular events in response to different MF. Design: Experimental groups received different MF to rats' maxillary 1st molar using a coil spring with an inactive sham control, where controls did not receive any appliance. At different time points, the maxillae were collected for various analyses. Results: There was a linear relation between the force and the level of IM expression during lower MF. Activity of various IM and number of osteoclasts reached a plateau in response to higher MF, with an unchanged rate of OTM. Conclusion: There is saturation in the biological response to higher MF with no further increase in IM, osteoclasts, or amount of OTM. Therefore, using higher MF to accelerate the rate of OTM is not justified.

The Role of Natural Killer Cells in Orthodontic Tooth Movement

Omer Fleissig
The Hebrew University - Jerusaelm, Israel

Objectives: Orthodontic tooth movement (OTM) is sterile inflammation based process in which immune cells are involved however little is known about their type and function in this process. NK cells (NKs) secrete TNF α and IFN γ , known to promote Osteoclastogenesis. NKs' main activating receptors are Ncr1 and NKG2D. We aimed to investigate the role of NKs and their receptors in OTM. Methods: Mouse model for OTM was used in 8 mice groups. OTM was measured using μ CT-scanner. NKs and Osteoclasts number was evaluated histologically. Results: OTM was reduced in the absence of NKs, Ncr1 and NKG2D receptors, TNF α and IFN γ . NKs' number increased in the PDL of treated teeth. Osteoclasts number correlated with OTM rate. Conclusion: OTM is mediated through Ncr1 and NKG2D receptors of NKs. NKs accumulate in the PDL of treated teeth. Understanding the immune mechanisms involved in OTM will contribute to find novel BIOLOGICAL therapeutic means to control it.

Screw Diameter and Orthodontic Loading Influence Adjacent Bone Response

Jonathan Francis
University of Kentucky

BACKGROUND: Miniscrews fail more frequently than endosseous implants. PURPOSE: Evaluate the effects of screw diameter and orthodontic loading on implant-adjacent bone turnover. RESEARCH DESIGN: 1.6, 2, 3 & 3.75mm implants (n=62) were placed in beagles. Implants on one side were loaded (2N). Bone labels were given IV prior to implant placement and at sacrifice at 3 months. Bone formation rate (BFR) and other variables were assessed from undecalcified bone-implant sections using microscopic imaging software. RESULTS: BFR was lower adjacent to 1.6mm diameter screws compared to 2.0, 3.0, & 3.75mm diameter screws ($p < .05$). BFR was lower adjacent to loaded 1.6mm screws compared to non-loaded 1.6mm screws ($p < .01$) or loaded 2.0-3.75mm diameter screws ($p < .01$). No significant differences were noted between 2.0, 3.0, & 3.75mm diameter screws regardless of load. CONCLUSIONS: 2.0mm diameter or larger machined screws are recommended for orthodontic anchorage. AAOF Biomedical Research Grant

Investigating the Etiology and Pathogenesis of Primary Failure of Eruption (PFE)

Heather Hendricks

University of North Carolina, Chapel Hill

This study examined the genetic basis of PFE, a diagnosis that conveys a poor prognosis in the eruption/function of teeth. Treatment with a continuous archwire worsens the condition. Two aims tested the hypothesis that PTH1R mutations result in loss of function and that multiple genes cause PFE: to determine 1) the fate of a functional PTH1R mutation and 2) the contribution of BMP2 and TNFSF-11 to PFE. Methods: We used IFA and transfected COS-7 cells with either the WT PTH1R sequence or 1092delG mutation identified in our lab to compare the fate of the expressed protein and performed mutational analysis of BMP2 and TNFSF-11 with PCR and sequencing. Results: Sequencing revealed 3 intronic SNPs in TNFSF-11; in silico and functional studies showed minimal changes in expression but putative structural changes in mutant vs WT PTH1R protein. Conclusion: PTH1R mutations in PFE likely result from loss of function; causative mutations in genes other than PTH1R have yet to be identified.

Time and Pigmentation Effects on Force Decay of Elastomeric Powerchains

Amir Hosseini

Roseman University of Health Sciences

Background: Elastomeric powerchains are a popular tool for intra-arch mechanics during orthodontic tooth movement; however, they are subject to deformation and force decay. Purpose: To test the force decay of powerchains (PCs) across multiple brands and to evaluate pigmentation effects on force decay. Research Design: This in-vitro experimental study investigates closed PCs from 6 brands (AO, GAC, 3M, RMO, Opal, Ormco) in 3 colors (gray, clear & black). The testing intervals include a continuous 24 hour test, and cross sectional tests at 48, 72, 168, 336, and 672 hours. ANOVA will be used to analyze force levels across brands of the same color and within each brand as a function of pigmentation. Results: PCs across brands exhibited similar initial force (~56 N) with similar decay rates across time. After 24 hours, the average force exhibited has decreased by approximately 33%. Conclusions: The force delivery of PCs is not consistent over time. Further research is needed in this area.

Comparison of the Effects of Three Surgical Procedures on the Rate of Orthodontic Tooth Movement in Rats

Zachary Librizzi

University of Connecticut

The aim of this study was to evaluate the effect of corticotomy, corticision and piezocision with and without mucoperiosteal flaps on rate of tooth movement(OTM) and alveolar response. 74 Wistar rats were divided into 6 groups: OTM Only, Corticotomy, Corticision and Piezocision with and without a flap. A 10g force was applied from the maxillary left first molar to the incisors along with the surgery. Stone models were created to measure OTM on day 0, 7, 14 & 21. MicroCT was performed on day 21 to evaluate OTM and alveolar response. Histomorphometry was performed on day 21 to calculate osteoclasts and osteoclast surfaces. Across all measurements, no significant differences were found in the areas of OTM, bone volume fraction, osteoclasts and osteoclast surfaces. Piezocision groups were omitted from statistical analysis due to surgery complications and need to be further examined. The data suggests no significant difference in rate of OTM or alveolar response across surgical procedures.

Clinical Research

Microbial Evaluation of the Effectiveness of Different Methods for Cleansing Clear Retainers

Rehaf Albanna

King Saud University - Saudi Arabia

Background: The literature lacks studies that evaluate the effectiveness of chemical cleansing products with clear retainers. **Purpose:** To compare the cleansing efficiency between: 1. Brushing Essix retainer with water only and brushing followed by soaking in cleansing tablets, and 2. Three commercial cleansing tablets. **Research Design:** A double-blinded clinical study with split mouth design was conducted on 60 volunteers (20 in each group). Each participant wore an upper Essix retainer (with electronic microsensor) full-time for 14 days. Participants used one of the 3 products on one side of the retainer for 15 minute/day. **Result:** Bacterial quantification tests demonstrate non-significant differences between the control and the test sides, and between the three cleansing tablets. Also, in-vitro tests show non-significant effect. **Conclusions:** Mechanical cleaning (brushing) is the most efficient method for maintaining the hygiene of clear orthodontic retainers.

Relationship Between Dental Calcification and Cervical Vertebrae Maturation in a Nigerian Population

Adesola Asade

Lagos University Teaching Hospital - Nigeria

Background: Ease of recognition of dental developmental stages, availability of panoramic radiographs and cost are practical reasons for attempting to assess skeletal maturity using dental calcification. **Purpose:** The aim of this study was to determine the correlation between dental calcification and cervical vertebrae maturation in a Nigerian population. **Research design:** Dental calcification and cervical vertebrae maturation stages were determined using panoramic and lateral cephalometric radiographs of 336 children aged 5 to 18 years respectively. Standard descriptive analyses and Spearman rank order correlations were performed. **Results:** Good correlations ranging from 0.475 to 0.743 were observed between dental calcification and cervical vertebrae maturation stages. The tooth most highly correlated was the mandibular second molar in both genders. **Conclusions:** Dental calcification stages may be used as a preliminary tool in determination of skeletal maturity.

Esthetic Preferences for Maxillary Incisor Labiolingual Inclination Across Races

Elvi Barcoma

Virginia Commonwealth University

Objective: To determine if the esthetic preference for maxillary incisor labiolingual inclination varies among people of different racial backgrounds. **Material and Methods:** Developed an electronic survey containing smiling profile images of a white female and a black female with various degrees of maxillary incisor labiolingual inclination (-15° to +15°). Laypeople ranked the images from most attractive to least attractive and identified the images that were esthetically unacceptable. **Results:** The survey was completed by 307 evaluators. The average of the top three inclinations ranged between -10° and -5°. All evaluators preferred retroclined maxillary incisors to proclined maxillary incisors. There were no significant differences in the preference for maxillary incisor inclination among races or between genders. **Conclusions:** Evaluators found retroclined maxillary incisors to be more esthetically acceptable than proclined incisors. There were no differences in the preference for maxillary incisor inclination across races or between genders.

Evaluation of Rate of Space Closure in Piezocision Assisted Orthodontic Tooth Movement

Shailesh Bhandari

Dr NTR University of Health Sciences – Vijaywada, India

Introduction: The purpose of this study was to evaluate the rate of extraction space closure in corticotomy (piezocision) assisted orthodontic movement. **Method:** 25 subjects requiring first premolar extractions with

no crowding were selected to undergo corticotomy assisted retraction. Piezocision was used for corticotomy. Group 1 included 15 individuals in whom retraction was done with NiTi closed coil springs and the rate of space closure was evaluated. Group 2 included 10 patients in whom retraction was done with NiTi closed coil springs on the right side and Powerchain on the left side. Result: The rate of space closure was significantly higher in the first two months after corticotomy. NiTi closed coil springs were more effective than Powerchain for space closure. Conclusion: Corticotomy increases the rate of space closure and the use of NiTi coil springs along with corticotomy for space closure is more effective. However, the duration of this faster tooth movement is short.

Evaluation of Diagnostic Accuracy of a New Intraoral Scanner

Tami Bonilla

University of Texas Health Science Center, Houston

Direct scanning of the dental arch with intraoral scanners should offer superior quality and accuracy. This project investigated accuracy of a commercial intraoral scanner in comparison to direct measurements and an industrial CT scan of the same dentition. .stl files were obtained from a Lythos® scanner and an industrial CT scanner (Imagix®) on 55 dry mandibles. Intercanine and intermolar widths and all 3 dimensions of the 2nd premolars were evaluated and compared with direct measurements. The Bland-Altman comparison test showed no consistent bias of one approach vs. the others compared with caliper measurements. For the estimation tooth dimension in vertical, transverse and sagittal planes, the mean bias did not exceed 0.3 mm. Similar findings obtained for the intermolar and intercanine width measurements with slightly higher confidence intervals. Therefore, Lythos® is capable of producing high diagnostic quality as compared to caliper measurements and an industrial CT scanner.

Effect of Invisalign(R) Trays on the TMJ and the Orofacial Muscles

Jennifer Brien

University of Montreal

Previous studies have shown that disarticulation of the jaws improves TMJ symptoms and reduces bruxism/clenching events at night. This prospective clinical study aims to evaluate the effect of continuous wear of Invisalign® trays on the TMJ and the orofacial muscles. The effect over time on the TMJ and muscles was assessed using the RDC/TMD. The number of bruxism/clenching events were measured using electromyograph recordings during sleep and daily reported by the patients with questionnaires. Repeated measurements were taken at specific moments: baseline (T0), 2 weeks (T1) and 6 months (T2) after the start of the treatment. By now, the data of the 43 participants has been collected and is currently being analyzed. Preliminary results are showing a significant reduction in the index (bruxism event/hour) from T0 to T1 and a significant reduction of the worst reported facial pain from T1 to T2. The final results will be conducted by the time and presented at the AAO Scientific Session.

3D CBCT Study of Airway Dimensions in Different AP Skeletal Patients

David Ensley

Tri-Service Orthodontic Residency Program

Introduction: Our objective was to determine whether the airways of Class I and II patients differ in size. Methods: 100 pretreatment CBCT images were randomly selected based on inclusion criteria. They were divided into Class I and II groups and lateral cep images were sectioned from the CBCTs. Using the Dolphin (R) airway tool all the airways were measured at two thresholds. Results: There was no statistical difference between the airway volume, area or MCA between the CI I group and the CI II group ($p>0.05$). The median averages were 15.2 cm³, 544 mm², and 199 mm² respectively for airway volume, area and MCA for CI I and 16.3 cm³, 580.9 mm², and 188.4 mm² for CI II. There was a large variation in airway sizes. The airway areas of high angle CI II patients were significantly smaller than those of the CI I

group ($p=0.045$). Conclusions: Airway sizes are highly variable and do not differ between CI I and II patients, except for high angle CI IIs who have smaller airways than CI I.

Eccentricity and Arch Form Analysis

Devin Zolnowski
Maimonides Medical Center

The aim of this investigation is to build upon previous research regarding the elliptical shape of the dental arch. To develop a correlation between the eccentricity of the Maxillary and Mandibular arch forms. To develop a value that will aid orthodontists in evaluating their finished cases.

Gingival Clefts Revisited

Robert Geiman
University of Maryland

Background: Gingival clefts (GCs) frequently occur during orthodontic space closure of bicuspid extraction sites. Purpose: To investigate factors that predispose subjects to GCs, and to confirm existing research on GCs. Research Design: Biotype indicators in 50 subjects undergoing bicuspid extraction were measured; the incidence and severity of gingival clefts were calculated. Results: The incidence of GCs was 71.4%. Extraction sites from Caucasians had the highest incidence (93.8%, $p=0.043$) and mean severity index (29.15, $p=0.005$). Slow rates of space closure ($<.6$ mm/mo) yielded larger GCs, while faster space closure (>1.2 mm/mo) led to smaller GCs. Sites that lacked buccal bone thickness had increased severity of GCs as compared to those with larger bone thickness. Conclusions: GCs remain common today. Although various parameters show correlation to both severity and incidence of clefts, all patients undergoing space closure after extraction are at risk, and should be monitored.

Metal Artifact Reduction Using MAVRIC in the Presence of Common Orthodontic Appliances*

Jeff Kohlmeier
Mayo Clinic

Background: Orthodontic appliances produce artifact in MR imaging of the head and neck causing many difficulties for orthodontists and radiologists. Purpose: The aim of our study was to quantify the metal artifact reduction when utilizing MAVRIC sequences to image orthodontic appliances. Research Design: Various orthodontic appliances (SS brackets, ceramic brackets, SS retainers) were embedded within MR safe retainers. A phantom was imaged with each configuration using four MR techniques. For each scan, the area of signal void was measured. Results: Results demonstrated a significant reduction in signal void when comparing MAVRIC to conventional scans. The type of appliance had a significant impact on the signal void in all scans. Conclusions: The MAVRIC sequence displays promising results for reducing signal void and geometric distortion. Utilizing MAVRIC sequences it may be possible to decrease the frequency that orthodontic appliances need to be removed for MR imaging.

A Novel Predictor of Skeletal Response to Rapid Maxillary Expansion

Chad Larson
University of Minnesota

Background During adolescence, increasing interdigitation of the midpalatal suture increases resistance to rapid maxillary expansion (RME), which decreases its skeletal effect. Purpose To determine if a novel measure of midpalatal suture maturity, the midpalatal suture radiographic density ratio (MPSD), is a predictor of the skeletal response to RME. Research design Pre-treatment measurements of MPSD ratio, age, and cervical vertebral maturation (CVM) were obtained of 30 patients who underwent RME. Measurements on CBCT scans were used to determine the proportion of prescribed expansion achieved at both the greater palatine foramina (GPF) and infraorbital foramina (IOF). Results There was a

statistically significant correlation between the MPSD and both GPF and IOF ($P < 0.05$). In contrast, age and CVM were not significantly correlated to the measures of skeletal expansion ($P > 0.05$). Conclusions: The MPSD has the potential to become a useful clinical predictor of skeletal response to RME.

Stability of Rapid Maxillary Expansion Post-Retention: A Follow-Up Study

David Lazzara

State University of New York, Buffalo

Background: Despite the popularity of rapid maxillary expansion (RME) in orthodontics, its long-term stability in adolescence remains controversial. **Purpose:** To investigate the long-term dental stability of adolescents treated with RME followed by full fixed appliances (FFA). **Research Design:** Digital models were obtained from two groups of patients: a treated group with Hyrax RME followed by FFA (TG) and a comparison group with FFA only (CG). Maxillary and mandibular arch width, depth, palatal depth and molar tipping were measured at three time points: pretreatment (T1), post-treatment (T2), and post-retention (T3). **Results:** 126 Total models were obtained with a mean follow-up of 3.4 yrs (SD 1 yr). There was no significant difference in relapse of maxillary intermolar width (T3-T2) in TG (Mean -0.61 mm, SE 0.23 mm) and CG (Mean 0.23 mm, SE 0.46 mm). Relapse in arch depth, palatal depth and molar tipping were not significant. **Conclusions:** RME in adolescence is stable in the long-term.

Incidence Study of Malocclusions in Children with Obstructive Sleep Apnea

Kevin Chien-Hsun Lee

University of British Columbia

The aim of this study is to establish the incidence of malocclusion in children with obstructive sleep apnea (OSA) diagnosed using polysomnography (PSG). The sample comprised 64 children between ages 4-16 who were referred to BC Children's Hospital for PSG. Malocclusion was assessed clinically by one orthodontist (K.L.), blinded to PSG results. Children with craniofacial syndromes and previous orthodontic treatment were excluded. 39 children remained and were divided into a control group ($n=22$) with an apnea and hypopnea index (AHI) < 2 , and an OSA group (AHI ≥ 2 ; $n=17$). There were no significant differences in the craniofacial morphology and occlusal characteristics between children with or without OSA. A subgroup of OSA group (AHI ≥ 5 , $n=8$) showed non-significant trends of: decreased incidence of narrow palate and posterior crossbite, less crowding, and less overjet. These findings disagree with the conventional view of malocclusion in OSA, suggesting further study is necessary.

A Three-dimensional Evaluation of Airway Volume Changes in Two Expansion Activation Protocols

Varghah Lotfi

Indiana University

Abstract: Rapid Maxillary Expansion (RME) is used in orthodontics to expand the maxilla. Literature suggests that in addition to expanding the maxilla, expansion can affect the airway structure. The aim of this retrospective study was to evaluate the airway volume changes in two RME protocols using 3-D CT. **Methods:** 3-D CT scans from completed cases were analyzed. The sample consisted of two groups of 20 patients each. Group A had an activation rate of 0.8mm/day and group B had an activation rate of 0.5mm/day. Scans were taken before and after expansion. Dolphin imaging software was used to identify landmarks and calculate airway volumes. T-test was performed for comparison between groups. **Results:** There were significant differences in the initial versus final measurements for Nasal Cavity Volume for both treatment groups A and B, and for Nasopharynx Volume for group A. **Conclusion:** This study demonstrated that a faster expansion rate led to a higher nasal cavity volume increase.

2D and 3D Airway Analysis and Mandibular Advancement Treatment in Sleep Apnea

Whitney Mostafiz

University of Illinois, Chicago

Background: Obstructive Sleep Apnea (OSA) is a major public health problem. Oral appliance therapy is well-tolerated, but predicting success rates is difficult. Purpose: To relate oropharyngeal airway dimensions, protrusion with a mandibular advancement splint (MAS), sleep characteristics, and treatment response in an OSA sample. Research Design: 33 adults were assessed retrospectively. Pre-treatment CBCTs were obtained to assess airway dimensions with Dolphin 3D and ImageJ. SomnoMed MAS appliances were titrated. Pre- and post-treatment polysomnograms (PSGs) were used to assess treatment response. Results and Conclusions: There were 23 males and 10 females; 10 complete, 11 partial, and 12 non-responders. Oropharyngeal 2D and 3D variables were associated with treatment response. Patients with increased OSA severity and smaller airway volumes may have increased response to MAS therapy. Decreases in volume due to increased soft tissue may lead to a decreased MAS treatment response.

Perceptions and Psychosocial Impact of Malocclusion: Comparison Between Cleft Lip/Palate and Orthodontic Patients and Parents

Sreevatsan Raghavan

Kerala University of Health Sciences - India

BACKGROUND: There are considerable differences between professional and patient perceptions of dentofacial aesthetics and treatment need. PURPOSE: To assess the psychosocial impact of dental aesthetics using the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ), Satisfaction with Life Scale (SWLS) and Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN). RESEARCH DESIGN: 40 CLP and 40 routine orthodontic patients were administered the questionnaires along with AC rated by the patients and parents respectively. Kruskal-Wallis test was used for analysis. RESULTS: For AC in both groups the parents score was greater than the patients score which was statistically significant and lower PIDAQ 'aesthetic concern' sub-part score of the Cleft group ($p < 0.02$). No other significant differences were observed. CONCLUSION: The attitudes, perceptions, and support of parents and patients are crucial factors influencing patient's psychological self-concept and treatment need.

Midfacial and Dental Changes Associated with Nasal Positive Airway Pressure in Children with Sleep-Disordered Breathing

Soleil Roberts

University of Washington

Introduction: This retrospective study compared midfacial growth in pediatric craniofacial subjects diagnosed with Sleep Disordered Breathing (SDB) that were compliant vs. non-compliant with Nasal Positive Airway Pressure (nPAP) therapy. Methods: Lateral cephalometric analysis was used to determine mean annual change in midfacial structures from T1 to T2. Compliancy was indicated by PAP usage of >20 hours/week for >6 months. Results: 50 subjects (mean age 10.42) were compliant with PAP therapy for an average of 2.57 years. 50 non-compliant subjects (mean age 8.53) comprised the control group. Compliant subjects experienced negative mean annual change for all midface measurements compared to non-compliant subjects (SNA: -0.57° vs. 0.56° , SN-PP: -1.15° vs. 0.09°) and positive change in maxillary incisor measurements (U1-SN: 2.41° vs. -0.51°). Conclusion: Pressure to the midface from compliant nPAP use may result in maxillary retrusion, counterclockwise tipping of the palatal plane and flaring of the maxillary incisors.

Effect of Temporary Prosthetic Mandibular Advancement on Velopharyngeal Closure for Speech

Kyungsup Shin

University of Iowa

Although orthognathic surgeries may affect velopharyngeal closure (VPC), the effect of mandibular advancement surgery on VPC has not been studied at length. The purpose of this study was to elucidate the effect of temporary prosthetic mandibular advancement on velopharyngeal function. Fourteen subjects produced 5 repetitions of the testing sentences; normally, and while wearing a prosthetic appliance to advance the mandible. Movements of the velopharyngeal mechanism were transduced using a videoendoscopy/photodetection system that sensed the amount of light and quantified the VPC. For 7 of the 14 subjects, the extent of VPC decreased significantly ($p < .05$) under the advanced mandible condition. On the other hand, 5 subjects showed significantly ($p < .05$) increased VPC with their mandibles advanced. For 2 subjects, VPC was not significantly changed. Preliminary results indicate a large individual variability in response to the mandibular advancement condition.

Bone Turnover Markers in Pre Versus Post-menopausal Women Receiving Orthodontic Treatment

Sorapan Smuthkochorn

Case Western Reserve University

Compare gingival crevicular fluid (GF) bone turnover markers in postmenopausal (PM) vs premenopausal women (M) receiving orthodontic therapy. 12 PM and 16 M without gingival disease participated in this IRB approved study. GF samples were taken at pre (T0) and 24 hrs post-orthodontic activation (T1). GF bone markers: RNKL, osteonectin (ON) and osteopontin (OP) were analyzed using ELISA. At T0 RNKL and ON, were significantly different between PM vs M ($p=0.035$, $p=0.026$ respectively). In all groups, all markers increased significantly after activation (RNKL: T0 3.69 ± 3.5 vs T1 10.05 ± 5.0 , T0 6.74 ± 5.4 vs T1 11.94 ± 7.6 ; ON: T0 558.83 ± 362.8 vs T1 1061.7 ± 822.8 , T0 325.1 ± 231.2 vs T1 872.8 ± 409.9 ; OP T0 323.26 ± 157.2 vs T1 489.61 ± 268.6 , T0 278.62 ± 138.9 vs T1 531.72 ± 465.9) Changes in concentrations in PM vs M in RNKL ($p=.777$), ON ($p=.446$) and OP ($p=.269$) were not significantly different. Although baseline differences exist, initial orthodontic activation does not trigger a different response in PM

Dentofacial Changes Between Extraction and Nonextraction Orthodontic Treatments in Borderline Extraction Adolescents

Travis Tingey

University of Oklahoma

Introduction: This study compared soft and hard tissue differences between extraction and nonextraction treatment in a homogeneous group of borderline extraction cases. Methods: 81 cases, 41 extraction (mean age: 13.4 ± 1.6) and 40 nonextraction (mean age: 13.6 ± 1.7), were evaluated. Cephalometric and cast measurements were compared for pre- and post-treatment records. Comparisons within the extraction group were also performed to account for any differences between first premolar and second premolar extraction treatments. Results: Significant differences were found between extraction and nonextraction groups for soft tissue and dental measurements. Conclusions: Extraction treatments experienced greater facial changes than did nonextraction treatment that were retrusive while nonextraction treatment produced minimal facial changes. Second premolar extraction therapy did not produce facial changes that were significantly different from first premolar extraction treatment.

Effects of Orthodontic Appliances on Diagnostic Quality of MR Images of the Brain

Dzmitry Zhylich

University of Toronto

We studied the effect of fixed appliances on brain MRI acquired in a 3 Tesla scanner to determine which ones need removal for specific MR sequences. Methods: MRI were acquired for 10 adults wearing Essix trays with 4 appliances: ceramic brackets, steel brackets, ceramic brackets+steel molar tubes, steel mandibular lingual retainer. For each appliance, 6 sequences were done: sagittal T1, axial T2, axial gradient-recalled (GR), axial diffusion-weighted (DW), axial magnetic resonance angiography (MRA) and axial fluid

attenuated inversion recovery (FLAIR). Resulting 13860 images were analyzed by 2 neuroradiologists to record image distortion. Results: Wilcoxon signed rank test showed significant differences between distortion scores of all appliances compared to each other ($p < 0.0001$). None of the appliances need removal for MRA, FLAIR and T2; steel brackets need removal for T1, GR, and DW; ceramic brackets do not need removal; steel tubes need removal before GR and DW; steel lingual retainer needs removal only for DW