

2015 AAO Annual Session Oral Research Presentations

The Oral Research presentation will be held on Sunday, May 17 in Moscone Center Room 122 from 8:00am-3:45pm with a break from 11:45am to 12:30pm. Oral Research presentations are 10 minutes long with 5 minutes for questions from the audience.

*- Denotes financial interest or visual enhancement

Moderator: Dr. Shannon Owens- 8:00am-10:00am

ORTHODONTIC CONSIDERATIONS: SIDE EFFECTS

8:00am-8:15am

Image Gently Campaign in Dentistry: Promotion of Responsible Use of Ionizing Radiation for Children
Ahmad Abdelkarim
Jackson, MS, USA

Image Gently Campaign is joined by over 80 healthcare organizations. Initiated in September 2014, the Image Gently Campaign in Dentistry is an education and awareness initiative focusing on radiation safety in pediatric maxillofacial radiology. Children are susceptible to the effects of ionizing radiation because of their long life expectancy and increased radiosensitivity of their developing organs. Since they comprise a large portion of orthodontic patients, it is important to use ionizing radiation appropriately and safely. There are six steps that orthodontists can employ to integrate the principles of Image Gently Campaign in Dentistry into their practices: 1) Select x-rays for a patient's individual needs, not as a routine, 2) Use the fastest image receptor possible, 3) Collimate the x-ray beam to expose only the area of interest, 4) Use thyroid collars, 5) Child-size the exposure, and 6) Use CBCT only when necessary. These steps will be described and examples will be presented.

8:15am-8:30am

Impacted Maxillary Canine Induced Root Resorption: A Cone Beam Computed Tomography Assessment
Meenakshi Vishwanath, et al.
Farmington, CT, USA

Aim: To determine the rate, extent & location of root resorption associated with impacted maxillary canine using CBCT exams. Methods: A total of 205 deidentified CBCTs were assessed for root resorption by dividing each affected tooth into 7 regions. Extent of resorption was correlated with canine position and physical/follicular contact with adjacent teeth. Results: Good inter and intra-examiner reliability was obtained. Rate of root resorption was 67%. Lateral (66.9%) & central (23.9%) incisors were most commonly affected followed by the premolar (10.1%). Apical, midroot & cervical resorption were 39.8%, 19.8% & 4.9%. Resorption was graded from 0-3 based on the depth of involvement; severe involvement was found in 15.6% of the cases. Follicular contact caused more resorption than physical contact ($P=0.016$). No correlation between the severity of impaction & extent of resorption. Conclusion: Extent & severity of root resorption with impacted canine was significantly greater than previously thought.

8:30am-8:45am

Alveolar Bone Loss During Orthodontic Treatment Studied with Cone Beam Computerized Tomography
Dimitrios Makedonas, Michail Mastoris Mastoris
Athens, Greece

Aim: to study the amount of buccal and lingual/palatal alveolar bone level changes and lower incisor teeth extra-alveolar displacements in patients treated with full fixed orthodontic appliances. Subjects and methods: 40 Angle Class I patients with bimaxillary crowding, completed standardized with full fixed appliances treatment and extraction of 4 premolars. CBCT radiographic examinations were obtained to measure the buccal and lingual/palatal bone levels from first molar to first molar in lower jaw and the buccal-lingual root position in the alveolar process. Results: 42% had one or more teeth displaced out of

the alveolar process to the extent that at least half of the root was displaced without cortical plate covering. The sagittal alveolar bone width appeared smaller than the labiolingual diameter of the incisor roots. Conclusions: pronounced incisors retraction during treatment can be critical and create a progressive lingual and labial cortical plates bone loss.

8:45am-9:00am

Comparison of Root Resorption Caused by Conventional, Self-ligating and Clear Aligner Therapy. A Randomized Controlled Clinical Trial

Sachin Agarwal, et al.
Farmington, CT, USA

Aim: To evaluate the difference in root resorption caused by conventional & self-ligating brackets & clear aligners system. Methods: n = 60, non-extraction patients, mean age 16 ± 08 yrs, randomly assigned to 3 groups; G1, clear aligners, G2, self-ligating & G3, conventional brackets. Peri-apical radiographs of maxillary lateral incisor and second premolar were taken at start of treatment (T0) and at end of 18 months of treatment or at debond, whichever is early (T1). ANOVA with Bonferroni post hoc was used, with significance set at $P < 0.05$. Results: All groups were similar at T0. At T1, lateral incisor had more amount of root resorption as compared to second premolar in all three groups. No differences were observed between G1 and G2. Both G1 and G2 had significantly less resorption than G3. Conclusion: Maxillary lateral incisor had a larger root resorption than second premolar. Both, clear aligners and self-ligating brackets had less root resorption as compared to conventional brackets

9:00am-9:15am

Volumetric Pulp Changes after Orthodontic Treatment Determined by Cone Beam Computed Tomography

Shreya Ajmera, Shivanand Venkatesh
Osmanabad, India

Aim: Evaluate pulp volume changes during orthodontic treatment. Method: Eighty seven patients (two groups: experimental – 48, control – 39) were the study sample. CBCT records were taken before the treatment (T0) for both and after space closure for experimental group, whereas for control group CBCT images were obtained approximately 17-18 months (T1). CBCT data were reconstructed with surface and volume rendering software (MIMICS; Materialise, Belgium) and the volumetric images were modified to display the teeth from various orientations. Six anterior teeth were segmented and their pulps isolated. The paired t-test was used for statistics. Results: The difference was statistically significant at $P < .05$ for all the anterior teeth in the experimental group and at $P < .05$ for the right canine, right and left lateral incisors and left central incisor in the control group. Conclusion: Orthodontic treatment in the experimental group produced a significant decrease in the volume of pulp.

ORTHODONTIC TREATMENT EFFECTS

9:15am-9:30am

Cephalometric Evaluation of the Effects of Twin Block Appliance in Class II Division 1 Malocclusion

Aisha Khoja
Karachi, Pakistan

This study aims to assess the mean change in skeletal, dento-alveolar and soft tissues of Class II division 1 malocclusion patients on lateral cephalogram from baseline (T0) to 1 year (T1) following Twin block appliance therapy. After taking an informed consent, pre- and post- treatment lateral cephalogram of 53 patients aged 9-16 years were obtained. Several lines and angles were drawn on these radio-graphs to evaluate the changes in soft and hard tissues. The pre- and post-treatment variables were compared by Paired t-test ($p \leq 0.05$). There was significant improvement in skeletal relationship of underlying jaws ($ANB = p < 0.001$), increase in the vertical jaw relationship ($GoGn-SN = p = 0.01$), increase in mandibular unit length and body ($Co-Gn, Go-Gn = p < 0.001$). Significant reduction in upper incisors and increase in lower incisors inclination was found ($p < 0.001$). There was significant retraction of upper lip ($p < 0.01$), increase in nasolabial ($p < 0.02$) and Z-angle and decrease in H-angle ($p < 0.001$).

9:30am-9:45am

Microelectronic Wear-time Documentation of Removable Orthodontic Devices Detects Heterogeneous Wear Behavior and Individualizes Treatment Planning

Timm Schott, Björn Ludwig
Tuebingen, Germany

The aim of this study was to investigate whether microelectronic wear-time documentation can contribute to individualized orthodontic management. The wear times and behaviors of 281 patients undergoing orthodontic treatment with removable appliances were quantified and analyzed using the TheraMon microelectronic system over a 6-month treatment period. The 281 study participants wore their removable appliances for a median of 9.0 hours per day, compared with the 12 to 15 hours per day prescribed. Wear behavior was variable and heterogeneous in patients with almost identical median wear times, with fluctuating and numerous zero wear-time periods observed. Both the duration of daily wear time and the wear behavior need to be considered to individualize the prescription for wear time; this is made possible with microelectronic wear-time documentation. Individual prescription changes based on the wear-time documentation can be arranged with patients in shared decision-making progress

9:45am-10:00am

Comparison of Clinical Success, Aesthetic Acceptability and Stability of Autotransplantation and Orthodontic Traction as Treatment Modalities in Severely Impacted Anterior Teeth: A Randomised Clinical Trial

Meghna Vandekar
Mumbai, India

47 adult patients with impacted teeth in the anterior zone were randomly allocated to 2 groups. Both groups had levelling and aligning of arches followed by (ST) Orthodontic traction post surgical exposure (n=22) and (RPA) Rapid Prototype aided Autotransplantation as treatment modalities (n=25). Subjects between the groups were statistically evaluated for A) Clinical Success : i) Bone levels adjacent to teeth II) Root resorption of tooth and adjacent teeth III) Gingival & Periodontal health IV) Time taken for treatment completion; B) Aesthetic acceptance i) Blinded VAS scale by peers ii) Emergence Profile iii) Gingival contours and C) Stability : Positional changes measured by Little's Irregularity index 1 year post debonding. Results comprehensively proved Autotransplantation (RPA) as a superior modality in categories A) ii) III) & iv), Bi) & II) when compared with ST. There were no clinical or statistically significant differences in category A i) and C) between groups.

Moderator: Dr. Flavio Uribe - 10:00am-11:45am

10:00am-10:15am

Class II Treatment with Functional Appliances: A Meta-Analysis of Short Term Treatment Effects

Viraj Doshi, et al.
Mumbai, India

This meta-analysis aims to analyze current literature for evidence on effects of functional appliances (Removable FA & Fixed FA). Literature survey of articles was performed. A Meta analysis was attempted by using the Random Effect Model (REM); heterogeneity & sensitivity analysis were also done. Articles that met the inclusion criteria were 24 for RFA and 7 for FFA. The total subjects evaluated were 1469 (780 treated & 689 controls) for RFA and 353 (219 treated & 134 controls) for FFA. The results from a REM showed significant effects on Mandibular skeletal (Co-Gn: 2.29 mm (p < .0005), SNB – 1.43° (p < .0005), N Perp Pg – 2.08 mm (p < .006) and dental changes (L incisor horizontal – 1.34 mm (p < .0005). Significant Maxillary dental changes (U Molar Horizontal – 2.84 mm (p < .0005) were only observed with FFAs. Sensitivity and chi square tests also confirmed these findings. The analysis of the effect of treatment by FFAs and RFAs versus untreated controls showed statistically significant changes.

10:15am-10:30am

Impact of Self-ligating and Conventional Brackets on Root Resorption, Treatment Time and Extraction Rate During Orthodontic Treatment

Viviana Jacobs, et al.
Düsseldorf, Germany

Objective: Study determined EARR (external apical root resorption) between self-ligating (SL) and conventional (Non-SL) brackets. Rate of extraction, appointments and treatment time were analyzed. **Methods:** 213 patients were treated with SL brackets (n=139, Smartclip, 3M Unitek, USA) or Non-SL (n=74, Victory, 3M Unitek, USA). Crown and root length of incisors were measured. ANOVA was performed. **Results:** There was no difference between Non-SL or SL regarding EARR (Non-SL: 4.5 vs. SL: 3.0). Occurrence of severe EARR (sEARR) did not differ (Non-SL 0.5 vs. SL: 0.3). Percentage of tooth extraction (Non SL: 8.1 vs. SL: 6.9) and number of appointments (Non-SL: 12.4 vs. SL: 13.9) did not show differences. Time was shorter with Non-SL (Non-SL: 18.1 vs. SL: 20.7 months). **Conclusion:** This is the largest study showing that there is no difference regarding EARR, appointments and extraction between SL and Non-SL. For the first time we demonstrate that occurrence of sEARR does not differ.

CRANIOFACIAL DISORDERS

10:30am-10:45am

Lateral Cephalometric Analysis and Phenotypic Characterization of Ellis-van Creveld Syndrome2 (Evc2) Mice

Mohammed Badri
Jacksonville, FL, USA

Objective: To investigate and characterize the craniofacial phenotype in Evc2 knockout (KO) mice. **Methods:** Lateral cephalometric radiographs and analysis were conducted on three postnatal groups of Evc2 KO mice. Evc2 expression pattern, levels of both proliferation and apoptosis in chondrocytes were investigated. **Results:** Growth rate of craniofacial bones in KO mice was reduced to 72-79 % of that of controls at the tested time points. Growth of nasal bone, palatal bone and premaxilla was more affected in KO than in the controls. There was a remarkable change in facial bones' spatial relationship to the cranial base and vault. We also found lack of chondrocyte zones organization, abnormal proliferation pattern, and enhanced levels of apoptosis in chondrocytes in KO compared to controls. **Conclusions:** Evc2 is required for craniofacial bone development and deficiency in Evc2 leads to specific facial bone growth defect due to imbalance of cellular proliferation and cell death.

10:45am-11:00am

Quantitative Analysis of Bilateral Mandibular Morphology of Patients with Mandibular Deviation

Han Lin, et al.
Guangzhou, China

Objectives: Bilateral asymmetry often remains in patients with mandibular deviation after midline correction. The current study conducted a three-dimensional (3D) quantification of bilateral mandibular bodies with virtual BSSRO to characterize the asymmetry. **Methods:** 55 adult patients diagnosed with skeletal class III and mandibular deviation were included. The virtual BSSRO was performed on the reconstructed mandible models to achieve aligned midline. Further, virtual mirroring and superimposition of the paired hemi-mandibles were performed. Then the volume of the residual asymmetries were measured. **Results:** The volumetric differences (occurrence incidence) were $467.7 \pm 98.3 \text{ mm}^3$ (43.6%), $2146.6 \pm 318.5 \text{ mm}^3$ (34.6%) and $538.4 \pm 118.5 \text{ mm}^3$ (21.8%) at mental region, mandibular body and mandibular angle respectively. **Conclusions:** The asymmetry of mandible remains after midline correction. The 3D quantification of mandibular morphology provides clinical references for the orthognathic surgery.

11:00am-11:15am

Treatment of Osteoarthritis by Losartan in a Mouse Model

Michelle Mian, Yefu Li
Boston, MA, USA

The goal of this research was to inhibit TGF- β 1 signaling and slow osteoarthritis (OA) progression in adult mouse joints. To achieve this goal, we administered Losartan, a TGF- β 1 inhibitor, in mice after they were subjected to a knee surgery to induce OA and examined its effects. Background: Evidence supports a specific pathway in OA pathogenesis of adult joints that involves increased TGF- β 1 activity. Innovation: Losartan has not been tested in a surgical murine model for its effects on OA progression. Approach: Deliver systemic Losartan to two groups: sham and DMM (Destabilization of Medial Meniscus) surgical mouse models. The DMM surgery induces OA. Mice were sacrificed at 8 and 16 weeks after the surgery for histological analysis. Results: Histological analysis revealed slowed OA progression in the OA murine model treated with Losartan at both 8 and 16 weeks post the surgery compared to the control. Conclusions: Losartan slowed the progression of OA in the murine model of OA.

11:15am-11:30am

Oral Appliance and Pharmacotherapy for Obstructive Sleep Apnea: A Pilot Clinical Study

Maria Therese Galang-Boquiren, et al.

Chicago, IL, USA

Objectives: Because the mandibular advancement device (MAD) is not fully therapeutic in moderate to severe obstructive sleep apnea (OSA), we pilot tested augmentation of the MAD by pharmacotherapy in these patients. Methods: A prospective, placebo-controlled, blinded crossover study of 12 subjects with moderate to severe OSA was conducted. Treatment was a MAD plus placebo medication for two weeks, followed by a combination regimen of ondansetron (24 mg/day) and fluoxetine (10 mg/day) with continued use of the MAD. The primary outcome measure was Apnea-Hypopnea Index (AHI). Results: Paired samples t test indicated: AHI MAD (19.9 \pm 4.5) was significantly lower than the AHI baseline (36.1 \pm 2.7); AHI MAD + Drug (15.0 \pm 2.9) was significantly lower than the AHI baseline, and lower than AHI MAD, but this difference was not statistically significant. Conclusions: Combination of pharmacotherapy and oral appliance may be a viable option in treating patients with moderate to severe OSA.

11:30am-11:45am

MSX1 Genetic Analysis in Hypodontia and Oral Clefting

Ayse Altug, et al.

Ankara, Turkey

AIM: To investigate if there is a specific pathogenic mutation and/or polymorphism of MSX1 gene variants in non-syndromic tooth agenesis. SUBJECTS and METHOD: 110 individuals with hypodontia (78 female, 32 male) with any type of congenitally missing teeth. EDTA blood samples were collected, polymerase chain reaction (PCR) was applied for genetic evaluation and the data was analyzed by Chi-squared test and Kappa analysis. RESULTS: Total number of missing teeth was 236. Three variants of MSX1 gene presented polymorphism. Additionally, a statistically significant difference in allele frequency for MSX1 (c.*6C>T) polymorphism for congenitally missing lateral incisors ($p < 0.05$). MSX1 (c.*6C>T) polymorphism was previously described as variations related with cleft lip and palate. CONCLUSION: These findings strongly suggest that hypodontia is under the influence of MSX1 gene and absence of maxillary lateral incisors could be a very mild rebound of a recovered cleft lip and palate deformity.

Moderator: Dr. Nan Hatch - 12:30pm-2:00pm

MINISCREWS AND TEMPORARY ANCHORAGE DEVICES

12:30pm-12:45pm

Use Of Mini Implants to Limit the Dento-Alveolar Side Effects of Forsus Fatigue Resistant Device: A Randomized Controlled Trial

Sherif Elkordy, et al.

Cairo, Egypt

Aim: To detect the 3 dimensional skeletal, dental & soft tissue effects of Forsus Fatigue Resistant Device (FFRD) & the effect of its use with mini implants. Methods: A sample of 43 skeletal Class II growing females with deficient mandibles were randomly allocated into 3 groups; 16 subjects received FFRD (F

group), 15 received FFRD & mini implants (FMI group) & 12 untreated controls. CBCT images were taken before appliance insertion & after removal. 3 dimensional analysis & statistical tests were applied. Results: Class I molar relationship & overjet correction resulted in 88 % of the cases. No significant skeletal differences were found. Retroclination & extrusion of upper incisors & distalization of upper molars were greater in the FMI group. Proclination & intrusion of lower incisors, soft tissue measurements were greater in the F group. Conclusion: Class II correction was mainly dento-alveolar. Unfavorable lower incisors proclination & intrusion were effectively minimized with the mini implants

12:45pm-1:00pm

Skeletal and Dental Changes in Bone-Anchored, Tooth-Anchored Maxillary Expanders Assessed with Cone-Beam Computer Tomography - A Randomized Clinical Trial

Manuel Lagravere

Edmonton, AB, Canada

Objectives: Determine skeletal and dental changes in rapid maxillary expansion (RME) treatments using bone and tooth anchored appliances assessed through cone-beam computer tomography (CBCT). Methods: 60 patients from with maxillary transverse deficiency (11-17 years old) were treated. Patients were randomly allocated into a tooth-borne expander group, a bone-anchored expander group or a control group. CBCTs were obtained at two time points (baseline and 2.5 years once braces tx complete). Avizo software was used to locate landmarks on different anatomical structures for analysis. Results: Dental changes were larger than skeletal changes. Changes between groups were not statistically different ($p < 0.05$). Two-year post expansion shows statistically significant ($p < 0.05$) increase in vertical and anterior-posterior facial dimensions. Conclusion: RME using bone or tooth anchored expanders had similar skeletal and dental changes.

1:00pm-1:15pm

Are Miniscrews Efficient in Preventing Anchorage Loss During Herbst Treatment?

Antonio Manni, et al.

Racale, Italy

Objectives To analyse and compare anchorage loss during Herbst treatment with and without miniscrews and to determine if there is a difference in the miniscrew ligation method. Methods In this retrospective study, pts were divided in 3 groups: -1 (controls) 20 pts treated with acrylic splint Herbst; -2 (elastic ligature -EL-) 20 pts treated with an acrylic splint miniscrew-Herbst; miniscrews ligated with elastic ligatures; -3 (metallic ligature -ML-) 20 pts treated with an acrylic splint miniscrew-Herbst; miniscrews were ligated with metallic ligatures. Essential results ANOVA test showed that the comparison among the three groups was significant ($p > 0.001$). The Bonferroni test showed that anchorage loss control was higher in the EL group (control $p < 0.001$; ML $p = 0.004$) and that there was no difference between the control group and the ML group ($p = 1.0$). Conclusions Herbst treatment with miniscrews and elastic chains seems to be the most effective for anchorage loss control.

1:15pm-1:30pm

Evaluation of the Relationship Between Bone Architecture and Primary Stability of Mini-implants

Amanda Carneiro da Cunha, et al.

Rio de Janeiro, Brazil

The design of mini-implants (MI) and bone substrate have been associated to its primary stability (PS). The objective of this study was to evaluate if there was a relation between the design of MI and insertion site quality. Two types of MI (1.6 mm X 8 mm) were divided into groups in accordance with their design: DEN (Dentaurum®) and RMO (RMO® Dual-Top). Forty sections (8 mm \varnothing x 10 mm) were obtained from bovine pelvis ilium (D1) and pubic bone (D2). MI design was evaluated by Scanning Electron Microscope imaging. Bone quality was assessed with a micro-CT system and PS by insertion torque (IT). Intergroup comparisons were performed by ANOVA/ Tukey and Pearson's correlation test ($p < 0.05$). No significant difference was observed with DEN (IT: 12.87 N.cm) and RMO (IT: 9.95 N.cm) in D1. However, DEN group expressed an increase in IT (25.08) ($p < 0.05$) in D2. PS of MI differed according to bone substrate indicating that its design may be set according to the site quality.

BIOLOGY AND MANAGEMENT OF FACIAL GROWTH

1:30pm-1:45pm

Evaluation of Condylar Growth as a Function of Growth Factors (IGF-1 & TGF- β) in Young Rabbits with and without Mandibular Advancement

Amol Patil, Ravindranath Sable

Pune, India

New Zealand (NZ) rabbits with administration of IGF-1 and TGF- β with and without mandibular anterior repositioning appliances (MARA) are explored for the growth of the mandibular condylar cartilage (MCC). 32 NZ rabbits were divided into 4 groups: (i) saline injection in TMJ, (ii) MARA, (iii) growth factor injection in TMJ and (iv) growth factors injection as well as MARA. Real time RT-PCR in conjunction with histological and biochemical analysis have been used. Genes up-regulated as a function of injection of IGF-1 and TGF- β and MARA: i) MMP-1 5.70-fold; ii) DCN 4.59-fold; iii) MGP 3.22-fold; iv) VEGF 2.80-fold; v) SOX-9 2.09-fold. The upregulation of gene showed a synergistic effect in the combined group. Biochemical assay as well as histomorphometry confirmed increase in proteoglycans in experimental group. Endochondral ossification as a function of injection of growth factors and appliances seems to have accelerated growth of MCC, providing the hope for clinical applicability in future.

1:45pm-2:00pm

Influence of Masticatory Muscle Function on Craniofacial Suture Bone Growth

Chi-Yang Tsai, et al.

Taipei, Taiwan

The purpose of this study was to evaluate the effects of reduced masticatory muscle function on the craniofacial bone. 48 male Wistar rats were divided into 4 groups. Group I subjects received no Botulinum Neurotoxin type A (BTX-A) injection. Group II subjects received injections of BTX-A in the masseter muscle. Group III subjects received injections of BTX-A in the temporalis muscle. Group IV subjects received injections of BTX-A in both the masseter and temporalis muscles. 42 days after, All subjects were sacrificed and direct measurements of maxillary arch, bone surface density (with micro CT) and sutural bone deposition distances were recorded. The results showed that significant changes in the BTX-A group, such as decreased maxillary arch width were found. BTX-A group showed a significant decrease in the bone deposition distance. According to the results, reduced masticatory function may affects the craniofacial bony structure, dental pattern and the internal bony structure.

Moderator: Dr. Frans Currier - 2:00pm-3:45pm

2:00pm-2:15pm

Evaluation of Skeletal and Dentoalveolar Effects of AVPA Versus Reverse Headgear: A Randomized Comparative Clinical Trial

Berk Özoğul, Sevil Akkaya

Ankara, Turkey

The aim of this randomized comparative clinical trial is to evaluate the skeletal and dentoalveolar effects of Active Vertical Protraction Appliance (AVPA) in comparison with Reverse Headgear (RH). AVPA is recently developed to provide simultaneous openbite and Class III treatment in patients with increased or optimum vertical dimensions. The inclusion criteria for the AVPA (30 patients, average age: 10.19 years) group were the presence of maxillary deficiency caused skeletal Class III with increased or normal vertical dimensions. RH group consisted randomly selected 30 patients (average age: 10.81 years) from archive records. As a result of AVPA treatment major Class III correction was achieved in all patients. Palatal plane inclination remained stable in AVPA group whereas it decreased in RH group. Gonial, ramal and mandibular plane angles decreased in AVPA group, however, significant increase was observed in RH group. Vertical control was successfully achieved with AVPA during protraction.

2:15pm-2:30pm

Orthopedic Effect of High Frequency Acceleration on the Mandibular Condyle

Luz Maria Barrera Alviar, et al.

New York, NY, USA

The application of High Frequency Acceleration (HFA) increases osteoblast activity. Since osteoblasts and chondrocytes are originating from similar osteoprogenitor cells we expect similar effects on chondrocytes. Objective: To investigate the effect of HFA on chondrocytes in the mandibular condyles. Methods: 45 growing rats were divided into 3 groups: Control (C), static load (Static) and HFA. HFA group received treatment 5 minutes/day. S group received same static force. C group did not receive any treatment. Samples were collected at 0, 7, 28 and 56 days for histology, BrDu staining, RT-PCR, μ CT and fluorescent microscopy analysis. Results: HFA increased the rate of chondrocyte proliferation. Progression of chondrocytes through early chondrogenesis into the hypertrophic stage and replacement with bone was significantly faster in HFA group. Conclusion: Similar to osteoblasts, chondrocyte activity is increased by HFA, which can help in treatment of patients with mandibular deficiency.

BIOLOGY OF ORTHODONTIC TOOTH MOVEMENT

2:30pm-2:45pm

Saturation of the Biological Response to Orthodontic Forces and Its Effect on the Rate of Tooth Movement

Laura Edwards, et al.

New York, NY, USA

Objectives: Investigate the expression of inflammatory markers in response to different magnitudes of orthodontic forces; correlate this response with molecular events during tooth movement. Methods and Materials: 245 rats were divided into control, sham, and experimental groups. Different force magnitudes were applied to the upper first molar using a Sentalloy spring. At various time points, maxillae were collected for RNA, protein analysis, histology, and μ CT. Results: There was a linear relation between force and level of cytokine expression during lower magnitudes of force, but not at higher magnitudes of force. Activity of CCL2, CCL5, IL-1, TNF, RANKL, and number of osteoclasts reached a saturation point in response to higher magnitudes of force long term; rate of tooth movement was unchanged. Conclusion: After a certain force magnitude, there is a saturation in the biological response, where higher force does not increase inflammatory markers or amount of tooth movement.

2:45pm-3:00pm

Effect of Number of Micro-osteoperforations on Rate of Tooth Movement in Rats

Tali Elfersi, et al.

New York, NY, USA

Previously we have shown that micro-osteoperforations (MOPs) can increase cytokine expression and therefore rate of tooth movement (TM) in rats during application of orthodontic forces. However, it is unclear if the number of MOPs affects the magnitude of this response. Objectives: To evaluate the effect of number of MOPs on expression of cytokines and magnitude of TM in response to orthodontics forces. Methods: 48 rats were divided into 4 groups and 10cN force was applied to the maxillary right first molar using a NiTi spring: Orthodontic force only (O), 1 MOP plus force, 3 MOPs plus force, and control group. Cytokine expression, number of osteoclasts and rate of TM was compared between groups. Results: 3 MOPs group had significant increase in cytokine expression, osteoclast activation and rate of TM, while 1 MOP group did not show any statistical difference compared with O group. Conclusions: Number of microperforations had a direct effect on expression of biological markers and TM.

3:00pm-3:15pm

Natural Killer Cells Participate in Orthodontic Tooth Movement

Omer Fleissig, et al.

Jerusalem, 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 the 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: In-vivo experiment was performed in which mouse model for OTM was used in 8 mice groups. OTM was measured using μ CT-scanner. The number of NKs and Osteoclasts 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

3:15pm-3:30pm

Quantitative Detection of Protein Biomarkers for Root Resorption in Patients Undergoing Orthodontic Treatment After Removal of High Abundance Proteins

Karolina Kaczor-Urbanowicz, et al.

Jerusalem, Israel

Introduction: Root resorption (RR) is one of the most prevalent, iatrogenic and unavoidable consequence of orthodontic tooth movement. Objective: To establish a panel of biomarkers for RR induced by orthodontic treatment. Material and Methods involved unstimulated saliva collection from 64 RR patients and 26 healthy controls. Radiographic assessment of 4 upper incisors was done prospectively before and 9 months after upper bonding. Afterwards, the patients were divided according to the age and to the different degree of RR. High-abundance proteins were depleted followed by 2DE and qMS. Results and Conclusions: Proteomic analysis discovered 308 new potential protein biomarkers in young severe RR patients and 78 in adults. Additionally, bioinformatics in young severe RR group revealed pathogenesis mechanisms related to actin cytoskeleton regulation complex, while in adults, associated with focal adhesion, which is a revolutionary finding in the field of orthodontics.

3:30pm-3:45pm

Accelerated Bone Formation of Distracted Alveolar Bone with rhBMP-2 Injection

Jung-Yul Cha, et al.

Seoul, South Korea

This study aimed to evaluate the effect of bone morphogenic protein-2 (rhBMP-2) injection in Distraction Osteogenesis (DO). 12 adult beagle dogs were assigned to control and BMP-2 groups. After distraction completed, rhBMP-2 was injected into regenerated alveolar bone of the BMP-2 group. Histological and microCT analysis of regenerated bone were done for each 2 weeks and 6 weeks of consolidation period. rhBMP-2 injection significantly increased bone volume of regenerated bone and improved both width and height of regenerated ridge as well as increasing bone density. rhBMP-2 injection accelerates bone formation, and makes adequate bone morphology and volume. This technique will be helpful to reduce the consolidation period and additional bone graft procedure for implantation.