

College of Dentistry Research Day Poster Presentation Abstracts

#223 Abstract Title: Pediatric Phantom Dosimetry and Image Quality of i-CAT

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Abstract: Purpose: The purpose of this study was to evaluate doses resulting from various combinations of parameters with and without a thyroid collar using a child phantom with the i-CAT. A second aim was to measure contrast to noise ratio (CRN) and modulation transfer function (MTF) as quantitative measures of image quality for the various exposures options offered by the i-CAT with and without the thyroid collar. Methods: Dosimetry was acquired using a tissue equivalent phantom simulating the anatomy of a 10-year old child. Dosimeters were positioned at 24 locations corresponding to ICRP (2007) weighted tissues and other tissues of interest (lens of eye) in the head and neck area. Image quality indicators were acquired using a QUART DVT-AP phantom (DVT_AP, Quart GmbH, Zorneding, Germany) Results: Child phantom effective doses were on average 35% greater than adult phantom doses reported for the same volume and exposure settings. The placement of the thyroid collar affected the CNRs with both protocols (Quickscan and Standard) and both voxel sizes. When the thyroid collar was placed to cover either half of the image quality element (IQ) or the whole IQ element, the changes in the CRN were significant ($P < .01$) indicating a worse image contrast and subsequent image quality. Conclusions: There is a trend of decrease in thyroid dose and overall effective dose, when shielding is used in all the standard FOV used at the University of Kentucky. Unfortunately, the use of thyroid collar significantly affected the quality of the image.

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College of Dentistry Research Day

Poster Presentation Abstracts

#224 Abstract Title: **AHI, BMI, Comparison Among Obstructive-Sleep-Apnea-Patients with Different-Facial-Profiles, morphometrics**

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Abstract: Objectives: A previous study of patients with Obstructive Sleep Apnea (OSA) found that those who were not overweight were more likely to be Class II. This study sought to investigate whether there was a difference in facial morphology among the Class II patients, especially as it relates to BMI. Methods: In an ongoing study in the Graduate Orthodontic Program at the University of Kentucky, 176 multi ethnic subjects with moderate to severe OSA (AHI > 15) are being studied for possible morphometric and/or genetic predictors for OSA. Thirty-seven subjects from this study were diagnosed as having a class II profile (excess convexity). Of these Thirty-seven subjects, 19 were obese (BMI > 29.9) and 18 were not obese (BMI ≤29.9). From lateral photographs of all 37 subjects, nine facial landmarks previously published by Lee et al., 2008 were chosen and analyzed for morphometrics, using the TIPSDIG and J-MORPHO programs. Facial convexity was determined by Dolphin Imaging version 11.7. Students t-test was used to compare the G-Sn-Pog angle between the higher and lower BMI category Class II facial profile patients with OSA. Results: There is no significant difference between males and females (p=0.7). There is no significant interaction between sex and BMI category (p=0.9). There is a significant difference between the Class II group with lower BMI (x=11.3°), and the Class II greater BMI (x=5.5°) group (p=0.009). Conclusions: Class II facial profile non-obese patients with OSA are more likely to have excess facial convexity than Class II facial profile obese OSA patients.

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College of Dentistry Research Day Poster Presentation Abstracts

#225 Abstract Title: Prosthetic Considerations for Patients with Oral Dryness

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Abstract: Saliva is a muco-serous exocrine secretion crucial for the preservation of oral health. Oral dryness is considered a medical condition that should be professionally managed to prevent tooth loss and in edentulous patient to increase the chances of success of prosthodontic treatment. It can be caused by single or multiple factors including polypharmacy, systemic diseases, radiation therapy, viral infections, drug use and carbonated beverages. Saliva is also important for patient's quality of life, as well to prevent conditions like fungal infection and burning mouth. Oral dryness can result in an increase in acidity, reduction in natural cleansing mechanisms and an enhanced plaque buildup, promoting an environment favored by cariogenic microorganisms. Combining these factors can lead to rapid and aggressive deterioration of a patient's dentition and/or result in recurrent decay. Edentulous patients will lack the natural lubrication and immune defenses necessary to maintain the health of the soft tissues. Patients wearing complete dentures are at a higher risk for tissue trauma and fungal infection, and they have a higher likelihood of experiencing decreased retention. Lastly, the immense impact on quality of life should not be overlooked, including saliva's role in nutrition, taste perception and the body's ability to heal and/or repair itself naturally. Therefore, timely diagnosis and management of oral dryness is crucial in maintaining oral health and enhancing the success of prosthodontic treatments. It is important for preventing damage to oral hard and soft tissue reducing the cost of prosthodontic treatment, and increasing and overall patient satisfaction.

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College of Dentistry Research Day

Poster Presentation Abstracts

#226 Abstract Title: Dental After-Hour Urgent Care for Pediatric Dentists in Kentucky

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Abstract: Purpose: To investigate the management of after-hour dental urgencies by private practice pediatric dentists in Kentucky by investigating how the emergency call is answered and the treatment recommendations if a person or automated message is reached. Methods: An anonymous phone survey was conducted to determine the method of patient-dentist contact after hours on a Wednesday evening and a Saturday afternoon. The responses were analyzed, as well as gender, type of practice, location of practice and if the pediatric is a Diplomate of the American Board of Pediatric Dentistry to determine if there was a correlation. Results: A total of 67 pediatric dental practices in Kentucky were contacted on Wednesday and Saturday. On Wednesday and Saturday, 65% had someone available via phone or an extension, while 35% referred to an emergency department, residency program, no option, or leave a message. The majority of solo and group practices had someone available to speak with. Providers in rural areas referred patients to the emergency department more frequently than those in urban areas. Providers in cities near residency programs were found to refer to the residency program for dental emergencies more often. Conclusion: The majority of private practice pediatric dentists in Kentucky are available for management of after-hour dental urgencies, with the most common type of contact being an after-hours number to call. A small percentage of private practice pediatric dentists in Kentucky refer patients to the emergency department or a residency program for management of after-hour emergencies.

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Poster Presentation Abstracts

#227 Abstract Title: Music Therapy as an Adjunct to Managing Children's Behavior in the Dental Setting: A Pilot Study.

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Abstract: Live music therapy has been shown to be effective in reducing anxiety and improving behavior during health care procedures. Music interventions conducted by board-certified music therapists have potential benefits for improving children's behavior in the dental setting. However, no studies have been conducted regarding the effectiveness of live music therapy in dentistry. The purpose of this study was to determine if procedural support music therapy by a music therapist prior to and during dental restorative treatment could reduce anxiety in children and improve their cooperation. Twelve children, age 4-6, with high anxiety as identified by parents, were enrolled in the research and randomly assigned to either the experimental or control group. All children were provided restorative care, including the administration of anesthesia, placement of a rubber dam, and the completion of a restoration. The children in the experimental group experienced a standard live music therapy regimen performed by a board-certified music therapist for 15 minutes before initiating treatment, and then throughout the restorative procedure. Three songs with specific dental themes were created by the music therapist, with the theme of each song corresponding to the following aspects of the dental treatment, and performed while this procedure was occurring: anesthesia, rubber dam placement, and use of the handpiece. Both groups were digitally video recorded, with the videos independently analyzed by two trained observers using the methodology of Allard and Stokes. Initial data suggest that live music therapy can have a calming effect on the child, reducing anxiety and improving cooperation.

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College of Dentistry Research Day

Poster Presentation Abstracts

#228 Abstract Title: Predicting Outcomes of Open Joint TMJ Surgery

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Abstract: Introduction: Temporomandibular joint disorder (TMD) is recognized as the most common non-odontogenic related chronic orofacial pain condition encountered by dentists and other health professionals. Its been reported that over 50% of the population exhibits symptoms of TMD and up to 30% are in need of stomatognathic treatment. Some patients fail to improve with open joint Temporomandibular Joint (TMJ) surgery, indicating that an alternate procedure may have been more suitable. To our knowledge, there is currently no set of criterion that can be used to predict an unsuccessful outcome of open joint TMJ surgery. Methods: A retrospective chart review was conducted for patients who underwent open joint TMJ surgery at the University of Kentucky. Characteristics of patients and their outcomes following open joint TMJ surgery were analyzed to identify associations with an unsuccessful outcome. Analyses were conducted in SAS V9.3 using generalized estimating equations (GEE). Results: There were a total of 64 outcome observations, 56 (87.5%) of which had a success and 8 were failures. Overall, ignoring any predictors, the probability of a success was estimated to be 0.875 [95% CI: (0.786, 0.965)]. No significant associations were provided between individual factors and an unsuccessful outcome. Conclusion: None of the variables, by themselves, are highly predictive of an unsuccessful outcome. Further research is needed to help identify individual factors as well multiple factors combined that will predict which patients will not benefit from open joint surgery so that future patients selected for these procedures will have higher success rates.

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College of Dentistry Research Day Poster Presentation Abstracts

#229 Abstract Title: Xenogenic Collagen Matrix to Increase the Zone of Keratinized Mucosa Around Implants

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Abstract: With the advent of dental implants, the structure and function of the mucosa that surrounds them has been extensively examined. Similar to the findings around teeth, the presence or absence of adequate keratinized or attached mucosa around dental implants is an area of controversy. Some evidence suggests that lack of keratinized mucosa did not compromise the maintenance of peri-implant soft and hard tissue health as long as good oral hygiene is maintained, many clinicians believe that creation of keratinized peri-implant tissue of sufficient width and thickness is a desirable therapeutic goal to avoid tissue recession around the implant. Different mucogingival surgical procedures have been developed for creating or widening the keratinized tissue around teeth and implants. The epithelialized free gingival graft harvested from the patient's palate is one of the most commonly used techniques to create or widen the band of attached gingiva or attached mucosa around teeth and implants. To overcome the drawback of patient morbidity associated with two surgical sites, a new collagen matrix xenograft (Mucograft®) has been approved for clinical use. The study was a split mouth longitudinal clinical study that compared the Mucograft® collagen matrix to the free gingival autograft around dental implants. Thirty subjects who had two contralateral implants were recruited from the clinics of the University of Kentucky College of Dentistry. The width of keratinized gingiva and attached mucosa on the facial aspect of the two implants was measured. The subjects returned for the surgical procedure and follow up examinations at 1 and 2 weeks and 1, 3, and 6 months. The clinical results demonstrated that the free gingival graft added an average of 3.73 mm of keratinized tissue, and the Mucograft added an average of 3.23 mm of keratinized tissue. Seventy percent (70%) of the subjects experienced some degree of post-operative pain with the free gingival grafts, while fifty percent (50%) of the subjects experienced some degree of post-operative pain with the Mucografts. The cosmetic results seemed to favor the Mucograft because the tissues blended with the surrounding tissues better than the free gingival graft. As with any cosmetic dental parameter, the site and the patient's specific smile line need to be considered when choosing between a free gingival graft and a xenograft such as the Mucograft.

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#230 Abstract Title: Effects of ageing and periodontitis on bone-related gene expressions in oral mucosal tissues in nonhuman primates

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Abstract: Osteoclastic activity plays a vital role in bone remodeling during orthodontic treatment. Potential variations in the expression of bone-related molecules in the oral tissues related with ageing remain unclear. A systems biology approach to determine age-related changes in bone gene expression profiles in gingival tissues in naturally-occurring periodontitis was previously performed. The study included 24 healthy non-human primates (*M. mulatta*) grouped as adult (n=7), aged (n=6) and periodontitis: adult (n=5) and aged (n=6). Unilateral interdental papilla between 2nd premolar/ 1st molar from maxilla or mandible were obtained and subjected to RNA extraction and further microarray analysis using Gene Chip Rhesus Macaque Genome Array (Affymetrix). In an ongoing study, the gene expressions involved in osteoclast/osteoblast proliferation, adhesion, and function were evaluated. The healthy and periodontitis tissues were compared across and between the age groups using a t-test and accepting a p-value <0.05 for significance. Heat maps were prepared to show the biological variability among samples and are plotted against the mean expression levels of the healthy group. Substantial up-regulation (>1.5-fold) was noted in periodontitis with CASP9, FOS, DC-STAMP, IL-17A, IL-1b, IL-6, IL-20, MMP1, MMP9 and SPP1. QPCR was performed on representative genes (CASP9, FOS, IL17A, MMP9 and SPP1) to validate microarray data. All the above five genes had expression profiles consistent with that of microarray-based measurements. In addition, immunohistochemical analysis was performed on representative tissue sections from the above groups to verify Osteopontin (SPP1) at protein level, to further validate microarray and QPCR data. Elevated expression of Osteopontin was consistent with lesions of chronic periodontitis and the host tissue reaction creating an inflammatory environment. While various genes related to up-regulation of osteoclast functions were observed in healthy gingival tissues with ageing, the profile of numerous genes that mitigate osteoclast functions or enhance osteoblast activities was also found in healthy tissues. These observations give a broad picture of local inflammation triggered bone and connective destruction in periodontitis, which transitions from a disease of typical bacterial etiology to a pathognomonic of a complex condition with osteoimmunological origins.

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College of Dentistry Research Day

Poster Presentation Abstracts

#231 Abstract Title: **Rapid Assessment of Periodontal Disease using Salivary MMP-8 in a Lateral Flow Chromatography Device**

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Abstract: Objective: The objective of this research was to determine if saliva can be used in a point-of-care immunoflow device (POCID) for distinguishing periodontal disease from health. Methods: An oral rinse and expectorated saliva sample collected from 31 participants who had clinical measures consistent with periodontal disease and 10 participants who were periodontally healthy were analyzed for matrix metalloproteinase (MMP)-8 concentration by Luminex and POCID. Two examiners assessed the POCID results optically and then visually. Data were analyzed by Pearson correlation and receiver operator characteristics. Results: The mean concentration of MMP-8 in the rinse was 4.54x greater in the periodontal disease group than the healthy samples, and 3.26x greater in saliva as determined by Luminex. Overall the correlation performance of saliva in the POCID with Luminex was excellent, with the best correlation observed at the 1:5 dilution ($r=0.93$). An optical cutpoint readout of 34-39 for rinse dilutions from the POCID demonstrated a range of sensitivities (0.7-0.9) and specificities (0.5-0.71), with the 1:4 dilution providing the best results (sensitivity 0.9; specificity 0.65; $p = 0.16$). Saliva dilution samples demonstrated an optical cutpoint readout of 53-58, which yielded a sensitivity (0.7-0.8), and specificity (0.54-0.7), with the saliva at a 1:5 dilution providing the best results ($p = 0.0046$). The visual evaluations by both examiners produced similar results with similar cutpoints of 2 (scale 0 to 8) for saliva, and similar sensitivity 0.9 and specificity 0.65 for identifying periodontal disease participants at a salivary dilution of 1:5 ($p=0.01$). Conclusions: Overall, the performance of the hand-held immunoflow chromatography device was excellent regardless of the use of rinse or saliva. These data help validate the use of salivary biomarkers for distinguishing periodontal disease from health using a rapid POC approach. Supported by Office of the Associate Dean for Research, College of Dentistry, University of Kentucky.

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Poster Presentation Abstracts

#232 Abstract Title: **Skeletal analysis from Computer-Aided Three-Dimensional Simulation and Navigation in Orthognathic Surgery (CASNOS)**

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Abstract: Purpose: Computer-aided craniofacial reconstructions have been developed to allow surgeons to accurately simulate and predict the surgical outcome on complicated 3-D craniofacial structures. We have developed a new computerized method of 3-D simulation and navigation in orthognathic surgery (CASNOS) that not only enables clinicians to plan and simulate the surgical procedures, but also provides a bony "guiding splint" to allow surgeons to precisely position the bony segments into the planned location. Methods: Fifteen adult patients with severe dento-skeletal discrepancies treated with orthodontics, 2-jaw orthognathic surgery were selected. All managed with maxillary LeFort I osteotomy and mandibular bilateral sagittal split osteotomy. Pre-surgical CT scan was carried out 3-week before surgery after orthodontic movement was completed. The surgical simulation and prediction were executed according to our CASNOS protocol. The surgical outcome was assessed by CT scan taken 6 months after surgery. The accuracy of CASNOS was evaluated by comparing the differences between prediction and post-surgical CT data. Results: The post-surgical profile of patients showed significant improvement. The surgical bony movements complied with those of simulation in terms of magnitudes and directions. The outcome demonstrated the satisfactory result, and the means of geographical summation error in this study were within the range of ± 0.589 mm. Conclusions: The CASNOS protocol with pre-designed bony guiding splint in treating craniofacial patients in this study can grant surgeons to precisely manage the complicated skeletal deformities. Our CASNOS technique provides a novel approach for orthodontists and surgeons to accurately remedy the patients with complex craniofacial discrepancies.

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College of Dentistry Research Day

Poster Presentation Abstracts

#233 Abstract Title: **Impact of Smoking on Post-traumatic Stress Disorder Symptomatology in Temporomandibular Disorder Patients with a History of a Significant Traumatic Event**

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Abstract: Aims: To evaluate the interactions between cigarette smoking and post-traumatic stress disorder (PTSD) symptom severity on measures of pain and psychological distress in population of patients diagnosed with a temporomandibular disorder (TMD). Methods: A retrospective database review was conducted of data gathered during initial evaluations of 610 patients who were diagnosed with a TMD and reported a history of a traumatic experience. Average pain intensity was assessed using a visual analog scale (VAS). PTSD symptoms were assessed with the PTSD Checklist—Civilian Version (PCL-C). Measures of anxiety, depression, somatization, global psychological functioning, life interference, life control, affective distress, and general activity were obtained using the Symptom Checklist 90-Revised and the Multidimensional Pain Inventory. Linear regression analyses evaluated main effects of smoking and PCL-C score as predictors of pain and psychological distress. Further regression analysis examined smoking status as a moderator of PCL-C on the same outcome variables. Results: Main effects of smoking and PCL-C were associated with significant increases in measures of pain and psychological distress. However, the interaction of PCL score and smoking was not statistically significant regarding all variables except one: smoking had a statistically significant effect in attenuating the impact of increasing total PCL-C score on affective distress. Conclusion: The lack of significant interactions between smoking and PCL-C may reflect a ceiling effect due to the already-high levels of pain and anxiety experienced by smokers.

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#235 Abstract Title: Comparison of Traditional Histomorphometry to 3D Superimpositions from in vivo μ CT Imaging

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Abstract: Objective: The aim of this study was to compare the accuracy of 3D superimpositions from μ CT images to measurements of bone modeling obtained via traditional histomorphometry. Methods: 3D reconstructions of the maxillae of adult rice rats were obtained as follows: Raw binary files from the μ CT (Siemens Inveon Preclinical μ CT, Knoxville, TN) imaging were imported into Image J and regions of interest were defined. The raw binary files from the two imaging time points were segmented and surface models were built by ITK-SNAP. The voxelbase registrations were obtained and the changes in bone morphology between the two time points in the registered superimpositions were visualized using graded (each 0.05 mm) assigned color maps with 3D Slicer. The digital superimpositions were compared to histomorphometric sections in which two pairs of (alizarin and calcein) fluorescent labels marked the sites of bone formation between the two time points. Undecalcified sections of 12 rats were examined, with 6-8 observations/animal with a total of 84 observations. Sites of bone modeling or bone arrest close to the alveolar crest were quantified in the histological section using Bioquant (Nashville, TN) imaging software. The exact same area in the 3D reconstruction was examined for bone formation or areas of arrest from the quantitative color maps. The agreement (difference in measurements) between methods was categorized as follows: poor ($>150\mu\text{m}$), average/good ($100\text{-}150\mu\text{m}$), or excellent ($50\text{-}100\mu\text{m}$). The paired measurement from the histological sections and 3D color maps were statistically analyzed using generalized estimating equations. Results: Out of 84 observations, 3 were categorized as poor (3.6%), 12 were average/good (14.3%), and 69 were excellent (82.1%). The estimated probability of having an excellent agreement was 0.824 [95% CI: (0.700, 0.948)]. Conclusion: Understanding bone adaptation in 3D will overcome one of the most critical limitations of analyzing 2D bone sections. Validation of this novel method for quantifying bone surface modeling in animals has allowed for accurate 3D morphological visualization of changes associated with growth and drug interventions.

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College of Dentistry Research Day

Poster Presentation Abstracts

#236 Abstract Title: Periodontal Therapy and Preeclampsia: Clinical, Serum, and Microbiologic Effects.

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Abstract: Objective: Observation studies have identified a relationship between periodontitis and adverse pregnancy outcomes. This investigation examined the effects of periodontal therapy, provided as part of the Obstetrics and Periodontal Therapy Study-(OPT), on clinical, serum, and microbiologic measures in pregnant women who later developed preeclampsia (cases) compared to those who did not (controls). Methods: A nested-case control study with 52 cases and 104 controls were matched on age, race, recruitment center, and study treatment [scaling and root planing (SRP) + oral home care instructions (OHI) vs OHI alone]. Descriptive statistics were obtained for each of four groups (cases±treatment, controls±treatment) for clinical, serum, and microbiologic measures. Bleeding on probing (BOP), probing depth (PD), plaque index (PI), gingival index (GI) and clinical attachment loss (CAL); serum: CRP, IL-1 β , IL-6, IL-8, PGE2, TNF- α , MMP-9, endotoxin, fibrinogen and antibodies to seven bacterial species; and microbiologic: individual bacterial counts, total bacterial count, and percent of total DNA for 7 bacterial species were evaluated. Results: All clinical measures were statistically significantly different (PD, P<0.0025; BOP, P<0.0001) between baseline and end of study for those receiving SRP compared to OHI. Statistically significant differences (P<0.05) were seen for bacterial counts of Pg, Tf, Pi, sum of the seven bacteria and total DNA for SRP vs OHI, however, no differences were observed for serum measures between treatment groups. Serological measures only differed for cases/controls during the study for CRP (P<0.0356) for start vs P<0.0327 for end of study but no differential trend related to treatment provided. Conclusions: Treatment with SRP showed significant reductions in clinical and microbiologic variables compared to OHI, but there were no trends in differences in the biologic variables between preeclampsia cases and controls.

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College of Dentistry Research Day Poster Presentation Abstracts

#237 Abstract Title: Immediate Loading of Unsplinted Implant Retained Mandibular Overdenture: A Randomized Controlled Pilot Clinical Study

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Abstract: Background: Early and delayed loading protocols for implant retained mandibular complete overdenture (IOD) showed equivalent survival rates; 98% and 97% for delayed and early loading, respectively. However, there is lack of comparative studies on immediately loaded of unsplinted IOD. Purpose: This study aimed to compare the implant success rate and peri-implant tissue response between immediate loading protocol and delay loading protocol for unsplinted IOD. Materials and Methods: Twenty completely edentulous patients were enrolled. 10 patients received 20 implants and immediately loaded in test group and 10 patients received 20 implants and conventionally loaded in the control group. Implants were placed at the mandibular canine positions. Locator™ abutments were torqued to 20 Ncm. Attachments were picked up intra-orally and light retention inserts were placed. Results: Implant success rate after one year follow up was %100 in both groups. Overall marginal bone level change was $-0.5\text{mm} \pm 0.27\text{mm}$ for test group and $-0.6\text{mm} \pm 0.44\text{mm}$ for control group. Attached gingiva change was $-0.5\text{mm} \pm 1.3\text{mm}$ for test group and $-0.5\text{mm} \pm 0.7\text{mm}$ for control group. Osstell® value for test group was increased by $+1.38\text{ISQ} \pm 5.57\text{ISQ}$ and for control group was increased by $+15.25\text{ISQ} \pm 0.35\text{ISQ}$. Gingival index was higher in control group than test group with 0.5 ± 0.58 . Plaque index was higher in test group than control group with 0.88 ± 0.35 . No statistically significant difference between groups ($p > .05$). Conclusion: The preliminary results of this study indicated that immediate loading protocol for unsplinted IOD is as successful as delayed loading protocol with similar periimplant tissue responses after one year of implant loading.

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College of Dentistry Research Day Poster Presentation Abstracts

#238 Abstract Title: Table Clinic on Accelerated Osteogenic Orthodontics

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Abstract: Accelerated orthodontic tooth movement is an area of interest in the current literature. Decreasing time in treatment would decrease the risks of orthodontic treatment such as root resorption and decalcification. One method of achieving a shorter treatment time involves reflecting a gingival flap and performing small corticotomies in the areas where increased rate of tooth movement is wanted. The mechanism behind this process, called accelerated osteogenic orthodontics (AOO), has been the focus of recent research. The biological mechanism underlying AOO is the regional acceleratory phenomenon (RAP); an increase in bone turnover (remodeling), and transient osteopenia secondary to the healing process following injury to bone cortices. The extent of bone area included in the corticotomy procedure varies, with the classic procedure including both buccal and lingual cortices. Recently a more conservative approach to increasing the rapidity of tooth movement has been proposed. Using small incisions with a piezoelectric knife, very minimal soft tissue damage can be caused with similar cortical results. In addition to shortening average treatment time, the use of alveolar bone augmentation in conjunction with corticotomy has been utilized to theoretically improve stability, while even expanding the envelope of possible tooth movement.

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College of Dentistry Research Day Poster Presentation Abstracts

#239 Abstract Title: In vitro evaluation of osteoblast responses to carbon nanotube-coated titanium surfaces

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Abstract: We are evaluating osteoblast response to multiwalled carbon nanotube coated titanium discs with (MWCNT-COOH) & without (MWCNT) active carboxylated groups for their biocompatibility & use in temporary anchorage devices (TADs). Surface characteristics of MWCNT, MWCNT-COOH and uncoated Ti discs (control) were evaluated using scanning electron microscopy & roughness average (Ra) using surface profilometer. MC3T3-E1 mouse pre-osteoblastic cells were cultured for 48 hours. Hoechst assay was used to calculate DNA synthesis as a measure of cell proliferation. Alkaline phosphatase activity was measured after days 7 & 14 to evaluate osteoblast cell differentiation. Alizarin Red staining was used to evaluate matrix mineralization on cells cultured after 28 days. SEM observation of coated Ti discs showed uniform coating of MWCNTs & MWCNT-COOH. The Ra of 0.83 μm for both coated groups was significantly different ($P < 0.05$) from Ra of 0.15 μm for uncoated. SEM observation showed better cell adhesion in coated groups due to increased surface roughness. After day 3 of cell culture, DNA measurement using Hoechst assay showed higher cell proliferation on uncoated Ti group followed by MWCNT-COOH group, MWCNT group and cell culture plastic group. At day 7 & 14, cell differentiation (ALP assay) was highest in MWCNT-COOH group followed by MWCNT, Plastic and Uncoated Ti group. Matrix mineralization (Alizarin Red assay) was highest in the MWCNT-COOH group, followed by MWCNT, Plastic and Uncoated Ti groups.

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College of Dentistry Research Day

Poster Presentation Abstracts

#240 Abstract Title: Screw Diameter and Orthodontic Loading Influence Adjacent Bone Response

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Abstract: **OBJECTIVES:** To evaluate the effect of screw diameter and orthodontic loading on implant-adjacent bone turnover. **METHODS:** 1.6, 2, 3 & 3.75mm implants (n=62) were placed in beagles following premolar extraction and healing. Implants on one side were loaded (2N) via coil springs. Epifluorescent bone labels were given IV prior to implant placement and sacrifice 90 days later. Bone-implant sections were prepared using undecalcified methods. Bone formation rate (BFR) and other variables were assessed using microscopic imaging software blinded to orthodontic loading. **RESULTS:** Bone remodeling (BFR) was significantly lower for bone adjacent to the 1.6mm diameter screws compared to bone adjacent to the 2.0, 3.0, and 3.75mm diameter screws ($p<.05$). BFR was significantly 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, regardless of loading condition, between the 2.0, 3.0, and 3.75mm diameter screws. BFR was significantly greater in the mandible than the maxilla ($p<.01$) and significantly greater in bone within 1mm of the implant interface compared to 1-3mm from the interface ($p<.0001$). **DISCUSSION:** 1.6mm diameter screws demonstrated significantly lower bone turnover in the implant-adjacent bone. Orthodontic loading of 2N did not affect bone remodeling near screws 2.0mm diameter or larger, but did decrease bone remodeling adjacent to the 1.6mm screws. 2.0mm diameter or larger machined screws can be used at extraalveolar locations without osseointegration in the short term period required for orthodontic anchorage.

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College of Dentistry Research Day

Poster Presentation Abstracts

#241 Abstract Title: **Comparison of Skeletal Classification, Facial Convexity, BMI, AHI, and Genetic Variants Among Sleep Apnea Patients**

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Abstract: Objectives: The purpose was to determine whether facial profile (skeletal classification) correlated with Apnea-Hypopnea-Index (AHI) and/or Body-Mass-Index (BMI) of patients with Obstructive-Sleep-Apnea (OSA). We also determined whether the Single-Nucleotide-Polymorphism (SNP) rs1800629 in the TNF α -gene-promoter-region was associated with profile classification among OSA patients. Methods: One-hundred forty-nine Caucasian subjects (99 males, 50 females) with moderate-to-severe OSA (AHI > 15) were recruited, and underwent intraoral/extraoral exam to evaluate facial profile/skeletal classification. A lateral photograph was taken for soft tissue profile analysis. BMI, AHI, and a saliva sample were collected. Genomic-DNA was isolated from saliva and genotyped for rs1800629 utilizing Taqman®-based methodology. ANOVA, T-tests, X2 tests, and logistic regression (LR) were used to analyze the data. Results: The average age+std error of all participants was 55.6+1.1 years, with no difference (LR, p=0.7) in age based on skeletal classification. AHI was not different when comparing Class-I, II and III cases (ANOVA, p=0.25) or Class-II versus Class-I+III cases (T-test, p=0.12; LR, p=0.14). In contrast, BMI was significantly different when comparing Class-I, II and III cases (ANOVA, p=0.001) or Class-II versus Class-I+III cases (T-test, p=0.0003; LR=0.0002). Of the Class-II cases, 18% had a normal BMI compared to 2% of the Class-I+III cases (X2, p=0.006). No associations were identified with rs1800629 genotypes when comparing Class-I, -II and -III cases (X2, p=0.2) or Class-II versus Class-I+III cases (X2 and LR, p=0.8). Conclusions: Class-II profile OSA patients are more likely to have a lower BMI than non-Class-II subjects. Class-II profile may be a contributing factor for OSA independent of BMI.

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College of Dentistry Research Day

Poster Presentation Abstracts

#242 Abstract Title: Chronic Trigeminal Pain Induces pERK Expression in the Spinal Cord

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Abstract: Trigeminal neuropathic pain is a chronic condition described by patients as excruciating, burning pain. There was no animal model to study the underlying mechanisms of the hypersensitivity reported by patients. We have developed a model to study central changes following chronic trigeminal inflammatory compression (TIC) injury to the infraorbital branch of the trigeminal nerve that induces long-term sensitization. In our model, we have determined that the mice with TIC also have wide-spread hypersensitivity not only on the face but also on the hindpaw. Three weeks after induction of the chronic pain model, mice were euthanized and aldehyde fixed. It has been demonstrated in other experiments that phosphorylated extracellular signal-regulated kinase (pERK) is evident in the spinal cord or spinal trigeminal nucleus following acute noxious stimuli. There has been no report of non-evoked pERK expression in chronic pain. Spinal segments L4-L5 and the medullary dorsal horn were immunostained for pERK and staining density quantified. In our experiment, we found increased levels of pERK throughout the spinal cord and medullary dorsal horn indicating widespread cellular activation at those sites.

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Poster Presentation Abstracts

#243 Abstract Title: **Fatigue Mediates the Effect of Sleep Disturbances on Life Interference in Patients with Continuous Neuropathic Orofacial Pain**

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Abstract: Aim of Investigation: Sleep disturbances (SD) and life interference (LI) are not only prevalent complaints in orofacial pain patients but have proven to be related. Poor sleep quality has been linked with higher fatigue levels and greater pain intensity in orofacial pain patients. Whether fatigue or pain intensity mediate the effect of SD on LI has not yet been tested. The purpose of this study was to test these relationships. Methods: Cross-sectional and retrospective study of 484 consecutive patients diagnosed with continuous neuropathic orofacial pain completed a self-reported battery of questionnaires. These included the Multidimensional Fatigue Symptom Inventory, the Multidimensional Pain Inventory, and the Pittsburg Sleep Quality Index. We tested mediation models where SD (independent variable) affected LI (dependent variable) through fatigue or pain intensity (mediators). Results: After testing mediations, results indicated that fatigue completely mediated the relationship between SD and LI (Total R²=0.2770, β =0.5739, t [481] =0.4855, P < .6275) in continuous neuropathic orofacial pain patients. Pain intensity did not mediate the relationship between SD and LI (Total R²=0.2747, β =4.1257, t [469] =3.7913, P < .0002). Fatigue findings remained significant after controlling for gender and pain intensity. Conclusions: The results of this study highlight the importance of assessing for fatigue symptoms in continuous neuropathic pain patients; along with target early psychosocial interventions directed not only to improve sleep but also to reduce fatigue; in order to decrease life interference in this patient population. Acknowledgements and/or Funding Source: None

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Poster Presentation Abstracts

#244 Abstract Title: Upper Airway Computed Tomograph Findings Associated With Sleep Apnea

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Abstract: Objectives: The aim of this study was to determine whether alterations in anatomical structures and/or function of upper airway are present in patients with Obstructive or Central Sleep Apnea. Methods: Upper airway computed tomography (UACT) and polysomnography were performed on 370 adult individuals from Bogotá (Colombia). Informed consent was obtained from all individuals according to a protocol approved by the Ethical Committee of faculty of Medicine of Pontificia Universidad Javeriana and Hospital Universitario San Ignacio. Individuals were divided into three groups following polysomnography: non-apneic control group (112 individuals; apnea-hypopnea index (AHI)<5 events/hr), Obstructive Sleep Apnea (OSA) group (215-individuals; AHI≥15 events/hr) and Central Sleep Apnea (CSA) group (43-individuals; AHI≥15 events/hr). The structures evaluated by UACT included: airway length, laryngopharynx length, mandibular plane to hyoid distance, uvula size, uvula morphology, minimum lateral dimension of the retroglossal airway, retropalatal anteroposterior/lateral dimension, retroglossal anteroposterior/lateral dimension and ANB angle. To adequately evaluate airway function, all UACT measurements were taken in individuals during sleep and wakefulness. Associations between Sleep Apnea and alterations in upper airway structure and/or function were analyzed by Chi-square test. Results: Both OSA and CSA showed statistically significant associations with septum deviation ($p=0.026$), uvula size ($p=0.03$), uvula morphology ($p=0.032$), mandibular plane to hyoid distance ($p=0.06$) and ANB angle (Class I associated to OSA, $p=0.023$). The comparison of minimum lateral dimension of the retroglossal airway, retropalatal anteroposterior/lateral dimension and retroglossal anteroposterior/lateral dimension did not show statistically significant differences when were compared during sleep and wakefulness. Conclusions: Our results suggest that airway anatomy/collapsibility is associated to sleep apnea in adults and these alterations can be identified using these UACT measurements.

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Poster Presentation Abstracts

#245 Abstract Title: **Progress Report: Co-Factors and Genetic Markers Influencing the Dual Occurrence of Ovarian Cancer and Dental Agenesis**

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Abstract: Objective: Our team has been studying genetic connections between cancer and dental agenesis. We are actively recruiting unrelated Caucasian women diagnosed with ovarian cancer (OvCA) or cancer-free controls. This report begins to describe the age, residence location, and personal/family history information for various parameters. In addition, the genetic marker rs2877098, within the Inhibin- α (INHBA) gene, was studied for potential association with OvCA. Methods: This study was approved by the UK IRB (#11-0499-F6A). To date, 31 women diagnosed with OvCA have been enrolled in the UK Gynecologic/Oncology clinic and 76 cancer-free women in the UK Ovarian Cancer Screening Clinic. Dental and family history information has been/is being gathered via an oral examination, a patient-completed questionnaire, and dental/medical records. DNA was isolated from patient saliva using Oragene-DNA collection kits and rs2877098 was genotyped using Taqman[®]-methodology. Statistics were completed using JMP Software. Results: Data summaries thus far suggest the OvCA population was significantly younger than the controls ($p=0.007$). Controls live within a larger radius around of Lexington than the cases. No significant differences were observed in tabulated data for family histories of either OvCA or dental agenesis, as well as for a personal history of dental agenesis. The genotypic-distribution of rs2877098 showed a borderline significant trend for TT to be associated with OvCA more than CT&CC ($p=0.0568$). Conclusions: As the cohort is enlarged, the subjects will analyzed based on their cancer and tooth agenesis status with various genetic markers. If tooth agenesis markers can be identified that are linked to cancer, these markers could be used to better predict OvCA risk in women with agenic teeth early in life.

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