



Congratulations to the Indiana University School of Dentistry students on their Research Day presentations.

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IUSD RESEARCH DAY PROCEEDINGS

VOLUME 29 APRIL 12, 2021

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The adaptation of the work environment over the past year has been nearly unprecedented. Even though it has been difficult, we as a university, as a team, have adapted and beautiful things have come from it. This cover has been created to honor the magic that we have created in our homes and sent out into the world.

Cover design, layout and Student Research Group photo by Nicole Alderson. Research Day proceedings monograph prepared by Keli Seering.

ABOUT OUR KEYNOTE SPEAKER DR. MARCELO ARAUJO



Dr. Marcelo Araujo is ADA Chief Science Officer and Chief Executive Officer of the ADA Science & Research Institute, Dr. Araujo provides strategic leadership and oversight for the management of the ADA's research subsidiary (ADASRI), develops collaborative opportunities for key scientific initiative, and is responsible for the scientific strategic plan for the ADA, including Council on Scientific Affairs activities and clinical excellence strategy. Dr. Araujo received his Doctor of Dental Surgery and earned a Certificate in Periodontology at Universidade Gama Filho in Rio de Janeiro, Brazil. He received his PhD in Epidemiology and Community Health and Master of Sciences in Oral Sciences from State University of New York at Buffalo, where he also completed a fellowship in Periodontology research and teaching.

ADA Science & Research Institute: The use of scientific strategy to support health policy and clinical practice

Dentists in the United States rely on scientific evidence based information to make informed decisions when treating their patients. In addition, today more than ever, science must be evaluated and used to support new and existing health policies. The ADASRI mission "Improving Lives through Oral Health, Science and Research" defines both patients and clinicians as costumers of the institute's research and helps create focus on evidence based as a core value for the ADA. The objective of this presentation is to provide a broad idea of the work done by the American Dental Association Science & Research Institute (ADASRI,LLC) in different areas of dental and oral health research, including:

- Progress on basic research, including microbiology and dental materials research
- Process of guidance to dental professionals when dealing with scientific information
- Development and dissemination of research and science to support policy in Dentistry
- Focus on the ADADRI efforts on dental materials research and public health (HPV vaccination and COVID-19 pandemic).

The presentation should assist dental researchers in academia on the development of new ideas and hypothesis that can have immediate applicability in clinical practice, public health and patient community.



SCHOOL OF DENTISTRY

OFFICE OF THE DEAN Indiana University Indianapolis

April 12, 2021

Indiana University School of Dentistry Colleagues and Friends:

Welcome to the 29th Annual Indiana University School of Dentistry (IUSD) Research Day!

We are most proud of our longstanding traditions of excellence in research and discovery, the foundation of the dental profession. The search for truth and new knowledge is at the heart of our mission to improve the oral health of the people of the state of Indiana and around the world through excellence in education, patient care, research, and community engagement. Participating in research and other forms of scholarship enhances the education of our students by exposing them to the thrill of discovery of new knowledge and providing opportunities for them to disseminate this knowledge through presentations and publications. For most, it will deepen their understanding of the science foundation of dentistry and enrich their clinical practice. For others, it will ignite a passion for another career path – to impact the world through dental research.

I am very proud of all of our student investigators and their faculty research mentors who are presenting their work today. Our annual Research Day is the day we showcase their science, appreciate the breadth of our work and its impact, and celebrate our investigators for their accomplishments and contributions to advance oral health through excellence in research.

This year we are pleased to offer a hybrid event, with virtual programming as well as in-person poster viewing throughout the School, in accordance with current social distancing policies. Amazing progress has been made in the fight against the COVID-19 pandemic – our knowledge of the SARS-CoV-2 virus; the disease it causes, COVID-19; its treatment, and modes of transmission; rapid and accurate tests; and highly efficacious vaccines are all the results of transformational, collaborative research that started decades ago and culminated over the past year. However, we have not yet won the race to herd immunity and mitigation of new variants of this virus, with sustained flattening of the curve. Therefore, our traditional Research Day "in-person" event will need to wait until next year as we comply with recommendations from the Centers for Disease Control and Prevention, the Indiana State Department of Health, and Indiana University. Science will lead us safely out of this pandemic and prepare us for the next one.

I want to thank the Research Day planning committee and the Indiana section of the American Association for Dental Research for producing today's event. I also want to give special thanks to our generous event sponsors.

Enjoy!

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Carol Anne Murdoch-Kinch, DDS, PhD Dean



March 26, 2021

Dear Research Day Attendees,

On behalf of the Organizing Committee and the Indiana Section of the American Association for Dental Research (IN-AADR), Taylor Dietl and I would like to welcome you to the Indiana University School of Dentistry (IUSD) 29th Annual Research Day.

The Indiana Section is the regional link to the national (AADR) and the international (IADR) associations for dental research. The primary objective of the IN-AADR is to promote and advance basic and clinical research in all areas of the dental sciences, including the oral cavity, its adjacent structures, and the relationship to the body as a whole. Together, by utilization of this knowledge, we hope to advance dental science by developing new and better options for the prevention and treatment of oral diseases, as well as pathologies of the head and neck. Furthermore, these activities intended to foster better communication and cooperation among professionals – from bench researchers to clinicians – in order to share this knowledge for the benefit of all.

Within IUSD, the IN-AADR sponsors or co-sponsors invited speakers from all dental disciplines, in addition to coordinating events for the annual Research Day. By itself, Research Day offers an opportunity for investigators to present and highlight advances in basic and clinical dental research at IUSD both to their peers and in a public forum. Furthermore, Research Day offers a chance for attendees to interact with faculty and student investigators in addition to various sponsors and vendors.

Currently, with the vaccine and advance treatments, it seems like we might see a promising hope to conquer the COVID-19 pandemic. However, as Dr. Anthony Fauci, NIAID director, said "we still have a ways to go,... before we can celebrate our victory over this pandemic". IUSD research day planning committee realized and fully put the health of the students, faculty, and staff at the highest priority along with the importance of oral health research.

For 2021, IUSD research day will be held in a hybrid format. The research posters will be displayed throughout the dental school for weeks. By using the smartphone, when scan the QR code on the poster, a short-prerecorded presentation of the project will be displayed on the smart phone. This allows the audience to experience the poster presentation from the owner of the project with the social distancing concept. For the livevirtual session, our guest speaker is Dr. Marcelo Araujo, ADA chief science officer, will present the topic of "The use of scientific strategy to support health policy and clinical practice"

With that, Taylor and I would like to thank all members of the Research Day Committee for their hard work and efforts toward this annual tradition at IUSD. Furthermore, we would also like to thank those who participated in the judging of research. Finally, we want to thank all of you who are attending IUSD Research Day and encourage you to review the research being conducted by your fellow peers and colleagues.

Sincerely yours,

Kamolphob Phasuk, DDS, MS President, Indiana Section of AADR.

Taylor Dietl President, IUSD Student Research Group.

Research Day Organizing Committee

Nicole Alderson Angela Bruzzaniti **Tien-Min Gabriel Chu Taylor Dietl** Simone Duarte Roxana Fuentes Richard Gregory Yusuke Hamada Lisa Maxwell Sheryl McGinnis Dean Carol A. Murdoch-Kinch Drashty Mody Kamolphob Phasuk, Chair Keli Seering Sabrina Feitosa Sochacki Mythily Srinivasan Yasuyoshi Ueki Terry Wilson Jr.

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President: Kamolphob Phasuk Vice President: Simone Duarte Secretary/Treasurer: Sabrina Sochacki Councilor: Anderson Hara Chair Research Award Judging Committee: Yusuke Hamada Chair Staff Award Judging Committee: Yusuke Hamada

Officers IUSD Student Research Group

President: Taylor L. Dietl Vice President: Drashty P. Mody Secretary/Treasurer: Niki Gheibi Dehnashi Newsletter Editor: William D. Castedo Faculty Adviser: Angela Bruzzaniti

Recognizing Excellence 2021 Awards

Dental Hygiene

Elizabeth A. Hughes Dental Hygiene Case Report Award

Undergraduate Students

IN-AADR Undergraduate Student Award

Predoctoral Dental Students

AADR Dentsply Sirona Student Competition for Advancing Dental Research and its Application

AADR Student Research Day Award

Cyril S. Carr Research Scholarship

Dean's Award for Research Excellence

IDA Student Research Award

IN-AADR Predoctoral Case Report Award

King Saud University Travel Award for Excellence in Preventive Oral Health Care

Research Honors Program Certificate of Achievement

Graduate Dental Students

Delta Dental Award for Innovation in Oral Care Research

King Saud University PhD Student Travel Award

King Saud University Travel Award for Best Clinical Case Report

Maynard K. Hine Award for Excellence in Dental Research

Staff

IN-AADR Research Staff Award

Faculty

IU School of Dentistry Alumni Association Distinguished Faculty Award for Teaching

IU School of Dentistry Alumni Association Distinguished Faculty Award for Research

King Saud University Distinguished Research Faculty Travel Award

Poster Presentations

DENTAL EDUCATION

P1 Self-Reported Physical Wellness Habits of Indiana University Dental Students. G. ZAKHAR*, C. JOHNSON, L. ROMITO (Indiana University School of Dentistry)

Introduction: Citing the demands of predoctoral education, dental students have described elevated stress levels, a decreased sense of wellness, and a reduction in overall health. Physical wellness includes maintaining optimal body structures and function through healthy food intake, physical activity, sleep health, drinking water, and being able to perform well for daily living. The purpose of this study was to assess the self-reported physical wellness behaviors of dental students (D2-D4), prior to the COVID-19 pandemic, to develop strategies and programs to enhance students' well-being. Methods: During Fall 2020 three dental cohorts (Classes of 2021, 2022, and 2023) were sent an email request to participate in a confidential 35-item electronic (Qualtrics) survey. The email contained study information and a survey link. The survey included 8 demographic items, and 27 items on wellness attitudes and behaviors of which response options were on a 5-point scale (1=Strongly Disagree to 5=Strongly Agree). Results: The response rate was 15% (N=68); 59.5% of respondents were females. The mean age of respondents was 25-29 years. Mean responses were highest for two survey items: Sixty-five students strongly agreed/agreed that dental school had increased their stress level compared to their experiences prior to enrollment (mean 4.69). Further, 73% of students strongly agreed/agreed (mean 4.07) that they met the AHA recommendations for meat and protein consumption. However, 75% of participants strongly disagreed/disagreed (mean 1.93) with the statement, "I exercise more now that I am in dental school." Of respondents, 53% strongly disagreed/disagreed (mean 1.78) with the statement, "I utilize school resources to promote my overall wellness." Conclusion: While dental students reported attainment of some level of nutritional wellness, they also reported increased stress and less exercise since entering the predoctoral program, as well as low utilization of IUSD programs intended to promote student wellness.

P2 Comparing Success Rates of Patient versus Manikin-based Dental Licensure Examinations.

R. BAYLES*, H. WEINGARTEN, A. SINGH, K.T. STEWART (Indiana University School of Dentistry) Background: Many dental schools' clinical licensure examinations were postponed or cancelled due to the COVID-19 pandemic. Because of these changes, the need for a non-patient licensure examination grew, and dental board agencies began instituting a manikin-based examination during the 2020 testing cycle. One of the dental licensure examinations, ADEX, introduced the CompeDont tooth for manikin restorative examinations, which identifies the same deficiencies as the patient-based examinations and requires candidates to recognize caries. Objective: The aim of this retrospective study was to compare the success rates and reasons for failure between patient and manikin-based dental board examinations for the 2020 testing cycle. Materials and Methods: Data was collected from The Commission on Dental Competency Assessments (CDCA) about the ADEX licensure exam and focused on the restorative components of this exam, including Class II and Class III preparations and restorations. Results: The first attempt pass rate of anterior restorative for 2,673 candidates that utilized a patient examination was 94.28%, while the 1,104 candidates who tested with the CompeDont examination had a rate of 94.75%. The first attempt pass rate for posterior restorative for 2,723 patient examination candidates was 94.34%, and the 1,045 candidates who tested with the CompeDont examination showed a pass rate of 93.78%. The most common errors contributing to failure were almost identical for both the anterior and posterior preparation and restoration between patient and manikin-based dental examinations. Conclusion: The data suggest that manikin-based dental licensure examinations are as effective in assessing the clinical abilities of individuals seeking dental licensure.

P3 Faculty Job Satisfaction: Comparison Between Dental and Medical Faculty Members. A. MITCHELL^{*1}, A. GHONEIMA¹, C. KEITH², R. JANIK², G. ECKERT³, K.T. STEWART¹ (¹Indiana University School of Dentistry, ²Indiana University-Purdue University Indianapolis, ³Indiana University School of Medicine)

Objectives: Analyze differences in faculty satisfaction levels between dental and medical faculty members at Indiana University, and identify modifiable factors that could potentially increase faculty retention in academia. Methods: A 47-item survey was administered through Qualtrics® and divided into 7 domains including: general demographic information, overall satisfaction, research satisfaction, leadership and professional development, work environment, distance/virtual learning due to COVID-19, and overall assessment. The survey was disseminated in 2 intervals to dental and medical faculty members throughout Indiana University. Results: The survey was sent to 2,860 dental and medical faculty members. Three hundred forty-three complete responses were received, leading to a response rate of 11.9%. The distributions of faculty respondents were as follows: 243 medical, 57 dental, and 37 categorized as other. Between the 3 groups, there was a statically significant difference in satisfaction with compensation levels (p=0.03). There was also a statistically significant difference in stress levels between the groups, with faculty in the "other" profession category indicating the highest stress levels (p<0.01). Nearly twenty percent of faculty indicated that they are not satisfied with their sense of appreciation at work, with medical faculty indicating higher levels of dissatisfaction compared to dental faculty (p=0.04) When faculty were asked if they would engage in academics again as a career, only sixty-four percent confirmed that they would. In the free response section, faculty identified additional areas of concern, which included lack of faculty, diversity, and time to perform responsibilities. Conclusion: Overall, faculty indicated satisfaction with their current employment opportunities within the university. Areas of potential improvement to increase satisfaction include increasing levels of compensation and improving work environment.

DENTAL EROSION

P4 Optimized Cross-Polarization Optical Coherence Tomographic Assessment of Erosive Tooth Wear. M.J.R.H. ROMERO^{*1}, S.J.C. BEZERRA^{1,2}, D. FRIED³, V. YANG³, F. LIPPERT¹, G.J. ECKERT⁴, D.T. ZERO¹, A.T. HARA^{1 (1}Indiana University School of Dentistry, ²University of São Paulo School of Dentistry, ³University of California San Francisco School of Dentistry, ⁴Indiana University School of Medicine)

Modern lifestyle and diet have led to increased prevalence of erosive tooth wear. Early detection, monitoring as well as prevention-focused strategies must now take priority. Nevertheless, as current diagnostic methods are limited to subjective clinical indices there is a need for quantitative methods with objective outcomes. This study tested cross-polarization optical coherence tomography (CP-OCT) monitoring of erosive tooth wear (ETW) under clinically relevant conditions. Twenty partial denture-wearing participants were enrolled in this 14-day/arm, 3-arm crossover in situ study simulating different ETW severities. Participants received two enamel specimens (per arm) on their denture and were randomized to all three ETW protocols: severe (s-ETW, lemon juice/pH: 2.5), moderate (m-ETW, grapefruit juice/pH: 3.5) and non-ETW (water, control). Enamel thickness was measured using CP-OCT at baseline, 7 and 14 days. CP-OCT analysis was optimized by post-processing CP-OCT central B-scans in MATLAB software and applying a rotating kernel transformation filter. Enamel thickness was also assessed with micro-computed tomography (µ-CT) at day 14. Enamel surface loss was determined with CP-OCT and optical profilometry (OP) after 7 and 14 days. Data were analyzed using an ANOVA model suitable for a 3-arm, 3treatment crossover design and correlation coefficients and scatterplots were used to examine relationships between measurements. CP-OCT showed higher enamel surface loss for day 14 than day 7 for m-ETW (p=0.009) and s-ETW (p=0.040) and differentiated ETW severity at day 14 (s-ETW>non-ETW, p=0.027). OP was able to differentiate surface loss between days (7<14, p<0.001) for m-ETW and s-ETW, and ETW severity effect after 7 and 14 days (non-ETW<m-ETW<s-ETW, p<0.001), validating the ETW simulation model. At day 14, CP-OCT and µ-CT were highly positively correlated (r=0.87). CP-OCT showed limitations differentiating ETW severity but was able to monitor ETW progression between days with strong correlation with µ-CT, indicating its potential as a tool for clinical longitudinal monitoring of ETW. (Supported by the National Institute of Dental and Craniofacial Research of the National Institutes of Health Grant No. R21DE026844)

DENTAL INFORMATICS

P5 Identifying Sjogren's Syndrome Patients Using Matched Electronic Dental-Health Record Data. G.F. GOMEZ^{*1}, D. RAJENDRAN¹, J. PATEL², H.M. BANDARU¹, J.C. SMITH³, G.J. ECKERT⁴, S.J. GRANNIS^{3,4}, S.T. HUGENBERG^{4,5}, S. ZUNT¹, D.T. ZERO¹, T.P. THYVALIKAKATH^{1,3} (¹Indiana University School of Dentistry, ²Temple University College of Public Health, ³Regenstrief Institute, ⁴Indiana University School of Medicine, ⁵Indiana University Health)

Objectives: Dental clinicians rely on patient-reported medical histories and therefore, miss even Siogren's Syndrome (SS), which adversely impacts oral health. We identified dental patients with SS using matched electronic dental record (EDR)- electronic health (EHR) record data. Methods: We gueried matched EDR-EHR data from the Indiana University School of Dentistry and Indiana Health Information Exchange databases between January 1st, 2005 and October 31, 2016 for SS diagnostic codes entered until 2019. Patients with diagnostic codes of head and neck radiation, certain infectious, and inflammatory disorders were excluded. Two clinical experts developed guidelines to classify patients' SS status as confirmed, uncertain and negative through review of clinical notes, laboratory, and diagnostic reports in the EHR. A SS case is positive in the presence of at least one objective finding of a positive anti-SSA/Ro antibodies, lip biopsy, salivary flowrate or ocular tests and a subjective symptom such as dry eyes or mouth, or salivary gland enlargement. Presence of symptoms and absence of anti-SSA test result indicate an uncertain SS case and absence of symptoms and test results positive for SS and/or presence of exclusion criteria in the notes indicate negative SS. Results: Approximately 89% (105.000) of patients had matched EDR-EHR data. Three hundred and seventy-eight patient records had a SS diagnostic code and SS mention in the clinical notes. Sixty-eight cases (18%) were positive; 222 (59%) were negative; and 88 (23%) were uncertain. Only 25% of 378 patients had mention of SS in EDR data. 35% of positive cases, 31% of uncertain and 20% of negative cases in EHR were reported by patients as having SS during dental care. Conclusions: The results indicate the importance of reviewing dental and medical record data to confirm a patient's medical condition. They also highlight the need to confirm a diagnosis using different data sources and not rely on diagnostic codes alone. (NIH/NIDCR grant R21 DE027786-02)

P6 Modeling Approaches of Obtaining Patient Medical Histories: Strengths, Drawbacks. A. RAJAPURI^{*1, 2}, S. LI², G. GOMEZ², E. MENDONCA^{1, 3}, T. THYVALIKAKATH^{1,2} (¹Regenstrief Institute, ²Indiana University School of Dentistry, ³Indiana University School of Medicine)

Objectives: Access to up-to-date patient medical history is essential for dental clinicians (DC's) to avoid potential harm and improve dental treatment outcomes. We modeled DCs current approaches to gather patient medical information, identified their strengths and weaknesses. Modeling breaks down the complexity and transparency of the current processes and delivers further insights. Methods: Information collection and conceptual modeling are the two phases of modeling. We retrieved 54 peer-reviewed PubMed indexed articles published between January 2013 and November 2020 that described DC's medical information gathering approaches, their respective strengths, and drawbacks. We identified two major processes -patient-reported medical histories and optional medical consultations with physicians, and an integrated electronic health record system (IEHR) with a dental module. Next, we built IDEF0 and use case models. The IDEF0 is a modeling method used for analyzing and communicating the functional perspective of a system. Whereas the use case models represent how different users interact with the system. Results: The medical consult process model highlighted the patient's burden of memorizing and recalling their medical and medication history, delaying in executing treatments due to information discrepancies, and the essential face-to-face time lost. The IEHR allows DCs to spend more time reviewing and interacting with patients than gathering information. However, such a system provides patient information which are registered in that system. Conclusions: We modeled dental providers' two major patient medical information gathering processes. Our models demonstrated the gaps and potential delays in the patient-reports and medical consultation process and the advantages and drawbacks of utilizing an IEHR system to obtain an up-to-date patient medical history. Enabling DCs to access medical information via community HIEs can include more patients from multiple healthcare systems than one system. We propose alternate medical information access for DCs via the community health information exchange (HIE) that addresses current approaches' drawbacks.

DENTAL MATERIALS

P7 Modified Dental Adhesive Containing HNT-encapsulated EGCG for Long-Lasting Adhesive-Dentin Interface. S. ALHIJJI*, S.F. SOCHACKI, J.A. PLATT, L.J. WINDSOR (Indiana University School of Dentistry

Resin-dentin interface degradation after restoration placement is multifactorial and can be attributed in part to matrix metalloproteinases (MMPs) and enzymatic activities associated with recurrent and secondary caries progression. This study focuses on characterizing a drug-loaded dental adhesive that may protect resin-dentin junction's integrity using a slow therapeutic compound release. Halloysite nanotubes (HNTs) were added to dental adhesive (3M ESPE, Adper[™] Scotchbond[™] Multi-Purpose) and used as a reservoir to allow sustained release of Epigallocatechin-3-gallate (EGCG). The EGCG compound is one of the most abundant catechins in green tea extracts. It can inhibit MMPs and potentially bacterial growth. Two concentrations of HNT-EGCG or HNT alone (7.5% or 15% w/v) were added to the adhesive to make four HNT containing groups. Two additional adhesive groups were prepared by adding EGCG alone directly to the adhesive in an amount equal to what was successfully loaded in the HNT-containing groups. Drug loading efficiency and release were analyzed by UV-visible spectrophotometer detection. Vickers microhardness and Fourier Transform Infrared Spectroscopy (FTIR) were performed to assess the effect on the curing efficiency. The average loading efficiency was found between 21% w/w (5.9 SD) and 22% w/w (3.3 SD) estimated from analyzing the supernatant after the encapsulation process and re-dissolving 10 mg of HNT-EGCG, respectively. The release of EGCG up to eight weeks of repeated detection indicated that HNT-EGCG groups showed a slower and steadier drug release than the EGCG only groups (p=0.049). The addition of HNT showed an enhanced effect on the VHN, degree of conversion (DC%), and polymerization conversion (PC%) results compared to the EGCG only groups (p<0.05). Simultaneously, no statistically significant difference was found between HNT-containing groups and control adhesive (p>0.05). Therefore, the combination of EGCG and HNT could have a therapeutic potential to improve dentin bonding durability and restoration longevity.

MICROBIOLOGY / IMMUNOLOGY / ORAL BIOLOGY

P8 Effect of Titanium Dioxide on Streptococcus mutans Biofilm. M.K. SANDERS*, S. DUARTE, H.M. AYOUB, A.C. SCULLY, L.A. VINSON, J.A. DEAN, R.L. GREGORY (Indiana University School of Dentistry and Riley Hospital for Children)

Background: Streptococcus mutans (S. mutans) participates in the dental caries process. Titanium dioxide nanoparticles produce reactive oxygen species capable of disrupting bacterial DNA synthesis by creating pores in cell walls and membranes. Objective: The objective of this study was to determine the effect of titanium dioxide on the disruption of S. mutans biofilm. Methods: This study was designed to be conducted in phases involving a titanium dioxide-containing toothbrush and titanium dioxide nanoparticles. Each phase was completed using 24 h established S. mutans biofilm growth. Phase one data was collected through a bacterial plating study, assessing biofilm viability. Biofilm mass was evaluated in phase two of the study by measuring S. mutans biofilm grown on microtiter plates following staining with crystal violet. The third phase of the study involved a generalized oxygen radical assay to determine the relative amount of oxygen radicals released intracellularly. Phase four of the study included the measurement of insoluble glucan/extracellular polysaccharide (EPS) synthesis using a phenolsulfuric acid assay. Results: Both exposure time and time intervals had a significant effect on bacterial viability counts (p=0.0323 and p=0.0014, respectively). Bacterial counts after 6 min of exposure were significantly lower than after 2 min (p=0.034) and the no treatment control (p=0.0056). In addition, as exposure time increased, the amount of remaining biofilm was statistically lower than the no treatment control. Exposure time had a significant effect on oxygen radical production. Both the 30 and 100 nm titanium dioxide nanoparticles had a significant effect on bacterial viability counts. The silver nanoparticles and the 30 and 100 nm titanium dioxide nanoparticles significantly inhibited tube-based EPS production. Conclusion: The titanium dioxide-containing toothbrush kills. disrupts, and produces oxygen radicals that disrupt established S. mutans biofilm. Titanium dioxide nanoparticles and silver nanoparticles demonstrate the inhibition of EPS production and reduce biofilm viability.

P9 Evaluation of the Development of an Anaerobically Grown Biofilm Model. D. MODY*, B. PANAREILLO, S. DUARTE (Indiana University School of Dentistry)

The microbiota in the oral cavity influence biofilm formation on newly placed implants. It has been verified that the biofilm around an infected implant presents a high prevalence of pathogens related with periodontitis, such as Fusobacterium nucleatum and Porphyromonas gingivalis. Common early colonizers in the initial biofilm are streptococci, Veillonellae and actinomyces. Streptococci and Actinomyces species can co-aggregate and offer attachment sites and growth support to further bacteria, for example, Veillonellae spp. For the evaluation of antibiofilm therapies, appropriate models are required, such as multispecies biofilm models, to simulate the in vivo condition. Therefore, the objective of the experiment was to evaluate the development of a four-species anaerobic biofilm model formed on titanium surfaces over 7 days. The biofilm model was composed of: Fusobacterium nucleatum (ATCC 25586), Actinomyces naeslundii (ATCC 12104), Veillonella dispar (ATCC 17748), and Porphyromonas gingivalis (W83). The microorganisms were individually placed in 5 mL of BHI culture medium supplemented with 1% yeast extract (YE), hemin (0.5 mg/mL), and menadione (5 mg/mL) and kept at 37 °C in anaerobic conditions for 24 h. To obtain a multispecies biofilm, suspension cultures were mixed at the same ratio at final concentration of ~105 CFU/mL (OD600nm=0.01) and applied to individual wells of a 24-well polystyrene plate containing a titanium specimen. The growth was measured at 24-h, 3 and 7 days. At each growth point, biofilms were removed from titanium surfaces, serially diluted, plated in blood agar, and anaerobically incubated for 5 days. Recovered colony-forming units were then determined. Bacterial growth was observed in all tested periods and the number of bacteria recovered was similar among the different periods tested (p>0.05). This multispecies biofilm model is appropriated for future studies on anti-biofilm therapies for peri-implantitis-related biofilms in different time-points. (Supported by NIH Grant Np:1R21DE028929-01)

P10 Effect of Coffee, Caffeine, Quercetin and Trigonelline on Streptococcus mutans. Y.S. BESHAY*, R.L. GREGORY (Indiana University School of Dentistry)

Coffee is one of the most consumed beverages worldwide. Literature has proven the numerous positive benefits that coffee has on health, specifically oral health. Previous research has demonstrated statistically significant inhibition effect that these three constituents of coffee, caffeine (4mg/ml), Trigonelline (1.25 mg/ml), and Quercetin (125 ug/ml), have on biofilm formation of Streptococcus mutans, the main carious causative agent. The purpose of this study was to test the combination effect that these 3 components of coffee have on S. mutans biofilm formation at these mentioned concentrations. Also, this study tested the effect of instant coffee, Folgers Classic Roast, at different dilutions on S. mutans biofilm formation. Crystal violet ELISA assay was done for both objectives. Instant coffee was diluted with 1:2 dilution ratio (0.1875, 0.375, 0.75, 1.5, 3, 6, 12, 24, 48 mg/ml). These tests were compared to S. mutans biofilm growth in TSBS (tryptic soy broth with 1% sucrose) with zero coffee concentration. Biofilm formation was measured at 490 nm. Biofilm formation readings showed statistically significant inhibition (p<0.05) for the combination of caffeine (4mg/ml), Trigonelline (1.25 mg/ml), and Quercetin (125 ug/ml) compared to the zero coffee wells. Biofilm formation for Instant coffee dilutions showed significant inhibition at concentrations (0.1875, 0.375, 0.75, 1.5, 3, 6, 24, 48 mg/ml) compared to zero coffee wells. Instant coffee at 24 and 48 mg/ml had the most inhibitory effect on biofilm formation. In conclusion, this study supports existing research in the potential use of coffee as an antimicrobial agent to inhibit biofilm formation and eventually improving oral health.

P11 Effect of AITC on Streptococcus mutans Biofilm Formation. R. FLETCHER*, R.L. GREGORY (Indiana University School of Dentistry)

The Brassica or cruciferous plant family are widely known for their antimicrobial and antioxidant effects. Brassicas or mustard greens account for a vast plant genus including many common household vegetables like broccoli, cabbage, cauliflower, kale, horseradish, and brussels sprouts. Their antimicrobial effects are due to their production of volatile isothiocyanates through a reaction of myrosinase enzyme and glucosinolates proceeding from plant tissue damage. In an effort to study the various foods that impact oral biofilm formation in the mouth, this study considered the effects of brassica tissue (broccoli extracts and horseradish powder) and allyl isothiocyanates (AITC's) on *S. mutans* biofilm formation. This investigation chose *S. mutans* strain UA159 since it is a common and well-studied cariogenic bacterium. *S. mutans* liquid cultures were combined with various concentrations of brassica extract and AITC's and incubated overnight in 96 well microtiter plates. These

wells were measured for overall *S. mutans* growth and then stained with crystal violet to indicate biofilm formation. The absorbance was measured using a spectrophotometer. AITC's and brassica tissue extracts consistently demonstrated biofilm inhibition between 2.5-10 mg/ml AITC and 0.31-5% horseradish powder solutions, respectively. The combination of brassica tissue and *S. mutans* suppressed growth and biofilm formation, demonstrating an indirect link to fewer caries and periodontal disease in individuals that consume brassica tissues.

P12 Scardovia wiggsiae Biofilm Formation and Probiotic Inhibition on Orthodontic Brackets. M. MYERS*, K.T. STEWART, R.L. GREGORY (Indiana University School of Dentistry)

Early childhood caries (ECC) is a global epidemic that effects approximately 3-6% of children under the age of 6. Orthodontic brackets increase surface area, which raise a compounding challenge to common childhood oral hygiene habits. The presence of orthodontic brackets allows for the elevated accumulation of plaque, bacteria, and acid, which may lead to increased caries risk. Historically, Streptococcus mutans has been the main driver of clinical cavitation but in recent years there has been an increased interest in identifying other cariogenic contributors. One of those bacteria is Scardovia wiggsiae (Sw), and a positive correlation between ECC and Sw has been established. This study aimed to investigate: 1) the growth of Sw biofilm on orthodontic brackets; and 2) the impact of a probiotic bacterium, Bifidobacterium dentium (Bd) on Sw biofilm growth. Initial trials confirmed that Sw and Bd both have the ability to form a biofilm on a 96 well microtiter plate. Additionally, Sw was found to have substantial and sufficient biofilm growth on orthodontic brackets. Co-culture microtiter plates (Sw + Bd) exhibited significant reduction (p<0.05) in biofilm formation by >75%. A subsequent trial was conducted utilizing orthodontic brackets and similar inhibitory effects of Bd were observed. Bd demonstrated significant reduction in Sw biofilm growth in both in vitro microtiter plates, as well as on orthodontic bracket surfaces. The accumulation of Sw on orthodontic brackets leads to an increased challenge for children to avoid current and future caries risk. However, the addition of probiotics such as Bd may help reduce the incidence of ECC, especially in individuals with additional challenges such as orthodontic appliances.

P13 The Intermittent Effect of Nicotine on *Streptococcus mutans* Biofilm Formation. I. RAY*, R.L. GREGORY (Indiana University School of Dentistry)

Oral health is a key benefactor in keeping the body healthy and aids in maintaining overall well-being. Streptococcus mutans contributes to oral biofilm formation and increases the risk of dental caries. Nicotine, in the 16-32 mg/ml range, when added to the oral cavity through smoking, has been demonstrated to increase S. mutans total absorbance and biofilm formation, and it is known to upregulate growth of oral bacteria in oral biofilm. The purpose of this study was to determine the intermittent effect nicotine has on S. mutans bacterial growth and biofilm formation. S. mutans strain UA159 and nicotine dilutions, ranging from 0-32 mg/ml, made using Tryptic Soy Broth (TSB), and TSB supplemented with 1% sucrose (TSBS) were used in this study. The nicotine treated cells were incubated for both 24 hour continuous and intermittent time periods, with the intermittent concentrations being incubated with bacteria for three 10 minute time intervals, followed by incubation in TSBS to determine if there was an increase in S. mutans bacterial growth and biofilm formation. Biofilm measurement was performed using a spectrophotometer and crystal violet assay to quantify the results of both total absorbance and biofilm formation in the continuous and intermittent plates. The crystal violet staining assay concluded that the continuous treatment had significantly lower (p<0.05) biofilm than the intermittent at 0, 0.5, and 32 mg nicotine/ml, but higher at 4, 8, 16 mg/ml, and total absorbance at 4 mg/mL, but lower than the intermittent at 32 mg/ml. The continuous application of nicotine was significantly greater than the intermittent, suggesting that intermittent application of nicotine to S. mutans biofilm may be more relevant to the average smoker.

P14 ACE2 Expression in Symptomatic COVID-19 Patients. M.M. JARAMILLO*, M. SRINIVASAN, T. THYVALIKAKATH (Indiana University School of Dentistry)

The novel virus, SARS-CoV2 has quickly spread to a pandemic crisis, causing the multisystem disease COVID-19. It is primarily transmitted person-to-person through airborne particles. As of March 2021, the United States has had over 28 million COVID-19 infections and 500,000 deaths. Oral symptoms, such as mucosal lesions and dysgeusia, are often early manifestations. To enter the host cells, SARS-CoV2 binds via the spike protein to the angiotensin converting enzyme-2 (ACE2) on the host cells, and is subsequently cleaved, allowing the virus to fuse with the cell. ACE2 is expressed in the epithelial cells of the lung alveoli, intestinal lining, the oral mucosa, and salivary glands. Following viral entry, a metalloprotease ADAM-17, cleaves the extracellular domain resulting in the release of a soluble form of ACE2 (sACE2). Functionally, the sACE2 can either sequester the circulating SARS-CoV2 and/or facilitate viral entry into the host at distant sites and thus play a role in disease expression. The objective of this project was to evaluate the presence of sACE2 in saliva of healthy and SARS-CoV2 infected individuals. Saliva samples were collected from symptomatic COVID-19 patients diagnosed by SARS-CoV2 nasopharyngeal swabs and admitted to the IU hospital system, with the help of the Indiana Biobank in accordance with their institutional review board. The control included age matched archived saliva samples from the salivary research laboratory at IU School of Dentistry. The saliva samples were analyzed using the CoviDrop ELISA assay that measures the binding activity of ACE2 to the plate bound SARS-CoV2 spike protein and the amount of ACE2 was calculated following the manufacturer's recommendations. The COVID-19 positive saliva samples exhibited significantly lower sACE2 as compared with age matched control saliva samples. <u>Conclusion: Our data suggest that reduced sACE2 in saliva could represent a biomarker for severity of COVID-19 and assist in disease prognosis.</u>

P15 Cannabidiol Effects on MMP Expression from Cigarette Smoke Responsive Fibroblasts. N. GHEIBI DEHNASHI*, A.A. AZABI, K. AL NASR ALLAH, L.J. WINDSOR (Indiana University School of Dentistry)

The recent increase in usage of Cannabidiol (CBD) oil has raised questions about its potential effects in the oral cavity due to its sublingual placement. CBD has shown some therapeutic benefits that includes anti-inflammatory, pain relief, anti-convulsive and anti-neoplastic. The anti-inflammatory effects are of particular interest due to the host-mediated inflammatory responses in periodontitis, which results in subsequent loss of the periodontal ligament, alveolar bone, cementum and gingiva. A primary risk factor for periodontal disease is tobacco, which increases the expression of matrix metalloproteinases (MMPs) from human gingival fibroblasts (HGFs) that leads to increased cell mediated collagen degradation. The purpose of this *in-vitro* study was to investigate the effects of CBD on cigarette smoke condensate (CSC) treated HGFs compared to untreated and CSC treated HGFs. The HGFs utilized were treated with and without 100 ug/ml CSC for 3 days before the conditioned media were collected and analyzed by gelatin zymography to determine if CSC increased MMP-1 production from HGFs compared to untreated cells. WST-1 and LDH assays of CBD treated HGFs were assessed to determine the highest non-toxic level and that did not affect cell growth, respectively. HGFs were then incubated for 72 hours with CBD (31.4 µg/mL), CSC, CBD and CSC, or nothing (control). The conditioned media were collected for analyses for changes in MMP expression by MMP protein arrays. <u>HGFs increased MMP-1 production when treated with CSC</u>. The highest non-toxic level examined of CBD that did not affect cell growth was 31.4 µg/mL.

P16 The Effects of Cannabidiol on Human Gingival Fibroblast Cells. A.A. AZABI*, L.J. WINDSOR (Indiana University School of Dentistry)

Cannabidiol (CBD), a non-psychoactive constituent of cannabis sativa plant, has been receiving unprecedented attention because of its many potential therapeutic applications. Due to its anti-inflammatory potentials, CBD may modulate the inflammatory responses of the cells involved in periodontal diseases. Research evidence indicate that CBD has an inhibitory effect on several matrix metalloproteinases (MMPs), which are the main class of proteinases involved in the degradation of extracellular matrix (ECM) in periodontal disease. Therefore, it is important to study the effects of CBD on the oral health and understand if it can modulate the inflammatory responses of the cells of the periodontium such as human gingival fibroblast cells (HGFs). The effects of different concentrations of CBD (0-15.9 µM) (>98%, Sigma-Aldrich) on cell proliferation and cytotoxicity of HGFs were studied using water-soluble tetrazolium-1 and lactate dehydrogenase assays, respectively (WST, Cytotoxicity detection kit plus, Roche Applied Science). The MMPs inhibitory effect of CBD (1mg/ml) on MMP-9 was studied using β -casein cleavage assay. The proliferation and cytotoxicity assays showed that CBD concentrations of 2.6 μM and below did not significantly affect cell proliferation and were not significantly toxic to the cells. β-casein cleavage assay showed that CBD was able to significantly inhibit MMP activity after 2 hours of incubation. Therefore, the concentration of 1 µM and 2 µM CBD were chosen to further evaluate the effects of CBD treatment on the expression of MMPs from human gingival fibroblasts when stimulated with antigenic stimuli such as P. gingivalis LPS.

ORAL DISEASE PREVENTION AND DIAGNOSIS

P17 Evaluation of Accuracy of Buccal Bone Thickness with Cone-beam CT. Y. TANAKA^{*}, V. DUTRA, W. LIN, S. BLANCHARD, J. LEVON, Y. HAMADA (Indiana University School of Dentistry)

Purpose: Cone-Beam Computed Tomography (CBCT) is widely used for implant treatment plans. However, the accuracy of buccal bone detection remains unclear. The primary aim of this study was to evaluate the accuracy of buccal bone thickness with CBCT compared to the direct measurement with histological sections in the maxillary anterior teeth. Methods: Five human dentate cadavers without clinical attachment loss between maxillary canine to canine were included in this study. After preparing the reference notches at the gingival margin of each tooth, the specimens were scanned with the CBCT. The buccal bone thickness at 3, 5, and 7 mm from the reference notches were measured on the cross-sectional images with the CBCT and histomorphometric images. The agreement of both thicknesses was assessed by Bland-Altman plots, and intraclass correlation coefficients (ICC) was calculated. The sensitivity and specificity of buccal bone detection with CBCT was analyzed. Results: A total of 30 teeth were included in this study. The mean thickness of the buccal bone was 0.52 ±0.05 mm with CBCT analysis and 0.40 ±0.05 mm with histology. Measurements from the CBCT sections had significantly overestimated the buccal bone thickness compared to the histological evaluation (P=.001). ICC of buccal bone thickness between the CBCT and histology was ≤ 0.53 , and an agreement was considered as poor. The sensitivity of the CBCT as a diagnostic tool to detect the presence or absence of the buccal bone was 75.4%, and the specificity was 65.5%. Conclusions: The buccal bone thickness of maxillary anterior teeth showed less than 2 mm at all sites on both CBCT and histology evaluations. CBCT measurements had relatively low accuracy and reliability for the measurement of buccal bone thickness. These findings should be taken into consideration when using CBCT as a measuring tool for thin bone structure.

P18 p53 in Predicting the Progression of Potentially Malignant Oral Epithelial Lesions. R. SHEMBARGER*1, K. MCNAMARA², J. KALMAR², N. SANTOSH¹ (¹Indiana University School of Dentistry, ²The Ohio State University College of Dentistry)

Objective: Timely diagnosis of oral squamous cell carcinoma (OSCC) is crucial as early stage lesions have an 84% five-year survival rate while late stage lesions have only 39% survival rate. OSCC often develops from potentially malignant oral epithelial lesions exhibiting oral epithelial dysplasia (OED); however, not all OEDs progress into OSCC. Establishing a panel of biomarkers that can predict the likelihood of OED progression is vital as it can enable a more accurate prediction of malignant transformation. Our recent study demonstrated that cornulin expression is significantly low in patients whose OED progressed to OSCC compared to patients with non-progressive OED that retained the same histopathologic grade across two biopsies. The objective of this current study is to determine the expression of p53 in patients whose OED progressed into OSCC compared to non-progressive OED patients, thereby, identifying a panel of biomarkers that can predict the progression of potentially malignant oral epithelial lesions. Methods: Following database review of Oral Pathology Group at Indiana University School of Dentistry and Oral Pathology Consultants at Ohio State University College of Dentistry, 10 patients with OED that progressed into OSCC (progressive group) and 10 patients with OED that retained the same histopathologic grade across two biopsies (non-progressive group) were identified. Following immunohistochemistry, p53 expression was analyzed using Aperio imagescope software and a histo-score was calculated based on the intensity of the staining and the percentage of positive cells. Repeated measures ANOVA is utilized for statistical analysis. Results: In the progressive group, p53 expression increased between initial biopsy and subsequent biopsy that progressed to OSCC. No difference in p53 expression was observed between initial biopsy and subsequent biopsy in the non-progressive group. Conclusion: p53 along with cornulin, may help identify high-risk OEDs which require more aggressive management, thereby facilitating personalized treatment in the prevention of OSCC.

ORTHODONTICS / IMAGING / CRANIOFACIAL

P19 Impact of Covid-19 on U.S. Orthodontic Practices: Rural/Urban Divide. D. ALBRIGHT*1, H. MOTEVASEL², L. HELMS², G. ECKERT², K.T. STEWART¹ (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

Objectives: To examine the perceptions of orthodontists on the impact of the Covid-19 pandemic by practice setting (rural, suburban, or urban). Methods: A 35-item voluntary survey was developed and validated to investigate the impact of the Covid-19 pandemic on a random sample of U.S. orthodontists. The survey contained five domains including demographic information, methods of Covid-19 information acquisition, practice ramifications, financial ramifications, and patient management strategies. The survey was distributed to 5,694 individuals and 507 complete surveys were obtained, yielding a response rate of 8.9%. The sample consisted of 56 rural, 355 suburban, and 96 urban respondents. Associations of demographic and practice characteristics related to Covid-19 were assessed using chi-square tests with a 5% significance level. Results: Orthodontists in rural and urban practices reported a few statistically significant differences among the parameters queried. Suburban practices tended to trend with either the rural or urban respondents, depending on the topic. Rural and suburban practices found professional associations, local professionals, and vendors to be better information sources than urban practices (p=0.018, 0.046, 0.034). Rural practices alone felt professional associations were helpful in the early management of the pandemic (p=0.003). Rural and suburban practice utilized teleorthodontics and email to communicate with patients to a greater degree than urban practices (p=0.001, 0.003). Urban offices were more likely to have limited patient encounters to handle emergencies alone (p=0.008), were more likely to have concerns regarding the need to permanently dismiss staff members (p=0.003), and expressed fears that circumstances might adversely impact plans to hire an associate (p=0.004). Conclusions: Rural and suburban practices tended to rely on professional associations to a greater degree than urban practices, and rural practices alone believed them to provide more helpful information. Additionally, rural practices embraced certain digital technologies to assist patient management to a greater degree than their urban counterparts.

P20 The Mechanics of NCCLs, Root Resorption and Abutment Screw Loosening. T.R. KATONA^{*1}, G.J. ECKERT² (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

Objectives: The purpose of this project was to propose a shared mechanism for the causes of non-carious cervical lesions (NCCLs), orthodontics-associated root resorption and implant abutment screw loosening. These are persistent clinical concerns with equivocal etiologies. Methods: A matched pair of 1st molar denture teeth was mounted in occlusion in a testing device. The weighted maxillary assembly, guided by precision slides, was cyclically lowered onto, and raised from, the mandibular tooth. As the mandibular assembly was supported by a load cell, the total loads (forces and moments) experienced by the mandibular tooth because of the occlusal contact forces, were continuously measured in all 3 directions. Results: The measurements confirmed previously obtained non- and counter-intuitive results. The directly relevant data is that the measured loads on the tooth, during the span of an *individual* chomp, is characterized by a wide range of magnitudes and directions. Moreover, these load profiles change with occlusal relationships that are shifted by as little as 0.05 mm (p < 0.001) and during occlusion vs. disclusion (p = 0.002). (It has previously been shown that the loads are also significantly altered by the presence of saliva and articulating papers.) Conclusion: The demonstrated transient loads experienced by a tooth, occurring within the span of a single chomp, produce complex mechanical environments in the structures. Thus, it is proposed that NCCLs, root resorption and abutment screw loosening result from specific loading combinations, not as in traditional investigations in which unidirectional forces are applied. (Consider the apt analogy of opening a child-proof medicine bottle cap. It has to be turned while being pushed down - simultaneously. Turning or pushing, individually or in sequence, will not open the bottle.)

P21 Dental Professionals' Perspective on Direct-To-Consumer Clear Aligners. B. HOAGBURG*, D. ALBRIGHT, R. JANIK, C. KEITH, K.T. STEWART (Indiana University School of Dentistry)

Background: Over the last 20 years, technology has drastically changed the practice of orthodontics. One significant change has been the advent of direct-to-consumer (DTC) clear aligners. This treatment model eliminates the necessity to undergo a clinical exam by a licensed dentist and forgoes any radiologic evaluation prior to initiating treatment. These are generally accepted standards of orthodontic care outlined by the American

Association of Orthodontics (AAO) Clinical Practice Guidelines. The purpose of this survey-based study was to collect quantitative data about dental professionals' perspectives of the DTC treatment model. Materials and Methods: The Qualtrics hosted survey was disseminated to dental professionals via orthodontist and dentist specific Facebook groups (Orthodontic Pearls and Dental Nachos), The Helpful Dentist dental blog email list and Indiana University School of Dentistry Alumni email list. The survey contained a total of 26 questions placed within four separate domains: basic demographic information (11 questions), perceptions of the direct-to-consumer clear aligner model (4 questions), standards of orthodontic care (4 questions) and patient experiences (7 questions). Responses were summarized with descriptive statistics. Results: A total of 334 completed surveys were recorded with 155 orthodontists (46.4%), 154 general dentists (46.1%) and 25 other dental specialties (7.5%). More than 95% of respondents had a negative or very negative view of the DTC treatment model with most respondents citing "suboptimal orthodontic care" and "misleading the public about orthodontic treatment" as the biggest influence in their negative view. Over 80% of respondents strongly agree that it is not within the standard of care to provide orthodontic treatment without obtaining radiographs and performing an in person clinical exam prior to starting treatment. <u>Conclusion: Results from this sample of dental professionals seem to indicate that treatment rendered by DTC modalities may not be in the best interest of the general public.</u>

P22 Dentoalveolar Changes in Class II/Division 2 Patients Using .018" Appliances. S. TWIGGS*, L. HELMS, K.T. STEWART (Indiana University School of Dentistry)

Objectives: This retrospective study aimed to assess whether retroclined maxillary incisors associated with Class II Division 2 patients can be uprighted to their normal inclination, without placing additional torque in the archwire, using a pre-adjusted edgewise bracket system. Secondarily, it evaluated the impact of the prescribed appliance on buccal bone thickness and anteroposterior skeletal relationships. Experimental methods: Thirty-seven Class II Division 2 patients and a control group of thirty-seven Class I patients were used in the study. Inclusion criteria included: individuals age 20 or younger, utilization of a .018" pre-adjusted edgewise appliance, and archwire progression to a .016x.022" stainless steel wire. The following diagnostic/treatment information was obtained for each subject: age, gender, treatment duration, appliances used (wires/brackets), initial (T₀) & final (T₁) CBCT images, and T₀ & T₁ molar classification. Cephalometric measurements from the T₀ & T₁ CBCT images were recorded for analysis. Mixed-model ANOVA was used to compare T₀ & T₁ measurements and comparisons between the case and control groups, while accounting for within-subject correlations and allowing different variances for each group. A 5% significance level was used for all tests. Results: There were no significant differences between the case and control populations based on gender (p=0.815), initial age (p=0.061), and treatment time (p=0.459). Incisor inclination for the case population approximated normative values at T₀ & T₁. Incisor inclination for the experimental group was found to be lower than the control group at T_0 (p<0.001) and demonstrated a greater increase than controls (p<0.001) during treatment. Increases in buccal bone thickness were observed at the root apex (p<0.001) and halfway between the apex and cementoenamel junction (p<0.001). Conclusion: The results suggest that a 0.018 pre-adjusted orthodontic appliance can promote desired changes in incisor inclination and buccal bone thickness during treatment without utilization of additional treatment strategies. (This project is supported by the Student Research Group Fellowship and cases were provided by Dr. Lana Helms, adjunct faculty in the Indiana University School of Dentistry, Department of Orthodontics & Oral Facial Genetics.)

P23 The Effects of Diabetes Mellitus on Alveolar Bone Mineral Density. V. AMIN^{*1}, R. HOLLAND¹, T. BELLIDO², H. TURKKAHRAMAN¹ (¹Indiana University School of Dentistry, ²University of Arkansas for Medical Sciences)

Objective: Although the detrimental effects of diabetes on the skeletal system have been well documented, its effects on the alveolar bone mineral density are still unclear. Therefore, the objective of this study was to find out the effects of Streptozotocin (STZ) induced diabetes on the alveolar bone mineral density of the mice. Materials and Methods: The material of this study consisted of 21 wild-type mice. In the experimental group (n=11), Type 1 Diabetes Mellitus (T1DM) was induced by 5 daily injections of STZ (45mg/kg i.p. in 50 mM citrate buffer, pH 4.5) followed by glucose measurements after 10 days to confirm T1DM (non-fasting blood glucose >250 mg/dL). In control group (n=10), citrate buffer alone was injected. Mice were euthanized at 22 weeks of age and heads were harvested and fixed in 10% neutral-buffered formalin (NBF) for 2 days and then stored in 70% ethanol. Specimens were scanned with a Micro CT scanner and alveolar bone area between roots of the maxillary first molars were

analyzed by CTAn Software. All statistical analyses were performed using SPSS for Windows. A two-samples ttest was used to find out the intergroup differences. Results: In the experimental group, mean and standard deviation values for bone volume/total volume (BV/TV), trabecular number, trabecular thickness and trabecular separation were 36.56±5.23, 0.02±0.005, 18.61±3.84 and 18.39±4.71, respectively. In the control group, mean and standard deviation values for the same variables were 35.01±6.86, 0.02±0.004, 17.89±5.15 and 19.83±3.57. No statistically significant intergroup differences were found in any of these measurements (P>0.05). <u>Conclusion:</u> <u>Based on these results, we can conclude that the alveolar bone mineral density is preserved in STZ induced</u> <u>diabetic mice</u>.

P24 The Prevalence of TMD Symptoms in an Adult Population. E. KOUFOS^{*1}, H. AVILA¹, K. KROENKE², K.T. STEWART¹, H. TURKKAHRAMAN¹ (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

Objective: Temporomandibular disorders (TMD) are characterized by pain in the masticatory apparatus and limited mobility of the temporomandibular joint. TMD and like symptoms affect almost 50% of the U.S. adult population yet are not easily detected among health care practitioners. Although the etiology of TMD still remains unclear and multifactorial in nature, female gender predominance has been reported in several studies. The aim of this study was to determine the prevalence of TMD symptoms in an adult population by using the TMD-7 screening tool and to determine whether there is gender predominance. Materials and Methods: A total of 226 subjects (74 males, 152 females) aged between 18-64 (mean age: 42.8 ± 8.7) were included in this prospective study. TMD symptoms included in the TMD-7 survey were headache, pain in jaw, pain in neck, pain in forehead, difficulty while opening mouth, noise while opening or closing, and difficulty while eating. Comparisons between genders for differences in the individual TMD-7 item ratings were performed using Mantel-Haenszel chi-square tests for ordered categorical responses. A 5% significance level was used for all tests. Analyses were performed using SAS version 9.4 (SAS Institute, Inc., Cary, NC). Results: Females had significantly higher ratings for headache (p=0.001), pain in jaw (p=0.006), pain in neck (p<0.001), pain in forehead (p=0.004), and difficulty when eating (p=0.021). Conclusion: The results of this prospective study showed that the female gender predisposes higher risk of having TMD symptoms in the adulthood.

P25 Radiation of CBCT and Traditional Orthodontic Imagining Utilizing Pediatric Phantom. K. RYAN^{*1}, J.F. YEPES¹, A. SCULLY¹, KT. STEWART¹, L. VINSON¹, Q. TANG², B. JOHNSON³ (²Indiana University School of Dentistry, ²Indiana University School of Medicine, ³University of North Carolina at Chapel Hill)

Purpose: This study's purpose was to compare the effective dose (E) and Equivalent dose (H_T) from pediatric phantom exposures related to traditional orthodontic imaging (panoramic and lateral cephalometric radiographic examinations) and a full head cone beam computed tomography (CBCT). Methods: Dosimetry was acquired by placing 24 dosimeters in tissues of interest in a 10-year-old phantom. Imaging modalities included full field of view CBCTs with OEM standard parameters, full field of view CBCTs with reduced exposure parameters, and panoramic and lateral cephalometric examinations. Repeat exposures of 12 scans were utilized and two examinations were replicated for each imaging modality. The average values of E and H_T were calculated. Results: At all locations, traditional orthodontic imaging is significantly lower than both 3D-Med and 3D-Small and 3D-Small is significantly lower than 3D-Med (p<0.05). The largest H_T in traditional imaging were found in the oral mucosa, salivary glands and extrathoracic airway. The largest H_T in both of the 3D imaging were found in the lens of the eyes, oral mucosa and salivary glands. Conclusions: The average effective dose of the 3D imaging was 4-5 times greater than the 2D imaging. Practitioners should weigh risks and benefits of exposure before prescribing CBCTs for orthodontic treatment planning.

PEDIATRIC DENTISTRY

P26 Radiographic Marginal Fit Analysis of Hall Technique Stainless Steel Crowns. D. ALLEN*, L. VINSON, J. YEPES, A. SCULLY, J. DEAN (Indiana University School of Dentistry, Riley Hospital for Children Indiana University Health)

Objectives: Evaluate the marginal fit, using radiographic measurement, of stainless-steel crowns (SSCs) placed on primary molars using the conventional technique (CT) versus the Hall Technique (HT). Methods: A retrospective cohort study was conducted using bitewing radiographs from two private, pediatric dental practitioners. A total of 100 radiographs were evaluated. 50 crowns were placed via CT by one of the two practitioners and the remaining 50 via HT by the other practitioner. SSCs were placed between 2017-2019 and were studied from each office by measuring bitewing radiographs obtained after placement of the crowns on asymptomatic, carious primary molars of patients age 3 to 9 years old. Radiographs were evaluated independently and blindly by two calibrated examiners using ImageJ Software® to determine the amount of mesial and distal overhang in millimeters. The measured overhang was then used to calculate a relative percentage of overhang between the two placement techniques. Results: Preliminary results with 36 total subjects, 18 each with CT and HT. Patient ages and mesial and distal marginal overhang of SSCs placed via each technique were compared using Wilcoxon Rank Sum tests. Treated teeth were compared between the two groups using chi-square tests. A 5% significance level was used for each test. No significant difference was found in age (p=0.784), specific tooth treated (p=0.405), or distal overhang percentage (CT=5.47%, HT=5.42%, p=0.912). However, HT had significantly higher mesial overhang percentage than CT (CT=4.65%, HT=6.84%, p=0.021). Conclusions: Data collected from this study will help determine if SSCs placed via the Hall Technique have a comparable marginal overhang ratio in relation to conventionally placed SSCs. Preliminary results suggest that CT crowns have a statistically significant less mesial overhang than HT crowns.

P27 Pediatric Dentists Perceived Demand for Dentist Anesthesiologists Following Specialty Recognition. C. BOUDREAUX^{*1}, J. JONES¹, J.F. YEPES¹, M. SAXEN¹, C. KEITH² (¹Indiana University School of Dentistry, ²Indiana University-Purdue University Indianapolis)

Introduction: The Centers for Disease Control and Prevention report that caries are the most common chronic disease of children aged 6-11 and adolescents aged 12-19. Some children and adolescents have extensive dental caries related needs due in part to acute situational dental anxiety, uncooperative age-appropriate behavior, decreased cognitive functioning, medical conditions, or disabilities. As a result, it may be difficult for pediatric dentists to treat these patients using only non-pharmacologic behavior management techniques. As advocates for the health care of infants, children, adolescents, and persons with special health care needs, the American Academy of Pediatric Dentistry (AAPD) supports the use of deep sedation or general anesthesia for children who do not respond effectively to non-pharmacologic behavior management. Purpose: The primary aim of this study is to gauge the pediatric dental community's current use of operating rooms in hospitals and surgical centers, current use of dentist anesthesiologists and assess barriers to accessing dentist anesthesiologist services. Methods: A 29-item survey distributed nationwide via email to AAPD members with questions regarding practitioner's demographic, access to hospital operating rooms, average number of patients treated in the operating room, use of in-office general anesthesia, and a comment section to explain any barriers faced regarding in-office general anesthesia. Results: Only 43% of respondents employ dentist anesthesiologists in-office however 43% of respondents report they would use a dentist anesthesiologist if one was made available. When rating perception, 52% of respondents report their perception of dentist anesthesiologists is very positive. Following the COVID-19, outbreak, 92% of respondents report no change in perception of dentist anesthesiologists. Conclusions: This project will help to inform healthcare facility decision makers of the current accessibility of operating rooms and dentist anesthesiologists, which indicates the need for more dentist anesthesiologists than exist to meet the emerging dental needs of the pediatric dental population.

P28 Impact of Endotracheal Tube Size and Design on Albuterol Delivery. C. JACKSON^{*1}, J. JONES¹, M. SAXEN¹, J.F. YEPES¹, L. VINSON¹, G. ECKERT² (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

The purpose of this study was to evaluate the amount of Albuterol administered using orotracheal and nasotracheal tubes, in a range of sizes commonly used when administering general anesthesia to children undergoing dental procedures. The study was completed in a laboratory setting using different sizes of nasal endotracheal and oral endotracheal tracheal tubes with a combination of materials to simulate a pediatric sized lung. The proximal 2-liter positive pressure bag was inflated with 2 liters of oxygen using a Drager Fabius Tiro ventilator. An initial dose of 180 micrograms of Albuterol was introduced into the proximal end of the endotracheal tubes in our experimental apparatus. A 60ml syringe was used to activate the metered dose inhaler, using a commonly accepted clinical anesthesia technique. The oxygen located in the proximal bag was forced through the endotracheal tube to create an oxygen-albuterol mixture, into the 1-liter distal bag, where the oxygen-albuterol mixture was collected and clamped. The amount of Albuterol located in the distal bag was measured using a BACtrack breath analyzer. The data collected showed the interaction between tube type and tube diameter was not significant (p=0.245), nor was the effect for tube diameter (p=0.225). The nasal tube delivered a statistically significantly higher percentage than the oral tube (p=0.046, 23% vs 21%). Most of this difference was for the 4.5mm diameter tubes (p=0.008, 5% difference), with negligible differences for the other diameters (5mm, p=0.540, 1% difference; 5.5mm, p=0.979, 0% difference; 6mm, p=0.416, 1% difference). Overall, nasal endotracheal tubes deliver more Albuterol in comparison to oral endotracheal tubes given the *in-vitro* study, with most the difference coming from the 4.5 diameter size tubes. The tube diameter comparison between the endotracheal tubes was not statistically significant in regard to difference in amount of Albuterol found at the end of the distal bags.

P29 Utilization of Space Maintainers by Pediatric Dentists versus General Practitioners. J. CROWE^{*1}, J.F. YEPES¹, J.E. JONES¹, L.A. VINSON¹, G. MAUPOME¹, G. ECKERT², Q. TANG² (¹Indiana University School of Dentistry, ²Indiana University School of Medicine)

Purpose: The purpose of this study is to evaluate the utilization of space maintainers by pediatric dentists and general dentists. Methods: Data from commercial dental insurance claims were used to compare the use of fixed space maintainers by general practitioners and pediatric dentists. Paid dental claims collected nationwide from January 2013 to June 2019 will be included for analysis. Deidentified data for children three to ten years old will be used. Dental procedures were selected based on Current Dental Terminology (CDT) codes for space maintainers (D1510, D1515, D1516, D1517, D1520, D1525, D1526, D1527 and D1575) as well as the exams performed (D0150, D0120, and D0140). Results: In the claims collected and analyzed in this study, pediatric dentists are placing space maintainers more frequently than general dentists in patients between the ages of three to ten years old. Majority of space maintainers are being placed in patients between the ages of seven to eight by both pediatric dentists and general dentists, accounting for 44% of all space maintainers placed in the sample. Conclusion: This study provides insight into how space maintainers for patients in primary and mixed dentition by pediatric dentists and general dentists and can be used to determine how these trends may correlate with malocclusion in the permanent dentition. It can also help shape predoctoral dental education curriculum to allow more exposure and emphasis on the use of space maintenance in pediatric patient populations.

P30 Prescription of Bitewing and Panoramic Radiographs in Pediatric Dental Patients. N. MENAKER*1, J.F. YEPES1, L.A. VINSON1, J.E. JONES1, T. DOWNEY2, G. MAUPOME1, Q. TANG3 (¹Indiana University School of Dentistry, ²P&R Dental Strategies, LLC, ³Indiana University School of Medicine)

Purpose: To evaluate prescription patterns for bitewing and panoramic radiographs (PR) for pediatric and adolescent dental patients following the implementation of the most recent ADA/FDA guidelines. Methods: Paid insurance claims data for all 50 states were accessed from January 1, 2013 to June 30, 2019 for patients age 18 years and younger; a 5% random sample population was extracted. Statistical analyses were performed to evaluate various imaging metrics for pediatric dentists (PD) and general practitioners (GP). Results: A total of 2,123,735 bitewing images were prescribed during 4,734,249 office visits. The average time interval between bitewing exams ordered by GPs was $13.9(\pm 7.4)$ months, and for PDs this average was $13.0(\pm 6.7)$ months

(p<.0001). When divided by age group, 3.5% of all bitewings were taken on patients age 0-4 years. For PRs, 286,824 images were included in this study. The average time interval between PRs ordered for the same patient was $3.4(\pm 1.3)$ years for PDs and $3.3(\pm 1.4)$ years for GPs. One percent of all PRs were prescribed for patients age 0-4, with 403 images attributed to PDs and 2348 to GPs. <u>Conclusions: PDs were more likely to follow the guidelines on radiograph prescriptions for pediatric and adolescent patients than GPs.</u>

PERIODONTICS

P31 Histological and Histomorphometrical Analyses of Peri-Implant Bone with Loaded Implants. L. CHIOU^{*1}, Y. TANAKA¹, J. IWANAGA², R. S. TUBBS², S. BLANCHARD¹, Y. HAMADA¹ (¹Indiana University School of Dentistry, ²Tulane University School of Medicine)

Objective: Bone-to-implant contact (BIC) is the gold standard to represent the degree of osseointegration. However, histological evaluations of fully osseointegrated dental implants from human remained unclear. Therefore, this observational study aimed to analyze the BIC and bone area (BA) from loaded implants from a human cadaver and to compare any differences between the mandible and maxilla. Methods: A fresh frozen cadaveric segment from an 88-year-old at death Caucasian female with nine root form dental implants (five in the maxilla and four in the mandible) were analyzed. Each specimen was sectioned parallel to the long axis of the implants of buccal-lingual dimension and stained with toluidine blue followed by basic fuchsin. The BIC was measured by dividing the total surface length of the implant surface in bone by the length where actual direct bone-to-implant contact. The BA was calculated as the percentage of occupying bone area within each thread. Mean values of BIC and BA were measured for each implant in the maxilla and mandible. The two-sample t-test was used to compare the maxillary and mandibular arches for the BIC and BA. Results: Peri-implant marginal bone loss was found in all specimens. Intrabony defects were present in four implants while horizontal bone loss was noted in five implants. Higher bone turnover was noted within the intrabony defects compared to the suprabony defects. The mean BIC were 83.24% and 74.41% for maxillary and mandibular implants, respectively. The mean BA for maxillary implants was 84.26%, whereas the mean for mandibular implants was 74.49%. There were no significant differences in the BIC and BA between the maxillary and mandibular implants (P>0.05). Conclusions: This report demonstrated the BIC and BA from functionally loaded implants were relatively high. In the same individual, no significant differences were found between implants placed in the maxillary and mandibular arches.

P32 Effects of Drilling Sequences on Bone Dimensions and Biomechanical Properties.

N. DANESHPARVAR*, T. CHU, S. BLANCHARD, Y. HAMADA (Indiana University School of Dentistry) Background: The quality and the quantity of the alveolar bone are important factors affecting the success of the dental implants. Osseodensification technique has been used for osteotomy to increase the dimension and bone density with counterclockwise (CCW) motion. However, the effects of conventional drills with CCW have not been tested compared to the osseodensification burs. Aim: The aim of this study is to compare the effects of regular implant drills with osseodensifying drills in clockwise and CCW motions in bone dimension change, and implant primary stability. Methods: A total of 40 bone models were created with size of 20 x 15 x 4 mm from porcine tibia to represent implants placed in soft bone. Implant osteotomies were prepared in the bone models, using one of the following techniques: 1. Regular implant drills in a clockwise direction (RCW), 2. Regular implant drills in a counterclockwise (RCCW) direction, 3. Osseodensifying drills in clockwise direction (OCW), and 4. Osseodensifying drills in a counterclockwise direction (OCCW). Bone level tapered shape titanium alloy implants (4.1x10 mm) were placed following osteotomy creation. Implant stability quotient (ISQ) was measured after implant placement. Each bone model was scanned with an optical scanner to convert to Standard Tessellation Language (STL) files before and after the osteotomy creation. Pre and post-surgical STL files were superimposed and the dimensional changes were measured at 1, 3, and 7 mm from the crestal bone. Results: The groups showed no significant differences in ISQ values (p=0.239). The amount of bone expansion decreased with distance from the crest (p<0.001). RCCW (p=0.039) and OCCW (p=0.001) showed significant expansions at all levels compared to RCW. No other statistically significant differences in dimensional change were found between groups. <u>Conclusion: The regular or the osseodensification burs in CCW motion contributes to expansion of the bone dimension compared to conventional methods</u>. (This study has been supported by a grant from the American Academy of Implant Dentistry Foundation.)

P33 Evaluation of Soft Tissue Thickness Measurement Accuracy: Three Different Methodologies.

K. FERRY*, S. BLANCHARD, V. DUTRA, WS. LIN, Y. HAMADA (Indiana University School of Dentistry) Background: Gingival thickness (GT) is integral for comprehensive treatment planning and successful outcomes for periodontal plastic surgery and implant dentistry. In clinical dentistry, there are several methods to measure GT prior to treatments. The purpose of this study was to analyze the accuracy of GT measurements with three different methodologies compared to the absolute GT measured from histology of cadaver anterior maxilla. M&M: Five human maxillary segments, with teeth #6-11, were harvested from cadavers. Measurements were taken at 3.00, 5.00 and 7.00 mm apical to gingival margin. In this study, bone sounding with endodontic k-file, Digital Imaging and Communications in Medicine (DICOM) data alone (FOV: 16 x 10 cm; Voxel: 0.25 mm) and superimposition of DICOM and Standard Tessellation Language (STL) data were analyzed. Direct measurements were made with a no. 25 k-file with digital caliper. DICOM data were obtained with a cone-beam computed tomography (CBCT) and STLs were created with portable intraoral scanner: images were superimposed in implant planning software. All non-decalcified histology images were digitalized and measured with computer software. One-way analysis of variance (ANOVA) was used to compare the three techniques for the differences from histology. Results: A total 72 sites were included for further analysis. Overall mean histological GT was 0.73 \pm 0.31 mm; measurements with bone sounding overestimated 0.22 \pm 0.20mm (p<0.001), whereas DICOM underestimated 0.23 ± 0.19 mm (p<0.001) compared to histological analysis. However, DICOM + STL had significantly smaller differences from histological analysis with 0.04 ± 0.21 mm (p=0.429). Intraclass correlation coefficient (ICC) of DICOM + STL achieved highest agreement with histology measurements (ICC: 0.74) compared to other two methods (ICC: 0.58, 0.54 respectively). Conclusion: DICOM and STL file superimposition had the highest agreement with histological measures in gingival thickness. This study supports the use of superimposition for the evaluation of gingival thickness.

P34 Effects of Cannabidiol on Cytokines from CSC-Treated Human Gingival Fibroblasts. U. JANU*, K. AL NASR ALLAH, A.A. AZABI, S.B. BLANCHARD, V. JOHN, L.J. WINDSOR (Indiana University School of Dentistry).

Cannabis sativa (marijuana) is the most frequently used illicit drug. Cannabidiol (CBD) is the major nonpsychotropic constituent of cannabis (45-50% of extracts). It has been suggested that CBD might reduce inflammation as it occurs in periodontitis. Tobacco is a significant risk factor for periodontitis. The purpose of this study was to evaluate the effects of CBD on cytokine expression from cigarette smoke condensate (CSC) treated human gingival fibroblasts (HGFs) in vitro. The effects of CBD on HGF cell proliferation and cytotoxicity were assessed using WST-1 and LDH assays, respectively. CBD at 31.4 µg/mL was not toxic and did not affect HGF growth. HGFs were incubated for 72 hours in serum-free media with CBD (31.4 µg/mL), with CSC (100 µg/mL), with CBD and CSC, or with neither. Conditioned media were collected and examined for changes in cytokine expression using cytokine protein arrays. CSC+CBD significantly increased IL-10 compared to the sum of the CSC or CBD alone (p< 0.05). Expression of IL-3 was significantly higher with CBD (p=0.030) or CSC (P=0.047) when compared to control, but CBD + CSC (p=0.123) turned IL-3 expression off. CSC induced significantly higher GRO alpha (p=0.044) and MCP-3 (p=0.039) expression when compared to control. CSC+CBD combination led to significantly higher expression of GRO a/b/g (p=0.028), GRO alpha (p=0.006), IL-8 (p=0.032), and MCP-3 (p=0.005) when compared to control. Conclusions: Individually CBD or CSC turned on the expression of IL-10. However, CBD+CSC was synergistic and increased IL-10 expression 2.5-fold compared to CSC alone and 9.3fold compared to CBD alone. CBD or CSC individually turned on IL-3 expression compared to the control and CBD+CSC turned off the expression of IL-3. These results appear to be mechanisms by which cells reestablish homeostasis and suggest that CBD could be of therapeutic value for tobacco users that developed periodontitis.

P35 Timepoint Optimization for Bone Resorption Analysis in Mouse Ligature-Induced Periodontitis. M. LEVITAN*, Y. UEKI, M. KITTAKA, T. YOSHIMOTO (Indiana University School of Dentistry, Indiana Center for Musculoskeletal Health)

Periodontitis is the most common cause of tooth loss affecting 47% of US adults. Ligature placement on mouse dentition induces an inflammatory cascade culminating in alveolar bone resorption by osteoclasts. Histomorphometric and microCT analyses are conducted between day 5 and 14 following ligature placement to quantify bone resorption. The analysis timepoint is arbitrarily determined depending on the institute. The objective of this investigation is to optimize the timepoint for bone resorption analysis in the ligature-induced periodontitis model. We hypothesized that bone loss would proceed in a linear fashion making later timepoints ideal for evaluation. Silk sutures were placed on the left-maxillary second molar of 10-week-old C57BL/6 mice. The mice were euthanized 0, 1, 2, 3, 5, 7, 10, or 14 days following ligature placement (at least 3 males and 3 females for each timepoint). Bone volume (BV) between the roots of the second molar was determined using microCT 3D analysis. The samples were then sectioned and stained for tartrate-resistant acid phosphatase. Histomorphometric analysis was performed and the number of osteoclasts (N.Oc) per bone surface (BS) and osteoclast surface (Oc.S) per BS were determined. MicroCT analysis revealed that significant decrease in BV occurs on days 5 and 7 followed by the restoration of bone loss by day 14 in male and female mice. Histomorphometric analysis showed N.Oc/BS and Oc.S/BS increase peaking at day 3 for male and day 5 for female. Consistent with the restoration of BV, N.Oc/BS and Oc.S/BS decreased after day 5. These data suggested that ligature placement induced bone formation in addition to bone resorption. In conclusion, researchers should carefully pick analysis timepoints based on preliminary studies or analyze at multiple timepoints because results will be considerably influenced by the timepoint chosen. Researchers should be cognizant of the effect of bone formation when using the ligature-induced periodontitis model.

PRACTICE MANAGEMENT / PUBLIC HEALTH

P36 Oral Health Influences in Saudi Arabia, 2017 National Survey. N. ABOGAZALAH^{*1}, C.T. YIANNOUTSOS², J.F. YEPES¹, A. SOTO-ROJAS¹, E A. MARTINEZ-MIER¹ (¹Indiana University School of Dentistry, ²R.M. Fairbanks School of Public Health)

Objective: To investigate self-reported influences on oral health in the Kingdom of Saudi Arabia (KSA) utilizing data from the national demographic and health survey (DHS) conducted in 2017. Methods: The 2017 KSA DHS applied a multistage stratified random sampling technique to select its population sample using primary health care centers' catchment areas as the primary sampling unit. Over forty-five thousand household heads plus a family member were interviewed. A conceptual framework for distal and proximal oral health influences, specific to the KSA, was adapted based on the WHO's oral health surveillance model. Constructs included as distal influences were: Sociodemographic; Socioeconomic; Home environment; General health; Oral health access. Constructs for proximal influences included: Oral health services use and oral health risk behaviors. Cross tabulation and Chi-square test were performed with consideration for sample weights. Frequencies and weighted percentages for each variable reflecting each construct were reported. Results: The total number of individuals included in the analysis was n=55,511, with ages ranging between 2 and >65 years old. There were more female (n=29,892) than male respondents (n=25,619) as well as more citizens (n=50,155) than non-citizens (n=5,356). Approximately 36% of the household heads reported they had health insurance. Approximately 22% of the respondents reported lacking available dental services when needed, with females reporting less access than males. Half of the respondents visited the dentist at least once last year. Dental pain was the most common reason for the last dental visit (69%), while only 6.4% reported routine dental examination visit. Only 15.3% reported they brush their teeth at least twice daily. Approximately 82% reported they eat sweets and 62.7% consume soft drinks on a regular basis. The 2017 KSA DHS illustrated that routine dental exam visits and oral hygiene behaviors are inadequate among the KSA's residents which may influence their oral health status.

P37 Dietary Factors Affecting Urinary Fluoride during Pregnancy in Mexican Women. G. CASTIBLANCO-RUBIO^{*1}, T. MUÑOZ-ROCHA², M. TÉLLEZ-ROJO², A. ETTINGER³, A. MERCADO-GARCÍA², K. PETERSON⁴, H. HU⁵, A. CANTORAL⁶, E A. MARTINEZ-MIER¹ (¹Indiana University School of Dentistry, ²National Institute of Public Health of Mexico-INSP, ³Rutgers University, ⁴University of Michigan, ⁵University of Southern California, ⁶Universidad Iberoamericana Mexico)

Urinary fluoride (UF) levels during pregnancy are used as a biomarker of prenatal fluoride exposure. Dietary factors affect UF in healthy nonpregnant adults, but for pregnant women, this is unknown. During pregnancy and 1-vr postpartum, we aimed to: 1) compare UF levels and 2) assess associations between UF and dietary fluoride (F) and calcium (Ca) intake from both diet and supplements; dietary acid load (AL); and use of fluoridated table salt (TS). A secondary data analysis was conducted in participants of the Early Life Exposures in Mexico to ENvironmental Toxicants (ELEMENT) cohort. A total of 421 women -who were exposed to fluoridated TS in their diet- were included in the study sample, among whom, 167 attended visits at least once during pregnancy. Oneto-three times during pregnancy and once at 1-yr postpartum, spot UF (mg/L) was measured by microdiffusion/fluoride-specific electrode, and dilution-corrected with specific gravity (SG) using refractometry. Dietary factors were estimated from validated Food Frequency Questionnaires. Data were summarized with descriptive statistics. A longitudinal random effects models for pregnancy, and a cross-sectional linear regression model for 1-yr postpartum, were generated. SG-corrected UF levels (median, range) during pregnancy (0.77, 0.01 - 4.73 mg/L) did not significantly differ from 1-yr postpartum levels (0.75, 0.15 - 2.62 mg/L); but did increase every 10 gestational weeks (β = 0.05 [CI: 0.00 – 0.10]). Dietary F and Ca intake, and AL were not associated with UF in either state. Ca supplementation decreased UF only during pregnancy (β = -0.012 mg/L [CI: -0.023 – 0.00]). Reporting the addition of TS to meals was associated with a 12% increase in UF only at 1-yr postpartum (p=0.026). Pregnancy and its associated dietary factors affect UF. The inclusion of gestational age and Ca supplementation as covariates in future studies validating the use of spot UF as a biomarker of prenatal fluoride exposure is recommended. (Funding details: this work was supported by NIH under grant RO1ES021446 and NIEHS/EPA grant P01ES022844 RD8354360; Instituto Nacional de Salud Pública de México (INSP); Indiana University's President's International Research Award (PIRA 23-140-39) and PhD in Dental Sciences Program, Indiana University School of Dentistry.)

P38 Dental Providers on Interprofessional Healthcare Teams for COPD: Rapid Review. N. NOVOSEL^{*1,3}, G.J. FRATARCANGELI¹, J. RANDHAWA¹, O.M. NOVOSEL², S.L. SIBBALD¹ (¹Western University London ON Canada, ²Queen's University Kingston ON Canada, ³Indiana University School of Dentistry)

Chronic obstructive pulmonary disease (COPD) is the third leading cause of death in the world. Emerging concepts like One Health, integrated care models for COPD, and associations between oral and respiratory health are innovative ways to approach COPD treatment. This study explored contemporary evidence on the inclusion of dental providers on interprofessional healthcare teams treating patients with COPD. The first objective was to explore the current state of interprofessional care for COPD, and the second objective was to explore dentistry used in interprofessional care. A rapid review was conducted from January-June 2020 using Scopus and PubMed. Upon assessing for duplication and relevance, 85 articles were included for Objective 1, and 194 for Objective 2. The results of this paper suggest that when dental providers are included on interprofessional healthcare teams, treatment outcomes for patients with multi-morbid, chronic disease such as COPD, are improved. The papers collected for review suggest that educational and clinical programs should implement interprofessional collaboration when treating chronic diseases. Healthcare teams can utilize the expertise of professionals outside the traditional medical field to better understand patients' needs. Healthcare administration should consider a One Health approach when developing COPD treatment guidelines. We believe our results are transferable to the Canadian healthcare system; however, more research is needed to determine transferability into the United States. The collaborative nature and holistic philosophy of a One Health approach provides a novel way to develop policies and procedures that can effectively address the burden of COPD.

P39 Beliefs, Perceptions and Attitudes of Dental Providers and Staff towards LGBTQIA+ Patients.

M. WOHLFORD*, T. ROSCOE, G. THARP, A. SHUKLA (Indiana University School of Dentistry) Objective: In healthcare settings, lesbian, gay, bisexual, transgender, and queer (LGBTQ+) populations experience discrimination, leading to decreased healthcare services utilization. We identify oral healthcare provider's perceptions toward LGBTQ+ patients, perceived barriers for LGBTQ+ patients, and whether inclusive oral healthcare environments contribute to healthy oral health practices. Methods: Oral healthcare professionals (OHPs) and LGBTQ+ patients in Michigan and Indiana completed an online survey. OHPs were asked about their perceptions of the LGBTQ+ community, inclusive healthcare practices in their workplaces, and potential improvements. LGBTQ+ patients were asked about oral healthcare (OH) seeking behaviors, barriers in accessing OH, and OH settings experiences. Regression analyses identified the relationship between patient and OHP characteristics and response types. Results: From August 2020-March 2021, 232 OHPs and 248 LGBTQ+ participated in this study. The median age of OHPs was 45 years (IQR, 33-59), with 63% (n=145) reporting having worked in their current setting > 4 years. 28% (n=66) reported not being affiliated with the LGBTQ+ community, while 52% (n=120) reported having a close friend or relative who was a member of the LGBT+ community. Only 28% (n=64) self-identified as allies to the LGBTQ+ community. Of enrolled LGBTQ+ patients, 89% (n=221) reported a non-heterosexual sexuality and 21% (n=52) were transgender. The median age was 29 years (IQR 25-36). 71% (n=168) reported attending a dentist regularly in the year before COVID-19; however, 34% (n=85) reported mistreatment at their dentist's office because of their sexual identity, and 50% (n=124) reported not seeking dental healthcare when needed due to financial constraints. 75% (n=187) agreed that oral healthcare is necessary, but only 44% (n=108) agreed that their dentist's office was welcoming for LGBTQ+ people. Conclusion: Our study results suggest LGBTQ+ populations experience an unwelcome environment in dental clinic settings, whether from an intentional or implicit bias held by the staff.

P40 Empathy and Cultural Humility in Global Experiential Learning. A. AMJAD^{*1}, J. STEELE² (¹Indiana University-Purdue University Indianapolis, ²Indiana University School of Dentistry)

This article presents an analysis of a 2020 survey seeking to compile feedback from dental school alumni on the impact of global service/experiential learning programs. Considering both dental school accreditation standards and gaps in current literature regarding benefits gained from service and experiential learning, this study focused on quantifying an important desired outcome of these global programs: empathy. Fifty-six dentists responded to the survey (10% response rate). Surveys were scored using a validated empathy scale produced supportive results via numerical empathy scores. These scores were compared between alumni who did and did not participate in service-learning programs, revealing a statistically significant difference between the mean scores of dental alumni who did and did not participate. Qualitative results were also collected from an included set of global citizenship questions. In their responses, alumni verbalized the positive impact of their global experiences.

PROSTHODONTICS

P41 Color Stability of 3D-printed Interim Restorations. L. ALMEJRAD*, D. MORTON, W.S. LIN (Indiana University School of Dentistry)

Purpose: Evaluate the color stability of 3D-printed interim restorations with different surface treatments while immersed in various beverages (artificial saliva, tea, coffee, and wine) for 6 months. Material and Methods: An acrylic tooth was prepared for an all-ceramic full-coverage restoration. A laboratory scanner was used to digitize the prepared abutment tooth. A virtual all-ceramic full-coverage restoration was designed on the digitized abutment tooth using a laboratory CAD-CAM software. Eighty abutment teeth and interim restorations were 3D-printed with tooth-colored photopolymerizing resin. The restorations were randomly allocated into two different groups: Polish and Optiglaze group. For the polish group, interim restorations were finished and polished with aluminum oxide. For the Optiglaze group, one layer of nanofilled, light-polymerizing protective coating was then applied. The 80 printed interim crowns divided into 4 different groups depending on where they will be immersed. After the sample allocations, there were 8 experimental groups with 10 specimens. Color measurements were obtained using a digital spectrophotometer in conjuction with The CIE L*a*b* system before the immersion and 6 months after the immersion. Two-way analysis of variance (ANOVA) was used. Results: Interaction between

surface treatment and immersion liquid was significant for ΔE (p<.001). The Polish group showed significantly higher ΔE than the Optiglaze group did in the Coffee (p<.001) and Wine (p=.015). The Optiglaze group showed significantly higher ΔE than the Polish group that was immersed in Artificial Saliva (p<.001). The Wine group showed higher ΔE than all other group (p<.001 for all comparisons). ΔE showed a color change that was significantly higher than the perceptibility and acceptability thresholds for all the groups under Polish surface treatment (p<0.001) and for Artificial Saliva, Tea, and Wine under Optiglaze surface treatment (p=.004). Conclusions: 3D-printed interim restorations showed significant discoloration after 6-months immersions in the artificial saliva and common beverages.

P42 Nutritional Assessment of Denture Wearers Using Matched Electronic Dental-Health Record Data. S.D. CHO*1, G. GOMEZ1, D. RAJENDRAN1, R. VARGHESE2, G. ECKERT3, S. BHAMIDIPALLI3, B. KHAN34, T. THYVALIKAKATH14 (Indiana University School of Dentistry, 2GlaxoSmithKline consumer healthcare Weybridge United Kingdom, 3Indiana University School of Medicine,4Regenstrief Institute)

Objective: Determine the nutritional profile of patients with removable dentures using nutritional markers derived from matched electronic dental (EDR) and health (EHR) record data. Methods: We studied matched EDR-EHR data of patients treated with removable dentures at the Indiana University School of Dentistry clinics. The Code on Dental Procedures and Nomenclature (CDT Code) were used to identify EDR (axiUm®) of patients who received removable dentures between January 1st, 2010 and December 31st, 2018. These patients' EDR data were matched with their EHR data available through the Indiana Health Information Exchange. Matched EDR-EHR data of patients who had laboratory reports within two years of the date of receiving dentures (denture index date) were included. Nutritional markers from the comprehensive and basic metabolic panel and thyroid panel tests were selected. General linear mixed effects models evaluated changes in nutritional markers before and after denture insertion. Results: Out of 6,834 unique patients with dentures, fifty-two percent (N=3,519) met the study criteria. Average age of study patients (±standard deviation) was 57±10 years with range 18-84 years. Sixtythree percent of patients were White and 61% lacked dental insurance. Forty-six percent were edentulous; 54% partially dentate, including 23% who were edentulous in a single arch. Analysis of nutritional markers showed stable serum albumin and serum calcium across two years prior to denture insertion, followed by statistically significant decreases in serum albumin (p=0.002) and serum calcium (p=0.039) over the two years after denture insertion. Serum creatinine was increasing prior to denture insertion but was significantly decreasing afterwards (p<0.001). Conversely, hemoglobin was decreasing prior to denture insertion (p<0.001) but remained stable afterwards. Conclusions: All changes in nutritional markers were within physiological limits. Results indicate the potential of serology tests to monitor denture-wearers' nutritional status. Diet and nutritional counseling for denture wearers can improve their overall health. (Grant support: GlaxoSmithKline consumer healthcare)

TISSUE REGENERATION AND REPAIR

P43 Kalirin Deletion in Osteoblast Lineage Leads to High Bone Mass. D. GODFREY*, J.M. HONG, A. BRUZZANITI (Indiana University School of Dentistry)

Objectives: Osteoblasts are responsible for forming the fundamental structure of bone whereas osteoclasts degrade bone. Osteocytes are derived from osteoblasts that become trapped within the bone matrix and orchestrate bone remodeling. However, the cellular mechanisms that control bone cell activity and cross-talk are still unclear. A mutation in Kalirin, a GDP/GTP-exchange factor, has been shown to lead to human skeletal pathophysiology, including short stature, low density and delayed bone age. Consistent with this, global Kalirin knockout exhibit a significantly reduced bone mass phenotype. However, since Kalirin is expressed in all three bone cell types, the specific role of Kalirin in bone formation is currently unknown. In this study we examined the effects of removing Kalirin from the osteoblast lineage on the bone mass phenotype of mice. Methods: To generate mice lacking Kalirin in osteoblasts and osteocytes, Kalirin-floxed mice were crossed with collagen type 1a-Cre mice. The resulting Kal-Col2.3 mice were examined *in vivo* for changes in bone mineral density and body composition by DEXA scanning. In addition, 6-month males and females were analyzed by micro-CT and histomorphometry. Results: Homozygous Kal-Col2.3 mice show an unexpected increase in bone mineral content. In addition, Kal-Col2.3 males and females exhibit an increase in bone volume/tissue volume and trabecular

thickness, whereas cortical bone area was unchanged compared to sex-matched littermate controls. Both osteoblast number and osteoclast number per bone surface were reduced, suggesting low bone turnover. Consistent with these findings, osteocyte apoptosis was increased in Kal-Col2.3 mice. Conclusion: <u>The data suggest Kalirin directly regulates bone mass through its actions in osteoblasts and osteocytes as well as its indirect effects on osteoclast formation. These studies provide key insights into the role of Kalirin in bone remodeling and may lead to the identification of new pathways that can be targeted for improving bone mass and quality.</u>

P44 The Effect of Kalirin on Osteocyte Apoptosis and Bone Mass. O. HENDZEL*, D. GODFREY, J.M. HONG, A. BRUZZANITI (Indiana University School of Dentistry)

Osteoporosis affects 50% of women and 20% of men, which may lead to bone fracture. There are three major bone cell types. The primary function of osteoclasts is bone resorption, while osteoblasts work to form bone. Once osteoblasts complete their purpose, they become embedded in the bone matrix and become osteocytes, bone cells which regulate the activity of osteoblasts and osteoclasts. The different bone cells and their functions allow efficient bone homeostasis, but an imbalance can cause diseases such as osteoporosis. Kalirin, a GTP-exchange factor protein, is expressed in osteoclasts, osteoblasts, and osteocytes, but its role is unknown. Kalirin deficiency has been found to be associated with a decrease in bone mass in humans and mice. The objective of this study was to understand the impact of Kalirin within osteoblasts and osteocytes. To genetically delete Kalirin in osteoblasts, and therefore, osteocytes, Kalirin floxed (KalFF) mice were crossed with Cre-recombinase collagen type 1a mice. The bone mass of 4-month-old KalFF-Col2.3 female mice was analyzed by micro-CT, which revealed an unexpected increase in bone mass. For this project, we performed histology to examine osteocyte number and viability. We used 5 mice for each genotype. Data was analyzed by student's t-Test, with significance set at p<0.05. Data shows that the deletion of Kalirin leads to low survival rates of osteocytes. Given that osteocytes are important in bone quality, their increased levels of apoptosis when Kalirin is deleted suggests Kalirin may regulate bone quality. Together, these findings suggest that the deletion of Kalirin in osteoblasts/osteocytes leads to changes in bone mass and may lead to poor bone quality.

P45 Bisperoxovanadium Promotes Motor Neuron Survival in Amyotrophic Lateral Sclerosis. L. TIERNEY*, J. WANG, R. MANN, T. LONSWAY, C.L. WALKER (Indiana University School of Dentistry) The objective of this study was to test the therapeutic efficacy of bisperoxovanadium (bpV) in cell culture and animal models of the motor neuron (MN) disease, amyotrophic lateral sclerosis (ALS). BpV is an inhibitor of the phosphatase and tensin homolog (PTEN) and has been shown to promote neuron survival in nervous system injury models. We hypothesized that treating a mutant superoxide dismutase 1^{G93A} (mSOD1^{G93A}) mouse model of familial ALS during motor neuron degeneration and an *in vitro* model of mSOD1^{G93A} motor neuron injury with bpV would reduce motor neuron death. To test this, we administered 400 µg/kg bpV intraperitoneally daily to mSOD1^{G93A} ALS mice between 70 and 90 days of age, which is a period of onset of motor neuron loss in the lumbar spinal cord in this model. After treatment, we examined the immunolabeling of motor neurons in cryosections of the lumbar spinal cord and microglial reactivity, which can contribute to pro-inflammatory causes of motor neuron loss. For the in vitro model, we cultured motor neuron-like NSC-34 cells transfected with a plasmid to overexpress mutant SOD1^{G93A} and starved them in serum-free medium for 24 hrs with and without bpV as well as downstream inhibitors of the Akt signaling pathway, which is affected by PTEN. These inhibitors were used to confirm the pathway's involvement in the neuroprotective effects of bpV. We found that roughly 20 days of bpV therapy significantly reduced ventral horn motor neuron loss (p < 0.05) in the mSOD1^{G93A} mouse while not significantly enhancing microglial reactivity. In vitro, bpV improved neuron cell viability, and blocking Akt activation reversed this protective effect (p < 0.05). In conclusion, our study indicates that systemic bpV treatment could be a useful neuroprotective therapy for ALS. (Funding: United States Department of Veteran Affairs 5IK2RX002688)

Clinical Case Report Presentations

DENTAL HYGIENE

CC1 Long-Term Effects of Diabetes Mellitus on the Oral Cavity. C. O'BRYAN*, S. CONRAD, M. CORNEWELL (Indiana University School of Dentistry)

Objective: To demonstrate that there is a correlation between uncontrolled diabetes mellitus type II and periodontal destruction. Background: A geriatric male presented to the dental hygiene clinic for prophylaxis and a comprehensive oral evaluation. Patient has a history of uncontrolled Diabetes Mellitus type II and an HbA1c of 8.0. Patient was diagnosed with Diabetes in 2011. Assessment: The patient presented with generalized plaqueinduced marginal gingivitis, deepest probing depth of 6mm, and radiographic bone levels of 4mm from CEJ to crest of bone. Images taken in 2013 compared to 2020 showed evidence of secondary decay and bone loss that led to the extraction of multiple teeth. A stage and grade were given to the patient to determine periodontal involvement. Patient's classification was given as Stage 3, Grade C due to probing depths of no greater than 6mm and HbA1c greater than 7.0. Dental Hygiene Care Plan: Research has shown that diabetes is a two-way street. If the glycemic control is poor, periodontitis will increase in severity and if periodontitis increases in severity then it will be difficult to have glycemic control. An adult prophylaxis was performed, and oral hygiene instructions were given. Student recommended brushing twice daily, flossing with the c-shaped technique, switching from a manual to an electric toothbrush, and maintaining recall appointments. Patient's dietary habits were addressed. Patient was advised to reduce soft drinks and to snack on non-cariogenic food. Conclusion: This patient is a classic example of what uncontrolled diabetes can do to the periodontium and what uncontrolled periodontitis can do to the glycemic control. At the recall appointment, the probing depth of 6mm was reduced to 4mm, and the patient's gingival condition went from generalized gingivitis to health, thus starting the patient on the path to improved periodontal health and glycemic control.

CC2 Cultural Challenges and the Effects on Oral Health. T. SUNG*, D. GREGORY, M. CORNEWELL (Indiana University School of Dentistry)

Objective: The objective of this case presentation is to address the effects that cultural differences have on oral health. Introduction: Culture combines attitudes, values, and beliefs and can affect one's thoughts or behaviors towards oral health. Some cultures do not believe in prevention as most Americans today and others may not have access to dental care. Background: A 21-year-old male presented to the dental hygiene clinic for a comprehensive exam. The patient had never been to the dentist before coming to the Indiana University School of Dentistry. He previously lived and grew up outside of America where he experienced a lack of access to dental care including finance and insurance coverage. His culture did not stress the importance of taking care of the teeth to prevent any sense of pain which also caused him to experience a lack of oral health education. He was not happy with the appearance of his teeth due to heavy stain from chewing tobacco causing him to seek oral care. Assessment: The patient presented with generalized plaque-induced marginal gingivitis as evidenced by dark pink, rolled, and spongy papilla. The patient had a history of chewing tobacco and the clinical examination revealed generalized heavy stain, supra calculus, and localized mild bone loss. The patient's plaque score was 85% during this visit. The patient never flosses nor uses mouth rinse. Dental Hygiene Care Plan: The patient received localized nonsurgical periodontal therapy with a 4-6 week tissue re-evaluation. He was placed on a four month recall for periodontal maintenance. Conclusion: Through the condition of the patient's oral health, we can see that emphasis and access was not available in his culture, yet through patient education and treatment the patient now understands the importance of maintaining his oral health and is able to easily obtain access to dental care.

CC3 Negative Impact of Covid-19 on Oral Health. A. CLEVENGER*, S. ALLEN, L. MAXWELL (Indiana University School of Dentistry)

Objective: To educate oral health professionals on the effects Covid-19 has had on the oral cavity and how we as oral health professionals can address them. Coronavirus has had a negative impact on the oral cavity. Increases in tooth fractures, decay, periodontal disease, and TMJ have all been reported in dental literature. Reasons for these increases include working from home, stress, snacking, and lack of activity. People are also reporting

increased anxiety and depression. With the pandemic forcing people to change their daily routine, oral home care routines have also changed in a negative way. We know that not removing the plaque biofilm on a routine basis, oral bacteria will multiply, leading to decay. Anxiety and stress can cause teeth grinding leading to fractures and TMJ pain. It can affect the periodontal structures through periodontal disease-associated enzymes allowing the mucosal surfaces to adhere and colonize respiratory pathogens. Unfortunately, the same population at risk for Coronavirus is also the same population at risk for periodontal disease. These at-risk populations have comorbidities of diabetes, obesity, and smoking, among others. Educating patients on the importance of homecare is crucial to a return to health. Conclusion: The importance of oral hygiene education, preventive services, and plaque biofilm control by oral health professionals can be a key in reducing oral complications from Covid-19.

CC4 Marijuana and the Effects on the Oral Cavity. H. MOTSINGER*, B. ROHLFING, T. RADER (Indiana University School of Dentistry)

The objective of this presentation is to discuss the effects of marijuana on the oral cavity. Much like cigarette smoking, smoking marijuana can also negatively impact almost every system in the body, particularly the oral cavity. Assessment: A 39-year-old, African American, male presented to the Dental Hygiene clinic for a cleaning. The patient reported it had been around 5 years since his last cleaning and in the medical history reported a current use of marijuana. After a thorough assessment of the patients' oral health and current radiographs, the patient presented with slight bone loss, localized gingivitis, and stage 1 periodontitis. Purpose: The purpose of this study is to investigate the effects marijuana has on the oral cavity and what oral healthcare providers could see in the near future if marijuana is legalized in Indiana. The effects of marijuana on the oral cavity should be investigated due to the number of individuals who use it recreationally, medically, and the possibility of it being legalized in Indiana. Conclusion: Not all individuals who smoke marijuana will present with negative effects on their oral cavity, but it is important to signify the similarities between smoking cigarettes and smoking marijuana to patients and discussing the potential oral health effects such as xerostomia, stomatitis, oral cancer, periodontal disease, and dental caries with patients.

CC5 Clinical Effects and Management of Hyposalivation. S. OSTLER*, T. MCGINLEY, T. RADER (Indiana University School of Dentistry)

Objective: The goal of this case presentation is to discuss the association of hyposalivation and dental decay. Patient Assessment: A 65-year-old female patient with hyposalivation presented to the dental hygiene clinic. The patient had several signs and symptoms of hyposalivation, which included: little pooling of saliva, the dental mirror sticking to the cheeks, a history of restorations, and current decay. Due to these findings, a salivary flow test was performed with the dental hygiene student and dentist and revealed insignificant salivary gland production as evidenced by salivary flow rate of 0.0006 mL per minute unstimulated and 0.48 mL per minute stimulated. Dental Hygiene Care Plan: The management of this patient included prescribing Prevident 5,000, a high concentrated toothpaste, for bedtime when brushing, proper oral hygiene instructions, with addition of water flosser, and improving dietary habits. Conclusion: Providing recommendations and education on how to slow the caries disease process related to hyposalivation, this patient will be able to manage the effects of hyposalivation and lower the risk for caries.

CC6 Communicating with Individuals with Hearing Impairments in a Clinical Setting. L. OWENS*, Y. FOX, T. RADER (Indiana University School of Dentistry)

Objective: To develop communication skills, utilize supplementary strategies, and implement a proper treatment plan to successfully communicate with dental patients with hearing impairments. Background: Adaptation and awareness of patient impairments in a medical/dental practice is crucial for accurate communication with deaf patients. However, a limited amount of healthcare professionals have the proper education needed to communicate and accommodate with deaf patients which can lead to improper care. Case Presentation: A greater increase of individuals with hearing impairments are seen within the healthcare setting which requires an understanding of the accommodations necessary to treat these patients adequately. In this presentation, we describe the proper treatment for a fifty-six-year-old male with a hearing impairment. Results: As a result of this presentation, we have discovered the significance of applying communication skills and utilizing supplementary strategies that adequately adapt for this specific patient's needs. We have explored the importance of utilizing

auxiliary aids, accurate communication skills, and a tell-show-do approach in order to efficiently communicate with patients who are deaf or hard of hearing. Conclusion: <u>We have concluded that proper implementation of visually</u> accessible communication and the proper knowledge on how to use auxiliary aids is crucial to provide a quality experience for the deaf patient and achieve desired outcomes.

CC7 A Multi-Factorial Outlook of Managing an Autism Patient's Oral Health. W. ALJOHANI*, L. VILLALOBOS, P. RETTIG (Indiana University School of Dentistry)

Objective: The objective in this clinical case report is to evaluate the effects of autism on the oral hygiene status of an individual with autism. Assessment: A 36-year-old African American male patient presented to the Dental Hygiene Clinic. The chief complaint stated by his mother was that she had been struggling to floss her son's teeth. Medical history was negative with the exception of having autism, a communication disability making his mother the caretaker. The clinical examination presented with generalized plaque induced gingivitis evidenced by generalized probing depths of 4-5mm on the posterior teeth. The patient's oral hygiene habits include: the mother brushing the patient's teeth using a manual toothbrush twice a day, flossing once a day, and using mouth rinse once a day. Dental Hygiene Care Plan: Oral hygiene instruction included discussing with his mother regarding her struggles with regular flossing the patient's posterior teeth. It was recommended to use a water flosser. Patient received a prophylaxis over the series of two appointments. Evaluation: With the help of a water flosser, the mother will be able to reach the posterior teeth with ease due to the patient's limited opening as well as inability to follow instructions. <u>Conclusion: The mother voiced difficulty in attaining a water flosser and asked if there are any organizations that could offer one with no charge due to the patient's disability.</u>

CC8 Periodontal Disease Management in a Difficult Geriatric Case. N. CANNON*, D. BALL, P. RETTIG (Indiana University School of Dentistry)

Objective: The objective of this case presentation is to discuss the effects of periodontal disease as a result of a combination of the effects from radiation therapy, medication-induced xerostomia, and previous poor oral hygiene. Assessment: A 74-year-old, Caucasian, female presented to the dental hygiene clinic with active periodontal disease. The patient was diagnosed with thyroid cancer in 2008 and underwent a thyroidectomy, radiation therapy, and prescribed multiple medications that cause xerostomia. The most current periodontal evaluation includes stage 3 as evidenced by tooth loss due to periodontal disease within the past three years, probing depths of 2 -4 mm, radiographic bone loss of 2 – 4 mm CEJ to the crest of bone, and 3-5 mm interdental loss due to recession. The patient also had generalized plaque induced gingivitis evidenced by dark pink, rolled margins, and blunted papilla. Plaque score was 36%. A salivary flow test diagnosed her with salivary hypofunction and positive for Sjogren's antibodies. Dental Hygiene Care Plan: Patient receives continuous periodontal maintenance therapy in all four quadrants every 4 months, probing depth comparisons, and extensive oral hygiene instruction. Results: The patient's gingival health was restored as patient presented with light pink, firm, stippled gingiva and blunted papilla. Her periodontal health is still diseased as evidenced by tooth loss within 3 years, radiographic bone loss has not progressed from generalized 2-4mm, 3-4mm interdental loss with localized 4-5 mm CAL on many teeth due to recession, overall probing depths were 1-3mm and 4mm on tooth #4. Conclusion: The patient's positive response to treatment is the result of beneficial patient education regrading at-home oral care, thorough scaling, and diligent 4-month recall prophylaxis appointments.

CC9 Effects of Head and Neck Radiation on the Oral Cavity. K. GROTE*, A. JARRETT, P. RETTIG (Indiana University School of Dentistry)

Objectives: The objective of this case presentation is to discuss the effects radiation therapy on the oral cavity and surrounding structures. Assessment: A 44-year-old African American female patient presented to the Dental Hygiene clinic with a chief complaint of "cleaning". The patient was referred to our clinic from the Graduate Prosthodontic clinic at the Indiana University School of Dentistry for oral prophylaxis prior to receiving dentures. Patient reported a history of squamous cell carcinoma in nasopharynx in early 2014 with radiation therapy from March to May 2014. Radiation therapy led to Stage III osteoradionecrosis (ORN) of the jaw, a complication causing the radiated bone to become necrotic and exposed. Patient reports other health conditions include hypothyroidism, marijuana use, and anorexia. The intra oral examination revealed presence of hyposalivation accompanied by the sensation of xerostomia, generalized recession, rampant decay, radiographic calculus and osteoradionecrosis of

the jaw. Dental Hygiene Care Plan included referral for extraction. Evaluation: The prophylaxis was stopped in the assessment stage due to the patient needing teeth #3 and #14 extracted in the Oral Surgery clinic. Conclusion: Based on evidenced-based literature, radiation therapy for treatment of cancer in the head and neck region can have complications such as osteoradionecrosis of the jaw, loose teeth, and xerostomia.

CC10 Oral Hygiene in Blind Patients. K. LITSEY*, N. LEN, P. RETTIG (Indiana University School of Dentistry) Objective: The objective of this clinical case presentation is to discuss the modifications needed to provide optimal oral hygiene instructions to a blind patient. Assessment: A 77-year-old African American male patient presented to the Dental Hygiene Clinic with a chief complaint of "I need to get my teeth cleaned." Medical history was completed showing that the patient has hypertension that is controlled by medication, has visual impairment that led to blindness, the use of a wheelchair, and has COPD that requires him to use oxygen all the time. The clinical examination revealed that the patient has periodontitis that is stage three, grade B as evidenced by vertical bone loss of less than 3mm. Patient has generalized 3-9mm probing depths. The intraoral radiographs revealed generalized moderate bone loss as evidenced by 2-7mm bone loss from CEJ to crest of bone. Patient is at high caries risk due to having three or more restorations in the past 3 years and being disabled due to blindness. Patient had a plaque score of 35%. Patient stated that he brushes twice a day and flosses occasionally. DH Care Plan: This included periodontal maintenance and a modified review of oral hygiene to help him with his home oral care. Evaluation: It is important to understand as a dental professional every patient's needs are different, and we need to know how to adapt to those differences. Conclusion: The patient will try to modify his home care using the techniques shown to him during the appointment. If home care hasn't improved the periodontal disease will worsen and the patient will require additional periodontal debridement.

ENDODONTICS

CC11 Onlay Endo-Crown Restoration of Endodontically Treated Premolar: Alternative Approach. A. ALMUDAHI*, K. DIEFENDERFER (Indiana University School of Dentistry)

Introduction: Endo crown can be defined as an indirect monoblock ceramic restoration that assembles the intraradicular post, core, and crown in one component, engaging the pulp chamber of endodontically treated teeth. This case report describes an alternative approach to restore a badly broken and tilted premolar that had endodontic treatment. Case report: A 64-year-old male patient reported to the Graduate Operative Dentistry clinic after endodontic treatment for #20 and #21. He had the endodontic treatment nine months before presenting in our clinic. The radiograph showed improvement in periapical radiolucency in #21 compared to the pre-operative radiograph taken before endodontic treatment. Intraoral examination showed tooth #20 tilted mesially with a large MOD amalgam with access cavity. The initial treatment plan included a cast post-and-core and porcelain-to-metal (PFM) crown. However, the patient presented at the next visit with a fracture in the amalgam combined with a fracture of the entire lingual cusp. Since there was less tooth structure remaining, a lithium disilicate Onlay endo crown was chosen as an option to conserve buccal tooth structure and reduce the further weakening of the tooth. Conclusion: The endo crown represents a promising treatment alternative for endodontically treated posterior teeth. The "onlay endo crown" preparation enhances conservation of tooth structure. It is an innovative approach for mechanical and aesthetic restoration of nonvital posterior teeth.

CC12 Management of Bilateral Endodontic Infections in Maxillary Lateral Incisors. M. MCKARY*, T. WHITFIELD, P. ALENA, Y. EHRLICH, N. WARNER (Indiana University School of Dentistry)

Case Report: A 45-year-old female was referred to IUSD Undergraduate Endodontic Clinic from a private practice for endodontic diagnosis and treatment. Patient recalls that as an adolescent a lingual bar placed following orthodontic treatment had fallen off. Patient's medical history was non-contributory and patient denied taking any medication. Teeth #7and #10 presented with similar deep DO caries. Teeth were subjected to endodontic testing: cold and electric pulp testing. Percussion and palpation testing were also done. The x-ray showed a widening of the apical lamina dura (PDL) and a periapical radiolucency (PARL). The endodontic diagnosis: #7 pulpal necrosis with symptomatic apical periodontitis (SAP), #10 irreversible pulpitis with SAP. The need for root canal treatment (RCT) was explained to the patient in Spanish and she agreed to proceed with treatment. Root canal treatment

was successfully treated in teeth #7 and #10. Discussion: The bilateral appearance may be the result of debonding of the lingual bar and ensuing caries. RCT was done in two visits with calcium hydroxide as the intracanal medicament. Root canal treatment was completed after improvement of symptoms were noted. Patient compliance was good and she was satisfied with the results. <u>Conclusion: Successful management of bilateral endodontically involved maxillary incisors was presented.</u>

CC13 Recurrence of Odontogenic Keratocyst: A Case Report. K. BROTHERS*, K. SPOLNIK, J. BRINGAS, Y. EHRLICH (Indiana University School of Dentistry)

Introduction: Odontogenic Keratocyst (OKC) is a development odontogenic cyst that can cause swelling, mild pain, or unusual taste following rupture of cyst. Treatment for OKCs consists of surgical enucleation and curettage, marginal or segmental resection, marsupialization, using Carnoy's solution, or chemical cauterization. OKCs have a recurrence rate of 30% and must be closely monitored after diagnosis and treatment. In the field of endodontics, depending on the case, surgical enucleation and curettage is often proceeded by non-surgical root canal therapy, followed by root end surgery with retro-preparation. Methods: A 59-year-old female patient presented to IU Graduate Endodontic clinic 8 years ago. Clinical and radiographic testing revealed apical lesion in close proximity to the apex of #7. Tooth #7 was treated with root canal therapy followed by surgical enucleation and biopsy of lesion. The histopathological findings determined the diagnosis to be OKC. The patient maintained a six month recall and underwent two more surgical procedures over the years due to the recurrence of OKC. The patient is currently asymptomatic. <u>Conclusion: This case report provides evidence of recurrence of odontogenic keratocyst over the course of 8 years and demonstrates the need for long-term follow ups once the diagnosis of OKC has been established.</u>

CC14 Obturation of Complex Root Canal Anatomy in Mandibular Molars. J. LONG*, K. SPOLNIK, J. BRINGAS, Y. EHRLICH, N. WARNER (Indiana University School of Dentistry)

After disinfection of an infected root canal system, a three-dimensional, well adapted obturation is desired. Obturation should be within 0 to 2 mm of the root canal apex. Certain anatomic variations may make obtaining these obturation goals difficult. Vertucci described a type VI root canal as "two separate canals leave the pulp chamber, merge in the body of the root, and redivide short of the apex to exist as two distinct canals." A CBCT image can help identify and manage difficult anatomic variations which may otherwise be difficult to discover clinically. This case series presents the obturation of a mandibular first and second molar with a Vertucci Type VI root canal system. A CBCT analysis was used to evaluate the root canal anatomy of the mandibular second molar. A 53-year-old male (Tooth #19) and a 67-year-old-male (Tooth #31) presented to IUSD Graduate Endodontics for non-surgical root canal treatment. To obturate the Vertucci Type VI root canal system, one master cone was introduced to the prepared working length. The master apical file was re-introduced into the adjacent canal to create a pathway through the first cone. This ensured the second cone was able to seat fully to its prepared working length. <u>Conclusion: This case series demonstrates that a Vertucci Type VI root canal system can successfully be obturated using a technique to create a pathway through one master cone so the other master cone can seat to the working length, achieving the objective of an obturation that extends within 2 mm of the root canal apex for each root canal involved.</u>

CC15 Intentional Replantation to Resolve a Persistent Periapical Infection: Case Report. P. MCINTYRE*, K. SPOLNIK, J. BRINGAS, Y. EHRLICH, N. WARNER (Indiana University School of Dentistry)

Introduction: The treatment of a tooth that presents with persistent symptoms or clinical evidence of a recalcitrant infection, despite seemingly adequate root canal treatment, can present a challenge to clinicians. The failure of root canal treatment is usually due to an intraradicular infection, but other reasons can include extraradicular infections, true periapical cysts, or cracks. Potential treatment options for these teeth include extraction, retreatment, root end surgery, and intentional replantation. This case report details the intentional replantation procedure a tooth with a persistent buccal sinus tract following root canal treatment. Case Presentation and Results: A 54-year-old male presented for evaluation and treatment of tooth #18 that presented with a sinus tract. #18 was diagnosed as pulp necrosis with chronic apical abscess, and root canal treatment was initiated. Following two rounds of calcium hydroxide as an intracanal medicament and obturation, the sinus tract persisted. An

intentional replantation procedure was then performed on #18 including extraction, root end resection, retropreparation of canals and isthmus, placement of a bioceramic retrofilling, and replantation of #18. The 6-month follow-up appointment showed resolution of the sinus tract and radiographic evidence of bone healing. <u>Conclusion: An intentional replantation procedure is a viable treatment option to resolve a persistent sinus tract of endodontic origin and allow for periapical bone healing.</u>

ORTHODONTICS / IMAGING / CRANIOFACIAL

CC16 Mini-screw Assisted Palatal Expansion and Anchorage Control: A Case Report. H. LEE*, D.A. ALBRIGHT (Indiana University School of Dentistry)

Background: Rapid maxillary expanders (RME) have many indications for their use in orthodontic therapy, including the correction of posterior crossbite and alleviating dental crowding. The common goal is widening the maxilla by separating the mid-palatal suture. To successfully accomplish this, we must understand the development and maturation process of the mid-palatal sutures and the circummaxillary suture complex. The start and the progression of fusion of the mid-palatal suture varies greatly with age and sex. Complete fusion of the mid-palatal suture can be seen in subjects ranging from 15 to 19 years old, with females maturing earlier than males. Appreciating individual variability in the timing of fusion of the mid-palatal suture in adolescent patients at the beginning of treatment is important in order to identify which patients can have RME as a less-invasive alternative to surgically assisted expansion. Patient Background: A 17-year-old, Caucasian female, ASA Class I, presented to the IUSD orthodontic clinic with a chief concern "I don't like my canines sticking out". Patient diagnosis included an Angle's Class III malocclusion with severe maxillary and mandibular crowding. She possessed a hyperdivergent vertical skeletal tendency with a maxillary transverse skeletal deficiency. Incisors demonstrated upright inclinations, with a palatally displaced tooth #10 in anterior crossbite. The patient presented with fair oral hygiene and had recently completed all restorative treatment. Treatment rendered consisted of a hybrid mini-screw assisted rapid palatal expander (MARPE) with 4 premolar extractions. Conclusion: The maxillary skeletal expansion was successfully completed with minimal dental side effects. Utilizing skeletal anchorage to accomplish the maxillary expansion yielded the additional benefit of assisting anchorage in extraction site space closure. This allowed for choosing a premolar extraction pattern that included teeth with restorations rather than being limited to choosing a more traditional biomechanically optimal option. The patient is currently 14 months into treatment.

CC17 Miniscrew Supported Maxillary Expansion in Adult Patients: A Case Report. S. STALLER*, K.T. STEWART (Indiana University School of Dentistry)

Background: Posterior crossbites involve a transverse discrepancy of the teeth and/or skeleton, often caused by a narrow maxilla. Rapid maxillary expansion is one technique utilized to manage posterior crossbites in patients. Posterior crossbites are often corrected by applying a transverse force to the maxilla and maxillary teeth. The resultant force causes opening of the midpalatal suture but may also affect other adjacent structures in the craniofacial complex. In males, however, the midpalatal suture usually closes around 14-15 years of age, forcing clinicians to utilize other techniques to address this issue. One such alternative includes the use of miniscrew implant supported expanders to correct posterior crossbites. Patient Background: A 27-year-old, Caucasian male, ASA Class I, presented to the IUSD orthodontic clinic with a chief concern "I want to fix my bite." Patient's diagnosis includes Angle's Class III molars and canines, no dental crowding, normal incisor inclinations, healthy periodontium, a posterior crossbite, and slightly retrusive maxilla. His planned treatment included a miniscrew supported maxillary expander, followed by clear aligners and Class III elastics to correct the anteroposterior discrepancy. The miniscrew supported maxillary expander was delivered and activated 32 times (8mm of expansion). During treatment, the miniscrews displayed mobility and the desired sutural expansion was not achieved. A new miniscrew supported maxillary expander was delivered with miniscrews at a more laterally oriented position. This expander was activated 38 times, but no sutural opening was observed. Unsuccessful sutural opening may be due to a lack of miniscrew bicortical engagement. Conclusion: While literature has shown this treatment approach to be effective, clinicians should also be aware of the potential shortcomings associated with the utilization of miniscrew supported maxillary expanders to address posterior crossbites in older patients.

CC18 Orthodontic Management of Canine-Premolar Transposition. S. YANG*, K.T. STEWART (Indiana University School of Dentistry)

Background: Tooth transposition occurs when one permanent tooth exchanges positions with an adjacent permanent tooth. It can be classified as a complete transposition in which the entire root and crown of one tooth is interchanged with that of another, or as an incomplete transposition in which only the crown positions are interchanged and the root positions are not. The incidence of tooth transposition is 0.2-0.38%. Etiologies can include both genetic and environmental factors, such as abnormal eruption sequence, early tooth loss or trauma during development. Tooth transposition can increase the complexity of orthodontic treatment and determining whether to maintain or reverse the transposition requires careful diagnostic workup and treatment planning. This case report highlights the orthodontic management of a patient with transposed teeth and limited buccal bone. Patient background: A 27-year-old Hispanic male presented to the IUSD Orthodontic Department with the chief concern: "I don't like my crowding." Medical history included no contributory conditions. Dental history includes past restorative work and regular cleanings. The patient presented with a Class II Subdivision Left malocclusion with crowding and partial transposition of the upper right canine and upper right first premolar. The planned treatment included reversal of the canine-premolar transposition and alleviation of crowding in the maxillary and mandibular arches. Due to re-evaluation of buccal bone width on the facial of the canine, the treatment plan was modified to maintain the transposition 40 months into treatment. After 70 months of treatment, the canine and premolar have been successfully transposed and lingual root torque has been applied to maximize canine stability. Conclusion: Careful evaluation of the periodontal apparatus around transposed teeth and thorough planning of biomechanical techniques are vital to the effective management of patients with tooth transpositions.

PERIODONTICS

CC19 Localized Loss of Periodontal Attachment and Bone from Tongue Piercing. A. KAKAR*, S.B. BLANCHARD, G. LIM (Indiana University School of Dentistry)

Intra-oral piercing is viewed as a form of self-expression among young individuals with tongue as the most frequent site. However, this body art can result in serious dental complications such as abnormal tooth wear, tooth cracking, gingival recession, and localized loss of periodontal attachment and bone support. This case report demonstrates a clinical presentation of periodontal complications associated with tongue piercing and surgical management. A 29-year-old Caucasian female was referred to IUSD Graduate Periodontology for treatment of localized bone loss associated with a mandibular incisor. Probing depth on the mid-lingual of #24 was 7 mm with bleeding along with 2 mm of gingival recession. The patient reported wearing a tongue stud for more than a year. The patient's oral hygiene was fair and further examination revealed generalized presence of mild plaque and calculus, but no other sites displayed loss of attachment. Management of the case initiated with scaling and root planning, counselling of patient regarding harmful effects of tongue piercing following with surgical intervention. A sulcular incision on the lingual aspects of the area was made to reflect full-thickness flap. Following debridement of the defect and root surfaces, a circumferential defect extending around the root apex from mesial to distal side of #24 was visualized. Emdogain® was applied on the root surface as a biologic modifier and the flap was sutured. At 1-month post-op, the healing was uneventful. The patient will be followed at 3-month intervals for a year to continue to monitor the stability of periodontal tissues. Conclusion: These findings strongly implicate tongue piercing along with plaque as the etiological factors contributing to localized loss of periodontal attachment and bone on mandibular anterior teeth.

CC20 Minimally Invasive Surgical Technique for Regenerative Therapy of Intrabony Defects. C. BATRA*, Y. HAMADA (Indiana University School of Dentistry)

Minimally Invasive Surgical Technique (MIST) for periodontal regeneration therapy was introduced with an aim towards minimal flap reflection for wound stability, allowing primary closure and gentle tissue handling for favorable periodontal healing. This case report demonstrates treatment of deep and narrow intrabony defects using MIST with application of growth factors and bone substitutes. A 66-year-old Caucasian female was referred to IUSD Graduate Periodontology for treatment of #22 and #28. The patient was classified as ASA class II due to the hypertension. No history of diabetes mellitus nor smoking were reported. Probing depth at #22 and #28 ranged

from 8-10 mm with bleeding upon probing, suppuration and evidence of subgingival calculus was noted. Radiographic examination revealed a deep, narrow intrabony defect approximating the apical third of both teeth. Vitality of the teeth were confirmed with cold test and a diagnosis of localized stage III grade B periodontitis (#22, 28) was made. Periodontal maintenance and oral hygiene instructions were given. Linear papilla preservation incisions were made around #22 and 28 and full thickness flaps were reflected labially with modified papilla preservation technique. The defects were thoroughly debrided, and adequate root planing was performed. The defects were one to two-wall in morphology and 4-5mm in depth. After application of 17% EDTA, rhPDGF-bb was placed at the apical end of defects and the defects were filled with demineralized freeze-dried bone allograft. Primary closure was obtained via internal vertical mattress suturing technique. Post-operative visit. Periapical radiographic shows evidence of radiographic bone fill. Patient is seen regularly for 3-month periodontal maintenance visits. The application of growth factors along with a minimally invasive surgical approach for periodontal defect treatment leads to favorable clinical and radiographic outcomes.

CC21 Correction of Gummy Smile with Lip Repositioning Procedure: Case Report. T. FUJII*, G. LIM, Y. HAMADA (Indiana University School of Dentistry)

Background: Excessive gingival display, commonly referred as "gummy smile", describes the condition of the overexposure of maxillary gingiva upon smiling. The disharmony of teeth, lip position, and the position of the gingival margin can negatively affect esthetics. The etiology of excessive gingival display includes altered passive eruption, vertical maxillary excess, and hypermobility of the upper lip. Lip repositioning (LR) is a surgical procedure that can effectively reduce the vestibule length by restricting the movement of upper lip. The aim of this case report is to describe the surgical method of LR and the application of a CO₂ laser for myotomy. Case presentation: A 32-year-old male patient presented with a chief concern of excessive gingival display with upper lip hypermobility. Clinical examination revealed 6.5mm of gingival display and 14.5mm of dentogingival exposure at maximum smile position. Therefore, LR was indicated to correct this condition. The surgical procedure was initiated with the removal of the maxillary labial mucosa via partial thickness flap from central incisor to first molar bilaterally. The excision was extended labially to a height of 12mm and the mid-buccal frenum was kept intact to maintain the central line. Myotomy was completed with CO₂ laser and a periosteum elevator. After initial hemostasis was obtained, horizontal mattress sutures were added bilaterally to proximate muscle layers. Primary closure was obtained with single interrupted sutures. Results: Post-operative wound healing was uneventful. At 7 weeks, the amount of gingival display and dentogingival exposure at central incisors were reduced to 0mm, 10.5mm, respectively. 4mm lip mobility reduction was observed. The outcome of LR was satisfactory to this patient. Conclusion: This case report highlighted the predictability of lip repositioning and myotomy with CO₂ laser. Long-term follow-up will be needed to confirm stability.

CC22 Guided Tissue Regeneration Using Biologic Modifiers to Treat Intrabony Defects. U. JANU*, G. LIM, S.B. BLANCHARD (Indiana University School of Dentistry)

Introduction: Gem 21S® contains platelet derived growth factor (rhPDGF-bb) which promotes periodontal regeneration by inducing intracellular events leading to chemotaxis and significantly increasing the proliferation of osteoblasts, periodontal ligament fibroblasts and cementoblasts. This case report describes the treatment of bilateral deep periodontal intrabony defects with the use of biologic growth factors and allogenic bone graft with up to one year follow up. Case presentation: A 64-year-old Caucasian male patient was referred to IUSD Graduate Periodontal Clinic for treatment of #19 and #30 vertical intrabony defects. Both teeth were tested vital; however, prophylactic RCT was performed on #30 given the extensive root apex involvement prior to initiating periodontal treatment. Intrasulcular incisions were made, and full thickness flaps reflected buccally and lingually from #18-20 and #29-31 (surgeries were scheduled six months apart). On #19, a 2-wall intrabony defect extended to the apical third of the distal root. There was also severe bone loss on #18 distal root with heavy residual calculus. The defect on #30 presented with 2-wall defect (15mm in depth) extended beyond the distal root apex. Following degranulation and root planing, EDTA was applied on the root surfaces and rinsed with saline. Gem 21S® was mixed with bone graft to fill the defects and covered with Gem Adapt collagen membrane. Primary closure was

achieved. Post-operative Amoxicillin 500 mg TID was prescribed for 10 days. At 1-year follow up for #19, clinical examination showed 7 mm probing depth reduction with 5 mm clinical attachment gain. At 6-month follow up for #30, clinical examination showed 8 mm probing depth reduction with 3 mm CAL gain. Periapical radiographs revealed radiographic bone fill in the defects. <u>Conclusion: The case report demonstrated favorable clinical and radiographic outcomes with the application of GEM 21S in deep intrabony defects.</u>

PROSTHODONTICS

CC23 Opioid Insufflation: When Subjective Report Contradicts Objective Findings. E. LAKS*, H. ANDERSON, J. LEVON (Indiana University School of Dentistry)

In 2017, more than 47,000 Americans died from opioid overdose, but the effects of the opioid epidemic cannot be measured only in mortality statistics. Opioid abuse manifests in a variety of presentations, often confounded by difficult conversations with patients reluctant to disclose their addiction. In this presentation, we will present one such encounter. In 2019, a female presented to our clinic with the chief complaint that her nose and palate were destroyed by frequent Afrin use and falling with a spoon in her mouth, respectively and that she would like an obturator and nasal prosthesis. The patient reported she had undergone multiple plastic surgeries to repair her nose. In reviewing medical history, the patient disclosed taking HCTZ, Ambien, lisinopril and denied taking any opioids. Intraoral examination revealed a large Aramany class III palatal defect, which she obturated with craftstore silicone. Although the patient subjectively reported the cause of her simultaneous palate and nasal trauma to be a spoon and Afrin respectively, a possibility of opioid insufflation was considered. To rule out opioid abuse, the authors consulted a state-controlled substances report indicating the frequency of opioid prescriptions over a twelve-month period. The report indicated significant quantities of opioid medication, usually Hydrocodone with Acetaminophen, occasionally Oxycodone, which she had denied. The authors gently questioned the patient regarding the opioid report and requested a medical clearance from her physician to rule out any ongoing opioid abuse. Ultimately, the patient did not return for treatment, stating she will transfer her treatment to another healthcare facility.

CC24 Application of CO₂ Laser for Maxillary Labial Frenectomy and Vestibuloplasty. R. VELGIS*, B. HERRON, Y. HAMADA (Indiana University School of Dentistry)

Maxillary labial frena can be an obstacle for adequate retention of complete dentures. Carbon dioxide (CO₂) lasers are typically used for soft tissue procedures due to minimal penetration characteristics. Application of CO₂ lasers can contribute to hemostasis by providing proper blood coagulation and help reduce post-operative pain and swelling. The purpose of this case report is to demonstrate the efficacy of CO₂ lasers with maxillary labial frenectomy and vestibuloplasty procedures. A 47-year-old Hispanic female presented to IUSD clinic with limited amount of vestibular space and presence of low frenal attachment. Clinical evaluation revealed the labial frenum was attached to the anterior part of the alveolar ridge, along with an additional frenal attachment on the distal right portion. These two frena did not allow the denture to fully seat when the patient spoke and activated the muscles in the frenum. After local anesthesia, a horizontal incision with 10,600nm wavelength CO₂ (incision mode: 2.0W focused, continuous wave) was made at the junction of the attached gingiva and the frenum then extended past the distal left frena. The incision was extended until the muscular attachment was fully removed and enough vestibular height was achieved for denture seating. Complete hemostasis was obtained. The patient was instructed to use chlorohexidine gluconate 0.12% mouth rinse twice daily and to mobilize the lip to reduce relapse potential and maintain vestibular height. Post-operative wound healing was uneventful. The vestibular surface was covered by a fibrin layer and proper height of vestibular was maintained. Patient reported that there was only minor discomfort during the first two days with no pain or discomfort thereafter. Patient was highly satisfied with the results and post-operative comfort level. This case report suggests that frenectomy utilizing a CO₂ laser improves soft tissue healing and minimizes patient discomfort.

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PLANTINUM

Crest + Oral B, Proctor & Gamble	Dr. Cyndee Stageman	Stegeman.ca@pg.com	(513) 431-4900
Delta Dental Foundation	Emily Waldschmidt	Ewaldschmidt@deltadentalmi.com	(517) 347-5482

GOLD

GlaxoSmithKline	Monica Bronowicki	Monica.Bronowicki@gsk.com	(630) 927-8212
International & American Associations for Dental Research (IAADR)	Anthony Jones	www.iadr.org	
Patterson Dental Supply	Alex Jimenz	Matthew.Lotz@pattersondental.com	(317) 873-2489

SILVER

Indiana Dental Association (IDA)	Jay Dziwlik	Jay@indental.org	(317) 634-2610
Contour Specialists Dental Lab	Mark Tritask	mtrtsk@aol.com; mjtritask@aol.com	(317) 706-8500
Dentsply Sirona	Todd Gard	Todd.Gard@dentsplysirona.com	(513) 300-0440
Kerr Dental	Zach Miller	Zachary.Miller@kavokeer.com	(800) 537-7123
Odeme Dental Research	Rafael Patzlaff	Odeme@odeme.us	(786) 758-8812



IUSD STUDENT RESEARCH GROUP 2020-2021



yler Whitfield

Grant Zakhar

Bianca Zero

Alyssa Zhao

Previous Year Summary

The 28th annual IUSD Research Day event shifted to an online format due to public health issues surrounding the COVID-19 pandemic. The event included 48 poster presentations and 33 clinical case reports. The award ceremony on May 1, 2020 recognized the following 18 distinguished faculty, staff, and students.

Dental Hygiene Students

Elizabeth A. Hughes Dental Hygiene Award, Anna Lindsay and Maria Lindvall

Undergraduate Students

IN-AADR Undergraduate Student Award, Sara Alhaffar

Predoctoral Dental Students

Cyril S. Carr Research Scholarship, **Reed McKinney** AADR/Dentsply Sirona SCADA, **Marcus Levitan** AADR Student Research Day Award, **Rebecca Shembarger** King Saud University Travel Award for Excellence in Preventive Oral Health Care, **Reed McKinney** IDA Student Research Award, **Stephanie Kawak** IN-AADR D4 Case Report Award, **Brandi Herron** Dean's Award for Research Excellence, **Reed McKinney** Research Honors Program Certificate of Achievement, **Reed McKinney**

Graduate Dental Students

King Saud University Ph.D. Student Travel Award, **Gina Castiblanco** King Saud University Travel Award for Best Clinical Case Report, **Niloufar Daneshparvar** and **Saud Alqahtani** Delta Dental Award for Innovation in Oral Care Research, **Katelyn Brauer** and **Lauren Long** Maynard K. Hine Award for Excellence in Dental Research, **Yu-Ting Yeh**

Staff

IN-AADR Research Staff Award, Adam Kelly

Faculty

IU School of Dentistry Distinguished Faculty Award for Teaching, **Dr. Michael Sovanich** IU School of Dentistry Distinguished Faculty Award for Research, **Dr. Simone Duarte** King Saud University Distinguished Research Faculty Travel Award, **Dr. Richard Gregory**

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