

33rd annual

# RESEARCH DAY

Thursday, April 10, 2025



**Keynote Speaker**

Hyun (Michel) Koo,  
DDS, MS, PhD

# IUSD RESEARCH DAY PROCEEDINGS

## VOLUME 33 APRIL 10, 2025

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# EVENT SCHEDULE

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## WEDNESDAY APRIL 9, 2025 - IU INDY CAMPUS CENTER (CE) 4TH FLOOR

5:00 - 8:00 p.m. Student Research Awards Competition

## THURSDAY APRIL 10, 2025 - IU INDY CAMPUS CENTER (CE) 4TH FLOOR

11:00 a.m.	Exhibitor Tables Open (Prefunition Lounge, CE 4 <sup>th</sup> Floor)	Exhibitors
12:00 - 1:00 p.m.	Registration (Campus Center 4 <sup>th</sup> Floor)	Research Day Attendees
1:00 - 1:10 p.m.	Welcome Remarks (CE 450B-C)	<b>Dr. Carol Anne Murdoch-Kinch</b> Dean, IU School of Dentistry
1:10 - 1:20 p.m.	IU School of Dentistry Research Update	<b>Dr. Tien-Min Gabriel Chu</b> Associate Dean for Research, IU School of Dentistry
1:20 - 1:25 p.m.	Introduction of Keynote Speaker	<b>Dr. Tien-Min Gabriel Chu</b> Associate Dean for Research, IU School of Dentistry
1:25 - 1:55 p.m.	Keynote Address: Exploring Biofilm Microbiomes: Integrating Biology, Engineering, and Dentistry	<b>Dr. Hyun (Michel) Koo</b> Co-Founder and Co-Director of Center for Innovation & Precision Dentistry, Professor of Orthodontics, School of Dental Medicine, University of Pennsylvania
1:55 - 2:05 p.m.	Announcement of Faculty and Staff Awards	<b>Dr. Carol Anne Murdoch-Kinch</b> Dean, IU School of Dentistry
2:05 - 2:35 p.m.	Announcement of Student Research Awards and Student Research Presentations	<b>Dr. Angela Bruzzaniti</b> Director of Student Research, Director of PhD Training & Research Development, IU School of Dentistry
2:35 - 3:00 p.m.	Announcement of Poster Presentation Awards	<b>Dr. Chandler Walker</b> President-elect, Indiana Section of AADOCR Associate Professor of Biomedical Sciences & Applied Sciences, IU School of Dentistry
3:00 - 4:30 p.m.	Research and Clinical Case Report Poster Presentations (CE 450A, 405, 409)	Research Day Participants
	<b>3:00 p.m. to 3:45 p.m. Even-numbered Posters and Clinical Case Reports</b> <b>3:45 p.m. to 4:30 p.m. Odd-numbered Posters and Clinical Case Reports</b>	

## LETTER OF WELCOME:

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INDIANA UNIVERSITY SCHOOL OF DENTISTRY  
**OFFICE OF RESEARCH**

April 10, 2025

Dear Colleagues:

Welcome to the 33rd Annual Indiana University School of Dentistry Research Day!

Today, we gather to honor our students and faculty's research achievements from the past year. Research has always been a core tenet of IUSD's mission and vision. Year after year, we aspire to curate communal research efforts between the students, faculty, staff, research collaborators, and industrial partners to continue our efforts in improving our care for the oral health needs of our community and beyond.

Over the past seven years, IUSD has consistently secured new federal funding, marking the longest streak in our history. Last year, IUSD achieved a record high with \$7.4 million in total awards, more than doubling the \$3.1 million from 2022. More than 60 percent of all 2025 awards were from federal grants, a total of \$4.7M

According to the Blue Ridge Institute of Medical Research, IUSD's ranking in dental school NIH funding improved from 41<sup>st</sup> in FY2021 to 24<sup>th</sup> in FY2024, placing IUSD in the top third among the 73 dental schools in the United States. IUSD's research growth is boosting Indiana University Indianapolis' (IUI) prestigious R1 status just awarded this year. IUSD research expenditures skyrocketed by 65%, from \$2.9 million in 2022 to \$4.8 million in 2024. This extraordinary growth encompasses diverse fields such as dental informatics, oral microbiology, bone biology, aging studies, muscle engineering, practice-based research, and interprofessional care.

On this 2025 IUSD Research Day, let our past success invigorate us as we forge new paths ahead with the new information gleaned from today's research posters and clinical case presentations which I trust you will find informative and engaging.

I would like to welcome today's keynote speaker, Dr. Hyun (Michel) Koo, professor of orthodontics at The University of Pennsylvania School of Dental Medicine and thank him for taking time to share his experience integrating biology and engineering with dentistry.

I want to thank Dean Murdoch-Kinch for her unwavering support of this annual event. I also want to thank the Research Day Planning Committee and the Indiana section of the American Association for Dental, Oral, and Craniofacial Research for the excellent planning and execution of this annual event. Thank you also to our sponsors who help support this important day.

Finally, I invite you to enjoy this research day to learn and to be inspired by our speakers and by the presentations from our students, staff, and faculty.

Best wishes to all of the 33rd annual IUSD Research Day participants!

Sincerely,

A handwritten signature in black ink, appearing to read "T.M. Chu".

Tien-Min Gabriel Chu DDS PhD  
Professor and Associate Dean for Research

## RESEARCH DAY PLANNING COMMITTEE AND OFFICERS

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# PLANNING COMMITTEE

Hawra AlQallaf  
Krsity Beach  
Angela Bruzzaniti  
Katie Chester  
Tien-Min Gabriel Chu  
Giovanna Denucci  
Vinicius Dutra  
Mauricio Escoffie  
Grace Gomez Felix Gomez  
Richard Gregory  
Abrielle Lamphere  
Frank Lippert  
Sheryl McGinnis  
Drashty Mody  
Halide Namli Kilic  
Abbey Rieck  
Naomi Riley  
Keli Seering, Co-Chair  
Hakan Turkkahraman  
Chandler Walker, Co-Chair  
Terry Wilson

# OFFICERS

## INDIANA SECTION OF AMERICAN ASSOCIATION FOR DENTAL, ORAL, AND CRANIOFACIAL RESEARCH

*President:* Chandler Walker  
*President-elect:* Hadeel Ayoub  
*Secretary/Treasurer:* Keli Seering  
*Councilor:* Hakan Turkkahraman

# OFFICERS

## DENTAL STUDENT RESEARCH GROUP 2023-2024

*President:* Katie Chester  
*Vice President:* Naomi Riley  
*Secretary/Treasurer:* Mohamad Okab  
*Newsletter Editor:* Hailey Lock  
*Faculty Advisor:* Angela Bruzzaniti

## RECOGNIZING EXCELLENCE

# 2025 AWARDS

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### DENTAL HYGIENE STUDENTS

IU Indianapolis Dental Hygiene Research Day Award

IU Fort Wayne Oral Health Research Award

### PREDOCTORAL DENTAL STUDENTS

AADOCR Student Research Day Award

Cyril S. Carr Research Scholarship

Dean's Award for Research Excellence

Dentsply Sirona/AADOCR SCADA Award Program - Selected Participant

IDA Student Research Award

King Saud University Travel Award for Predoctoral Student Research

Predoctoral Student Best Clinical Case Report Award

Recognition of Outstanding Research Engagement

Research Honors Program - Certificate of Achievement

### GRADUATE DENTAL STUDENTS

Delta Dental Award for Innovation in Oral Care Research

King Saud University Travel Award for Best Clinical Case Report

King Saud University Travel Award for Graduate Student Research

King Saud University Travel Award for PhD Student Research

Maynard K. Hine Award for Excellence in Dental Research

The Stookey Trailblazer Student Researcher Award

The Stookey Preventive Dentistry Research Award

### STAFF

IUSD Research Staff Award

### FACULTY

The Stookey Trailblazer Faculty Researcher Award

# ABOUT OUR KEYNOTE SPEAKER

## DR. HYUN (MICHEL) KOO

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Dr. Koo is a dentist-scientist trained in food engineering and cellular microbiology, and an inventor with multiple patents. He is a professor in the schools of dental medicine and engineering at the University of Pennsylvania. As co-founder/director of the Center for Innovation & Precision Dentistry, he bridges clinicians, scientists, and engineers to advance oral and craniofacial health through research, training, and entrepreneurship. Dr. Koo also directs an NIDCR T90R90 training program at the intersection of dental medicine and engineering, focusing on disease mechanisms, affordable therapies, and precision diagnostics. His research explores how biofilm and microbiome interactions cause oral diseases as well as seeking new therapeutic and diagnostic approaches by integrating nanotechnology, material sciences, and robotics. He has published extensively in dental, biomedical, and multidisciplinary journals, including PNAS, Science, Nature Communications, Science Robotics, JCI as well as in Nature Reviews and Cell Press Trends journals. He is an elected AAAS fellow, the recipient of the IADR Distinguished Scientist and Innovation in Oral Care Awards, STAT nationwide finalist for Best Innovations in Science and Medicine, and Clarivate Highly Cited Researcher. He has served on several NIH panels and AADOCR/IADR scientific committees and has a career-long mentoring commitment with many of his trainees securing faculty and industry R&D positions in the U.S. and worldwide.

The Research Day keynote address is titled **“Exploring Biofilm Microbiomes: Integrating Biology, Engineering, and Dentistry.”** The study of oral biofilms has advanced the knowledge about the composition, diversity, and spatial organization of the human microbiome. Microbes in biofilms form highly structured and organized communities that contain not only bacteria but also fungi and viruses. Importantly, the spatial organization dictates where microbes are located and associated to each other and with the host surfaces, which has direct implications on how the community functions to cause diseases in the oral cavity. This presentation discusses recent discoveries about the spatial structure of oral biofilms and new antibiofilm strategies by integrating the fields of biology, engineering, and AI, while sharing a personal journey as a dentist-scientist embracing multidisciplinary in research and training.

## IUSD FACULTY RESEARCHERS

# SERVING AS A PI/CO-PI ON FEDERAL GRANTS

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Following a year with record-high awards, there's no shortage of impactful research conducted within the halls of IUSD. Projects cover fields from bone biology to muscle engineering, with new advancements being discovered each month.

Peruse the following list of our dedicated faculty, curated for their breakthroughs, developments, and progress that have catapulted IUSD into the 30<sup>th</sup> percentile of NIH funding for US dental schools, and helped Indiana University Indianapolis secure its R1 status earlier this year.

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## ANGELA BRUZZANITI, PHD

**DIRECTOR OF DENTAL STUDENT RESEARCH, DIRECTOR OF PHD TRAINING & RESEARCH DEVELOPMENT, PROFESSOR OF BIOMEDICAL AND APPLIED SCIENCES**

- The Bruzzaniti Bone Research Laboratory is focused on unraveling the signaling proteins and intracellular mechanisms that control bone cell function, cellular crosstalk, and their effects on bone mass. Our impactful studies have identified novel proteins that are critical for bone health, which are being investigated for potential clinical translational approaches to restore oral and systemic bone loss. This research is funded by the NIH-NIAMS. The following are several key findings and ongoing studies.



- a. We discovered that the Pyk2 tyrosine kinase is a dual regulator of bone formation and resorption and are elucidating its mechanism of action in male versus female mice. We are also developing Pyk2 chemical inhibitors for bone-targeted applications.
  - b. We were the first to report a skeletal role for Kalirin, a novel GDP/GTP exchange factor. Our findings showing that Kalirin regulates osteoclast and osteoblast activity as well as osteocyte morphology, function and survival have human translational implications for preserving bone mass and quality, fracture resistance and craniofacial bone remodeling.
  - c. We are investigating signaling between osteoblasts and bone marrow niche cells, including megakaryocytes and bone-resident osteomacs, all of which are critical for maximal bone formation.
- Dr. Bruzzaniti research interests also include a clinical research program and along with Drs. Srinivasan and Thyvalikakath, received a large NIH-NIDCR U01-PRIMED grant. This clinical and educational research grant is aimed at identifying early biomarkers of Sjogren's disease as well as enhancing the practice-based clinical research skills of future dental clinicians. Dental and Hygiene students are encouraged to apply to participate.
  - Dr. Bruzzaniti also holds several administrative positions and directs the PhD, DDS/PhD and other DDS research programs. Students at all levels are encouraged to reach out for more information about how to participate in research.

[View Dr. Bruzzaniti's recent publications](#)

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## FACULTY RESEARCHERS

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# E. ANGELES MARTINEZ MIER, DDS, MSD, PHD

**ASSOCIATE DEAN OF GLOBAL ENGAGEMENT,  
DEPARTMENT CHAIR AND PROFESSOR OF DENTAL  
PUBLIC HEALTH AND DENTAL INFORMATICS**

Our research centers on community-driven strategies, with a focus on fluoride exposure, preventive interventions, and assessing the training of future dental professionals in community settings. We integrate epidemiology, biomarker analysis, and hands-on public health initiatives.

A core focus of our work is fluoride exposure and its role in health and disease. We investigate how populations encounter fluoride through water, salt, diet, and dental products. By assessing exposure at both individual and community levels, we bridge perspectives in environmental epidemiology and dental research to improve oral and overall health outcomes.

Our federally-funded research in vulnerable populations has informed fluoride safety policy, while student-led studies have advanced understanding of how diet and food preparation influence daily fluoride exposure. Our research on preventive strategies for oral health has informed dental practice, bridging gaps through evidence-based approaches.

The federally-funded implementation and assessment of our community-based education model ensures dental training is evidence-based. Embedding students in community settings has enhanced care delivery and expanded the workforce in underserved areas.

Our findings inform oral health policy through data-driven insights that guide decision-making at local, national, and international levels. By bridging research and practice, we enhance dental education, strengthen public health initiatives, and support preventive strategies that lead to long-term improvements in oral health.

[View Dr. Martinez Mier's recent publications](#)

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# YASUYOSHI UEKI, MD, PHD

**ASSOCIATE PROFESSOR BIOMEDICAL  
AND APPLIED SCIENCES**

Ueki's lab, located in the Indiana Center for Musculoskeletal Health (ICMH) on the 5th floor of the MS building, has three major research areas. We are investigating 1) the genetic cause of the human craniofacial disorder cherubism (OMIM#118400) and periodontitis, 2) the mechanism by which SH3BP2, also known as the gene responsible for cherubism, regulates osteoclast formation to cause bone destruction, and 3) how activation of immune and inflammatory signaling pathways of osteocytes regulates bone resorption and immune cell recruitment to the bone marrow. We use a variety of cutting-edge technologies, including high-throughput human genome sequencing, gene targeting in mice, tissue-specific gene knockout in mice, and bioinformatics to carry out these projects.

[View Dr. Ueki's recent publications](#)

Yasuyoshi Ueki M.D., Ph.D. Associate Professor Biomedical and Applied Sciences, Indiana University School of Dentistry  
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DR. MARTINEZ MIER'S RESEARCH TEAM



## FACULTY RESEARCHERS

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# THANKAM PAUL THYVALIKAKATH, DMD, MDS, PHD, FACMI



### ASSOCIATE DEAN OF DENTAL INFORMATICS AND DIGITAL HEALTH, DIRECTOR OF DENTAL INFORMATICS PROGRAM, PROFESSOR OF DENTAL PUBLIC HEALTH AND DENTAL INFORMATICS

The joint dental informatics program between the Indiana University School of Dentistry and Regenstrief Institute, Inc., is located on the third floor of Coleman Hall. The program's research areas include utilizing linked electronic health and dental record data to assess patient care processes and outcomes; harnessing machine learning to predict patient outcomes; applying natural language processing techniques to characterize patient's conditions; establishing interoperability to promote health information exchange between dental and medical providers; and leveraging artificial intelligence in developing and evaluating clinical decision support tools to improve decision-making.

[View Dr. Thyvalikakath's recent publications](#)

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# SURABHI MISHRA, MSC, MTECH, PHD

## ASSISTANT PROFESSOR OF BIOMEDICAL AND APPLIED SCIENCES



My lab's primary focus is to understand the structure, function, and biogenesis of cytoplasmic membrane proteins in bacteria, using the cariogenic pathogen *Streptococcus mutans* as a model. The cytoplasmic membrane is an essential structure in every cell that defines what will enter and leave the cell. It comprises a lipid bilayer and houses one-third of an organism's proteome, including proteins involved in transport, signal transduction, biofilm, and other virulence attributes of bacteria. An essential property of membrane proteins is the presence of one or more hydrophobic transmembrane domains, which require a multiprotein-RNA complex for transport into the lipid bilayer. While the components of the membrane biogenesis machinery and the mechanisms involved are primarily shared between bacteria, particularly *S. mutans*, and eukaryotic organelles, a significant knowledge gap remains in their mechanism. We employ multidisciplinary approaches to evaluate membrane protein translocation pathways and substrates, such as molecular genetics, solid-state NMR, multi-omics, in vitro transcription/translation/translocation, and coarse-grained Martini modeling. Additional research interests include understanding the homeostasis of enamel-relevant metals (magnesium and calcium) in streptococci. Significant achievements in the recent past include dissecting the structure-function of two distinct YidC paralogs in *S. mutans*, a feature shared with mitochondria and chloroplasts.

#### Funding Support:

NIH/NIDCR (R01): Membranes of the Dental Pathogen *Streptococcus mutans*. (R01DE008007; Total Direct Costs: \$2,739,723; July 2023-June 2027).

[View Dr. Mishra's recent publications](#)

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## IUSD FACULTY RESEARCHERS

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# ALEXANDRU MOVILA, PHD

## ASSOCIATE PROFESSOR OF BIOMEDICAL AND APPLIED SCIENCES

Dr. Alexandru Movila is trained as a microbiologist and neuroimmunologist with a strong emphasis on aging. He has expertise in oral biology, aging and systemic diseases. His lab combines multidisciplinary, cutting-edge assays in untargeted metabolomics, microbiology, and neuroimmunology to study crosstalk between bacterial-derived metabolites and host cells in the context of elevated periodontitis, oral cancer, and dementia. In addition, his lab focuses on understanding the impact of periodontal inflammation on accelerated aging in relation to military and environmental toxic exposures. Dr. Movila's lab collaborates closely with scientists from the Indiana University School of Dentistry, School of Medicine, School of Science, Stark Neuroscience Institute, Indiana Center for Musculoskeletal Health, and the Richard L. Roudebush VA Medical Center. His collaborative research is supported by several federal grants from the NIH and the VAMerit, as well as the Hevolution Foundation. As a Founding Director of the Imaging core at ICMH, he provides support for IUSD and ICMH investigators with their imaging projects using confocal microscopy. He is a senior corresponding or co-author of 56 peer-reviewed studies published in the Journal of Periodontal Research, Journal of Biomedicine and Pharmacotherapy, Frontiers in Immunology, and others.



[View Dr. Movila's recent publications](#)

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# ALLISON SCULLY, DDS, MS

## DIRECTOR OF PREDOCTORAL PROGRAM AND ASSISTANT PROFESSOR OF PEDIATRIC DENTISTRY

Dr. Allison Scully is federally funded through the Health Resources and Services Administration (HRSA) through a 5-year K02, career development grant. The goals of the grant are: 1) to support Dr. Scully's growth as an educator in pediatric dentistry, and 2) to innovatively transform how early childhood oral health prevention and treatment is accessed and provided for Indiana children. Through this grant, Dr. Scully has completed many additional continuing education courses in clinical dentistry, education, leadership, research, and holistic development. She is working towards a MS degree in Education of Healthcare Professionals. Dr. Scully has co-authored 10 publications since the beginning of the grant, was named a Fellow of the American Academy of Pediatric Dentistry and has received additional competitive grants totaling over \$50,000 to directly support her work teaching dental students in the clinic. Dr. Scully was recently named a recipient of the prestigious American Dental Association's (ADA) 10 Under 10 Award which recognizes and celebrates dentists who demonstrate excellence and inspire others in science, research & education, practice, philanthropy, leadership, and advocacy. Dr. Scully's HRSA grant also supports the initiation and continuation of additional clinical experiences in pediatric dentistry for dental students and residents. So far, 89 students have treated an additional 336 patients, providing over 1300 procedures to underserved patients living in rural Indiana. In addition to teaching dental students, Dr. Scully has started training medical colleagues in oral health screenings and fluoride varnish applications. Nurse practitioner and medical students rotate through the pediatric clinic to gain hands on experience in oral health, while practicing providers are given continuing education courses.



[View Dr. Scully's recent publications](#)

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## IUSD FACULTY RESEARCHERS

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# MYTHILY SRINIVASAN, BDS, MDS, PHD

## ASSOCIATE PROFESSOR OF ORAL PATHOLOGY, MEDICINE AND RADIOLOGY

### Salivary research and immunotherapeutics laboratory (Srinivasan Lab)

Two broad research focus areas:

- I. Salivary biomarker research The goals of this project are to identify molecular markers for oral and systemic diseases including chronic periodontitis, chronic autoimmune inflammatory conditions including Sjogren's disease, diabetes and log COVID.
- II. Peptide immunotherapeutics: This is similar to a drug discovery program to develop antagonists/steric inhibitors of critical protein: protein interactions in chronic inflammatory process to suppress disease progression. The research is protected by fully issued patents.



[View Dr. Srinivasan's recent publications](#)

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# RISHMA SHAH, BDS, MSC, PHD

## ASSOCIATE PROFESSOR OF ORTHODONTICS AND ORAL FACIAL GENETICS

### Shah Lab for Craniofacial Muscle Research

The Problem: Craniofacial deformity is debilitating, negatively affecting one's quality of life and the ability to integrate well into society. Such deformity may be congenital (e.g. craniofacial microsomia), or following trauma or surgery for disease removal. It has been shown surgical reconstruction increases attractiveness and decreases negative facial perception, as judged by the general public. Unfortunately, large volumetric muscle defects are very difficult to manage, with current methods of autologous grafting or use of fillers or prostheses fraught with limitations, including tissue mismatch and resorption.

The Potential Solution: Tissue engineering is an interdisciplinary field, which aims to provide substitute tissues and organs identical to that missing or defective. The provision of identical tissue allows for better integration and function, and a more permanent solution to those currently in place. Our long-term goal is permanent restoration of craniofacial soft tissue defects using precision-engineered autologous craniofacial skeletal muscle tissue.

### Achievements

For the past twenty-five years, our lab has been at the forefront of craniofacial muscle regeneration. Our philosophy is that functional muscle tissue regeneration is possible using a craniofacial muscle stem cell population combined with 3D-printed scaffolds, growth factors, mechanical loading, and low-intensity pulsed ultrasound. We have demonstrated the ability to reliably build *in vitro* craniofacial muscle tissue that expresses markers of muscle fiber formation and maturation. Our more recent work has shown simultaneous formation of tendon tissue, the critical connection between muscle and bone. Our lab has published in eminent journals such as Biomaterials and Tissue Engineering, presented at national and international meetings, secured >\$2.5m in funding, and many of our students have been awarded MS or PhD degrees in tissue engineering. The current goals are to test our engineered tissue *in vivo* and provide innervation.



[View Dr. Shah's recent publications](#)

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## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### CARIOLOGY

**P01 Dental Adhesive Protection Against Non-Carious Cervical Lesions Development.** G.C. DENUCCI\*<sup>1</sup>, L.C. LIMA<sup>2</sup>, G. ECKERT<sup>3</sup>, F.R.O. SILVA<sup>4</sup>, T. SCARAMUCCI<sup>2</sup>, S.F. SOCHACKI<sup>1</sup>, A.T. HARA<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>University of São Paulo School of Dentistry, <sup>3</sup>Indiana University School of Medicine, <sup>4</sup>Nuclear and Energy Research Institute)

**Objectives:** This study aimed to verify whether dental adhesives prevent non-carious cervical lesion (NCCL) development in an in vitro simulation model based on abrasive/erosive challenges. **Materials and methods:** Extracted human premolars were randomly assigned into three treatments (n=16): 1. Reference adhesive (Clearfil SE); 2. Experimental adhesive (10wt.% Beta-Tricalcium Phosphate nanoparticles); 3. Negative control (no treatment). After treatment, specimens were submitted to 11 episodes of 18h acid exposure (1% citric acid solution - 0.052 M – natural pH) interspersed by toothbrushing abrasion. Three-dimension images of teeth were captured at baseline and after 5,000, 10,000, 15,000, 35,000 and 55,000 toothbrushing strokes using an intraoral scanner. Tooth wear (mm<sup>3</sup>) was calculated after each toothbrushing period by scans superimposition. Lesion angle was measured, and shape classified. Data were analyzed using ANOVA and Fisher's PLSD tests (alpha=0.05). **Results:** Tooth wear increased with toothbrushing strokes overall (p<0.001) and within each treatment (p<0.05), except between 10,000 and 15,000 strokes (p=0.24). Reference had less tooth wear than control overall (mean difference [95% CI]: 0.68 [0.20,1.15], p = 0.008) and for all toothbrushing periods (p<0.05) except at 55,000 strokes (0.54 [-0.38,1.46], p = 0.25). Reference had less tooth wear than Experimental overall (0.54 [0.01,1.07], p = 0.046) and for 35,000 strokes (0.80 [0.13,1.46], p = 0.019). Experimental had less tooth wear than negative control at 5,000 and 10,000 strokes (p<0.05). Treatments had no effect on lesion angle (p = 0.52). At 55,000, Reference had more flat-shaped lesions than Experimental (p<0.001) and negative control (p<0.001), but Experimental and negative control were not different from each other (p = 1.00) having more striated lesions. **Conclusions:** In conclusion, adhesives showed some degree of protection against NCCL development at early stages; however, Reference had longer-lasting protection than Experimental.

**P02 Morphological Characterization of Natural Non-Carious Cervical Lesions.** N.H. KOKSAL\* (Indiana University School of Dentistry), G.C. DENUCCI (Indiana University School of Dentistry), A.T. HARA (Indiana University School of Dentistry)

**Objectives:** This ex vivo study assessed the morphology and angle of natural non-carious cervical lesions (NCCLs), in a sample of previously extracted human premolars. **Materials and methods:** 3D scans (Trios4, 3Shape) of a convenience sample of 647 premolars with NCCLs of different severities were analyzed using the Smith and Knight tooth wear index (TWI scores 0-4). TWI visual assessments were conducted by two experienced examiners, who scored the buccal surfaces of the studied teeth by consensus. 3D scans were evaluated using 3Shape TRIOS software, which allowed for 3D rotations and changes in magnification as needed, on a 65-inch high-resolution monitor. NCCLs were classified into flat, cup, wedge-shaped, and striated based on bucco-lingual cross-sections, obtained from the 3D scans. The internal angle between the occlusal and apical walls of NCCLs was measured using ImageJ software (NIH, Bethesda, MD, USA). Data were analyzed using one-way ANOVA with 5% significance level. **Results:** TWI scores were distributed as follows: 157 specimens with TWI0 (24.3%), 103 specimens with TWI1 (15.9%), 152 with TWI2 (23.5%), 104 with TWI3 (16.1%), and 131 with TWI4 (20.2%). Of the specimens with lesions, the mean angle differed significantly among TWI scores (mean±SD): TWI1 (166.7°±9.7)>TWI2 (155.3°±15.8)>TWI3 (134.3°±24.4)>TWI4 (108.7°±27.9) (p<0.001). Significant differences were found in mean angles among morphology classification: flat (158.1°±18.2)>striated (150°±17.1)>cup (127°±26.4)>wedge (94.5°±28.7). The most frequent morphology for each TWI scores were: TWI1-flat (75.7%), TWI2-flat (47.4%), TWI3-cup (42.3%), TWI4-cup (38.9%). **Conclusions:** The study found different morphologies and angles of natural NCCLs according to the TWI severity level. Lesion angle decreased with the increase in TWI severity. The most predominant lesion type at lower scores was flat and at higher scores was cup.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### CARIOLOGY

**P03 The Role of Prophylactic Pastes in Enamel Remineralization: Literature Review.** G. ALGHUNAIM<sup>1</sup>, O.R. CAPIN<sup>1</sup>, L. AL DEHAILAN<sup>2</sup>, F. LIPPERT<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Imam Abdulrahman Bin Faisal University)

Objectives: The literature review was conducted to assess the ability of prophylaxis pastes in promoting remineralization of early caries lesions. Method: The search was conducted across several resources, including Google Scholar, TRIP, ScienceDirect, MEDLINE (via PubMed), Wiley Online Library, and NIHR (National Institute for Health and Care Excellence). Search terms employed were “prophy pastes”, “early enamel caries”, and “remineralization”. The reviewer then screened the titles and abstracts of the citations retrieved through the search strategy. Published literature from 1970 to 2022 was included. The full-text articles of the primary studies that met the selection criteria were then assessed according to the predefined inclusion criteria. Results: Thirty studies were identified, of which 10 studies were eligible. After assessing 15 citations, 2 additional studies were included. Also 2 articles from a dental magazine were included. Overall, 14 studies (12 cross-sectional, 2 magazine articles) satisfied the inclusion criteria. Fluoride absorption in enamel using a prophylactic cup containing fluoride was found when used with fluoride-containing prophylaxis pastes, the cups significantly enhanced the fluoride content in enamel by releasing substantial amounts of tin and fluoride during the prophylaxis procedure. It was hypothesized that fluoride absorption from topical fluoride solutions in enamel was enhanced at a higher temperature. Conclusion: The use of prophylaxis pastes in enamel remineralization provided valuable insights into the potential of prophylactic pastes as a non-invasive strategy for managing early dental caries. While there is limited evidence supports their effectiveness in remineralizing early enamel lesions, the present review emphasized the need for further research and clinical trials to refine their use and determine optimal treatment protocols. As a key element of a comprehensive preventive strategy, prophylactic pastes could significantly reduce the reliance on invasive treatments and support sustained oral health over the long term.

**P04 Effect of Light cure on SDF's Enamel Caries Protection Ability.** M. ALHARBI\*, A.R.F. DE CASTILHO, L. AL DEHAILAN, F. LIPPERT (Indiana University School of Dentistry)

Aim: This study examined the impact of dental light curing on the ability of silver diamine fluoride (SDF) to prevent further demineralization of early enamel carious lesions. Methods: Early caries lesions created in permanent bovine enamel specimens (n=26 per group) were randomly assigned to nine groups following a three (SDF application time [SDFt]: 0; 10; 60 s) × three (light curing time [LCt]: 0; 20; 40 s) factorial design. Treatments were applied. All lesions were then pH cycled for five days. Lesions were characterized using transverse microradiography ( $\Delta\Delta Z$ -mineral loss;  $\Delta L$ -lesion depth;  $\Delta SZ_{max}$ -surface mineral density). Data were analyzed using two-way ANOVA. Results: Significant interactions between SDFt and LCt were observed for both  $\Delta\Delta Z$  ( $p=0.002$ ) and  $\Delta L$  ( $p=0.037$ ) but not for  $\Delta SZ_{max}$  ( $p=0.795$ ). For  $\Delta\Delta Z$ , longer SDFt led to increased mineral gain in groups without light curing. However, in groups where light curing was applied, no significant differences in mineral gain were observed between 10s and 60s of SDFt ( $p=0.678$  and  $p=0.136$ , respectively). Regarding  $\Delta L$ , longer SDFt resulted in greater lesion depth reduction in groups without light curing. Conversely, in groups with light curing, no significant differences in lesion depth reduction were found between 10s and 60s of SDFt ( $p=0.301$  and  $p=0.379$ , respectively). For  $\Delta SZ_{max}$ , both SDFt ( $p<.001$ ) and LCt ( $p=0.001$ ) were significant factors. Longer SDFt did lead to increased surface mineral density. Conclusion: Applying light curing for either 20s or 40s after SDF application positively impacted the prevention of further mineral loss in early enamel carious lesions.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### CARIOLOGY

**P05 Effect of Light Exposure on The Efficacy of SDF.** K. AHUSSAMI\*, L. AL DEHAILAN, O.R. CAPIN, G.J. ECKERT, F. LIPPERT, A.R.F. DE CASTILHO (Indiana University School of Dentistry)

Objective: This study investigated the impact of light exposure on the effectiveness of silver diamine fluoride (SDF) in preventing demineralization of dentin caries lesions. Methods: This study followed a three-factorial design: SDF application time (0/10/60s) × light application time (0/40s) × lesion type (subsurface/moderately softened). Caries-like lesions (n=26/subgroup) were created in bovine dentin specimens. SDF/light was applied. Specimens were pH cycled for 5d. Lesions were characterized using transverse microradiography ( $\Delta\Delta Z$ -mineral loss;  $\Delta L$ -lesion depth;  $\Delta SZ_{max}$ -surface mineral density). Data were analyzed using three-way ANOVA. Results: There were no three- or two-way interactions between factors for  $\Delta\Delta Z$  or  $\Delta L$  ( $p \geq 0.217$ ). For  $\Delta\Delta Z$ , longer SDF application times resulted in more mineral gain ( $p < 0.001$ ; 0s–311/10s–314/60s–525; means, vol% min $\times\mu m$ ). Subsurface lesions displayed greater capacity for mineral gain than moderately softened lesions ( $p < 0.001$ ; 281 vs. 85; means, vol% min $\times\mu m$ ). Light exposure time did not affect  $\Delta\Delta Z$  ( $p = 0.167$ ). For  $\Delta L$ , longer SDF application times resulted in greater reduction in lesion depth ( $p < 0.001$ ; 0s–20.1/10s–23.0/60s–36.5; means,  $\mu m$ ). Neither lesion type ( $p = 0.153$ ) nor light exposure time ( $p = 0.774$ ) affected  $\Delta L$ . For  $\Delta SZ_{max}$ , the SDF $\times$ light interaction was significant ( $p = 0.016$ ). No light exposure (0s) resulted in significantly larger  $\Delta SZ_{max}$  compared to 40s of light exposure in the 60s-SDF group ( $p = 0.037$ ; 12.3 vs. 9.1; means, min%). Light exposure had no effect on  $\Delta SZ_{max}$  in the 10s-SDF group ( $p = 0.574$ ) or absence of SDF application ( $p = 0.053$ ). Lesion type did not influence  $\Delta SZ_{max}$  ( $p = 0.853$ ). Conclusion: Light exposure did not impact the effectiveness of SDF in preventing the progression of dentin caries lesions.

**P06 Nano-Silver, Calcium, Fluoride, and Xylitol to Prevent Enamel Caries.** D. DOBERDOLI\*, O.R. CAPIN, G.J. ECKERT, S. BHAMIDIPALLI, A.R.F. DE CASTILHO, F. LIPPERT (Indiana University School of Dentistry)

The purpose of this laboratory study was to investigate the ability of aqueous solutions containing nano silver particles (Ag), calcium (Ca), xylitol (X), fluoride (F), and combinations to prevent the formation of early caries lesions in enamel using an established pH cycling model. This study followed a four-factorial design: Ag (0/20ppm) × Ca (0/63.2mM) × X (0/1.64M) × F (0/11.9mM). Human enamel specimens (n=12 per group) were randomly assigned to the 16 groups. All samples underwent five days of pH cycling regimen consisting of a 3 h/d acid challenge in a demineralizing solution (75mM acetic acid; 2.0mM  $Ca(NO_3)_2 \times 4H_2O$ ; 2.0mM  $KH_2PO_4$ , 0.030ppm F, pH 4.3), sandwiched between two one-minute treatment periods with one of the experimental solutions, and exposure to artificial saliva (1.5mM  $Ca(NO_3)_2 \times 4H_2O$ ; 0.9mM  $KH_2PO_4$ ; 150mM KCl; 0.050ppm F, 20mM cacodylate buffer, pH 7.0) at all other times. Solutions containing both calcium and fluoride were mixed just prior to application. Knoop surface microhardness (KHN) measurements were conducted before and after the pH cycling phase. The percentage change in KHN, %SMHc, was the study variable. The statistical analysis was carried out using four-way ANOVA at a significance of 5%, followed by Fisher's least significant difference test. There was a significant interaction between all four factors ( $p < 0.0001$ ). %SMHc values for each group were (mean/statistical grouping): AgF (-24.6/A), AgCaFX (-28.3/AB), AgCaF (-28.9/AB), F (-32.7/B), CaF (-39.0/C), FX (-41.5/C), CaFX (-44.7/C), AgFX (-59.3/D), AgX (-66.1/E), AgCa (-73.0/F), Ag (-82.3/G), X (-83.6/G), Ca (-84.3/GH), CaX (-86.2/GH), AgCaX (-89.8/HI), placebo (-92.9/I). In conclusion, the present study affirmed the caries-preventive effects of fluoride. Furthermore, there appears to be scope for improving the ability of fluoride to prevent enamel demineralization when combined with nano silver. (Acknowledgement: The authors are indebted to Novis, Inc. (UT, USA) for providing nano silver and xylitol for the present study.)

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### CARIOLOGY

#### **P07 Can Non-Fluoridated Toothpastes Facilitate Caries Remineralization?** A. GADHVI\*, F. LIPPERT (Indiana University School of Dentistry)

While fluoride's role in caries prevention and remineralization is well-established, the growing trend toward fluoride-free alternatives necessitates investigation of their caries-preventive potential. The objectives of this project on commercially marketed fluoride-free toothpastes are two-fold: a) to evaluate their fluoride and calcium contents; and b) to determine their ability to remineralize early caries lesions created in enamel. Fifteen fluoride-free toothpaste samples were identified in local grocery stores (Whole Foods, Walmart, Kroger). Toothpastes were analyzed for bioavailable and total fluoride content using standardized FDA testing protocols, with a fluoride-containing dentifrice (1100 ppm) as a positive control. Total fluoride (FDA Test #1) was analyzed using a microdiffusion method, whereas bioavailable fluoride (FDA Test #29) was analyzed directly. Both methods used a fluoride ion-selective electrode. FDA Test #1 revealed unexpected fluoride presence in two samples: 65.95 ppm in Himalaya Botanique and 43.82 ppm in Auromere All other toothpastes had fluoride concentrations that ranged between 0.87- 5.84 ppm. FDA Test #29 showed lower free fluoride concentrations (<5 ppm) across all samples, with only small differences between toothpastes. Natural ingredient-based formulations consistently showed detectable fluoride levels. Future steps of this project will be concerned with the calcium analysis and determination of remineralization potential of the tested toothpastes. The detection of fluoride in supposedly fluoride-free products suggests these dentifrices may possess limited remineralization potential through unintended fluoride presence and raises questions about their marketing claims.

#### **P08 Fluoride Migration into Legumes During Cooking with Fluoridated Tap Water.** VIDYA PATIL\*, SEOHYUN CHUNG, CHRIS BUCKLEY, and FRANK LIPPERT (Indiana University School of Dentistry)

Introduction: Fluoride is ubiquitous in the diet, yet little is known about the extent to which fluoride migrates into food during cooking with fluoridated tap water. This laboratory study aimed to investigate how various cooking methods (soaking vs. quick boil), soaking times (12 hours vs. 24 hours), and the addition of salt or baking soda influence fluoride migration from tap water (0.7 ppm fluoride) into legumes during cooking. Methods: Thirty-four bean types were studied using quick-boil and 12- or 24-hour soaking methods, while three lentil types were tested with quick-boil method. Samples were cooked with no additives, baking soda, salt, or both. Cooked beans were homogenized (1:1 w/w) with deionized water, and fluoride content was measured using the hexamethyldisiloxane microdiffusion method and a fluoride ion-specific electrode. Data were analyzed using SAS 9.4 software. Results: Of the 347 samples, 183 samples have been analyzed thus far. Fluoride migration was highest in the quick-boil method at 5.49 ppm (3.21–12.94 ppm), followed by the 24-hour soak at 3.66 ppm (2.44–7.05 ppm) and the 12-hour soak at 3.10 ppm (2.10–4.67 ppm). In lentils, quick-boiling resulted in the highest fluoride levels (2.66–3.46 ppm); adding baking soda reduced fluoride retention (2.22–2.32 ppm), while combining baking soda and salt slightly increased it (2.58–2.64 ppm) but remained lower than quick-boiling alone. On the other hand, adding baking soda in the 12-hour -soaked beans led to higher fluoride migration (3.34–6.00 ppm) than the quick-boil method with baking soda (2.87–5.76 ppm). Conclusion: The findings of this study demonstrate that fluoride absorption in beans and lentils varies based on type, soaking duration, and preparation method. Further research is needed to determine the exact influence of other factors like bean size, age, surface area, and cooking temperatures on the fluoride migration process. (This study was supported by the OHRI Fluoride Research Program.)

## **ABSTRACTS RESEARCH POSTER PRESENTATIONS**

### **DENTAL EDUCATION**

**P09 Effect of Interview Format on Orthodontic Resident Recruitment Efforts.** D. SIMMERS\*, K.T. STEWART, E. KHOO, A. WONG, S. CONLEY (Indiana University School of Dentistry)

Interviews are a critical factor in assessing the interpersonal skills of residency applicants and ensuring that the most meritorious candidates are selected for matriculation into programs. During the 2020-2021 application cycle, orthodontic residency programs hosted virtual interviews due to COVID-19 pandemic. In the 2021-2022 cycle, approximately half of all orthodontic residency programs hosted virtual interviews, while the other half returned to an in-person format. The impact of virtual versus in-person interviews on candidate selection and resident performance outcomes for those accepted during the 2021-2022 application cycle is unknown. The primary study aim was to investigate the effect of interview format, virtual or in-person, on the orthodontic candidate selection outcome. Secondly, the study sought to evaluate the influence of interview format on internal and external objective resident performance outcomes for those admitted during the 2021-2022 application cycle. An anonymous electronic survey was developed, validated, and administered through Qualtrics® to North American graduate orthodontic residency program directors (N=64). The survey included 5 domains and 20 items. Survey participation was solicited for 14 weeks and reminders were sent every 2 weeks. The study observed a 70% response rate (n=45); however, 15 responses were excluded from statistical analysis due to insufficient completion. For the 2021-2022 cycle, 50% of respondents reported using an in-person interview format, 40% used a virtual platform, and 10% used a hybrid format. When comparing residents admitted from the 2021-2022 application cycle to previous cohorts, most respondents indicated no change in the orthodontic selection outcomes. Additionally, most program directors reported no change in internal (76%) and external (70%) objective resident performance outcomes. Interestingly, nearly all (96.7%) respondents indicated their interviews would be in-person for the upcoming application cycle. The results suggest that the interview format employed by orthodontic residency programs had little impact on candidate selection outcome and/or resident performance outcomes.

**P10 Implementing Advanced CBCT Visualization into Graduate Dental Education: Student**

**Perspective.** E. KAMISSETTI\*<sup>1</sup>, V. DUTRA<sup>1</sup>, G. LIEDKE<sup>2</sup>, L.E.A. GUILLÉN<sup>1,3</sup>, PHILLIP WONG<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Federal University of Santa Maria, Brazil, <sup>3</sup>Universidad Científica del Sur, Perú)

Objective: To evaluate the implementation effectiveness of CBCT advanced visualization techniques into graduate dental education. Material and Methods: A survey was conducted with 30 graduate students. Students from various specialties attended a lecture as part of the graduate radiology course at our institution, and specialty catered content including CBCT advanced visualization techniques was presented. Feedback was collected using quantitative and qualitative methods. Quantitative data were analyzed for satisfaction levels, CBCT student understanding and improvement of student learning/patient care, while qualitative data were analyzed to identify areas of improvement and recommendations. Results: Overall, 100% of students liked or strongly liked the content presented, 96% considered the content appropriate for a graduate course, and 93% wanted to have more similar content. Content quality was considered extremely high and high by 66% and 34% of students, respectively. 100% of students considered that the content improved or significantly improved their understanding of CBCT. 76% of students considered the content could potentially improve student learning and patient care. Qualitative analysis demonstrated a great interest among the graduate students. Students showed interested in developing research projects in this topic, highlighted the engagement of the content, and real-life applications. Conclusion: The study demonstrated that the implementation of advanced visualization techniques in a radiology graduate course increased engagement, improved CBCT understanding, and has the potential to improve student learning and patient care. Recommendations include expanding the program to include hands-on training and integrating it into the undergraduate curriculum for broader impact.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**DENTAL EDUCATION**

**P11 Custom 3D-Printed Third Molar Extraction Model for Pre-Clinical Education.** J. MINOR\*<sup>1</sup>, K. GURSIMRAN<sup>1</sup>, G. LIEDKE<sup>2</sup>, E. KAMISSETTI<sup>1</sup>, P. WONG<sup>1</sup>, V. DUTRA<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Federal University of Santa Maria, Brazil)

Pre-clinical third molar extraction training traditionally utilizes standardized prefabricated models. However, these models often fail to represent the anatomical and clinical variations encountered in real patients, and custom models are typically costly and limited in availability. Objective: To design and 3D-print a custom training model for third molar extractions based on a patient's specific anatomy using freely available software. Methods: An anonymized DICOM dataset of a patient with bilateral impacted mandibular third molars was selected. Free software tools, including BlueSky, Meshmixer, and Cura, were utilized to create a digital 3D model showcasing anatomical features such as root dilacerations and proximity to the mandibular canal. A step-by-step process incorporating both conventional and AI-assisted tools was developed to enhance model accuracy. The final model was 3D-printed using an FDM printer (Ultimaker S5) and Pearl White PLA filament. Results: The resulting model demonstrated high anatomical fidelity, accurately replicating third molar root dilacerations and their relationship with the mandibular canal. This enhanced realism allows students to visualize complex anatomical structures relevant to surgical procedures. Conclusion: The described workflow provides an accessible, cost-effective method for creating anatomically accurate, patient-specific training models for third molar extractions. This approach enhances pre-clinical education by offering a customizable, detailed alternative to standard prefabricated models.

**P12 Perceptions of Pharmacology Teaching Approaches in Dentistry.** J.D. KELLENBERGER\*, S.D. PAPINEAU (Indiana University School of Dentistry)

Objectives: Dental school curricula employ various teaching approaches influencing students' learning and clinical application. Given the profound impact of teaching, it is essential to investigate which approaches best enhance students' retention and application of knowledge. The objective of this study was to analyze two different teaching modalities used in dental pharmacology education. This study evaluated dental students' perceptions of these teaching modalities and their impact on learning and clinical application of pharmacology concepts. Materials and Methods: A ten-question qualitative survey was distributed to 112 dental students who were taught a pharmacotherapeutics course over two semesters using two different teaching approaches. The first approach followed a traditional method, which was fact-centered and relied heavily on memorization (*D711 Pharmacotherapeutics*). The second emphasized clinical relevance and incorporated case-based scenarios with direct dental applications (*D712 Pharmacotherapeutics*). Students responded to each survey question using a five-point Likert scale: strongly agree, agree, neutral, disagree, and strongly disagree. Results: The survey had a response rate of 78% (87 responses). All respondents (100%) preferred the *D712* teaching method over the approach used in *D711*, with 87% selecting "strongly agree." After experiencing both teaching approaches, 100% of students agreed that their ability to apply key pharmacology concepts improved, while 98% agreed that their retention of critical pharmacology concepts was enhanced with the newer, clinically relevant teaching modality. Additionally, 98% of respondents reported that the case-based approach made pharmacology material more engaging and easier to understand. When asked whether the clinically focused teaching method increased their confidence in treating patients, 95% of students responded affirmatively. All respondents (100%) believed that future dental students would benefit more from the case-based teaching approach. Conclusion: This study demonstrated a case-based, clinically relevant teaching approach enhances students' understanding and retention of pharmacology concepts while increasing their confidence in making pharmacology-related decisions in clinical practice.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL EDUCATION

**P13 Dental Students Using Virtual Reality to Ease Patient Anxiety Effectively.** A.P. SIMHAMBHATLA\*<sup>1</sup>, P. MANE<sup>1</sup>, C. CLEMENTS<sup>2</sup>, D.P. MODY<sup>2</sup>, S.M. SCHRADER<sup>2</sup> (<sup>1</sup>Indiana University Indianapolis Luddy School of Informatics, Computing, and Engineering, <sup>2</sup>Indiana University School of Dentistry)

Background: Extended Reality (XR) technologies including Virtual Reality (VR) are increasingly used to improve patient experience by offering immersive environments that can ease procedural anxiety and discomfort. This pilot study, conducted at the Extended Reality Clinical Practice Education Lab (XRCPEL), explored the usability, satisfaction, and perceived clinical utility of VR-based relaxation tools among first-year dental students. Methods: A total of 91 first-year dental students participated in brief (5-minute per app) immersive sessions using Meta Quest 2 and 3 headsets and two applications: *Nature Treks VR* (relaxation) and *TRIPP* (guided meditation). A post-session Qualtrics survey assessed ease of use, satisfaction, and potential clinical application using a Likert-type scale. Two open-ended questions addressed challenges and envisioned use in patient care. Quantitative data were analyzed using descriptive statistics, while qualitative responses were interpreted using Glaser and Strauss's grounded theory. Results: 77% of participants found the headsets easy to use; 74.8% felt relaxed during the sessions. *Nature Treks* was preferred by 82.5% over *TRIPP* (62.7%). Themes from qualitative responses included: no challenges (48.1%), technical/audio-visual issues (15.18%), and difficulty with controls (12.7%). Clinical use themes included: promoting relaxation (57.6%), reducing patient anxiety (25%), and serving as a positive distraction (13.04%). Conclusion: Findings support VR as a promising non-pharmacological intervention to manage dental anxiety, echoing prior studies by Alqutaibi et al. (2024) and Fan et al. (2023). Students found the VR tools easy to use and effective for inducing relaxation, indicating strong potential for future clinical integration. Further studies are needed to explore long-term usability and patient-specific applications in dentistry.

**P14 Influence of Residency Status on Student Mental Health and Burnout.** J. COHN\*, K.T. STEWART (Indiana University School of Dentistry)

The cumulative physical and emotional strain that dentists experience within the profession has resulted in an increase in both burnout and diminished mental health. These feelings often develop in the early stages of the dental training process. And while dental education provides challenges to all students, there may be additional hardships encountered by nonresident students. Objective: The aim of the study was to evaluate the mental well-being and burnout of dental students at the Indiana University School of Dentistry when controlling for respondent geographic residency status. Methods: Students from the DDS Classes of 2025, 2026 and 2027 were recruited to participate in a voluntary, electronic survey via Qualtrics. A 45-item survey was developed, and it was divided into three main sections: (1) participant sociodemographic information, (2) dental school environment assessment, and (3) mental health assessment. The survey included questions from the Generalized Anxiety Disorder-7 (GAD-7) and Maslach Burnout Inventory Human Service Survey (MBI-HSS) assessment instruments to evaluate perceived anxiety and burnout, respectively. Results: Three hundred and thirty-five students were recruited and 126 participated (37.6% response rate). The largest self-reported respondent groups included females (71.2%), 25-27-years-old (50%), the DDS Class of 2027 (39.7%), and Indiana residents (68.8%). 41.3% of all respondents indicated they did not have any local acquaintances prior to matriculation, resulting in significantly higher anxiety as measured by the GAD 7 ( $p=.0371$ ). Respondents with origins outside the state of Indiana reported they had a less effective support system ( $p=.0297$ ) and felt more alone in their struggles ( $p=.0360$ ) when compared to native Indiana students. The cost of dental education more negatively impacted the anxiety and mental wellness of non-resident students ( $p < .0001$ ). Conclusion: The results suggest that student residency status is an important factor regarding burnout and mental health perception for IUSD dental students.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL HYGIENE

**P15 Long-Term Impacts of Oral Trauma During Toddlerhood Dentition.** M. ALEXANDER\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This literature review explores the nature of oral trauma, including its classification, progression, and implications for early childhood injuries. The review emphasizes the impact of trauma sustained in toddlerhood on the developing permanent dentition, identification of periodontal trauma, and guidelines for monitoring injuries and seeking professional intervention. Additionally, two case reports are analyzed, each tracking the long-term effects of oral trauma in toddlers over a minimum of four years. One case indicates no significant impact on the permanent dentition, while the other demonstrates lasting effects. These findings suggest that while oral trauma in early childhood can influence permanent dentition, the outcomes vary on a case-by-case basis. Early recognition and appropriate intervention may contribute to more favorable prognoses.

**P16 Impact of Smoking on Oral Health: Early Signs and Intervention.** G. ALLEN\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This research examines when the effects of smoking begin to manifest in adult patients, focusing on both immediate inflammatory responses and long-term oral health complications. This narrative review explores identifiable smoking-related changes in the oral cavity, including early signs that dental professionals can recognize to aid in patient education and intervention. Additionally, it evaluates preventative strategies to slow periodontal disease progression and emphasizes the role of behavioral assessment in addressing tobacco addiction before irreversible damage occurs. From a dental hygiene perspective, the research highlights the scope of practice in early detection and patient education, particularly through the use of motivational interviewing to facilitate tobacco discussions. By identifying early warning signs and employing effective cessation strategies, dental hygienists play a crucial role in mitigating the long-term oral health consequences of smoking.

**P17 The Role of Parental Involvement in Shaping Children's Oral Health.** N. BLUHM\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This literature review explores the critical role of parents in shaping children's dental habits and preventing early childhood caries (ECC). Research indicates that early exposure to proper oral hygiene practices, particularly with parental guidance, significantly contributes to lifelong oral health. This review examines key risk factors for ECC, including poor feeding habits, socioeconomic status, and parental education levels. Additionally, it assesses the impact of different parenting styles, particularly authoritative and permissive approaches, on children's oral health outcomes. The influence of external factors such as daycare attendance and health insurance coverage on dental care habits is also discussed. The findings emphasize the importance of collaboration between parents, communities, and dental professionals in fostering positive dental behaviors. Furthermore, the manuscript highlights the potential consequences of inadequate preventive measures and calls for further research into the long-term effects of early interventions, as well as the development of community-based programs to support at-risk families.

## **ABSTRACTS RESEARCH POSTER PRESENTATIONS**

### ***DENTAL HYGIENE***

**P18 The Importance of Ergonomics in Dentistry.** H. BLUM\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This narrative review explores the critical role of ergonomics in dental practice, highlighting its impact on the physical well-being of dental professionals and clinical outcomes. The integration of ergonomic principles can help reduce the prevalence of musculoskeletal disorders among practitioners. This review examines various ergonomic tools and strategies, including saddle chairs, loupes, optimized hand instruments, and proper body mechanics, such as stretching and muscle strengthening. By adopting ergonomic practices, dental professionals can enhance working conditions, improve performance, and promote career longevity. Additionally, fostering an ergonomic mindset in dental education can help future professionals develop sustainable habits. This review underscores the importance of ergonomics in dentistry and advocates for its widespread implementation to support a healthier, more efficient, and sustainable work environment.

**P19 The Effects of Tooth Whitening on Restorative Dentistry.** M. CAGLE\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

The growing concern over tooth discoloration has led to a significant increase in the use of enamel bleaching procedures in dentistry. Both in-office and over-the-counter whitening techniques rely on hydrogen peroxide, a widely used agent known for its ability to break down intrinsic stains. However, this same chemical process can also affect the structure of enamel and dentin, raising concerns about the long-term effects of repeated bleaching. This research via a narrative review examines the potential side effects of hydrogen peroxide use, focusing on its impact on tooth anatomy, possible complications such as increased enamel porosity, tooth sensitivity, and alterations in microhardness. Additionally, the study explores the implications of repetitive bleaching on future restorative treatments, including challenges in bonding strength, color matching, and overall tooth integrity. Understanding these effects is crucial for dental professionals to provide safe an effective whitening treatment while minimizing risks to long term oral health.

**P20 Oral Health Barriers in Appalachia.** D. DUNHAM\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

For decades, the Appalachian region of the United States has faced significant health disparities, particularly in oral health, due to physical, financial, and cognitive barriers. High poverty rates, a shortage of healthcare professionals, and low health literacy contribute to the region's limited access to dental care. One of the most pressing challenges is the lack of dental professionals, with some areas having as few as four dentists per 100,000 individuals. Financial barriers, such as limited insurance coverage and high treatment costs, further exacerbate these disparities. This review examines key contributing factors, including low health literacy, high tobacco use, and inadequate oral hygiene practices. Additionally, it explores potential solutions, such as improving health literacy through educational programs, implementing tobacco cessation initiatives, expanding insurance accessibility (particularly Medicaid), and utilizing motivational therapy. Addressing these barriers through targeted interventions could significantly improve oral health outcomes and reduce disparities in underserved Appalachian communities.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL HYGIENE

**P21 Alzheimer's Disease versus Oral Health Status.** M. HAHN\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

Individuals with Alzheimer's disease face significant oral health challenges that require targeted interventions to prevent deterioration. Oral health is often overlooked in this population despite its critical impact on overall well-being. The cognitive decline and functional disability associated with Alzheimer's frequently result in neglected oral hygiene routines, leading to an increased risk of dental decay, oral pathologies, and periodontal disease. Additionally, caregivers responsible for these individuals often experience heightened stress and mental health concerns, further complicating oral care management. This review examines the connection between Alzheimer's disease and oral health deterioration while emphasizing the need for systemic improvements. Proposed solutions include caregiver education, structured oral care environments, visual aids for improved patient comprehension, and enhanced caregiver support systems. Implementing these changes can help mitigate the oral health disparities seen in individuals with Alzheimer's disease and improve both patient and caregiver well-being.

**P22 The Impact of Vaping on Adult Oral Health.** K. KEIPER\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

Vaping has gained widespread popularity, particularly among young adults, due to the misconception that it is a safer alternative to smoking. However, emerging evidence highlights significant risks to oral health, both in the short and long term. This narrative review examines the biochemical and physiological effects of vaping, focusing on its impact on saliva production, taste sensation, periodontal disease, and dental caries. Vaping reduces saliva flow, leading to dry mouth (xerostomia), which increases the risk of oral infections and cavities. It also alters taste perception, contributing to poor oral hygiene habits. Long-term exposure to harmful chemicals in vape aerosols, such as nicotine and aldehydes, is associated with periodontal disease, alveolar bone loss, and tooth mobility, while the sugars and acids in vape juice contribute to dental caries. Misleading marketing and misconceptions about vaping's safety have led to increased use, particularly among vulnerable populations. This review underscores the importance of education and prevention strategies to mitigate vaping-related oral health risks. Dental professionals play a crucial role in raising awareness, providing preventive care, and supporting cessation efforts to protect patients' long-term oral health.

**P23 Treating Early Childhood Complications: The Role of Orofacial Myofunctional Therapy.** M. LANE\*, S. PETROUSKI, L. QUICK, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This review examines the role of orofacial myofunctional therapy in preventing and treating three common early childhood complications: tongue thrusting, speech difficulties, and trouble latching. Early diagnosis is essential to minimizing long-term consequences, as timely intervention can significantly improve developmental outcomes. Myofunctional therapy utilizes targeted exercises to strengthen the muscles of the mouth, pharynx, and upper respiratory tract, supporting essential functions such as breathing, swallowing, and feeding. Regular dental evaluations, beginning with the eruption of a child's first tooth, play a crucial role in identifying the need for intervention. Additionally, patient compliance is a key factor in achieving successful therapeutic outcomes, with research highlighting the importance of consistency in treatment. By incorporating myofunctional therapy into early care strategies, dental professionals can proactively address these functional challenges, reducing the risk of speech impediments, malocclusion, and feeding difficulties that may persist into later childhood.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL HYGIENE

**P24 Social Media's Impact on Oral Hygiene: Risks, Benefits, Dental Professionals' Role.** L. LINDHORST\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This narrative review explores the influence of social media on oral hygiene habits, particularly among younger generations. As social media continues to evolve, it has become a widely used platform for accessing health-related information, including oral health guidance. This review examines the relationship between social media and oral health education, highlighting both the advantages and challenges of relying on digital platforms for dental information. Additionally, it addresses the impact of oral health disparities on access to accurate information and care. A key focus is the role of dental professionals in mitigating misinformation, providing reliable guidance, and leveraging social media as a tool for patient education. Understanding the influence of social media on oral health behaviors can help professionals develop more effective communication strategies to promote evidence-based practices.

**P25 Advancing Oral Health with Stem Cell Therapy: Current Insights, Future Perspectives.** T. OEHNINGER\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

Stem cells are increasingly being explored in regenerative medicine, particularly in dentistry, for their potential to repair and regenerate oral tissues. Dental stem cells, derived from sources such as dental pulp, periodontal ligament, and dental follicle, have shown promising applications in tissue engineering and oral disease treatment. This review examines the ability of dental stem cells to differentiate into various cell types, including odontoblasts, osteoblasts, and cementoblasts, and their role in advancing stem cell-based therapies for oral health. While recent advancements have demonstrated successful clinical applications, challenges remain, including ethical considerations, high costs, and uncertainties regarding long-term outcomes. This review provides an overview of the current state of dental stem cell therapy, its potential for revolutionizing oral health care, and the future research needed to overcome existing limitations.

**P26 The Impact of Non-Nutritive Sucking on Occlusal Development.** M. PALPANT\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This narrative review examines current evidence on the impact of non-nutritive sucking on the occlusion of children's teeth during eruption. Prolonged non-nutritive sucking habits have been associated with the development of malocclusions, including posterior crossbite, open bite, underbite, and dental crowding. Early intervention plays a crucial role in preventing these adverse effects, with cessation strategies, orthodontic appliances, and positive reinforcement emerging as the most effective treatment approaches. Dental professionals play a key role in identifying at-risk children, educating parents on the implications of prolonged non-nutritive sucking, and recommending appropriate intervention strategies. By providing guidance on habit cessation techniques, monitoring occlusal development, and collaborating with orthodontic specialists, when necessary, dental professionals can help prevent long-term oral health complications. Understanding these interventions and the role of early dental intervention can aid in promoting optimal dental alignment and overall oral health in children.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL HYGIENE

**P27 The Relationship Between Diabetes and Periodontal Disease.** E. PETERS\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This research examines the by directional relationship between diabetes and periodontal disease, two widespread health concerns that significantly impact public health. Diabetes affects the body's ability to regulate blood glucose levels, which intern influences the host's response to periodontal disease. Conversely, periodontal disease can't exacerbate diabetes by contributing to systemic inflammation and poor glycemic control. This review explores key factors that increase susceptibility to periodontal disease individuals with diabetes, including hyperglycemia, tartar buildup, lifestyle habits, tissues cell involvement, and A1C levels. By summarizing current research, this study provides a deeper understanding of how diabetes influences oral health, and the importance of early intervention. The findings emphasize the need for individualized treatment plans in dental settings and improved professional collaboration between dental and medical professionals, to enhance patient care and overall health outcomes.

**P28 Procedures for Reducing Dental-Induced Anxiety in the Dental Office.** C. PRICE\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

Dental anxiety, or dentophobia, affects a significant portion of the U.S. population and is a major contributor to negative oral health outcomes. This narrative review explores both non-pharmaceutical and pharmaceutical methods for reducing dental anxiety in clinical settings. Non-pharmaceutical approaches, including auditory stimulation, aromatherapy, and virtual reality exposure therapy, are examined for their effectiveness and practical implementation in dental practice. Pharmaceutical interventions, such as nitrous oxide and oral sedation, are evaluated based on clinical performance and existing research. Additionally, this review discusses key barriers to implementation, including cost, feasibility, and potential disruptions to workflow, while offering practical solutions to enhance patient comfort and care. Research findings indicate that these methods lead to measurable reductions in physiological stress markers such as blood pressure, cortisol levels, respiratory rate, and pulse rate. The review concludes that integrating these strategies can create a more calming dental environment, improving the overall patient experience and encouraging better oral health outcomes.

**P29 Evaluating the Role of Forensic Odontology in Identifying Individuals.** A. RODRIGUEZ\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

Forensic odontology plays a vital role in identifying individuals when traditional methods such as DNA analysis and fingerprinting are unavailable or compromised. This study evaluates the effectiveness of forensic odontology in comparison to DNA and fingerprint analysis, highlighting its reliability in cases involving mass casualties, fire-related deaths, and decomposition. Through an analysis of significant case studies, including the Mary Lynn Breeden case, the 2012 DANA air crash, and the 2004 Indian Ocean tsunami, this review underscores the resilience of forensic dental evidence in extreme conditions. Dental records, radiographs, and advancements in tooth pulp DNA extraction have strengthened forensic odontology's role in human identification. Recent innovations, such as 3D imaging and digital dental databases, are improving its accuracy and accessibility, addressing challenges like limited dental record availability and the high costs of advanced imaging. While DNA analysis remains the gold standard, forensic odontology serves as a critical complementary tool, offering valuable insights and ensuring justice and closure for families of the unidentified.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL HYGIENE

**P30 Bruxism: Uncovering the Causes and Breaking the Grind.** I. ROUSSEY\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This narrative review provides an overview of bruxism, a condition characterized by the clenching and grinding of teeth, and explores three potential causes: sleep apnea, enlarged tonsils, and stress. Each cause is examined alongside corresponding treatment options to manage and mitigate its effects. Additionally, this study highlights the impact of bruxism on oral health, including pain, discomfort, and jaw misalignment. The role of dental hygienists in diagnosing and managing bruxism is also discussed, emphasizing the importance of comprehensive patient assessments and interdisciplinary collaboration in identifying underlying causes. This review offers valuable insights for dental professionals and individuals experiencing bruxism, contributing to improved patient care and awareness.

**P31 Oral Health Changes During Pregnancy.** T. SALIM\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This narrative review examines the impact of pregnancy on oral health, focusing on hormonal changes, common challenges, preventive strategies, and the critical role of health literacy in managing oral health risks. Health literacy, defined as the ability to understand and apply health information, is essential for empowering pregnant women to make informed decisions about their oral and systemic health. Pregnancy triggers significant physiological and hormonal changes, including fluctuations in estrogen and progesterone, which can alter the composition of oral microbiota and contribute to conditions such as pregnancy gingivitis and an increased risk of periodontal disease. These hormonal shifts, combined with changes in eating habits and oral hygiene routines, may lead to swollen, bleeding gums, and a higher susceptibility to tooth decay. Preventive strategies, such as integrating oral health education into prenatal care and expanding access to dental services, are crucial for reducing these risks. Implementing targeted interventions, including programs that provide accessible and comprehensive oral health care for pregnant women, can significantly enhance health literacy and improve maternal and fetal health outcomes.

**P32 Enhancing Oral Health Literacy in Kindergarten-Age Children to Prevent Dental Disease.** C. SMITH\*, D. FOX, K. SCOTT, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This study examines the relationship between health literacy and the prevention of dental caries in kindergarten-aged children through a pre-test/post-test research design. The intervention consisted of an oral health presentation aimed at educating children on proper oral hygiene behaviors, the importance of preventive care, and dietary habits that support oral health. By assessing knowledge levels before and after the presentation, this study evaluates the effectiveness of health education in improving oral health literacy and its potential role in reducing caries risk. A review of existing literature and case studies from high health literacy regions provides additional context for understanding how structured educational interventions contribute to long-term prevention efforts. While higher health literacy is a key factor in improving oral health outcomes, other influences—such as socioeconomic status and access to care—also play a role. The findings highlight the importance of integrating oral health education into early childhood curricula and dental care programs, advocating for a multifaceted approach to ensure sustainable improvements in oral health.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL HYGIENE

**P33 The Influence of Toothpaste Flavor and Color on Oral Health Habits in Children.** K. TAYLOR\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This narrative review examines the influence of toothpaste flavor and color on children under the age of 12, focusing on how sensory factors impact brushing habits and oral health outcomes. Flavor and color play a crucial role in making oral hygiene routines more engaging, helping children develop positive associations with brushing and encouraging consistency in their daily habits. Appealing flavors, such as fruity or sweet varieties, can enhance motivation, while vibrant colors contribute to the sensory appeal, making brushing feel more enjoyable rather than a chore. By fostering an enjoyable brushing experience, these factors promote better plaque control, biofilm reduction, and caries prevention, ultimately laying the foundation for lifelong oral health. Additionally, this review explores how toothpaste design and marketing strategies influence children's preferences and compliance with oral hygiene practices. Understanding the impact of sensory elements in toothpaste formulation can help dental professionals and caregivers select products that encourage healthy habits, improve adherence to brushing routines, and reduce the risk of early childhood caries.

**P34 Oral Health Risks of Betel Quid: Awareness and Prevention.** O. YA\*, A. LAMPHERE (Indiana University School of Dentistry Fort Wayne)

This narrative review examines the significant public health challenges associated with betel quid chewing. Betel quid use is strongly linked to oral diseases such as dental caries, periodontal disease, and the development of precancerous lesions, including leukoplakia and oral submucous fibrosis (OSF). Despite these health risks, its cultural significance, social role, and psychoactive effects contribute to its continued use. This review explores the effectiveness of public health campaigns in raising awareness and encouraging behavior change, alongside policy measures such as sales regulations and advertising restrictions aimed at reducing betel quid consumption. Additionally, the role of dental professionals is highlighted, emphasizing their responsibility in patient education, early detection of oral health complications, and advocacy for cessation strategies. Addressing this issue requires a comprehensive, multidisciplinary approach that integrates public education, healthcare interventions, and policy enforcement to effectively mitigate betel quid use and improve oral health outcomes in affected populations.

**P35 LGBTQ+ Inclusion in Dentistry: Challenges and Opportunities.** C. HERNANDEZ\*, R. GALL, L. BILLING (Indiana University School of Dentistry)

LGBTQ+ individuals frequently face barriers to receiving equitable healthcare, including in dental settings. This study includes a literature review conducted using the PubMed database, analyzing key articles from 2021 onward. This research aims to identify challenges and opportunities related to LGBTQ+ inclusion in dentistry, examining past studies addressing the unique needs of LGBTQ+ patients and evaluating approaches taken to improve inclusivity in dental care. Research suggests that LGBTQ+ content is not consistently included in dental and dental hygiene curricula, with significant variability across programs. Surveys conducted among oral health providers and LGBTQ+ patients have identified gaps in inclusive healthcare practices within dental settings. While many LGBTQ+ individuals report regularly seeking dental care, a notable proportion experience discomfort or perceive unfair treatment during appointments due to their sexual orientation or gender identity. The findings highlight that implementing cultural competency training, inclusive language, and gender-neutral documentation can significantly improve the dental experiences of LGBTQ+ patients. By adopting inclusive approaches, dental providers can improve the quality of care for LGBTQ+ members and foster a more welcoming dental environment positive experience.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL HYGIENE

**P36 Diversity in Dentistry: Reviewing Initiatives to Improve Minority Representation.** C. PINKSTON\*, J. GARCIA, L. BILLING (Indiana University School of Dentistry)

Background: Diversity in dentistry is essential in improving access to care and ensuring culturally competent treatment for diverse patient populations. Over the years policies and initiatives have aimed to increase minority representation in dental education, recognizing the benefits of a more inclusive workforce. While progress has been made, opportunities remain to further enhance recruitment, retention, and support systems for underrepresented minority (URM) students. This literature review explores the effectiveness of existing strategies and identifies areas of continued improvement for diversifying the dental profession. Methods: We searched the PubMed database for peer-reviewed literature focused on diversity in dental education and the barriers surrounding it. Results: The findings revealed key challenges in recruiting underrepresented minority (URM) students into dental hygiene programs. One study found that financial challenges, such as high program costs, educational debt, and a lack of racial and ethnic role models were major obstacles for URM students. Another study revealed that while many program directors recognized the importance of diversity, recruiting URM students was not always a top priority. Common recruitment challenges included time constraints, limited funding, and a shortage of qualified applicants from diverse backgrounds. Conclusion: To improve diversity in dental hygiene programs, a more comprehensive and prioritized approach to recruitment is necessary. This includes enhanced mentorship, targeted financial support, and culturally inclusive recruitment practices. Addressing these issues is crucial not only for expanding access to dental education, but also for ensuring that the dental hygiene workforce reflects the diverse communities it serves. Ultimately, this would improve patient care and reduce health disparities.

**P37 Abrasiveness of polishing modalities: Literature Review.** S. TWADDELL\*, K. HIATT, T. RADER (Indiana University School of Dentistry)

Introduction: Dental professionals use various technologies to manage periodontal health, including polishing techniques that aid in plaque and stain removal. There are currently two methods dental professionals use after scaling procedures to polish teeth and remove the acquired pellicle/ plaque biofilm: rubber cup polishing and air polishing. A literature review was conducted on in vitro and in vivo studies comparing the abrasion caused by each polishing system; prophy cup vs. air. Each method provides different benefits and limitations, and it is important for clinicians to be informed on the different polishing methods to best fit the needs of the patient. Materials and Methods: To identify relevant articles, a PubMed/Medline search was completed using the following keywords: coronal polishing, prophy cup polishing, air polishing, abrasion, oral hygiene, stain removal. Six relevant articles were selected for this literature review based on their focus on abrasiveness and polishing techniques. Discussion: Several factors extraneous from the type of polishing influence the ending surface texture of a tooth, and thus what the consequences of polishing are. The factors for prophy cup polishing analyzed included the type and grit of the prophy paste, the pressure applied to the foot pedal affecting the rotational speed of the prophy cup, and how hard the operator flares the prophy cup. Factors with air polishing include the powder being used, the angle and proximity the operator is polishing, and the power setting of the pressurized air and water. Clinical decisions should be a collaborative experience for the clinical operator and the patient, and the patient's preference and individual needs should influence these decisions. Results/Conclusion: While both polishing methods are effective for plaque and stain removal, air polishing is less abrasive on enamel surfaces. However, factors such as gingival health, patient comfort, and specific tooth conditions should be considered when choosing the appropriate polishing method.

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### DENTAL HYGIENE

**P38 Early Detection and Intervention for Sleep Apnea through Dental Screenings.** D. FELTS\*, G. BUSH, A. REED (Indiana University School of Dentistry)

Obstructive sleep apnea (OSA) affects an estimated 30 million people in the United States, yet only 6 million are diagnosed. Timely diagnosis and treatment are essential for enhancing patients' quality of life and mitigating related systemic complications. OSA, the most common sleep disorder, is characterized by temporary muscle relaxation in the upper respiratory tract, leading to airway narrowing or blockage and subsequent breathing interruptions, which result in inadequate oxygen intake. Research indicates strong correlations between OSA and various health conditions, including cardiovascular and cerebrovascular diseases, gastroesophageal reflux, and type 2 diabetes mellitus. This review aims to assess the scientific evidence linking oral health conditions to OSA, informing the role of dental professionals in the detection of this disorder through comprehensive oral examinations. A search of PubMed and Google Scholar was performed using key terms such as "obstructive sleep apnea," "periodontal disease," "risk factors," "oral health," "bruxism," and "oral appliance therapy," covering literature published from 2010 to 2024. The review included literature analyses, case-control studies, and age-matched studies. Findings indicate significant oropharyngeal risk factors for OSA, such as torus mandibularis class 6, narrow lateral pharyngeal walls, and Mallampati class 4. Additionally, patients with OSA exhibited a higher prevalence of bruxism, dry mouth, periodontal disease, temporomandibular joint disorders, and palatal and dental changes. By identifying the signs, symptoms, and risk factors associated with OSA, dental professionals can effectively screen patients through comprehensive health histories and thorough extraoral and intraoral assessments. Consequently, they should refer individuals with suspected OSA to sleep specialists for further evaluation, including polysomnography sleep studies. This collaborative, multidisciplinary approach to managing OSA enables early intervention, significantly enhancing the quality of life for those affected by the condition.

**P39 Chlorinated Water Exposure and Its Effects on Dental Health in Competitive Swimmers.** T. FIGUEROA\*, N. BURDETTE, A. RIECK (Indiana University School of Dentistry)

**Objective:** To examine the impact of chlorinated water exposure on the oral health of competitive swimmers. A literature review was conducted using PubMed and Google Scholar databases for articles published between 2000 and 2024. Inclusion criteria comprised studies related to chlorinated water effects on dental health, particularly staining, calculus formation, and decay. Studies were examined for data on dental erosion, caries, and swimmer's calculus, particularly in competitive swimmers who spend significant hours in the pool. Findings consistently indicated that prolonged exposure to chlorinated pool water contributed to dental staining, caries, and increased calculus formation in swimmers, with effects intensifying at higher exposure levels. Some studies observed that collegiate swimmers exhibited notable chlorine-induced staining, particularly with longer training durations and also suggested mouthguards with neutralizing agents could mitigate enamel erosion. Lastly, all research emphasized the importance of preventive measures such as regular dental check-ups and proper oral hygiene. The studies concluded that chlorine exposure in competitive swimmers has been linked to dental staining and enamel erosion. While protective mouthguards may provide some benefit, further research is necessary to develop more effective preventive strategies. Educating swimmers on proper oral hygiene practices remains crucial to reduce long-term dental damage.

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### DENTAL INFORMATICS

**P40 Application of Large Language Models to Assess Caries Risk.** T. P. JYESTA\*<sup>1</sup>, H. CHAUHAN<sup>1</sup>, G. FELIX GOMEZ<sup>2,3</sup> (1Indiana University Indianapolis Luddy School of Informatics, Computing and Engineering, <sup>2</sup>Indiana University School of Dentistry, <sup>3</sup>Regenstrief Institute)

This study investigates to compare the performances of open-source large language models (LLMs) to assess risk for caries at the point of care. Dental caries, a prevalent global health issue, is preventable and requires early detection and prevention to mitigate adverse health outcomes. Although evidence-based caries risk assessment methods are developed and used in clinical settings by integrating clinical and behavioral data they are subject to variability in clinician interpretation. To address this, 24 synthetic patient cases were developed, reflecting information recorded in the ADA Caries Risk Assessment form. These cases incorporated dental clinical findings, general health conditions, social and behavioral factors, and demographic details. Two separate analyses were conducted using three LLMs - ChatGPT (OpenAI), Gemini (Google®), and Meta AI—to evaluate their risk assessment consistency. Each tool provided caries risk categorizations (low, moderate, or high), which were compared using data visualization models to evaluate consistency and alignment with established guidelines. Findings revealed that ChatGPT and Meta AI produced similar results across both analyses, demonstrating consistency in risk classification. Among the three models, Meta AI exhibited the most accurate and stable performance, aligning closely with ADA guidelines. However, discrepancies were noted, particularly in complex cases with nuanced behavioral and clinical conditions. This research underscores the potential of AI tools to enhance decision-making in dental care by reducing variability and improving diagnostic accuracy. Additionally, it emphasizes the need for standardizing patient data formats and refining AI frameworks tailored to dental informatics. Conclusion: These advancements hold significant promise for improving patient outcomes, streamlining workflows, and driving innovation in AI-driven healthcare solutions. This work will be further explored by evaluating the accuracy of the LLM's with expert opinion.

**P41 Dental Patients' Perceptions of Malnutrition Screening Tools' Usability.** A. KUNAM\*<sup>1</sup>, H. XU<sup>2</sup>, T. THYVALIKAKATH<sup>3</sup>, G. FELIX GOMEZ<sup>3</sup> (1Indiana University Indianapolis Luddy School of Informatics, Computing and Engineering, <sup>2</sup>Indiana University School of Medicine, <sup>3</sup>Indiana University School of Dentistry)

Objectives: Malnutrition screening (MS) tools are seldom used in dental clinical settings. Even with prosthodontic rehabilitation, there is a lack of functionality as natural teeth, leading to malnutrition. For successful implementation, it is essential to assess the usability and functionality of these MS tools. This study aims to understand complete denture patients' perception of the usability of three MS tools using the System Usability Scale (SUS). Methods: Complete denture patients (N=93) from Indiana University School of Dentistry, Oral Health Research Institute, and the local community completed a one-time observational clinical study. Malnutrition Screening (MS) was completed using the 10-item Nutrition Screening Initiative (NSI), 6-item Mini Nutritional Assessment -Short Form (MNA-SF), and 2-item Malnutrition Screening tool (MST). After completing the three MS tools, patients assessed the usability of each tool using the 10-item SUS on a 5-point Likert scale. Item scores were inflated so that the total SUS score ranges from 0 to 100, with higher scores indicating greater usability. A score higher than 68 is considered acceptable. Descriptive statistics and repeated-measures ANOVA tests were performed to compare usability scores across the three tools. Results: The mean age of participants was 71 years, with 43% male and 57% female. About 50% of the study participants were Blacks, and 54% wore upper and lower dentures. The average SUS scores (mean ± SD) for NSI, MNA-SF, and MST were 70.22 (14.1), 70.13 (15), and 69.19 (15.6), respectively. There were no statistically significant differences among the three MS tools ( $p > 0.05$ ;  $F = 1.13$ ;  $F_{crit} = 3.04$ ). Conclusions: Findings suggest that complete denture patients consider the three MS tools acceptable and usable. NSI with ten questions is considered acceptable and not different from 6 or 2-question MS tools. Implementing MS tools within the dental workflow is essential to improve patient care outcomes. (Supported by Delta Dental Foundation Inc., GG-000000807)

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### DENTAL INFORMATICS

#### **P42 Natural-Language-Processing of Biomedical-Text on Juvenile Sjögren's Disease: A Pilot Study.** S.

MADARAPU\*<sup>1</sup> J. SHEN<sup>2</sup>, C. VETTER<sup>3</sup>, A. KUNAM<sup>4</sup>, Y.V.B. SANKURATRI<sup>1</sup>, T.P. THYVALIKAKATH<sup>1,2</sup>, G. FELIX GOMEZ<sup>1,2</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Regenstrief Institute, <sup>3</sup>Indiana University School of Medicine, <sup>4</sup>Indiana University Indianapolis Luddy School of Informatics, Computing and Engineering)

Juvenile Sjögren's disease (jSD) is an autoimmune debilitating condition with heterogeneous clinical manifestations in children, from non-specific constitutional issues to extra glandular involvement, complicating its diagnosis. This study explores use of natural language processing (NLP) to create knowledge summary from published research on diagnosing jSD. A comprehensive search was conducted in four databases (Embase, MEDLINE, CINAHL, and PsycINFO) for articles published up to May 2024. After removing duplicates, the remaining studies were screened in two stages: title and abstract review, followed by full-text review based on inclusion and exclusion criteria. Key terms related to jSD diagnosis were extracted using a structured template. These terms were processed using a large language model (LLM) called Bidirectional Encoder Representations from Transformers (BERT), which predicts missing words in a text based on the surrounding context. The LLM was trained gradually to improve its ability to recognize important diagnostic terms. A total of 7,795 articles were screened, and 59 studies were selected for testing. The model was trained for 10 cycles with small batches of data and controlled learning rate to ensure accuracy during predictions. A learning rate of  $1 \times 10^{-5}$  ensured stable learning. The model achieved a final training loss of 0.65, indicating effective learning without clear signs of underfitting. The training took approximately 17 minutes, with a processing speed of 0.578 samples per second and 0.078 gradient updates per second. After training, the model demonstrated promising capability to recognize key terms related to jSD diagnosis. Next steps include creating larger annotated dataset and calculating performance evaluation metrics. The findings suggest efficiency in using an NLP approach to generate knowledge summary. This research demonstrates the potential of establishing an NLP and machine learning pipeline in developing a diagnostic knowledge summary of jSD, laying the groundwork for a data-driven framework to enhance pediatric care.

#### **P43 Simulated NCCL Progression Prediction Using Machine Learning.** P.D. MISHRA\*<sup>1</sup>, G. DENUCCI<sup>2</sup>, A.T.

HARA<sup>2</sup> (<sup>1</sup>Indiana University Indianapolis Luddy School of Informatics, Computing and Engineering, <sup>2</sup>Indiana University School of Dentistry)

Objective: This study aimed to develop a machine learning-based regression framework that enhances the understanding of dental wear factors and can predict the development of *in vitro*-simulated non-carious cervical lesions (NCCLs). This model when integrated with an interactive application will allow researchers to explore different test variable combinations, identifying optimal conditions that can be applied in the lab, thereby reducing costs and personnel time. Methods: A dataset was collected from seven previously conducted *in-vitro* studies ( $n = 2477$ ) simulating NCCL development conditions. It included toothbrushing parameters, toothpaste abrasivity, acid exposure, and toothbrush head configuration. Interaction terms were created to capture complex relationships between variables. Three regression models—Random Forest (RF), Gradient Boosting Machine (GBM), and XGBoost—were implemented and optimized using hyperparameter tuning. Standardization and one-hot encoding were applied to preprocess the data. The models were evaluated using Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and  $R^2$  scores, along with cross-validation RMSE to assess model stability. Results: Among the three models, XGBoost exhibited the lowest Test RMSE (0.6019) and the highest  $R^2$  (0.6561) making it a better fit. XGBoost includes L1 (Lasso) and L2 (Ridge) regularization, which helps prevent overfitting better than traditional GBM and Random Forest. Besides RF and GBM train sequentially while XGBoost allows parallel training making it faster to train. A user-friendly input system was developed, allowing real-time volume loss predictions based on test parameter's selection. Conclusion: The results indicate that XGBoost outperforms other models in predicting NCCLs progression in-vitro, offering enhanced accuracy and stability. Besides, its ability to work efficiently on smaller datasets makes it a good fit for the proposed task. This model provides a cost-effective, time-saving predictive tool to optimize conditions and testing parameters' selection when designing *in-vitro* NCCL simulation studies.

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### **DENTAL INFORMATICS**

**P44 Invisible Barriers: Health Information Accessibility Challenges for Visually Impaired.** S. KASARANENI\*<sup>1</sup>, T. THYVALIKAKATH<sup>1,2</sup>, S. LI<sup>1,2</sup> (1Indiana University School of Dentistry, 2Regenstrief Institute)

Objectives: Health information accessibility is crucial for empowering visually impaired (VI) individuals to manage their health, yet barriers remain in accessing, interpreting, and using this information. This scoping review explores key usability challenges and technological solutions, focusing on mHealth apps, assistive technologies, and telehealth platforms. Methods: A search was conducted across PubMed, IEEE Xplore, Association for Computing Machinery Digital Library, and Ovid databases using Boolean operators ("AND" and "OR") with keywords such as "Visual Impairment," "Health Information Accessibility," "Blind Population," and "Information Accessibility." Results: Nineteen studies were selected for the thematic analysis to extract key findings on usability, design recommendations, and user engagement. Three major themes emerged during the analysis. First, Navigation and interface challenges: VI users find difficulty navigating digital health platforms due to poor integration screen readers, lack of tactile feedback and complex user interfaces make it hard for the user to access their health information. Second, Design and usability Recommendations: The studies suggest that there is a need for better design practices such as incorporating screen reader compatibility, voice commands, and clear navigation paths. Inconsistent adoption of these features across health platforms remains a significant challenge for VI users. The lack of universal standards across health platforms continues to be a significant barrier. Last but not least, Assistive technologies: Telehealth platforms and mobile assistive technologies such as screen readers and voice-activated systems were highlighted across studies for their role in improving accessibility. These were found to enhance health literacy and access to critical information, particularly for managing chronic illnesses but the integration is often found to be inconsistent. Conclusions: Despite advancements in assistive technologies, VI users continue to face challenges in accessing health information due to inconsistent accessibility features. Standardizing the integration of these features through user-centered design can improve their accessibility to health information.

**P45 Development of an NLP Annotation Guideline for Assessing Peri-Implantitis.** A. RAJAPURI\*, C. BATRA, S. LI, S. GADDAM, S. NARNE, T. THYVALIKAKATH, H. NAMLI (Indiana University School of Dentistry)

This study aims to develop a natural language processing (NLP) annotation guideline to retrieve pertinent information from clinical notes to evaluate the correlation between bone graft materials in staged Guided Bone Regeneration (GBR) or extraction/ridge preservation procedures and peri-implantitis. The development process comprised three major steps. First, we established the study cohort, consisting of patients who underwent Guided Bone Regeneration (GBR) or extraction followed by ridge preservation and implant placement at the school's graduate periodontics clinic between January 1, 2008, and December 31, 2023. Second, we conducted a literature review and consulted domain experts to develop the initial draft of the guidelines. Third, two researchers independently reviewed and annotated the same sets of deidentified clinical notes using an annotation tool Label Studio. Any inconsistencies were discussed and resolved collaboratively. The guidelines were then revised based on these discussions. This iterative process was repeated three times until the inter-annotator agreement reached 0.8, and the guidelines were finalized after the last round of annotation and discussion. We identified a total of 1040 clinical notes from 230 patients and selected randomly 60 clinical notes for guideline development. To develop annotation categories, the team created structured classifications that encompassed key areas of interest in clinical notes. This resulted in identifying five main classes as location, biomaterial used, inflammatory markers, bone loss and peri-implantitis along with their corresponding attributes such as tooth number, xenograft, allograft, pain, suppuration, tenderness, bleeding on probing, probing depths and type of bone loss (horizontal, vertical). In conclusion, a well-developed comprehensive annotation guideline ensures consistency, accuracy, and interoperability, enhancing the retrieved data quality. It is a critical step in building a good NLP model to analyze clinical notes. Next steps include creating an annotated corpus of clinical notes that will be used as training and test sets to validate automated information retrieval program from clinical notes.

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### **DENTAL INFORMATICS**

**P46 Implementation and Evaluation of Teledentistry for Special-Needs Hospital Dentistry Patients.** M.R. PINTO\*, S. LI, P.J. LINDER, T.P. THYVALIKAKATH (Indiana University School of Dentistry)

Background: Housed within the Department of Oral and Maxillofacial Surgery at Indiana University School of Dentistry (IUSD), the Hospital Dentistry (HD) service provides access for individuals with special care needs and complex cases, especially for those living in distant locations and facing social-economic disparities. Being an important regional clinic resource, the HD Service is facing an overwhelming demand, therefore resources optimization is essential, for both patient and staff perspectives. As the critical first step, the objectives of the current study were to understand the current in-person screening workflow and identify optimization opportunities and to prepare the future time-motion observation study. Methods: The long-term goal of this observational study is to gain information on in-person dental screening (before) and dental telescreening (after) routines, focusing on operations and time-motion analysis, with the support of the Department of Dental Public Health and Dental Informatics (OHRI-DI). There are two major steps in the project. First, the clinicians and staff were interviewed to better understand the current patient intake and screening workflow, identifying the primary points of attention and their expectations with the teledentistry implementation. Second, we have designed the implementation process was developed, along with the data collection instrument (data collection form), the last directed essentially to the time-motion study. This study does not consider interventions on patients and professionals or staff, being confined to observing and registering the dental screening processes at IUSD HD Service, collecting and analyzing data. Results: This is an ongoing project, that received authorization from IUSD-IRB (#25540) recently. Therefore, after pre-operational procedures, the data will begin to be collected in March 2025. To summarize, the IUSD-HD service intends to implement dental telescreening, aiming to offer a better service to its patients and to improve its overall performance.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### DENTAL MATERIALS

**P47 Strength of Resin Cements Bond to Ultra-Translucent Multilayered Zirconia.** S. CASKEY\*, M. YAMAUTI, B. RATLIFF, G. CHU (Indiana University School of Dentistry)

This project determined the effect of thickness of an ultra-translucent multilayered zirconia (UTML-Z) ceramic on shear bond strength (SBS) of two light-activated resin cements and measured light irradiance through UTML-Z thicknesses. Disks of UTML-Z 10 mm in diameter, with thicknesses ranging from 0.5mm to 2.0mm, were prepared (n=12). After sintering, the irradiance (mW/cm<sup>2</sup>) delivered by the LED curing unit was measured in triplicate with a control through UTML-Z using a MARC Resin Calibrator. The UTML-Z specimens were sandblasted (50µm Al<sub>2</sub>O<sub>3</sub>, 20mm, 30s). Two novel resin cements, Panavia SA Cement Universal (SA) and Panavia Veneer LC (PV) were bonded by light curing (>800 mW/cm<sup>2</sup>, 20s) through varying UTML-Z thicknesses using a mold (n=6). After water storage (37°C, 24h), the SBS was measured using a universal testing machine. Statistical significance set at 0.05. SBS data was analyzed using Kruskal-Wallis test and pairwise comparison (median MPa). For each cement, there was no significant difference between the UTML-Z thicknesses. The SBS of SA bonded to 1-mm thick UTML-Z (33.35MPa) was significantly higher than all PV groups except for the 0.5-mm group (8.91MPa). The SBS of SA bonded to 1.25-mm thick UTML-Z (19.95 MPa) was significantly higher than the PV 1.5-mm (8.39 MPa) and PV 1.75-mm (7.59 MPa) groups. The light irradiance control was 1265.26mW/cm<sup>2</sup>, which was significantly reduced by 67.9% when measured through 0.5-mm UTML-Z, reaching 88.18% reduction through 2.0-mm UTML-Z. UTML-Z thickness did not significantly affect the SBS of resin cements. SA cement had a greater SBS when cured through 1-mm thick UTML-Z than all PV groups cured with a thickness above 0.5 mm. SA cement also exhibited greater SBS when cured through 1.25-mm thick UTML-Z than the PV cured through 1.5-mm and 1.75-mm thick UTML-Z. The light irradiance decreased as the UTML-Z thickness increased.

**P48 Microtensile Bond Strength Testing: A Bibliometric Analysis in Dentin Adhesion.** G. NIVAR\*, M. YAMAUTI, D. MESSIAS, G. BASTIATA (Indiana University School of Dentistry)

Background: Significant advancements have been made in dental adhesive technology and understanding of adhesion mechanisms, particularly with dentin, in the past decades. The microtensile bond strength test, developed to evaluate adhesive systems with high bond strength to dental substrates, has been refined over the years. Therefore, this research protocol aims to conduct a qualitative and quantitative analysis of publications that utilize the microtensile bond strength test for dentin adhesion. Methods: A search was conducted in the PubMed database to identify studies using microtensile bond strength to dentin adhesion published between 1994 and 2024. A search strategy was created using specific words related to the field [(microtensile OR micro-tensile OR micro tensile) AND (bond strength) AND (dentin)]. Papers addressing any aspect of dentin adhesion, including both direct and indirect procedures, were included. Editorials, case reports, opinion, ex-vivo studies and non-English publications were excluded from the analysis. Results: A total of 1,991 articles were initially identified. Between 1994 and 2000, only 38 papers were published, corresponding to the early studies utilizing this technique, which was introduced in 1994. From 2001 to 2010, there was significant increase in publications was observed, with 838 articles, indicating researchers, growing acceptance of and interest in the technique, followed by the advancements in adhesive systems - particularly self-etch adhesives- and a better understanding of adhesion mechanisms and their degradation. From 2011 and 2024, the number of studies further expanded to 1,312 articles, reflecting the development of universal adhesives, the wide-spread adoption of microtensile bond strength technique, and a focus on evidence-based dentistry, including 18 systematic reviews and meta-analyses). Conclusion: The microtensile bond strength test is an essential screening tool for assessing adhesion to dental hard tissues, particularly dentin. It plays a critical role in evaluating newly developed materials and innovative adhesive solutions.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**DENTAL PUBLIC HEALTH**

**P49 Assessment of Promotora-Led Interventions in a Rural Indigenous Population.** A. MANTILLA-RODRIGUEZ\*<sup>1</sup>, M. ESCOFFIE<sup>2</sup>, E.A. MARTINEZ-MIER<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Autonomous University of Yucatan)

Objectives: The study aimed to evaluate the effectiveness of a caries prevention program by: 1) Assessing changes in oral health perceptions, beliefs, and knowledge of guardians before and after participation; and 2) Measuring changes in children's caries incidence and oral hygiene. Methods: The study was conducted in Catmis, Yucatan, Mexico. First-grade parents were trained to deliver educational components in Spanish or Mayan. NaF varnish was applied to all tooth surfaces by pediatric dentist, with assistance from predoctoral students. Statistical management: Data on oral health outcomes and health literacy were collected, cleaned, structured, and analyzed. Statistical analyses included descriptive statistics and determined whether there was a statistically significant difference between metrics obtained prior to intervention and those obtained after. A paired t-test or a Wilcoxon signed ranks test was used based on the distribution of the data using SPSS statistical software. Results: Baseline mean DMFT (5.16) showed a slight increase at 6-months (5.31, P -value = 0.660) but decreased at the 12-month mark (4.67, P -value = 0.578). This difference was not statistically significant. Baseline OHI mean score (2.0) showed a steady decline at 6 months (1.7, P -value = 0.005) and 12-months (1.0, P -value < 0.000). Baseline mean knowledge index (26.57) showed a statistically significant increase at 6 months (28.64, P -value = 0.009) and- 12 months (36.16, P -value < 0.000). Conclusion: Oral health interventions that integrate a community's cultural background appear to improve oral health outcomes and literacy in rural Indigenous populations. (Supporting agency: The Indiana Clinical and Translational Sciences Institute)

**P50 Impact of Toenail Sample Mass on Fluoride Analysis Reliability.** G. TAMAYO-CABEZA\*, M. ZENNI, G. CASTIBLANCO-RUBIO, F. LIPPERT, G. ECKERT, E.A. MARTINEZ-MIER (Indiana University School of Dentistry)

The objectives of this study were: 1) To determine the mass threshold required for reliable fluoride analysis in toenail samples and 2) to compare fluoride extraction percentages (%FE) from toenail samples using two protocols with hexamethyldisiloxane (HMDS)-facilitated diffusion. Toenail samples from 11 IRB-consented female participants (16-50 years) were collected. Samples were prepared using sonication with deionized (DI) water, followed by drying at 37° C; then cut and grouped into specific masses: 1.0-5.0 mg ( $\pm 0.5$  mg). Fluoride content was analyzed with a HMDS-facilitated diffusion method and a Fluoride Selective Electrode. Then, fluoride from 3.0 mg ( $\pm 0.5$  mg) of pooled nails from four randomly selected participants was analyzed using two protocols: A used 1 mL of HMDS-saturated 3N sulfuric acid and 2 mL of DI water; B used 3 mL and 3 mL, respectively. Samples were re-tested twice to calculate %FE. The mass threshold for reliable analysis was determined using intraclass correlation coefficients (ICC) with 95%-confidence intervals (CI) and change-point analysis from mixed-effects models accounting for participants' variability. F-tests compared the variance in %FE between the two HMDS-facilitated diffusion protocols. Ninety-eight toenail samples with masses ranging from 0.80 to 5.50 mg were analyzed for fluoride content and showed a range of concentrations from 0.81 to 11.67  $\mu\text{g F/g}$ . Excellent reliability (ICC=0.90, 95%CI=[0.71, 0.95]) was observed in samples with a minimum mass of 2.5 mg. Change-point analysis showed a significant change in fluoride with sample masses between 2.5 to 2.75 mg. %FE for protocol A ranged from 43 to 58%, while protocol B ranged from 38 to 80%. A higher variance in %FE was observed in protocol B compared to A (F-ratio=0.2568, p=0.0331). Toenail sample mass affects the reliability of fluoride analysis at the participant level. Further research is needed to develop standard techniques accounting for the potential limitations of toenails as fluoride biomarkers.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**ENDODONTICS**

**P51 Antibacterial Effect of Electromagnetic Stimulation On In Vitro Endodontic Biofilms.** T. WHITFIELD\*, K. SPOLNIK, Y. EHRLICH, A. MOVILA (Indiana University School of Dentistry)

Objective: The objective of this in vitro study was to evaluate if electromagnetic stimulation alone has a direct anti-bacterial/biofilm effect on an established multispecies endodontic biofilm compared to bacterial samples which had not received any EMS. Materials and Methods: A total of 75 sutures were inoculated with a previously obtained endodontic biofilm. Suture lengths consisted of 2mm, 4mm, and 6mm allowing for 25 samples per length. Sutures were then stimulated with a specified number of 1 second bursts ranging from 1, 2, 4, 8, and 16 bursts. A control was taken from each group to allow for direct comparison between stimulated and non-stimulated colonies. Biofilm and total growth were analyzed via spectrophotometry and were finally plated on agar plates to analyze colony forming units via ProtoCOL machine. Results: The bacterial colonies evaluated following stimulation resulted in statistically significant results. Compared to the control of bacteria, which did not receive any simulation, any amount of stimulation resulted in a significant decrease in biofilm formation, bacterial load, and presence of bacterial colonies as shown by optical density and colony forming units. Conclusion: Based on results from the current study, it is evident that EMS use alone has a direct anti-bacterial and anti-biofilm effect when compared to our control, which depending on the length of suture and stimulation amount, result in statistical significance.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**MICROBIOLOGY / IMMUNOLOGY / ORAL BIOLOGY**

**P52 Overexpression of Kalirin GEF1 Domain Increases Osteocyte Dendritic Length.** A. ABDELSAMAD\*, S. MAHALANOBISH, K. CHESTER, A. BRUZZANITI (Indiana University School of Dentistry)

Background: Kalirin is a guanine nucleotide exchange factor (GEF) protein with multiple functional domains. Kalirin regulates neuronal dendritic length and morphology. The lab published in 2014 that when Kalirin is globally deleted, mice exhibit decreased bone mineral density, increased osteoclast and decreased osteoblast number, highlighting its importance in bone homeostasis. Kalirin is also expressed in osteocytes, which act through their dendritic network to regulate the balance between osteoclast and osteoblast activity. Unpublished studies in the Bruzzaniti lab suggest Kalirin deletion leads to shortened osteocyte dendrites, but the mechanism is unknown. The current study focuses on understanding the molecular mechanism of Kalirin's actions on osteocytes. Hypothesis: We hypothesize that Kalirin regulates osteocyte dendrite length through a functional GEF1 domain. Methods: A cDNA plasmid construct expressing the Kalirin-GEF1 domain, tagged with the Myc epitope, was transiently transfected into the osteocytic cell line MLOY4 ( $3 \times 10^5$  cells/9.6 cm<sup>2</sup> well) using Lipofectamine 2000. 48 hours post transfection, cells were fixed (3.7% paraformaldehyde), permeabilized, and blocked (0.1% BSA, 0.05% saponin, and 5% normal goat serum) for 30 mins. To detect transfected cells, cells were incubated with a mouse primary antibody against Myc (1:200) followed by a goat anti-mouse Alexa Fluor 468 secondary antibody (1:1000). Nuclei and filamentous actin were stained with DAPI (300 nM) and rhodamine phalloidin (1:40), respectively. On average, 65 cells/slide were counted with 3 replicates. Results: GEF1-overexpressing osteocytes (myc-positive) exhibited a 39% increase in average dendrite length (20.80  $\mu$ m) compared to non-transfected controls (12.82  $\mu$ m). An independent t-test revealed a statistically significant difference in dendritic length between the two groups (p-value=0.047). Conclusion: These results suggest Kalirin promotes osteocyte dendrite length through its GEF1 domain. Ongoing studies are investigating whether other Kalirin domains similarly influence osteocytes to further our understanding of Kalirin's role in osteocyte function and, consequently, bone mass.

**P53 Kalirin Deletion Impacts Craniofacial, Periodontal, and Dental Structures in Mice.** H. CLARK\*, K. CHESTER, A. BRUZZANITI (Indiana University School of Dentistry)

Background: Global deletion of Kalirin in a mouse model led to reduced bone mineral density, increased osteoclast number and activity, and decreased osteoblast number. This model also showed increased cementum-enamel-Junction to alveolar bone crest (CEJ-ABC) distance and decreased tooth crown volume. Preliminary immunohistochemistry confirmed Kalirin expression in the periodontal ligament, dental pulp chamber, gingiva, and alveolar bone. In 2016, two siblings with a Kalirin missense mutation were reported to exhibit craniofacial abnormalities, delayed bone age, short stature, and intellectual disability, supporting Kalirin's clinical relevance. The current study investigated Kalirin's role in Dentin Matrix Protein 1 (DMP1) expressing cells, including osteocytes, odontoblasts, fibroblasts, and ameloblasts, on craniofacial, periodontal, and dental structures. Hypothesis: Kalirin deletion in DMP1-expressing cells will negatively impact dental, craniofacial, and periodontal structures in mice. Methods: Kalirin floxed mice were crossed with DMP1 Cre recombinase mice to remove Kalirin in DMP1-expressing cells. At 14 weeks, female mice were euthanized, heads dissected and fixed. Craniofacial structures were then analyzed using 1176 Skyscan (7  $\mu$ m resolution). Parameters assessed included craniofacial width, height, periodontal ligament space, CEJ-ABC distance, tooth size, root and crown length, and bone volume. Statistical differences were analyzed using a Student's T-test (p < 0.05) between female mice for Kalirin deficient (FFC+) and littermate controls (FFC-) (n=11). Results: FFC+ mice had decreased craniofacial width, reduced bone volume, and thinner trabecular bone compared to controls. They also showed increased CEJ-ABC length, smaller tooth crown size, and larger periodontal ligament spaces. Conclusions: Kalirin deletion negatively impacts craniofacial, dental, and periodontal structures. Given microcephaly, dental abnormalities, and compromised periodontium are known to impact quality of life in humans, further studies in mouse models may shed light on the mechanisms underlying these defects. Future research will investigate if mouse models of Kalirin deletion are affected by age and sex of mice.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### MICROBIOLOGY / IMMUNOLOGY / ORAL BIOLOGY

#### **P54 Kalirin Deletion in Osteocytes Regulates Craniofacial Development and Growth.** K. CHESTER\*, D. MARIN CADAVID, A. BRUZZANITI (Indiana University School of Dentistry)

Background: Our lab demonstrated mice lacking Kalirin (KO) show decreased bone mineral density, increased osteoclasts, reduced osteoblasts, and abnormal periodontium. Osteocytes from Kalirin KO mice also show defects in viability and morphology. Additionally, it was reported that a sibling pair with a Kalirin missense mutation exhibited delayed bone age, short stature, and craniofacial abnormalities, highlighting the potential clinical significance of our studies. We investigated if Kalirin deletion in osteocytes, the primary bone cells regulating bone remodeling, affects craniofacial structures. Hypothesis: We hypothesize deleting Kalirin in osteocytes reduces bone mineral density and causes craniofacial abnormalities. Methods: 14- and 26-week female mice with Kalirin deletion targeted to osteocytes using dentin matrix protein 1 (DMP1) (FFC+) and littermate controls (FFC-) were analyzed by Micro-CT, assessing bone quantity in the interradicular bone of the second maxillary molar and the second mandibular molar. qPCR measured SOST expression, a key osteocyte gene that regulates osteoblast activity (18S =housekeeping gene). Immunohistochemistry (IHC) assessed normal Kalirin localization. Results: IHC confirmed Kalirin expression in periodontal ligament, pulp chamber, gingiva, and alveolar bone in control mice. Micro-CT of Kal-FFC+ revealed reduced craniofacial height at 14 and 26-weeks. Maxillary bone volume/tissue volume was reduced 14 weeks (19%) but not at 26 weeks. Tooth size was smaller at both ages. SOST expression at 14 weeks was elevated in FFC+ compared to FFC-. Conclusion: Kalirin deletion in osteocytes alters craniofacial structures and tooth dimensions. Craniofacial bone age was delayed at 14 weeks but normalized by 26 weeks. Given SOST was elevated at 14-weeks, we speculate increased osteoblast activity is part of the mechanism leading to temporal changes in maxillary bone mass caused by Kalirin deficiency. These results demonstrate Kalirin's role in the development and growth of craniofacial and tooth structures. Further studies will explore underlying mechanisms in aged mice, and potential sex differences.

#### **P55 Pyk2-deletion Promotes Female Femoral Bone Gain Without Affecting Jawbone Density.** D. MARÍN-CADAVID\*, K. CHESTER, A. BRUZZANITI (Indiana University School of Dentistry)

Bone loss accelerates with aging and affects women more than men due to estrogen loss. Antiresorptive therapies are common treatments for osteoporosis but can negatively affect maxilla and mandible, leading to osteonecrosis of the jaw. Therefore, novel therapies to preserve bone mass with better safety profiles are needed. The proline tyrosine kinase-2 (Pyk2) acts in part by decreasing osteoblast activity and increasing osteoclast resorption. Consistent with this, previous studies demonstrated that global deletion of (Pyk2-KO) increases bone mass in female mice and that estrogen stimulates Pyk2-KO osteoblast activity, indicating possible sex-specific effects. However, male mice have not yet been investigated, nor have the effects of Pyk2 deletion on jawbone been elucidated. We hypothesized that Pyk2 deletion will lead to sex-specific bone phenotypes in femoral, maxillary, and mandibular bones. Micro-CT analysis of the femur versus maxillae/mandibles of 16-week-old female and male Pyk2-KO mice and littermate (WT) were performed. T-test were performed for significance by sex between genotypes at the different bone sites (n=5/6 mice/group; p<0.05). Pyk2-KO female femurs showed statistically higher femoral bone volume/tissue volume (BV/TV), trabecular number (Tb.N), trabecular thickness (Tb.Th) and reduced trabecular spacing (Tb.Sp) compared to WT females. In contrast, whereas no changes in BV/TV were found in Pyk2-KO female maxillae or mandibles. In Pyk2-KO males, no significant changes in femoral or mandibular bone mass were detected, although maxillae showed a modest decrease in BV/TV. Taken together with previous findings, we suggest Pyk2 may serve as a novel dual-acting therapeutic target for the treatment of bone loss and osteoporosis in females, both inhibiting bone resorption and promoting bone formation, with potentially fewer oral complications compared to current antiresorptive therapies. Ongoing studies are currently investigating the molecular mechanisms underlying the sex-specific and bone site-specific effects of genetic deletion and inhibition of Pyk2. (Supported by Grant No. 1R01AR080076)

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**MICROBIOLOGY / IMMUNOLOGY / ORAL BIOLOGY**

**P56 Impact of Cell Density on Dendrite Length in MLOY4 Osteocytes.** S. MAHALANOBISH\*, A. BRUZZANITI (Indiana University School of Dentistry)

Background: Osteocytes, characterized by their long dendritic processes, play a crucial role in sensing mechanical loading, which is essential for bone remodelling. The murine long bone osteocyte Y4 (MLOY4) cell line closely resembles primary osteocytes and has been widely used in bone research. Similar to primary osteocytes, MLOY4 cells exhibit complex dendritic processes. However, significant variations in dendrite length have been observed depending on cell density. Hypothesis: Plating density of MLOY4 cells influences dendrite length. Methods: MLOY4 cells were seeded at different densities (0.1, 0.5, 1, 2, and  $3 \times 10^5$  cells in  $9.6 \text{cm}^2/\text{well}$  dishes) and cultured for 24 hours in the presence of alpha MEM with 5% FBS, 5% BCS, 1% PenStrep at  $37^\circ\text{C}$  with 5%  $\text{CO}_2$ . Cells were then fixed with 3.7% paraformaldehyde, permeabilized with ice cold acetone and stained with rhodamine phalloidin for 1 hour. Nuclei was counterstained with DAPI. Three replicates were used per group with an average of 10 random fields imaged under 20x magnification. Student t-tests were used for statistical significance between 2 groups ( $p < 0.05$ ). Results: Cells plated at the lowest density ( $0.1 \times 10^5$ ) exhibited the shortest dendrite length (9.62 mm) compared to all other groups ( $p < 0.05$ ). Dendrite length increased in a density-dependent manner up to a maximal of 20.5 mm at  $2 \times 10^5$ , after which the higher density group ( $3 \times 10^5$ ) showed shorter dendrites (19.78 mm) that were comparable to the  $1 \times 10^5$  group (20.90 mm). Conclusion: Cell density plays a crucial role in regulating dendrite length and beyond a certain density threshold, dendrite lengths become decreased. These findings suggest that surrounding cells and secreted factors may be required to achieve optimal osteocyte dendrite extension. The molecular mechanisms regulating osteocyte dendrite extension, which is important for maintain osteocyte function and bone quality, remains to be identified.

**P57 Characterization of Kalirin Deletion in Osteocytes on Bone Mineral Density.** K. ROBERTSON\*, K. CHESTER, A. BRUZZANITI (Indiana University School of Dentistry)

Background: Kalirin, a protein extensively studied in neurons, was reported to be crucial for bone homeostasis by the Bruzzaniti lab in 2014. A mouse model with global Kalirin deletion resulted in decreased bone mineral density (BMD) in both sexes, with females more severely affected. In 2016, a Kalirin missense mutation in siblings was associated with shorter stature, delayed bone age, craniofacial abnormalities, hypotonia, and intellectual disabilities. These findings highlight the importance of understanding Kalirin's role in regulating bone mass and its cellular mechanism of action. This study aims to investigate the effect of Kalirin deletion in osteocytes on overall bone mineral density. Hypothesis: We hypothesize that osteocyte-specific Kalirin deletion will decrease bone mineral density (BMD) and bone mineral content (BMC) in male and female mice. Methods: Kalirin floxed mice were crossed with Dentin Matrix Protein 1 (DMP1) Cre Recombinase mice (FFC+), which is highly expressed in osteocytes. Littermates expressing normal Kalirin served as controls (FFC-). Male and female mice at 14 weeks underwent Dual Energy X-ray Absorptiometry (DEXA) to assess BMD, BMC, and lean body mass (LBM). Scans were analyzed by segmenting out whole body, spine, and femur. Statistical differences were determined using Student's T-test between two groups ( $p < 0.05$ ). Results: Female FFC+ mice showed a 9.47% decrease in BMC and a 7.7% decrease in BMD in the spine compared to FFC- controls. No significant differences were found in the femur or whole body. LBM was unchanged. No differences were found in male mice at any site examined. Conclusion: Kalirin deletion in osteocytes predominantly affects bone mass in the female spine. Given the spine is mainly composed of trabecular bone, these findings indicate Kalirin's importance in trabecular bone remodeling. Future micro-CT studies will provide detailed measurements of trabecular versus cortical changes and elucidate the observed sexual dimorphism.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### MICROBIOLOGY / IMMUNOLOGY / ORAL BIOLOGY

**P58 Pyk2 Deletion leads to Sexual Dimorphism and Age-Related Changes in Bone Mass.** J. YEO\*, K. CHESTER, A. BRUZZANITI (Indiana University School of Dentistry)

Background: Postmenopausal women experience increased osteoporosis and fracture risk. Determining possible therapeutic targets is necessary to improve bone health in these women. Pyk2 is a dual-acting focal adhesion tyrosine kinase. In published studies, Pyk2 deletion in mice leads to increased osteoblast activity and decreased osteoclast activity, favoring bone gain. Additionally, previous data demonstrates an estrogen-specific effect and female mice with Pyk2 deletion treated with 17 $\beta$ -estradiol after ovary removal showed increase overall bone mass. Our long-term goals are to understand the effects of Pyk2 deletion in male versus female mice over different ages. Hypothesis: We hypothesize that Pyk2 regulates bone mass in a sexually dimorphic manner. Methods: We conducted Dual Energy X-ray Absorptiometry (DEXA) analysis of male and female Pyk2-KO (knockout) and WT (wild type) at 16, 32, 52, and 72 weeks of age. Scans were then analyzed via Lunar Piximus software. Differences were determined using 2-way ANOVA to compare between 2 genotypes and 2 sexes and post hoc analyses ( $p < 0.05$ ) ( $N \sim 19$  mice/group). Results: Female Pyk2-KO mice have increased bone mineral density (BMD) at ages 16, 32, and 52 weeks of age compared to WT mice. In contrast, male Pyk2-KO mice have increased spinal and whole-body BMD observed only at 52 and 72 weeks compared to male WT mice. Discussion: The BMD results showed sexually dimorphic and age-specific effects, with female Pyk2-KO mice demonstrating an early onset of bone gain that appeared to normalize by 72 weeks-of-age whereas bone gain in males was only observed in aged Pyk2-KO mice. Although it is not yet possible to ascertain the mechanism underlying the bone sexual dimorphism in our Pyk2-KO mice, future studies will investigate if changes in sex hormone levels in male versus female mice with aging is involved in Pyk2's effects on bone mass.

**P59 Effects of CD74 on Osteoclastogenesis and Periodontitis during Aging.** N. SANZ\*<sup>1</sup>, J. AKKAOUI<sup>2</sup>, C. GARCÍA<sup>1</sup>, C. YAMADA<sup>1</sup>, A. MOVILA<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Florida International University)

CD74 is a cell surface receptor for the pro-inflammatory cytokine macrophage migration inhibitory factor (MIF). The CD74-MIF axis promotes osteoclastogenesis and leukocyte accumulation in periodontitis lesions. In contrast soluble CD74 has been reported to counteract MIF's effect. This study aims to understand whether recombinant CD74 protein affects age-associated osteoclastogenesis and inhibits recruitment of macrophages (M $\phi$ ) and neutrophils to periodontal lesions. Methods: Young (2-MO) and aged (24-MO) male C57/B6 mice ( $N = \text{per condition}$ ) from the NIA were used. Bone marrow-derived macrophages were primed with M-CSF/RANKL and exposed to recombinant MIF alone (1 ng/ml) or combined with CD74 at 1 ng/ml (low concentration, LC) or 10 ng/ml (high concentration, HC). The expression patterns of osteoclastogenic (OC/DC-stamp, RANK, CTSK, NFACT1) senescence-protecting (BUB1B, SIRT6, SIRT3, SIRT1) and senescence-promoting markers (p53, p21, p16/cdk2na, HMGB1) were assessed. The impact of gingival CD74 injections (1  $\mu\text{g/ml}$  LC or 10  $\mu\text{g/ml}$  HC) on F4/80+ (M $\phi$ ) and Ly6G+ neutrophil accumulation in periodontitis lesions was histologically assessed. Statistical analysis: Kruskal-Wallis and Dunn's tests ( $*p < 0.05$ ). Results: MIF significantly enhanced RANKL-primed osteoclastogenesis in both age groups in vitro. We also observed that LC-CD74 reduced expression of osteoclastogenic markers, OC-stamp and CTSK in aged cells. No effect of CD74 on senescence markers in young osteoclasts was detected. In aged group HC-CD74 promoted high levels of senescence marker p53, and lower levels of HMGB1, p16/Cdk2na and senescence-protecting SIRT1. In the ligature-induced periodontitis model, HC-CD74 increased the lesion area in aged and young mice. Neutrophils density was lower on both LC- and HC-CD74 compared with ligature alone on young male, with no differences on aged male. M $\phi$  density was lower in young LC-CD74 only. Conclusion: Although we observed beneficial effects of recombinant CD74 protein in vitro, preventing young and aged osteoclastogenesis, in vivo data indicate that it may have limited effects preventing periodontal inflammation in the context of aging. (Funding Acknowledgement: NIH AG-053615, AG-064003, DE-028699, and DE-027153. Hevolution foundation HF-GRO-23-1199172-46)

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### MICROBIOLOGY / IMMUNOLOGY / ORAL BIOLOGY

**P60 Effects of Pyk2 deletion on Trabecular Bone Mass in Aged Mice.** A. SIERRA-CRISTANCHO\*, K. CHESTER, A. BRUZZANITI (Indiana University School of Dentistry)

Bone remodeling is a dynamic process influenced by aging and sex-related hormonal changes. Bone loss leads to osteoporosis with aging, a process that is pronounced in postmenopausal women due to estrogen deficiency. The proline tyrosine kinase-2 (Pyk2) has been implicated in bone mass regulation, with previous studies showing increased bone mass in 16-week-old female Pyk2-knockout (KO) mice. However, its long-term effects on bone remodeling and potential sex-specific differences remain unclear. This study evaluated aged, 90-week-old Pyk2-KO mice (equivalent to 80-year-old humans), for skeletal effects on trabecular bone. Micro-CT was performed on femurs from 90-week-old male and female Pyk2-KO and littermate wildtype (WT) mice (n=8/8 for WT/KO females; n=11/15 for WT/KO males). Reconstructed micro-CT images were analyzed for changes in trabecular bone parameters. Statistical significance was determined using Mann-Whitney U tests ( $p \leq 0.05$ ). Results showed that Pyk2-KO males exhibited significantly higher bone volume (BV) and BV/tissue volume (TV) was increased, trabecular number (Tb.N) was increased while trabecular spacing (Tb.Sp) was reduced, with no significant changes in trabecular thickness (Tb.Th). Pyk2-KO females exhibited increased BV and BV/TV as well as a significant rise in Tb.Th, Tb.N, and decreased Tb.Sp, indicating improved trabecular structure compared to WT. Pyk2 deletion enhances bone mass in aged male and female mice. While only female Pyk2-KO mice had high bone mass at 16 weeks, aged females showed increased trabecular thickness, whereas males exhibited greater trabecular number and a significant reduction in trabecular separation. These findings suggest a sex and age-dependent response and highlight Pyk2 as a potential therapeutic target for age-related trabecular bone loss.

**P61 Inhibitory Effects of Oral Bacterial Sphingolipids on OSCC.** C. YAMADA\*, C. MAO, F. NICHOLS, A. MOVILA (Indiana University School of Dentistry)

Objectives: Oral squamous cell carcinoma (OSCC) is one of the most common oral cancers in the oral cavity and lip. It is still elusive whether the key periodontal pathogen, *Porphyromonas gingivalis* (*P. gingivalis*), possesses anti-cancer effects. Acid ceramidase (aCDase/ASAH1) regulates the balance between tumor-suppressing ceramides and tumor-progressing sphingosine-1-phosphate (S1P). We recently demonstrated that a specific *P. gingivalis*-derived sphingolipid, phosphoethanolamine dihydroceramide (PEDHC), suppresses human OSCC cell growth through downregulation of aCDase *in vitro*. In this study, we evaluated the potential suppressive effect of *P. gingivalis*-sphingolipids on OSCC migration and proliferation, and the relationship to host-mediated sphingolipid metabolism. Methods: To evaluate immunohistochemistry Score (H-Score) of the aCDase, S1P, and *P. gingivalis* in human OSCC and the corresponding adjacent normal control tissue, samples were obtained from the Indiana University Melvin and Bren Simon Comprehensive Cancer Center. To examine the cell proliferation effects of *P. gingivalis*-derived sphingolipids on OSCC, the human OSCC OECM-1 cell line was incubated with various concentrations of *P. gingivalis*-derived sphingolipids for 24 h. Then, the intracellular concentration of sphingolipids and aCDase gene expression in OECM-1 cells were analyzed by liquid chromatography tandem mass spectrometry, and qPCR, respectively. We also analyzed the correlation between aCDase and both S1P and ceramide levels. Results: The H-Score of *P. gingivalis* was lower in human OSCC tissue than the corresponding adjacent normal control tissue. The H-Score had elevated levels of aCDase and S1P at OSCC lesions compared to healthy control parts. In addition, the H-Score of aCDase had a significantly positive correlation with the H-Score of S1P. Exposure of OECM-1 cells to *P. gingivalis*-derived sphingolipid metabolites inhibited ASAH1 mRNA expression and promoted intracellular accumulation of total ceramide and dihydroceramide levels. Conclusions: The present study demonstrated for the first time that *P. gingivalis*-derived sphingolipids have anti-proliferative effect on OSCC through the downregulation of aCDase.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**OPERATIVE DENTISTRY**

**P62 Bibliometric Review of Clinical Diagnosis Methods for Cracked Tooth Syndrome.** A.M. ALOMARI\*, D. DOBERDOLI, O.R. CAPIN, G.R. BATISTA, D.F. MESSIAS (Indiana University School of Dentistry)

Background: Cracked Tooth Syndrome (CTS) is characterized by non-physiological microcracks that develop on the tooth surface. Due to their subtle early-stage symptoms and the difficulty in detecting microcracks, CTS is often misdiagnosed or mistreated. If left untreated, these cracks can propagate, leading to pulpitis or complete tooth fracture. Early and accurate diagnosis is essential for effective management. This bibliometric review aims to provide a comprehensive overview of clinical methods used to diagnose CTS. Methods: A literature search was conducted in the PubMed database to identify studies on CTS diagnosis. The search included the keywords “Cracked Tooth Syndrome” or “tooth fracture” or “cracked tooth” and “diagnosis”. Only English-language articles published between 2015 and 2025 were considered. Inclusion criteria focused on studies discussing clinical diagnostic approaches, while exclusion criteria eliminated duplicate articles, non-English publications, and studies unrelated to diagnostic methods. A total of 72 articles were identified, of which 15 met the inclusion criteria and were selected for analysis. Results: Clinical examination remains the primary diagnostic method for CTS, with techniques such as bite tests (e.g., Tooth Slooth), transillumination, staining with methylene blue dye, and surgical exploration being commonly used. Cone-beam computed tomography (CBCT) assists in detecting indirect indicators of cracks, such as bone resorption. Emerging technologies, including Swept-Source Optical Coherence Tomography, Infrared Thermography, Ultrasonic Systems, and Laser-Assisted Diagnosis, show promise in improving CTS detection, though validation for routine clinical use is still needed. Conclusion: Early diagnosis of CTS relies on a combination of traditional clinical methods and imaging techniques. While CBCT provides indirect diagnostic support, novel technologies have the potential to enhance detection. Further research is necessary to establish their clinical applicability.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**ORAL AND MAXILLOFACIAL SURGERY**

**P63 Interprofessional Care for Temporomandibular-Joint Disorders: Psychosocial and Functional Treatment Outcomes** M. MCMANAMA\*, N. NOVOSEL, M. DI GIOSIA, N.S. MATTHEWS (Indiana University School of Dentistry)

Temporomandibular disorders (TMD) refer to debilitating musculoskeletal conditions that affect the temporomandibular joints (TMJ) along with surrounding musculature, and conditions associated with TMD are notoriously difficult to manage. The TMJ Institute at Indiana University School of Dentistry incorporates professionals in the fields of dentistry, medicine, physical therapy, and social work to provide a collaborative approach targeted at improving the physical and psychosocial signs and symptoms of TMD. This multidisciplinary treatment model is not widely practiced due to the logistical challenges of having various disciplines concurrently present in the same clinical space. Patients presenting with complex TMJ dysfunction and psychosocial problems are expected to exhibit decreased feelings of anxiety, depression and pain, in conjunction with an improvement in jaw function following treatment. The aim of this study is to analyze the psychosocial and functional aspects of patients struggling with complex TMD before and after treatment at the TMJ Institute to emphasize the value of treating patients using this interdisciplinary approach. Patients willing to participate in the study are given three questionnaires to complete prior to their first appointment at the TMJ Institute: Hospital Anxiety and Depression (HADS), Graded Chronic Pain Scale (GCPS) and Jaw Functional Limitation Scale (JFLS). The patients then complete the same questionnaires at their follow-up appointment to enable assessment of mean numerical changes. Changes in scales are tested for statistical significance using paired t-tests or nonparametric Wilcoxon Signed Rank tests if necessary. Patients presenting with complex TMD have mean parameter post-treatment reductions of -1.30 in jaw function limitation and -1.80 in chronic pain compared to their initial, pre-treatment scores. Although not as noteworthy, patients experienced reductions of -1.15 in depression and -0.54 in anxiety after treatment implementation. The results reinforce the hypothesis that multidisciplinary treatment approaches are effective in treating patients with debilitating TMD.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**ORAL DISEASE PREVENTION & DIAGNOSIS**

**P64 Assessment of Oral Pathological Lesions- Evaluation of Diagnosis and Management.** N. MCKEE\*, V. JOHN (Indiana University School of Dentistry)

Dental education aims to equip students with the clinical competencies necessary to diagnose and manage a wide range of oral health conditions, including oral soft tissue pathologies. The aim of this study was to assess the knowledge of diagnosis and management of common oral soft tissue pathologies among third- and fourth-year dental students at several dental schools in the United States to identify gaps in knowledge and performance variability across schools. One hundred and sixty dental students from four different dental schools in locations in the United States completed a survey that included 10 diagnostic, and 10 management questions based on case scenarios and static images. Logistic regression models were used to analyze responses, accounting for Dental School, Year in Training, and their interaction. Multi-rater kappas were calculated to assess inter-rater agreement. Diagnostic accuracy ranged from 48% for erythema migrans to 95% for smokeless tobacco keratosis, with squamous cell carcinoma identified correctly by 86%. Management accuracy was highest for squamous cell carcinoma (99%) and candidiasis (94%) but lower for recurrent aphthous ulcers (67%) and idiopathic leukoplakia (52%). One school outperformed the others overall, particularly in management accuracy. Multi-rater kappas revealed mostly slight agreement among respondents, with fair agreement in only five instances. Performance was comparable between third- and fourth-year students within most schools, except for one of the schools, where third-year students performed significantly better on the management questions. For both the Diagnosis and Management Questions models, only Dental School was found significant (p-values < 0.0001). While students demonstrated strong diagnostic and management accuracy for most of the pathologies tested, gaps remained. Variability across schools underscores the need for targeted curriculum enhancements to standardize and improve clinical preparedness in oral pathology.

**P65 Analyzing 2D Photos and 3D Scans for Caries and Erosion.** G. ALHARBI\*, A. SOTO ROJAS, A. HARA, H. TURKKAHRAMAN, A. VALDIVIA TAPIA, G. ECKERT (Indiana University School of Dentistry)

Introduction: Despite advancements in preventive dentistry, dental caries remains a significant public health concern, affecting over 2 billion people worldwide. Caries leads to tooth destruction, pain, and reduced quality of life, making accurate diagnosis essential. The International Caries Detection and Assessment System (ICDAS) standardizes caries detection. Similarly, erosive tooth wear (ETW), primarily caused by dental erosion, poses diagnostic challenges, with the Basic Erosive Wear Examination (BEWE) index widely used for assessment. Advances in digital imaging, including 3D intraoral scanners, have expanded diagnostic possibilities. However, limited research has compared their accuracy with 2D clinical photographs. Purpose: This study evaluates the agreement and reliability between 2D photographs and 3D intraoral scans for diagnosing and monitoring carious lesions and ETW in orthodontic patients, focusing on the occlusal surfaces of permanent first molars and second premolars. Materials and Methods: This retrospective study assessed carious lesions and erosive wear on 394 occlusal surfaces using ICDAS and BEWE. Two calibrated examiners evaluated 2D photographs and 3D intraoral scans to determine agreement and reliability. Eligible cases from Axium and Dolphin Imaging at IUSD required fully erupted first molars and second premolars with available 2D and 3D records. Cases with missing orthodontic records or restorations affecting occlusal surfaces were excluded. ICDAS and BEWE scores were recorded, and 3D scans were analyzed using a digital intraoral scanner (iTero system). Results: Agreement between 2D photographs and 3D intraoral scans was moderate for BEWE (69.5%) and ICDAS (70.6%). The weighted kappa was 0.57 for BEWE and 0.54 for ICDAS (p<0.0001). The Spearman correlation coefficients were 0.607 for BEWE and 0.593 for ICDAS. Conclusion: Moderate agreement between 2D and 3D imaging supports 3D scans as a complementary tool. However, variability in severity classification suggests further validation and AI integration to improve diagnostic accuracy.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**ORAL DISEASE PREVENTION & DIAGNOSIS**

**P66 TMD-7: Sensitivity and Specificity, Expediting Diagnosis and Referral.** O. ROBERTSON\*, M. GUTIERREZ, H. AVILA, T. TREAT (Indiana University School of Dentistry)

Temporomandibular disorders (TMDs) describe a group of musculoskeletal conditions that may or may not involve pain and/or dysfunction in the masticatory muscles, temporomandibular joints (TMJ) and other neighboring structures. With TMDs being a progressively worsening condition, early recognition and treatment of TMDs may prevent the chronic, life impacting pain experienced by 5% of the population. Simple patient questionnaires have been developed to aid in early identification, but no one has received widespread acceptance. The objective of our study is to determine the sensitivity and specificity of four different TMD patient questionnaires: TMD-7, TMD-Pain Screener, 3Q/TMD, and TMD-29, while also comparing the time of completion of each form. This study is being completed at the Indiana University School of Dentistry Screening Clinic. Our goal is to create novel diagnostic screening tools that will amplify proper diagnosis and timely referral of patients suffering from TMD. Following a screening appointment, investigators ask eligible subjects (aged 18+) if they are willing to participate in the study. If the subject consents to participate, then they complete four paper questionnaires, while investigators record the time. Following completion of each form, a Diagnostic Criteria for TMDs Assessment is conducted by a study investigator, which will be used to determine sensitivity, specificity, positive predictive value, and negative predictive value of the TMD patient questionnaires included in this study. Of the 37 subjects recruited so far, the average age is 46 years old and the average time it takes individuals to complete each questionnaire are listed as follows: 3Q/TMD: 17 seconds, TMD-7: 36 seconds, TMD-Pain Screener: 44 seconds, and TMD-29: 3 minutes and 2 seconds. Three of these four screening tools take less than one minute on average for subjects to complete. Additional subjects are needed to determine the sensitivity and specificity of each form in identifying Temporomandibular Disorders.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### ORTHODONTICS

#### **P67 Guiding Impacted Maxillary Canine Treatment with AI-segmented CBCT, 3D-Printed Models.** V. VAID\*, R. HOAGBURG, K. STEWART, V. DUTRA, P. WONG, R.S. CONLEY (Indiana University School of Dentistry)

Introduction: Cone beam computed tomography (CBCT) in orthodontics has been widely used for cleft lip, palate, impactions, and orthognathic surgery. Research supports CBCT for diagnosing and treatment planning of impacted teeth, especially maxillary canines since three-dimensional (3D) localization is crucial for management. While CBCT use is documented, manual or artificially segmented CBCT's roles in visualizing tooth structures, angulation, resorption, and impaction effects are less understood. This study evaluates the impact of Artificial Intelligence (AI) 3D-segmented CBCT and 3D-printed models on diagnosing and planning treatment for impacted maxillary canines. Materials and Methods: Three evaluator groups (beginner, proficient, and expert) with 7 clinicians each, assessed 6 standardized cases through information presented over 3 sessions, for a total of 10 impacted canines. In Session 1, all evaluators received the conventional CBCT and associated orthodontic records. Session 2 randomly provided either AI-segmented CBCT or 3D models to evaluators, and Session 3 incorporated the information not received in Session 2. A standard questionnaire assessing diagnosis, management, prognosis, and confidence level was completed each session. An additional question in Sessions 2 and 3 evaluated the impact of the supplemental visualization on the initial diagnosis and treatment plan. Results: Evaluators receiving 3D-printed models for Session 2, reported a significant decrease in the prognosis score ( $p < 0.05$ ). The initial recovery vector changed significantly when adding either the 3D models ( $p < 0.05$ ) or the segmented CBCT ( $p < 0.05$ ) to the initial CBCT. Finally, evaluators perceived that 3D-printed models affected the diagnosis and treatment plan significantly more than the segmented CBCT ( $p < 0.001$ ). Conclusion: These results suggest that the addition of both AI-segmented CBCT and 3D-printed models improved evaluator confidence in diagnosis and treatment plans. Moreso, 3D models had a greater impact on the prognosis of impacted maxillary canines: whether to extract permanent teeth or not, and the initial recovery vector.

#### **P68 Predicting Orthodontic Extraction/Non-extraction Decision using AI-driven Image Analysis.** S. AHMAD\*<sup>1</sup>, A.S. DE ARAÚJO<sup>2</sup>, C.F.A. GOMES<sup>2</sup>, Q. ROEDERER<sup>1</sup>, C.E. CARVALHO<sup>2</sup>, M.S. PINHO<sup>2</sup>, D. GRIEBLER<sup>2</sup>, V. DUTRA<sup>1</sup>, H. TURKKAHRAMAN<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>PUCRS School of Technology)

Objective: This study aimed to develop a robust machine learning classifier capable of predicting extraction vs. non-extraction decisions in orthodontic treatment planning by integrating lateral cephalometric radiographs (LCRs) and intraoral scans (IOS), thereby improving diagnostic accuracy and clinical efficiency. Methods: We collected data from 181 subjects (mean age=13.9 years) at the Indiana University School of Dentistry, with an orthodontic faculty-resident panel identifying 84 extraction cases. For each IOS, Blender's Python API produced six 2D grayscale images (back, frontal, right, left, maxilla, mandible), while LCRs were downscaled to 240×240 pixels using bilinear interpolation. We extracted 88 radiomic features per image via PyRadiomics, then performed exploratory analyses and nested cross-validation, employing five internal folds for hyperparameter selection. A final holdout test with previously unseen data evaluated generalizability. Results: The MLP classifier using LCR alone yielded 0.6304 accuracy and 0.5641 F-score. When combined with all IOS views, classification results varied by segmentation: full LCR concatenation reached 0.5217 accuracy and 0.4761 F-score, while partial LCR restricted to jaw regions improved both metrics to 0.6521. Further limiting the LCR to downsized jaws alone achieved the best performance (0.7173 accuracy; 0.6976 F-score) with Logistic Regression. Notably, this approach outperformed full-segmentation models, suggesting that excluding extraneous structures reduces noise and highlights key anatomical features. Conclusions: Targeted LCR segmentation focusing on jaw regions significantly enhances classification performance when combined with IOS data. Larger LCR segments introduce extraneous information that hinders meaningful feature extraction. This study underscores the value of radiomic analysis in orthodontic treatment planning, providing an efficient, reproducible method to evaluate extraction decisions. By combining precisely segmented LCRs with IOS, clinicians can leverage automated models to reduce subjectivity, improve diagnostic consistency, and optimize patient care outcomes on a broader scale. The final holdout test confirmed these gains, emphasizing the model's potential for seamless adoption in clinical practice.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### ORTHODONTICS

**P69 Effects of Direct Attachments' Shape and Thickness in Simulated Extrusion.** B. SEO\*<sup>1</sup>, A. BOJRAB<sup>1</sup>, A. AKBARI<sup>2</sup>, J. MAGURA<sup>1</sup>, M. LEAR<sup>1</sup>, G. ECKERT<sup>3</sup>, J. CHEN<sup>2</sup>, H. TURKKAHRAMAN<sup>1</sup>, R.S. CONLEY<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Purdue University School of Mechanical Engineering, <sup>3</sup>Indiana University School of Medicine)

Objectives: Clear aligner therapies have increasingly advanced in materials and technology in recent decades. However, the understanding of its biomechanics remains limited, and challenges remain in achieving specific tooth movements. One such challenge is the extrusion of the maxillary lateral incisors. This study aims to evaluate the effects of direct attachments' shape and thickness on the forces and moments created during the simulated extrusion of a maxillary left lateral incisor (UL2) using thermoplastic aligners. Methods: This in vitro study simulated a 0.2mm extrusion of UL2 using a standardized maxillary model. Four test groups with an attachment in the middle third with varying shape (rectangular or hemi-ellipsoid) and thickness (0.5mm or 1mm) were evaluated alongside a control model free of attachments. Five thermoplastic aligners were fabricated for each group and each tested twice, resulting in 10 trials per group. An orthodontic force tester measured the 3D forces and moments on UL2, as well as on the neighboring teeth. Nano17 load cells recorded the forces, and statistical analysis using ANOVA determined the effects of attachment shape and thickness. Results: The variation in attachments' shape and thickness had a statistically significant effect on the forces and moments generated for extrusion ( $P < .001$ ). The extrusive forces ( $F_z$ ) generated with different attachment combinations ranged from 1.39 to 8.96 N in UL2 and -7.66 to 1.00 N for UL1 and UL3. The buccal lingual moments ( $M_x$ ) generated ranged from -1.76 to 10.55 Nmm for UL2 and from -9.90 to 20.77 Nmm for UL1 and UL3. Conclusions: Direct attachments' shape and thickness has a significant role on the forces and moments generated during extrusion of the maxillary lateral incisors with thermoplastic aligners. 1mm rectangular attachment resulted in the largest extrusive force and 0.5mm rectangular attachment resulted with the least unwanted moment on a simulated extrusion of the UL2.

**P70 Expansion with Clear Aligners: Effects of Attachment Shape and Number.** B. SEO\*<sup>1</sup>, M. LEAR<sup>1</sup>, A. AKBARI<sup>2</sup>, J. MAGURA<sup>1</sup>, A. BOJRAB<sup>1</sup>, G. ECKERT<sup>3</sup>, J. CHEN<sup>2</sup>, R.S. CONLEY<sup>1</sup>, H. TURKKAHRAMAN<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Purdue University School of Mechanical Engineering, <sup>3</sup>Indiana University School of Medicine)

Objectives: Clear aligners are often used with composite direct attachments to enhance retention and deliver orthodontic force systems. Dentoalveolar arch expansion is commonly used to create space, however the effects of direct attachments in expansion require further study. This study evaluated how direct attachments' shape and number affect forces and moments generated during simulated orthodontic expansion. Methods: Four models with 0.2mm arch constriction were created with varying attachment shape (rectangular or hemi-ellipsoid) and number (three attachments on UR3, UR5, UR7 or five from UR3 to UR7). A typodont with no attachments served as control. 0.76mm thick aligners were thermoformed based on the models and tested on an orthodontic force tester. Nano17 load cells recorded the forces and analysis of variance was used to evaluate two-way interactions. Results: Variations on attachment size and number had a statistically significant effect on the forces and moments generated ( $P < .001$ ). The buccal-lingual force ( $F_y$ ) generated ranged -0.96 to 0.70 N for UR3, -1.29 to 0.78 N for UR4, -1.68 to 0.28 N for UR5, -2.3 to 1.28 N for UR6 and -2.43 to -0.07 N for UR7. The buccal-lingual moment ( $M_x$ ) generated ranged -27.75 to 20.02 Nmm for UR3, -4.37 to 5.61 Nmm for UR4, 0.47 to 3.82 Nmm for UR5, -7.41 to 4.18 Nmm for UR6 and -0.51 to 15.64 Nmm for UR7. Conclusions: Direct attachments' shape and number has a statistically significant effect on the forces and moments generated during simulated expansion with thermoplastic aligners. The attachment configuration to achieve the best forces and moments in expansion were as follows: for UR3, a rectangular attachment on UR3, UR5, UR7; for UR4, a rectangular attachment on UR3 to UR7, for UR5, a hemi-ellipsoid attachment on UR3 to UR7; for UR6, no attachment and for UR7, a rectangular attachment on UR3 to UR7.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**ORTHODONTICS**

**P71 Effects of Direct Attachments' Shape and Thickness on Simulated Torque.** B. SEO\*<sup>1</sup>, J. MAGURA<sup>1</sup>, A. AKBARI<sup>2</sup>, M. LEAR<sup>1</sup>, A. BOJRAB<sup>1</sup>, G. ECKERT<sup>3</sup>, J. CHEN<sup>2</sup>, R.S. CONLEY<sup>1</sup>, H. TURKKAHRAMAN<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Purdue University School of Mechanical Engineering, <sup>3</sup>Indiana University School of Medicine)

Objective: This study aimed to evaluate the effects of direct attachments' shape and thickness on the forces and moments generated during simulated torque movement of the upper central incisor (UR1) using thermoplastic aligners. Methods: Four dentoforms with varying attachment shape (rectangular or hemi-ellipsoid) and thickness (0.5mm or 1mm) for the UR1 were digitally printed and evaluated alongside a control model free of attachments. Five thermoplastic aligners were made for each group and tested twice for ten trials. An orthodontic force tester with 1° of lingual crown torque on the UR1 was set up. Nano17 load cells recorded the forces, and statistical analysis using ANOVA determined the effects of attachment shape and thickness on forces and moments generated. A two-sided 5% significance level was used for all tests. Results: For buccal-lingual moments (Mx), a negative value represents buccal crown/lingual root torque, while a positive value, the opposite. For vertical forces (Fz), a positive value represents extrusion and a negative value, intrusion. The interactions between group and teeth were statistically significant ( $P < .001$ ). For UR1, the highest Mx was with a 0.5mm hemi-ellipsoid attachment with  $-33.92 \pm 1.18$  Nmm of lingual root torque. The lowest Mx obtained was with a 1mm rectangular attachment with  $3.31 \pm 12.92$  Nmm of buccal root torque. The highest Fz obtained for the UR1 was with no attachment with  $3.97 \pm 1.88$  N of extrusion and the lowest Fz was with a 1mm hemi-ellipsoid attachment with  $2.32 \pm 0.53$  N of extrusion. Conclusions: Direct attachments' shape and thickness have a significant effect on forces and moments generated during simulated torque movement with thermoplastic aligners. The highest moment obtained for the UR1 was with a 0.5mm hemi-ellipsoid attachment, meanwhile the lowest unwanted vertical force was with a 1mm hemi-ellipsoid attachment.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### PEDIATRIC DENTISTRY

**P72 Dental Caries Visual Examination on 3D-Digital Images of Primary Teeth.** G. HAINES\*<sup>1</sup>, A.C. VALDIVIA-TAPIA<sup>1</sup>, B.Y.V. SANKURATRI<sup>1</sup>, I. WALAYAT<sup>1</sup>, P.F. CASTELLUCCIO<sup>2</sup>, A.T. HARA<sup>1</sup>, A.R.F. DE CASTILHO<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Indiana University School of Medicine)

**Objective:** This in vitro study compared two different assessments for caries detection: visual examination performed directly on extracted primary teeth (direct method) and on their 3D colored 3D digital dental images (indirect method). **Methods:** Extracted primary molars with varying degrees of caries severity were used (n= 233). Each tooth was mounted on modeling wax, with the crowns exposed for the assessments. The occlusal surfaces were analyzed and scored using the International Caries Detection and Assessment System (ICDAS), grading lesions from 0 to 6. For the direct method, teeth were visually examined, under standard conditions of lighting, dryness and magnification. For the indirect assessment, teeth were scanned with an intraoral scanner (TRIOS 4, 3Shape) and assessed in dedicated software (3Shape Unite software). Three previously calibrated examiners independently performed the two assessments. The final score for each method was reached by consensus among examiners and used for the statistical analyses. Kappa statistics and percent of agreement were calculated between both assessments (alpha=5%). **Results:** Substantial agreement was observed between the two assessments (71.2%; Kappa =0.64; p<0.0001) using the ICDAS index for caries detection. The highest percentages of agreement were found for ICDAS4 (100%), ICDAS5 (96%), ICDAS6 (92%), ICDAS2 (64%), ICDAS1 (61%), ICDAS3 (52%), and ICDAS0 (36%). General over/underestimation for the scores obtained with the indirect method in relation to the direct was observed at 17% and 12%, respectively. The over/underestimation for each score was as follows: ICDAS0=64%/0%, ICDAS1=35%/3%, ICDAS2=10%/26%, ICDAS3=0%/48%, ICDAS4=0%/0%, ICDAS5=4%/0%, and ICDAS6=0%/8%. **Conclusion:** 3D-colored digital dental images proved to be a reliable tool for visually assessing occlusal caries lesions in primary teeth. They can be a valuable adjunct method for dental practitioners.

**P73 Erosive Tooth Wear Visual Examination on 3D-Dental Images of Primary Teeth.** B.Y.V. SANKURATRI\*<sup>1</sup>, A.C. VALDIVIA-TAPIA<sup>1</sup>, G. HAINES<sup>1</sup>, I. WALAYAT<sup>1</sup>, P.F. CASTELLUCCIO<sup>2</sup>, A.T. HARA<sup>1</sup>, A.R.F. DE CASTILHO<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Indiana University School of Medicine)

**Objectives:** This in vitro compared two methods for visually assessing erosive tooth wear (ETW) on primary teeth: direct (visual examination) and indirect assessment (3D-colored digital dental images). **Methods:** Extracted primary molars with varying severity levels (early, moderate, or severe) of ETW were used (n=164). Each tooth was mounted on modeling wax, and their occlusal surfaces examined and scored using the Basic Erosive Wear Examination (BEWE) index, grading the lesions from 0 to 3. For the direct method, teeth were visually examined, under standard conditions of lighting, dryness and magnification. For the indirect assessment, teeth were scanned with an intraoral scanner (TRIOS 4, 3Shape) and later assessed in dedicated software (3Shape Unite software). Two previously calibrated examiners independently analyzed the two assessments. The final score for each method was reached by consensus among examiners and used for the statistical analyses. Kappa statistics and percent of agreement were calculated between both assessments (alpha=5%). **Results:** Substantial agreement was observed between the direct and indirect BEWE assessments (80.5%; Kappa=0.58; p<0.0001) for ETW detection. The highest percentages of agreement were observed for BEWE2 (99%), followed by BEWE3 (62%), BEWE0 (47%), and BEWE1 (42%). **Conclusion:** The visual evaluation of 3D-colored digital dental images substantially agreed with the direct visual examination for detecting ETW in primary teeth. Stronger agreements were observed at more severe ETW lesions.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### PEDIATRIC DENTISTRY

**P74 Effect of Suction Device Type on Risk of Oral-Surgical Fires.** E. ASDELL\*, J. JONES, J. YEPES, M. SAXEN, G. ECKERT, A. SCULLY (Indiana University School of Dentistry)

Increase in supplemental oxygen concentration during dental surgical procedures in the oropharyngeal region is associated with oxygen pooling and an increased risk of oral airway fires. The purpose of this study is to determine the effectiveness of intraoral suctioning on decreasing the oxygen concentration to safe levels in a simulated oral cavity. This volumetric study evaluated three different suction tips and their effectiveness at reducing unsafe oxygen levels in a simulated oral cavity of a 10-year-old. Five liters/minutes of supplemental oxygen was added to the simulated oral environment via nasal canula. Oxygen concentration was recorded at 10 second intervals with alternative periods of suction devices turned off and on. Groups tested include: Control (no suction), High-Speed Dental Suction Tip (HVE), surgical Yankauer Suction Tip (YS) and a standard Fixed Tip Saliva Ejector (FTSE). HVE and YS decreased oxygen concentration faster than the FTSE ( $p < .001$ ). HVE and YS reduced oxygen concentration to a safe level after 45 seconds of suctioning. Oxygen levels were not reduced to a safe level within one minute using FTSE. Oxygen levels during all suction time periods never went below 21%. HVE and YS are recommended compared to FTSE for reducing intraoral oxygen concentrations to a safe level during dental procedures using 5 L/min of supplemental oxygen in order to reduce oropharyngeal fire risk. (Research supported by the Indiana University School of Dentistry Graduate Student Research Committee)

**P75 Speech Intelligibility in the Pediatric Dental Setting.** A. BROUILLARD\*, T. HSU, A. YEPES, K. PHASUK, G. ECKERT, A. SCULLY (Indiana University School of Dentistry)

Noise is a frequent barrier to communication in a dental office. Articulation index (AI) is a sound metric that measures speech intelligibility of a space and ranges from 0, where no speech is understood, to 1, where all speech understood. An AI of  $>0.7$  is excellent,  $0.5-0.7$  is good,  $0.3-0.5$  is acceptable for some scenarios, and below  $0.3$  is unacceptable. The primary aim of this study is to compare the articulation index associated with different pediatric dental procedures and locations to understand how noise impacts speech intelligibility in a pediatric dental setting. A sound level meter (SLM) model 831C collected sound data from 4 locations: 1) five chair open bay (OB), 2) quiet room (QR), 3) moderate sedation suite (OS), and 4) outpatient surgical operating suite (OR) over 19 clinical days. CDT codes, patient age, FRANKL score, type of isolation, use of protective stabilization, and post-graduate year of treating provider were obtained for each patient via a retrospective chart review. Categorical variables were summarized as frequencies and percentages and compared across treatment locations using either Chi-Squared Tests or Fisher's Exact Tests. Continuous variables were summarized as medians and quartiles and compared across treatment locations using Kruskal-Wallis Test. The AI ranged from  $0.31-1.0$  with median values per location of  $0.69$  (OB),  $0.65$  (QR),  $0.63$  (OS),  $0.66$  (OR) and was not significantly different between locations or procedures ( $p > 0.05$ ). The AI ranged from excellent to barely acceptable in some scenarios. There was a significant difference between location regarding isolation method ( $<.0001$ ), use of protective stabilization ( $p < .001$ ), PGY year ( $p < .001$ ), patient age ( $p = 0.046$ ), and Frankl Score ( $p = 0.020$ ). While not statistically significant, the results suggest that noise impacts speech intelligibility regardless of treatment location or procedure performed. (Research supported by the Indiana University School of Dentistry Graduate Student Research Committee)

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### PEDIATRIC DENTISTRY

**P76 Survey Evaluating Differences within the Curriculum of Pediatric Dentistry Programs.** N. PRITCHARD\*, B. SANDERS, L. VINSON, A. YEPES, G. ECKERT, A. SCULLY (Indiana University School of Dentistry and Riley Hospital for Children)

Purpose: The purpose of this study was to assess the differences in emerging clinical techniques taught within the pediatric curriculum of dental schools and residency programs in the United States. This study compared didactic, laboratory, and clinical instruction in four key areas: space maintenance, tooth isolation, pulpal therapy for non-vital teeth, and impression methods. Methods: A 13-item survey hosted in Qualtrics was distributed to predoctoral and post-graduate program directors. Comparisons of methods within a topic area (e.g. Isolite system vs. dental dam) were made using Cochran-Mantel-Haenszel chi-square tests for stratified ordinal responses, with respondent as the stratum. Comparisons between program types were made using Mantel-Haenszel tests for ordinal responses. A two-sided 5% significance level was used for each test. Results: Residents in graduate pediatric dentistry programs had more diverse clinical experiences compared to pre-doctoral students. Less than 50% of pre-doctoral students had clinical experience involving space maintenance compared to nearly 100% of residents. The use of isolation systems and intraoral scanning are slightly increasing in both types of programs while rubber dam and traditional impression techniques are slightly decreasing. The use of different space maintainers (lab-fabricated and prefabricated) has remained constant at both the pre-doctoral and graduate levels. The incorporation of LSTR (lesion sterilization and tissue repair) into possible treatment options for teeth with a diagnosis of irreversible pulpitis or necrosis is slightly increasing and extraction remains the most performed treatment in pre-doctoral and residency programs. Conclusion: Recent residency graduates have broader experiences in terms of new technologies and procedures in pediatrics than dental students. Diverse experiences in isolation techniques are almost universal while other techniques such as intraoral scanning and LSTR are increasing, but not yet the most common methods taught. Recent graduates may be familiar with new techniques but need more training and experience to fully implement them.

**P77 Effects of Supplemental Oxygen Concentrations and Suction Methods on Oral Surgical Fires.** A. CLARK\*, L. VINSON, J. JONES, M. SAXEN, G ECKERT, A. SCULLY (Indiana University School of Dentistry)

Purpose: The purpose of this in vitro study was to evaluate the effect of various intraoral suctioning methods on oral surgical fire risk in procedures that use supplemental oxygen. Methods: Oxygen concentrations in a surgical environment were continuously monitored while delivering supplemental oxygen in a simulated oral cavity. The ability of the Yankauer suction (YS), DryShield® isolation system (DS), and high-volume dental evacuation (HVE) suctioning devices to reduce the oxygen concentration to acceptable levels (<30%) when administering 3 L/min and 5 L/min of oxygen were separately studied and compared. Results: Mean oxygen levels were significantly higher for all trials conducted with 5 L/min of oxygen compared to 3 L/min. No significant difference was found in the slope of decrease in oxygen concentration from the HSE, DS, and YS in trials with oxygen supplementation of 3 L/min. The slope of decrease in oxygen concentration from the HSE and DS was significantly larger/faster (approx. 40-45 seconds for oxygen levels decrease to less than 30%) than from the YS (approx. 50-55 seconds) in trials with oxygen supplementation of 5 L/min. Conclusions: All three suctioning devices (Yankauer suction, DryShield® isolation system, and high-volume evacuation) were found to be effective in decreasing intraoral oxygen concentrations to acceptable levels (<30%) in trials with 3 L/min and 5 L/min of oxygen supplementation. The DryShield® isolation system and high-volume evacuation were found to be more effective than the Yankauer suction at rapidly reducing intraoral oxygen concentrations in trials conducted with 5 L/min of oxygen supplementation.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### PEDIATRIC DENTISTRY

**P78 Retrospective Chart Review of BMI and Its Impact on Sedation Outcomes.** A. ROEDERER\*, L. VINSON, B. SANDERS, A. CASTILHO, A. SCULLY (Indiana University School of Dentistry)

Mild to moderate sedation with oral medication is a routine treatment modality in pediatric dentistry and is essential for managing patients with limited cooperation. Medical history and health status are carefully evaluated to determine if the patient is a candidate for sedation. Anatomic variations in tonsils and airway can be limiting factors in determining patient selection. Lack of universally accepted dosing standards and clear contraindications based on a patient's body mass index (BMI) present significant challenges. Understanding how BMI influences sedation outcomes is essential to optimize treatment efficacy and ensure patient safety. Little is known about how one's physical stature and resulting BMI impacts the outcome of a sedation. The purpose of this study is to evaluate if body mass index impacts the outcome of a procedural oral sedation in pediatric dentistry by performing a retrospective chart review. Data was obtained from Dentrax Enterprise Management Software from patients of the Riley Dental Clinic located in Indianapolis, IN from January 1, 2014, to December 31, 2024. A convenience sample included children who were ages one-year-old to eighteen-years-old with an ASA I, ASA II, or III physical status that underwent a mild to moderate procedural sedation using oral midazolam with or without nitrous oxide / oxygen analgesia. A total of 903 charts were reviewed with 339 subjects meeting inclusion criteria (170 females and 196 males). According to the CDC standards, 29 patients were considered to be underweight (7.9%), 212 were considered to be of normal weight (57.9%), 61 were considered to be overweight (16.7%) and 64 were considered to be obese (17.5%). The hypothesis was that a higher body mass index in children was associated with increased sedation failures. The results of the stepwise ordinal logistic regression showed no evidence of BMI category being associated with the sedation outcome, either alone or in conjunction with behavior prior to sedation and patient age. The only statistically significant predictor of sedation outcome was behavior prior to sedation (p-value = 0.0307). The results obtained in this study further verify that preoperative behavior is one of the strongest predictors of sedation success.

**P79 Direct Restorations vs. Full Coverage Crowns in Primary Maxillary Molars.** T. BAKALA\*, J. YEPES, A. SCULLY, J. JONES, G. ECKERT, G. MAUPOME (Indiana University School of Dentistry)

Dental caries is a multifactorial disease that affects over 500 million children worldwide. Proximal caries in the primary dentition have a rapid rate of progression due to morphological characteristics. These anatomic factors facilitate caries progression and make high quality restorative care challenging. The objective of this study was to examine the survival rates of primary maxillary first molars initially restored with a direct restoration versus those restored with a full coverage crown (SSC). Private insurance data claims from 2004-2023 were obtained through Fluent Dental Strategies in partnership with Indiana University. CDT codes for direct restorations, full coverage crowns and follow-up care were used to track success over time. Time to first re-treatment was compared between the direct restoration and SSC groups using Cox proportional hazards survival analysis. A marginal model was used to account for correlation among multiple teeth within a patient. Provider specialty, patient age, and patient gender were included as covariates in the analysis. A survival, model-based hazard ratio (HR, with 95% CI) was adjusted for patient gender, patient age, and provider specialty. Analyses were performed using SAS version 9.4. 502,863 total observations (426,033 direct restorations, 76,830 SSCs) from 375,671 patients: Risk of failure was significantly higher for direct restorations than SSCs (HR=1.53 (1.48-1.57), p<0.001). Provider specialty had a significant effect (HR=1.27 (1.25-1.30, p<0.001) for general dentist vs. pediatric dentist. The results suggest that primary maxillary first molars initially restored with a full coverage crown have a lower risk of failure and should be considered as primary when diagnosing and treatment planning. (Research supported by the Indiana University School of Dentistry Graduate Student Research Committee)

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**PEDIATRIC DENTISTRY**

**P80 Dental Caries in Children and Adolescents Living in Food Deserts.** G. CASEY\*, J. YEPES, A. SCULLY, J. JONES, G. ECKERT, G. MAUPOMÉ (Indiana University School of Dentistry and Riley Hospital for Children)

Food insecurity has been associated with a higher rate of dental caries. One known cause of food insecurity is living in a food desert. In this study our aim was to evaluate if children and adolescents who live in food deserts experience dental caries more frequently than children and adolescents who do not live in food deserts utilizing a database of commercial dental insurance claims. This retrospective cohort evaluated commercial insurance claims data from 2015-2019 for children ages two to fourteen. Insurance claims data retrieved included CDT codes and ZIP Code of the insured patient. The patient's ZIP code was used to obtain the corresponding food desert utilizing the United States Department of Agriculture Food Research Atlas, median household income, and distance to the closest Federally Qualified Health Center, which were included as covariates. The study included 5,878,457 individual patients. 5,666,064 (96.4%) patients resided in a non-food desert zip code and 212,393 (3.6%) resided in a food desert zip code. The mean age of patients was 8.3 (SD 3.6). Patients from a ZIP code that is considered a food desert had lower median income for the ZIP code and longer distance from a FQHC ( $P<.001$ ). Absence of a food desert had less caries-related claims (OR 0.997, 95% CI 0.985-1.009). Food deserts were associated with lower median income areas and higher incidence of dental caries. Future public health preventive programs may be most impactful if targeted towards food desert locations.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### PERIODONTOLOGY

**P81 Global Metabolomics of Periodontitis GCF Biomarkers: A Cross-Sectional Study.** C. HENDERZAHS\*, H. ALQALLAF, A. MOVILA, C. YAMADA, V. JOHN, M. SRINIVASAN, G. ECKERT (Indiana University School of Dentistry)

Periodontitis, a chronic inflammatory disease affecting more than 64 million US adults, is the result of dysbiosis between the biofilm and host mediated responses. Rather than exclusively relying on clinical parameters, GCF is an ideal substrate to investigate this interaction as it's a site-specific, molecular reflection of the pathologic process occurring within the periodontium. Although there is substantial evidence identifying cytokines as markers of progression, current knowledge about the disease's metabolomic signatures is limited. The objective was to develop a foundation for identifying novel metabolomic signatures in GCF relevant to periodontal disease progression, facilitating personalized treatment. GCF was collected from 17 healthy and 19 periodontitis patients using Dentsply Absorbent Points. Untargeted metabolomic profiles from human GCF samples were processed using unbiased mass spectrometry peak characterization and metabolite identification. Using one-way ANOVA, statistical analysis was conducted to identify metabolites exhibiting significant alterations between groups. Machine learning bioinformatic pathway analysis was then performed to understand the biologic impact of these differences on periodontal health. 4,168 metabolites were detected, of which 1,747 were confidently identified. Compared to healthy individuals, purine metabolism is dysregulated in periodontitis patients. More specifically, a statistically significant increase in proinflammatory 3',5' cyclic AMP, adenine, guanine, guanosine, hypoxanthine, and inosine was detected, indicating an acceleration in the purine degradation pathway. Purine metabolism is particularly enriched in the GCF of periodontitis patients. Elevated purine metabolites suggest increased cellular turnover and inflammatory activity, contributing to an increase in reactive oxygen species production and corroborating the significance of purine metabolites in periodontitis monitoring. Further studies are warranted to understand the importance of individual purine metabolites when developing personalized treatment and monitoring disease progression; novel GCF purine metabolite biosensors development to diagnose a patient's personalized disease status should be considered. (Supported by NIH R01AG064003, VA Merit Pilot Award I21BX006307, Hevolution Foundation Grant HF-GRO-23-1199172-46 AM)

**P82 Comparative Accuracy of Implant Location in Dynamic and Static CAIS.** Y. LEE\*, W.S. LIN, C.C. YANG, V. DUTRA, M. GIBSON, H. ALQALLAF (Indiana University School of Dentistry)

Both static and dynamic computer assisted implant surgery (CAIS) have proven to improve the accuracy and achieve predictable surgical outcomes. This study aimed to evaluate accuracy between static and dynamic computer aided implant surgery (s-CAIS & d-CAIS) in anterior versus posterior implants using aggressive thread implants. 40 dental models simulating human bone with missing #9 (anterior) and #13 (posterior) were used. 20 models went through the s-CAIS workflow with two separate guides fabricated for #9 and #13 (total of 40 surgical guides), and 20 models went through the d-CAIS workflow. For implant placement, s-CAIS group osteotomies were prepared by standardized guided surgery protocol from a CoDiagnostix plan. 3.75 x 10mm Straumann BLX replica implants were placed in #9 and #13 for each of the 20 models. For d-CAIS, the preparation of osteotomies was done as per the virtual plan on X-Nav with the same implants and same sites. Accuracy evaluated using CoDiagnostix treatment evaluation tool, to obtain measurements including offset at tip(mm), offset at base(mm) and angular deviation(degrees). Regarding angle deviation, the findings revealed a significant main effect of Type ( $F(1,76) = 20.12, p < .001$ ), indicating that angles were significantly higher in the s-CAIS group compared to the d-CAIS group. Regarding offset at base, there was a statistically significant effect on Location ( $F(1,38) = 4.99, p = 0.031$ ), indicating that the offset at base(mm) is significantly higher from Posterior group compared to the Anterior group. Regarding offset at tip, the statistical analysis displayed no statistically significant effect on Location, Type, and interaction between Type and Location. Regarding precision, neither the location nor the type of surgery exhibited a statistically significant difference with the angle, offset at base, or offset at tip. The results suggest that d-CAIS performs better with implant angle deviation and anterior group showed better accuracy on offset at base.Z

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**PERIODONTOLOGY**

**P83 Senescence-associated Gene Expression in Human Gingival Tissue Affected by Periodontitis.** S. KIM\*<sup>1</sup>, C. BATRA<sup>1</sup>, H. YOSHII<sup>2</sup>, Y. HAMADA<sup>3</sup>, Y. UEKI<sup>1</sup>, G. ECKERT<sup>4</sup>, V. JOHN<sup>1</sup>, M. KITAKA<sup>2</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Dental College of Georgia, <sup>3</sup>University of California Los Angeles School of Dentistry, <sup>4</sup>Indiana University School of Medicine)

Accumulation of senescent cells are increasingly recognized as a fundamental mechanism of aging and are regarded as an attractive therapeutic target for various age-associated pathological conditions. Although the prevalence and severity of periodontitis are highly associated with age, and preclinical studies have demonstrated that senescent cells could be a potential therapeutic target of age-associated alveolar bone loss, clinical data that indicates the association between cellular senescence and periodontitis is limited. This study evaluated the accumulation of the senescent cells in periodontal tissues and its association with the disease state by comparing level of senescence markers in healthy and diseased human gingival tissue. Gingival tissues were collected from patients with or without a diagnosis of periodontitis, followed by RNA isolation from tissue samples and cDNA synthesis. Then, qPCR assays were performed to analyze gene expression of senescence-associated genes, including cell cycle inhibitors (*p16*, *p21*, *p15*, *TP53*), anti-apoptotic genes (*BCL2*, *BCL2XL*), and senescence-associated secretory phenotype (SASP) genes (*IL1B*, *IL6*, *IL17A*, *IL8*, *MMP2*, *MMP8*, *MMP12*, *MMP13*, *MMP14*). Differences in senescence marker expression were analyzed using two-sample *t*-tests. Total of 54 gingival tissue samples were included in the study. Of the 54 samples, 27 were from patients diagnosed with periodontitis while the other 27 were from patients without periodontitis. Among the genes analyzed, *p16*, *TP53*, *MMP2*, and *MMP14* showed significantly higher expression in the group diagnosed with periodontitis than control group ( $p = 0.010$ ,  $0.017$ ,  $0.045$ , and  $<0.001$ ). The expression levels of inflammatory genes did not differ significantly between the periodontitis group and the control group. There were no statistically significant positive correlations between the gene expression levels and age. Gene expression analysis indicates an association between periodontitis and senescent cell accumulation in periodontal tissue. Upregulation of *p16*, *TP53*, *MMP2* and *MMP14* would be a characteristic of periodontitis-associated senescence.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### PROSTHODONTICS

**P84 Correlation Between Outcome Measures in Implant Impression-Making Research.** A. LIMONES<sup>\*1,2</sup>, D. MORTON<sup>1</sup>, W.S. LIN<sup>1</sup> (1Indiana University School of Dentistry, 2University Complutense of Madrid)

Objective: To identify correlations among outcome measures in implant impression-making research. Materials and methods: A maxillary implant cast with four parallel implants was scanned with an industrial scanner (Artec Micro II; Artec 3D; Senningerberg, Luxembourg) and 100 times using an intraoral scanner (TRIOS 5; v 22.1.10; 3 Shape; Copenhagen, Denmark) under controlled conditions. Primary outcome measures for assessing accuracy were linear and angular inter-implant deviations, linear and angular intra-implant (platform) deviations, and root mean square (RMS) error calculations. Secondary outcome measures were scanning time and number of photograms. Pearson's correlation coefficients with the Bonferroni correction were applied to assess correlations among all outcome measures ( $\alpha = 0.05$ ). Results: Very large positive correlations were found between RMS error and both linear inter-implant deviation ( $r = 0.831$ ,  $p = 0.001$ ) and linear intra-implant deviation ( $r = 0.864$ ,  $p = 0.001$ ). Angular deviations were not correlated with other outcome measures except with each other ( $r = 0.669$ ,  $p = 0.001$ ). Scanning time was moderately correlated with most deviation outcomes (RMS error:  $r = 0.478$ ,  $p = 0.001$ ; linear inter-implant:  $r = 0.318$ ,  $p = 0.027$ ; and linear intra-implant deviations:  $r = 0.319$ ,  $p = 0.026$ ). The number of photograms was correlated only with scanning time ( $r = 0.678$ ,  $p = 0.001$ ) and showed no correlation with deviation measures. Conclusions: RMS error is associated with higher linear deviations, making it a reliable indicator of implant accuracy when combined with color maps. The accuracy of the IOS tested may slightly worsen with longer scanning durations and is not impacted by increasing the photogram count. Clinical Significance: RMS error is a reliable indicator of linear implant deviations but should be complemented with color maps to understand the spatial deviation distribution and clinical relevance.

**P85 Operator Experience in Digital Impression-Making: Systematic Review, Meta-Analysis and Meta-Regression.** A. LIMONES<sup>\*1,2</sup>, A. SALLORENZO<sup>2</sup>, W.S. LIN<sup>1</sup>, D. MORTON<sup>1</sup>, (1Indiana University School of Dentistry, 2University Complutense of Madrid)

Objectives: To answer the following two PICO questions: "In digital impression-making for dentate, partially edentulous, or fully edentulous scenarios: (1) are there differences between inexperienced compared to experienced operators, and (2) what is the effect of receiving training sessions on the learning curve, when assessing accuracy in in vitro studies, and scanning time and patient satisfaction in randomized controlled trials (RCTs)?" Methods: Three databases (Embase, Medline, and The Cochrane Library) were systematically searched from their inception to January 2024 to identify studies. The primary outcome measure was accuracy. Secondary outcomes included scanning time, and patient satisfaction. Data were pooled and analyzed using mean differences (MDs) and prediction intervals (PIs) in cases of significant heterogeneity ( $I^2 > 50\%$ ), which was investigated through subgroup analysis and meta-regression on potential sources of confounding. The certainty of the Evidence (CE) was assessed using the GRADE system. Results: PICOS #1: Inexperienced operators obtained clinically irrelevant lower accuracy compared to experienced operators (MD 2.51  $\mu\text{m}$  [95% CI: 0.16 to 4.86]; 8 in vitro studies; 720 scans on casts, CE: low certainty), took longer to complete the scanning process (MD 41 s [17 to 65]; 3 controlled clinical trials; 180 scans on patients; CE: low), and provided less comfort to patients (VAS MD -12.69% [-20.96 to -4.42]; 1 controlled clinical trial; 40 scans on patients, CE: very low). PICOS #2: Receiving training sessions improved accuracy (MD -19.15  $\mu\text{m}$  [95% CI: -26.29 to -12.15]; 2 in vitro studies; 120 scans on casts; CE: moderate), and efficiency of digital impression-making (MD -76 s (95% CI: -122 to -31); 2 controlled clinical trials; 298 scans on patients). Conclusions: Undergoing training sessions improves accuracy and efficiency in impression-making. After acquiring basic knowledge of the scanner, operator inexperience does not clinically affect accuracy but does increase scanning time and reduce patient satisfaction.

## ABSTRACTS RESEARCH POSTER PRESENTATIONS

### SALIVARY RESEARCH

**P86 Zymogen Granule 16B Interactions in Human Salivary Gland Cell Systems.** D. MODY\*<sup>1,3</sup>, J. NGUYEN<sup>2</sup>, E. XU<sup>2</sup>, Y. WANG<sup>3</sup>, M. AURE<sup>3</sup>, J. MAYS<sup>3</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>National Cancer Institute National Institutes of Health, <sup>3</sup>National Institute of Dental and Craniofacial Research National Institutes of Health)

Objective: Acinar exocrine cells produce and secrete zymogen granule 16B (ZG16B), a jacalin-related lectin protein found in salivary gland secretions. This protein contains a positively charged binding domain with alternating beta-prism folds enabling transient protein-protein interactions within the human salivary gland (HSG). Despite ZG16B's detection in HSG datasets, these interactions are yet to be characterized. Here, we use an HSG cell culture system to identify intra- and extracellular protein binding partners of ZG16B. Methods: HSG cells were verified to be free of HeLa cell contamination. Cells were then transfected with commercially designed (ZG16B-flag-pcDNA with poly-A tail plasmid) to overexpress the bait protein ZG16B. After 48 hours, the supernatant (growth media) and cell pellet (lysate) from the control (untreated) and the transfected culture plates (n=2 for both conditions) were harvested and incubated with anti-flag M2 Affinity Gel beads for co-immunoprecipitation (Co-IP). The elution was further prepped for mass spectrometry analysis to identify distinct proteins. Reactome 2024 was used for downstream pathway analysis with significance set at adjusted  $p \leq 0.05$ . Results: Mass spectrometry identified 362 distinct proteins, ranging from 11.4 - 532.1 kDa. ZG16B's molecular weight in this Co-IP was 22.7 kDa. Versus the control, there were 25 distinct proteins detected in the transfected cell lysate and 33 distinct proteins detected in the transfected supernatant elution. Pathway analysis of the intracellular (cell lysate) samples identified ZG16B interactions in the translational elongation, infectious disease and cell-extracellular matrix interactions pathways. Secreted (supernatant) ZG16B, was predicted to interact significantly with interactor the cytokine signaling, glucose metabolism and neutrophil degranulation pathways (adjusted  $p < 0.05$ ). Conclusions: Based on this data, ZG16B has distinct protein-protein interactions in the intra- vs. extracellular environment. Work is ongoing to further validate binding partners within the immune-protective pathways using western blotting to better understand the functional importance of ZG16B and ramifications of its loss in salivary gland disease.

**P87 TAS2R38 and CA6 Gene Variants: Role in Taste and Immunity.** N. RILEY\*, S. JAISHANKAR, M. SRINIVASAN (Indiana University School of Dentistry)

Objectives: Emerging data suggests increased prevalence of persistent symptoms in individuals infected with SARS-CoV-2, commonly referred to as Long-COVID-19. This multisystem condition presents variety of signs and symptoms with loss or alteration of smell and taste included amongst the common. The *TAS2R38* gene has been linked to COVID-19 susceptibility due to its role in the immune response of the upper respiratory tract. Individuals with the PAV haplotype have a stronger response to bitter compounds and better mucociliary clearance in contrast to those with the AVI variant. The *CA6* gene which works alongside the *TAS2R38* gene to influence bitter taste sensitivity is involved in maintaining pH balance in the mouth and immune responses by influencing cytokine production. The *CA6*'s AA genotype at rs2274333 are PROP super-tasters. Our aim is to explore the genotypes of *TAS2R38* and *CA6* genes in Long-COVID subjects and their immune response. Methods: Taste and smell acuity were assessed in 31 individuals using the Waterless Empirical Taste Test. *TAS2R38*'s rs713598, rs1726866, rs10246939 and *CA6*'s rs2274333 variants were analyzed by Sanger sequencing. Inflammatory cytokines IL-6, IL-8, sCD14 and IFN- $\gamma$  in saliva were assessed by ELISA. Archived samples stored in saliva bank prior to 2019 constituted as control samples. Results: Preliminary data suggest that in our long-COVID cohort, 30% of patients exhibit persistent dysgeusia. Sanger sequencing of 10 individuals with low bitter scores, identified no non-taster *CA6*, two non-taster *TAS2R38* and two double supertaster genotypes. Supertaster and taster genotypes for *TAS2R38* and *CA6* were equally distributed. Long-COVID saliva exhibited elevated IL-6, IFN- $\gamma$ , sCD14 and IL-8 cytokines as compared to pre-COVID saliva samples. Conclusions: Our findings suggest that dysgeusia is not genetically predisposed but is likely a result of COVID-19 infection. Enhanced cytokines expression in the saliva of Long-COVID subjects over pre-COVID subjects indicates chronic inflammation presumably following COVID infection.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
**SALIVARY RESEARCH**

**P88 Salivary and Serum Biomarkers for Sjögren’s disease: A PubMed Review.** V. SANGAM\*, A. BRUZZANITI, M. SRINIVASAN, T. THYVALIKAKATH (Indiana University School of Dentistry)

Sjögren’s disease (SjD) is a systemic autoimmune disorder characterized by lymphocytic infiltration of exocrine glands, leading to dryness of the eyes and mouth, and systemic manifestations. Accurate diagnosis and monitoring remain challenging due to the heterogeneity of clinical presentations and the overlap with other autoimmune conditions. This systematic literature review aims to synthesize current evidence on biomarkers associated with Sjögren’s disease, focusing on diagnostic, prognostic, and therapeutic utility. A comprehensive search of PubMed was conducted to identify studies published October 2024. Inclusion criteria required original research articles investigating molecular, genetic, serum and salivary biomarkers relevant to SjD diagnosis or disease activity. Of 20,309 English language articles retrieved. After removing duplicates, 137 studies met the inclusion criteria. The review identified predominantly (69/137) studies evaluating inflammatory markers in saliva and serum for SjD. Pain markers were assessed by few studies (8/137). Other promising biomarkers, include salivary gland proteins, such as salivary beta-2 microglobulin and gustin. in addition to anti-SSA/Ro and anti-SSB/La autoantibodies. Emerging biomarkers, including interferon-regulated gene signatures, cytokine profiles, and exosomal microRNAs, were highlighted for their potential in stratifying disease phenotypes and predicting therapeutic response. The findings underscore the need for standardized biomarker panels to enhance diagnostic accuracy and individualized patient management. However, significant variability in study design, sample size, and validation methods was noted, limiting the generalizability of some findings. Future research should prioritize multicenter cohort studies and longitudinal designs to validate biomarker efficacy and explore their integration into clinical practice. This review provides a comprehensive foundation for advancing biomarker research in Sjögren’s disease and improving patient outcomes.

**ABSTRACTS RESEARCH POSTER PRESENTATIONS**  
***TISSUE REGENERATION AND REPAIR***

**P89 Intramuscular Administration of Adipose Stem-Cell-Derived Secretome in Amyotrophic Lateral Sclerosis.**

Z. ESTAKI\*<sup>1</sup>, C.L. WALKER<sup>1</sup>, J.R. HUOT<sup>2</sup>, C.L. MUMAW<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Indiana University School of Medicine)

Objectives: Amyotrophic lateral sclerosis (ALS) is a devastating motor neuron (MN) disease with no cure. The involvement of numerous cellular and physiological processes and the complexity of the disease are significant obstacles to developing effective therapies. Thus, a multifactorial approach like stem cell-based therapeutics is likely to be the most appropriate as it can target multiple mechanisms simultaneously. Adipose-derived stem cells (ASCs) are multipotent mesenchymal stem cells that can be obtained easily from adipose tissue. Stem cell secretome contains various beneficial trophic factors and cytokines. Previous data has shown the therapeutic benefits of the systemic ASC secretome in ALS mouse model. In the present study, we hypothesized that local intramuscular (IM) administration of hydrogel containing ASC secretome at late pre-symptomatic stages of disease (P63-P70) would improve neuromuscular junction (NMJ) innervation as well as physiological (muscle torque) and electrophysiological landmarks (e.g. CMAP, MUNE). Method: Sixteen mSOD1G93A mice (8 female, 8 male) received IM injection in right gastrocnemius muscle with either hydrogel containing ASC-secretome or hydrogel containing normal saline at P63. Mice were sacrificed at P84, both gastrocnemii were harvested and prepared for NMJ innervation analysis. Twelve mSOD1G93A mice (6 female, 6 male) received IM injection in left and right gastrocnemius muscle with hydrogel-ASC secretome or hydrogel-saline respectively at P69. In vivo plantar-flexion torque, CMAP and MUNE were measured at P89. Then, mice were sacrificed at P90, and both gastrocnemii were harvested for NMJ innervation analysis. Results: There was no significant difference in NMJ innervation and CMAP measures between hydrogel-saline and hydrogel-ASC secretome treated legs in both females and males. MUNE and max torque were significantly increased in males in the leg receiving hydrogel-ASC secretome ( $P < 0.05$ ). Conclusion: Gradual release of ASC secretome from hydrogel into the muscle has a positive impact on muscle force and number of motor units in males.

## ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS

### DENTAL HYGIENE

**CC01 The Effect of Acidic Beverages on the Oral Environment.** K. LOVELESS\*, K. WALKER, M. CORNEWELL (Indiana University School of Dentistry)

Introduction: The focus of this case-based presentation is on the demineralization process that occurs within the oral environment when acidic beverages are consumed frequently, resulting in the pH dropping below the critical threshold of 5.5. This can be further exacerbated with the relational evidence of attrition and erosion, therefore, leading to the overall severe loss of tooth enamel and dentin. Background: An adult male presented to the dental hygiene clinic with evidence of severe dental erosion and attrition. On completion of the assessment including caries risk and management forms which include dietary habits, it was discovered that the patient has a history of clenching/grinding his teeth along with consuming a gallon of Diet Mountain Dew daily. Dental Hygiene Care Plan: A prophylaxis cleaning was performed with a large portion of the appointment being used for patient education and nutritional counseling with the patient's pH in mind. Discussion: Literature clearly reveals that carbonated beverages and sports drinks are highly acidic according to the pH scale and contribute to the drop in the oral pH below enamel critical pH, causing leaching of calcium and phosphorus from tooth enamel therefore, causing demineralization. The evidence suggests attrition, a biomechanical action of tooth wear contributes to the overall loss of enamel and dentin by creating microcracks in enamel allowing acid to further exacerbate the reaction and, when both acid and attrition are introduced into the oral environment there is an overall decline in the structure of the teeth. Conclusion: Preventative measures are essential and as dental hygienists' it is important to educate patients on the long-term effects of acidic beverages, diet modifications needed, and best homecare practices to reduce the risk of demineralization, erosion, caries and to achieve a healthier oral environment.

**CC02 Importance of Adolescent Periodontal Screening.** A. MILLER\*, A. ROBINSON, M. CORNEWELL (Indiana University School of Dentistry)

Introduction: Grade C molar-incisor periodontitis, previously known as aggressive periodontitis, is a periodontal disease that can affect adolescents and young adults. The condition affects oral function, aesthetics, and psychological well-being. It typically presents with periodontal defects affecting the first permanent molars and incisors. Patients with early-onset periodontitis exhibit greater plaque, deeper probing depths and increased bleeding points compared to healthy individuals. However, clinical signs may not always be visibly apparent, making early screening essential. Case Description: To educate patients, legal guardians, and other oral health professionals on the prevalence of early-onset periodontitis and the importance of screening and treatment. Background: An adolescent female was referred to the Dental Hygiene Clinic for assessment following an orthodontic evaluation. The patient had a history of poor oral hygiene, and dental crowding. Clinical findings included localized bone loss extending to the mid-third of root, probing depths of up to 6mm, a bleeding score of 54%, and a plaque score of 56%. The initial treatment plan included non-surgical periodontal therapy in all four quadrants. Patient education focused on proper plaque removal using the bass brushing technique, the importance of interdental care, and dietary modifications to reduce cariogenic risk. At a one-month follow-up, clinical data indicated successful outcomes from non-surgical periodontal therapy. However, there was no observed improvement in the patient's oral hygiene and dietary habits. Conclusion: Grade C molar-incisor periodontitis may not be detectable without proper screening and comprehensive clinical evaluation. Oral healthcare professionals should be trained to screen adolescent patients for periodontitis and educate patients and their legal guardians about its implications.

## **ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**

### ***DENTAL HYGIENE***

**CC03 Respiratory Effects of Dental Material in the Workplace.** A. PULOS\*, M. COLES, S. ITELL, P. RETTIG (Indiana University School of Dentistry)

Introduction: A 65-year-old male presented to the dental hygiene clinic for a routine prophylaxis, with a history of interstitial lung disease (ILD). The patient attributes the development of his disease to prolonged exposure to dental materials during his 40-year career as a dentist. While limited, recent research suggests that dental professionals may be at risk for chronic, progressive lung diseases due to inhalation of monomer dusts, such as methacrylates, which are commonly found in dental materials like resins and prosthetics. This study aims to raise awareness among dental health professionals about the occupational hazards linked to various respiratory conditions and dysfunctions.

Methods: A comprehensive review of the patient's pulmonary scans, spirometry tests, medical records, and an in-depth interview helped identify potential causes, preventive measures, and the progression of his disease. A search of PubMed was conducted to explore existing studies highlighting the risk of significant declines in lung function among dental professionals. Existing studies suggest that dental workers may experience reductions in forced vital capacity and expiratory volume compared to other healthcare professionals. Although standard personal protective equipment (PPE) like surgical masks is used in dental settings, research suggests that these masks may not be effective at preventing the inhalation of respirable dust. Results: Dental professionals face significant risks related to methacrylate inhalation, which can adversely affect pulmonary health. The ongoing exposure to these materials in clinical settings appears to lead to measurable declines in lung function. Conclusion: This research underscores the importance of further investigation into the long-term pulmonary effects of dental materials and calls for the implementation of more effective safety protocols in dental environments to mitigate the risk of life-threatening respiratory conditions.

**CC04 Management of Patients with Osteoradionecrosis of the Jaw.** M. GREATHOUSE\*, E. AMIS, A. RIECK (Indiana University School of Dentistry)

Introduction: Although rare, Osteoradionecrosis is one of the most significant late complications in patients treated with radiation therapy. It is described as a site of exposed, non-vital bone in a radiated field that does not heal spontaneously within 3 months. Objective: To educate oral health professionals on the identification, etiology, and management of patients with Osteoradionecrosis. Background: An 84-year-old male presented to the dental hygiene clinic for his 3-month periodontal maintenance appointment. The patient's medical history indicated treatment for oral cancer in 2014. The intraoral examination identified a 5x5 ulcer, characterized by grayish-white tissue, located on the left retromolar pad distal to tooth number 19. DH Care Plan: A medical consultation was sent to the patient's primary care provider to gather more information on their previous cancer diagnosis. Intra-oral photographs of the lesion were taken. Patient education included guidance on proper oral home care, salivary substitutes, and the importance of routine visits with ENT specialists due to their prior cancer history. The patient was referred to the University Hospital and Oral Surgery for further inspection of the lesion. Results: During the patient's follow-up with oral surgery, the lesion was diagnosed as Stage II Osteoradionecrosis of the Jaw. Dental hygiene debridement was put on hold until the infection was fully treated. Additionally, the patient was educated on the seriousness of the situation and the importance of prioritizing the treatment of osteoradionecrosis over continuing dental hygiene debridement, to prevent further infection and support proper recovery. Conclusion: Oral healthcare professionals must be well-informed about abnormal oral conditions to effectively educate patients, guide them through potential changes in their dental hygiene care plan, and assist in navigating treatment adjustments and determining appropriate next steps.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**DENTAL HYGIENE**

**CC05 The Potential Effects of Antiretrovirals on Alveolar Bone.** K. SALKIE\*, G. KINDRED, A. RIECK (Indiana University School of Dentistry)

Introduction: Antiretroviral therapy (ART) is essential in the management of individuals with human immunodeficiency virus (HIV). This therapy includes a combination of medications that work to stop the virus from reproducing. Both ART medications and HIV itself have been associated with alveolar bone loss, with some studies indicating a greater impact in older men. This research study investigates the possible correlation between an HIV+ patient's periodontal health decline due to antiretrovirals. Background: A 60-year-old male presented to IUSD for a periodontal maintenance recall. His medical history noted a 17-year history of HIV, managed with antiretroviral medication. At his initial visit, the patient's assessment exhibited periodontal health on a reduced periodontium, following successful treatment of periodontitis. Periodontal maintenance was planned to be completed at next visit, however at patients request, he did not return for several months. Upon return, an additional clinical assessment revealed significant changes in his periodontal condition, including an increase in probing depths and bleeding. The patient also reported a new diagnosis of osteoporosis. DH Care Plan: Due to a noticeable decline in the patient's periodontal health between appointments, the student performed periodontal maintenance debridement. Given the rapid progression of probing depths, the patient was then referred to the Graduate Periodontics Clinic for further evaluation and treatment. Previous research suggests that men with HIV who have been on ART for at least one year may experience greater alveolar bone loss, as indicated by changes in alveolar crestal height (ACH), compared to individuals without HIV. Elevated ACH values indicate greater alveolar bone loss. Conclusion: Based on the evidence linking antiretroviral therapy to alveolar bone loss in HIV+ men, oral healthcare professionals must be aware of this potential side effect. Regular updates to health history and comprehensive periodontal assessments are essential in identifying underlying causes of changes in oral health.

## **ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**

### **DENTAL IMPLANTS**

**CC06 “Sticky Bone” with PRF for Guided Bone Regeneration: Case Report.** Y. KUBOTA\*, H. NAMLI (Indiana University School of Dentistry)

Introduction: The loss of alveolar bone in edentulous areas frequently requires bone grafting before implant placement. Guided Bone Regeneration (GBR) is a crucial technique used to achieve adequate bone width and length, ensuring that implants are positioned optimally. This approach involves the use of various bone graft materials and barrier membranes to promote new bone formation while preventing the infiltration of undesirable cells, which enhances the healing process. In particular, when dealing with the anterior maxilla, it is crucial to consider both functional and aesthetic factors. Case Presentation and Results: The patient presented with edentulous spaces at sites #7 and #10 and expressed a desire for implant placement to support fixed prosthetics. The prognosis for tooth #8 was questionable due to the loss of its crown. To address these deficiencies, a treatment plan was developed that included horizontal GBR at sites #7 to #10, utilizing freeze-dried bone allograft (FDBA) in combination with platelet-rich fibrin (PRF) to promote healing in both hard and soft tissues, along with a resorbable membrane. It is especially noteworthy that the combination of PRF with FDBA created a "sticky bone" effect, significantly improving surgical handling. This allowed sufficient bone material to be filled into the defect. Post-treatment evaluations indicated sufficient bone width was achieved for implant placement. These positive results support the effectiveness of the GBR technique in managing severe horizontal bone loss, particularly in the anterior maxilla. Conclusion: Severe horizontal bone loss poses significant challenges in dental implantology. However, this study demonstrates a successful approach through the effective use of a combination of materials and techniques, specifically employing GBR with FDBA and PRF. The findings provide valuable insights and guidance for clinicians.

**CC07 Lateral Window Sinus Lift with Simultaneous Guided Bone Regeneration.** Y. KUBOTA\*, H. NAMLI (Indiana University School of Dentistry)

Introduction: Implant placement in sites with missing teeth offers an effective solution for restoring occlusion and function, similar to natural teeth. However, the loss of alveolar bone in edentulous areas often necessitates bone grafting prior to implant placement. Guided Bone Regeneration (GBR) is a vital technique employed to enhance alveolar bone volume, facilitating optimal implant positioning. In terms of the maxilla, sinus lift techniques have been successfully implemented to increase the vertical dimension. This case report aims to evaluate the efficacy of GBR combined with the lateral window sinus lift technique in cases with both horizontal and vertical bone loss. Case Presentation and Results: A patient presenting with edentulous spaces from #1 to #5 expressed a desire for implant placement to support fixed prosthetics. However, insufficient bone height at site #3 and inadequate width at sites #4 and #5 were noted. To address these deficiencies, a treatment plan incorporating horizontal GBR at sites #3 to #5, alongside a lateral window sinus lift at site #3, utilizing freeze-dried bone allograft (FDBA) with platelet-rich fibrin (PRF) and a resorbable membrane, was developed. Incorporating PRF into FDBA has significantly improved material handling. In addition, placing a PRF membrane over an absorbable membrane enhances soft tissue healing and provides additional protection for the wound site post-surgery, addressing one of the potential risks associated with GBR. Post-treatment results indicated sufficient bone regeneration, allowing for implant placement. This report details the treatment plan and procedural steps undertaken to achieve the desired clinical outcome. Conclusion: Horizontal and vertical bone loss presents significant challenges in clinical situations; however, through the effective use of combined materials and techniques, this report demonstrates a successful approach to addressing these issues. The findings provide valuable insights and guidance for clinicians, expanding the scope of treatment options available for similar cases.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**DENTAL IMPLANTS**

**CC08 Restoration of an Implant with Limited Space Due to a Drifting.** E. RUBALCAVA\*, W.S. LIN, D. MORTON, C.C. YANG, J. LEVON (Indiana University School of Dentistry)

This case report explores methods for restoring an implant when the interproximal space in the occlusal area is restricted due to a drifting molar. A patient presented with two previously placed implants in areas #30 and #19, requiring final restoration. The main concern was focused on the left area (#19), where limited interproximal space was observed due to the drift of molar #18, which had an occlusal amalgam restoration and a missing filling on the buccal side. The space between the distal healing abutment of implant #19 and the mesial surface of the drifting molar was approximately 1 mm, complicating the prosthodontic design. Periapical radiographs were taken, impressions were obtained using alginate, and study casts were articulated on a Whip-Mix articulator. Various treatment options were discussed. Orthodontic treatment was recommended to reposition tooth #18, aligning it to create adequate space for proper restoration. Enamelplasty was considered, but the significant enamel reduction required would compromise the tooth structure. Instead, a conservative porcelain onlay was planned to optimize interproximal contour and minimize food trapping. The final option presented to the patient was the possibility of no intervention. Results: A porcelain onlay was successfully placed on tooth #18, replacing the old filling and restoring the buccal area. This restoration improved aesthetics, ensured adequate interproximal spacing, facilitated proper insertion of the adjacent restoration, and prevented food accumulation, improving the patient's oral hygiene and ease of flossing. Conclusions: The restoration significantly improved both the esthetics and functionality of the shifting teeth. Comprehensive treatment planning is crucial for ensuring successful fixed restorations, taking into consideration tooth alignment, periodontal health, and occlusal function.

## ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS

### ENDODONTICS

#### **CC09 Endodontic treatment of an Infected Tooth with Spontaneous Dentin Bridge Formation.** T. GRACE\*, A. SANBORN, Y. EHRLICH, N. WARNER

Objective: To report the treatment of a patient with an endodontically infected tooth with arrested root development and spontaneous dentin bridge formation. Case report: Dentists often encounter patients with a history of dental trauma and must address its aftereffects on the teeth. A 59-year-old patient presented to IUSD with long standing discomfort from a discolored #9 with a small incisal fracture. The patient remembered hitting his face at bottom of a swimming pool about 40 years ago. Sensibility testing was performed. In the radiographs and CBCT, arrested root development and a spontaneous dentin bridge in the coronal third of the canal were seen. The endodontic diagnosis was #9: Irreversible Pulpitis with Symptomatic Apical Periodontitis. The dentin bridge could be negotiated during the endodontic treatment, successfully performed in two visits with calcium hydroxide as an intracanal medicament. After the patient's symptoms subsided, a round of internal bleaching was done to achieve the patient's esthetic desires. Conclusion: Following dental trauma, a spontaneous dentin bridge can be formed in the canal. During endodontic treatment, the dentin bridge could be negotiated, and endodontic infection can be successfully addressed, and internal bleaching was done.

#### **CC10 Endodontic Considerations and Challenges in HIV-positive Patients: A Case Report.** J. HAN\*, Y. EHRLICH, N. WARNER, T. WHITFIELD (Indiana University School of Dentistry)

Introduction: Endodontic treatment in HIV-positive patients is challenging but successful outcomes can be expected. A successful case of a root canal treatment (RCT) in an HIV patient is presented. HIV status should not deter from performing endodontic treatment. Objective: To report an RCT in tooth #10 with necrotic pulp and symptomatic apical periodontitis in an HIV-positive and discuss the outcome of endodontic treatment in HIV patients. Case Report: A 59-year-old female patient of African descent with a history of HIV presented to IUSD for RCT in #10. The patient had no other significant medical conditions, and her HIV was well managed with antiretroviral therapy (ART). The patient complained of pain from #9. #9 presented with a defective ML resin restoration. The cold testing #9 was negative. Percussion and palpation, testing was positive. The radiographic examination of #9 included digital radiographs and a CBCT. The imaging revealed a large PARL and facial cortical bone perforation. The endodontic diagnosis was Tooth# 9: Pulp Necrosis with Symptomatic Apical Periodontitis Treatment: After local anaesthesia was obtained #9 was isolated, and endodontic access was established. The pulp was necrotic. The working length was determined, and the canal was shaped with hand files and rotary Profile files to a size 40.04. The canal was irrigated with 6% sodium hypochlorite (NaOCl) and calcium hydroxide was placed as an intracanal medicament. After 24-hour the patient was asymptomatic. The tooth was accessed, and calcium hydroxide was removed. The canal was dried and obturated with gutta-percha and Grossman's sealer using the cold lateral condensation technique. The endodontic access was temporized and later sealed with resin composite restoration. On a 3 month follow the patient was asymptomatic and evidence of radiographic healing could be seen. Conclusion: HIV Patients with longstanding large endodontic infection can be successfully treated with non-surgical endodontic treatment.

## ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS

### ENDODONTICS

#### **CC11 Long-Term Application of Calcium Hydroxide to Treat Large Periapical Pathology.** J. KOHAN\*, Y. EHRLICH, S. GOVINDOOL, G. KARUNANAYAKE, N. WARNER (Indiana University School of Dentistry)

Introduction: Calcium hydroxide paste is a widely used intracanal medicament in endodontic therapy due to its strong antibacterial properties and ability to promote periapical healing. This alkaline compound, with a high pH (around 12.5–12.8), creates a hostile environment for bacterial survival. Additionally, it can inactivate endotoxins, suppress inflammatory cytokines and upregulate alkaline phosphatase enhancing the healing of periapical tissues. Case Presentation: This case report shows the use of two different Ca(OH)<sub>2</sub> pastes used over the course of 6-months to promote healing of periapical tissues in a tooth with a large periapical lesion. A 36-year-old female patient presented to IUSD graduate endodontic clinic from the IUSD emergency clinic. Tooth #14 was diagnosed with necrotic pulp with a chronic apical abscess. Probing depths of 6mm were present mid-buccal buccal with a grade 1 mobility. Periapical radiographs displayed significant bone loss present encompassing all 3 root apices #14 and displaying early resorption on buccal roots. A pulpectomy was performed and 35% Ca(OH)<sub>2</sub> (Ultracal) paste was placed in all canals. The patient was re-evaluated at 3-months review radiographic healing. The tooth was re-medicated with Ca(OH)<sub>2</sub> paste applied in the form of Vitapex, as radiographic healing was evident. A second review after an additional 3-months revealed the tooth was asymptomatic with continued radiographic healing. The Vitapex paste was rinsed out and #14 was obturated and restored. The patient was evaluated 6-months post-operatively. She was asymptomatic, and clinically the buccal probing depths had reduced to 3mm. The tooth showed no mobility. Radiographically there was a significant increase in bony healing in the periapical region of #14. Conclusion: The long-term application of Ca(OH)<sub>2</sub> paste, in teeth with extensive apical bone loss and endodontic -periodontic lesions, can resolve periodontal attachment loss and promote periapical healing.

#### **CC12 Regenerative Endodontics in a Necrotic Infected Dens Evaginatus Premolar.** A. SULLIVAN\*, Y. EHRLICH, G. KARUNANAYAKE, S. GOVINDOOL (Indiana University School of Dentistry)

Background: Conventional endodontic treatment on an immature tooth with an infected root canal poses challenges due to an open apex and weak root structure. Regenerative endodontic treatment utilizes tissue engineering principles aimed at replacing necrotic pulp with viable tissue, allowing continued root formation. Case Report: A 13-year-old male was initially referred for extraction of tooth #29 due to incomplete root development and a large periapical radiolucency. Clinical examination revealed a necrotic pulp, percussion tenderness and a buccal sinus tract. There were no signs of caries, cracks or prior restorations. Magnification revealed a fractured tubercle (accessory cusp) on the occlusal surface of #29. Intact tubercles were visible on adjacent and contralateral premolars indicating dens evaginatus. Thus, the etiology for pulp necrosis on #29 was fracture of the tubercle which had created a pinpoint pulpal exposure. Consent was obtained and under local anesthesia with rubber dam isolation, the accessory cusp was reduced, and the pulp chamber accessed. The root canal was disinfected using sodium hypochlorite (NaOCl) and ethylenediaminetetraacetic acid (EDTA) solutions, and with a triple antibiotic paste (TAP). At the second appointment, the sinus tract had resolved, and the tooth was non-percussion tender. Under local anesthesia and rubber dam isolation, the canal was re-irrigated removing the TAP, and bleeding was induced to allow stem cells, growth factors and a scaffold to infiltrate the disinfected root canal space. Biodentine, which is a bioactive material, was placed over the blood clot, followed by Fuji II LC and a composite resin restoration. Results: At six-month follow-up review, the periapical radiolucency had fully healed, satisfying the primary treatment goal. Root canal thickness had also increased, which should improve the strength of the root. Conclusion: Regenerative endodontics proved to be a successful treatment option for an immature premolar tooth with root canal infection from dens evaginatus associated pulp exposure.

## ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS

### **OPERATIVE DENTISTRY**

**CC13 Minimally Invasive Replacement of Upper Ceramic Veneers: A Case Report.** A.B. LINJAWI\*, O.R. CAPIN, G.R. BATISTA, D.F. MESSIAS (Indiana University School of Dentistry)

Ceramic veneers can be indicated in situations requiring minimal or no tooth preparation, preserving dental structure while providing a durable and stain-resistant esthetic enhancement. This case report describes the conservative replacement of upper ceramic veneers with minimal tooth preparation to improve patient's smile. A female patient presented to the IU Graduate Cariology and Operative Dentistry Clinic with the chief complaint "I want a better smile". She had prepress indirect ceramic veneers placed 30 years ago. Due to the gingival recession and normal wear, she sought to cover exposed margins while achieving a brighter shade. Comprehensive clinical and radiographic examinations including a smile analysis and occlusal evaluation, were conducted to assess health, function, and esthetic needs. A diagnostic wax-up and a bisacryl resin mock-up were used to evaluate the necessity of tooth preparation, esthetics, phonetics, while improving the patient's understanding of the proposed treatment. The existing veneers were carefully removed, and minimal preparation was performed only on teeth #8 and #9 to improve alignment within the arch. A final impression was taken using the double retraction cord technique and dual-viscosity impression material to ensure precision. Intraoral photographs recorded the stump shade and desired final shade for accurate shade match. Occlusal records were also taken. Ceramic veneers, fabricated using lithium disilicate ceramic, were bonded with light-cured resin cement, ensuring optimal adhesion and longevity. The final results showed a brighter, natural-looking smile with seamless coverage of the recession areas. The veneers demonstrated excellent adaptation, esthetics, and function, successfully meeting the patient's expectations. In conclusion, a conservative veneer approach preserves tooth integrity while achieving highly esthetic and long-lasting results. Minimizing tooth preparation enhances restoration longevity and supports the maintenance of natural dental structures. Proper case selection, meticulous treatment planning, and precise adhesive techniques are essential for long-term success and patient satisfaction.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**ORAL AND MAXILLOFACIAL RADIOLOGY**

**CC14 Importance of Clinical and Radiographic Assessments in Managing Impacted Teeth.** I. WALAYAT\*<sup>1</sup>, C.E. CARRARA<sup>2</sup>, S.D.O.B. FRANZOLIN<sup>2</sup>, A.R F.D. CASTILHO<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Universidade do Sagrado Coração)

Impacted teeth and eruption problems are common occurrences that can lead to functional and aesthetic concerns in children. Early diagnosis and timely intervention are crucial to ensuring proper oral development and preventing complications. Clinical and radiographic examinations play a pivotal role in this process. This case report describes the detection and management of an impacted lower left second premolar (#20). A comprehensive clinical and radiographic evaluation revealed that the delayed eruption was due to gingival hypertrophy obstructing the tooth's path. The chosen treatment approach was the surgical removal of the overlying gingival tissue to facilitate eruption. Approximately seven months after the gingivectomy, the tooth had fully erupted into the arch without requiring orthodontic intervention. This outcome underscores the importance of precise diagnosis, individualized treatment planning, and early intervention in managing impacted teeth. A conservative surgical approach, such as gingivectomy, may serve as a viable alternative to orthodontic treatment in select cases, minimizing the need for prolonged interventions while promoting natural eruption. However, the choice of treatment should be tailored to the individual patient's needs, considering factors such as the severity of impaction, age, and overall oral health. In conclusion, integrating clinical and radiographic examinations is essential in diagnosing and treating erupting teeth. This approach ensures comprehensive care, leading to favorable functional and aesthetic outcomes for pediatric patients.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**ORAL DISEASE PREVENTION & DIAGNOSIS**

**CC15 Squamous Papilloma Observed During Screening Appointment: Case Report.** C.G. WILSON\*, N. SANTOSH, A.C. RITCHIE (Indiana University School of Dentistry)

Introduction: Squamous papilloma is a benign epithelial neoplasm, resulting in a papillary or verruciform mass. They are relatively common and comprise approximately 3% of all oral lesions submitted for biopsy. Case Findings: We present a case of a 27-year-old female patient who presented to the Fritts Screening Clinic at Indiana University School of Dentistry with a small white papillary lesion on the tongue. Upon examination, a hyperkeratotic papillary nodule on the left lateral border of the tongue, measuring 0.8x0.7x0.4 cm, was noted. The patient did not report any pain or symptoms in the area. Methods: An excisional biopsy was performed at the IUSD Oral Maxillofacial Surgery Clinic. The differential diagnosis included squamous papilloma, transient lingual papillitis, dysplastic leukoplakia, and oral hairy leukoplakia. Hematoxylin and Eosin, and Period acid Schiff stains were performed, and the case was reviewed by the IUSD Oral Pathology Group. Diagnosis: Microscopic examination of the submitted tissue confirmed the diagnosis of a squamous papilloma. The patient was followed up in two months with no signs of recurrence. Conclusion: The ventrolateral border of the tongue and floor of the mouth are sites of high prevalence for malignancy. White lesions should always be biopsied to have a precise histopathologic diagnosis for accurate patient management.

## **ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS ORTHODONTICS**

### **CC16 Mini-Screw Assisted Rapid Palatal Expander Utilization for Unilateral Crossbite Correction.** A. ZHAO\*, D. JOHNSON (Indiana University School of Dentistry)

A unilateral posterior crossbite can either result from a transverse skeletal maxillary deficiency, a functional shift due to premature dental contacts, or a combination of the two. Unilateral posterior crossbites require timely intervention to prevent further functional and skeletal asymmetries. Effective skeletal expansion requires separation of the maxillary midpalatal suture. This suture typically fuses at puberty, which can render dental-borne conventional rapid palatal expanders (RPEs) to be insufficient in expanding skeletally mature patients. Mini-screw assisted rapid palatal expanders (MARPEs) offer an alternative in such patients by providing skeletal anchorage and expansion through temporary anchorage devices (TADs). **Patient Background:** A 14-year and 1-month Hispanic female presents with a chief complaint “my jaw is crooked.” She exhibited a Class III malocclusion with unilateral crossbite extending from her right lateral incisor to right second molar. Upon clinical examination, she exhibited a functional shift with deviation to the right and anteriorly. Her initial treatment plan involved use of a conventional Hyrax RPE. After 1 month of turning, no observable changes other than minor dental tipping occurred. Given the patient was more than two years post-menarche, the expander was removed, and the posterior teeth were allowed to relapse to their original occlusion while a new treatment plan was created. A MARPE was placed with four miniscrews on the hard palate and was turned 1x/day for ten weeks until the patient was no longer in posterior crossbite and a midline diastema of 3.5mm was achieved. The MARPE was maintained for six months after active expansion to allow for proper bony fill in the space created. Conclusion: The effectiveness of traditional tooth-borne RPEs diminishes with increased skeletal maturity. The use of a MARPE provides an excellent treatment alternative in adolescents with unilateral posterior crossbites who have achieved mid-palatal suture fusion.

### **CC17 Orthodontic Management of a Patient with a History of Seizures.** J.O. ANIGBO\*, K.T. STEWART (Indiana University School of Dentistry)

**Introduction:** While orthodontic treatment is possible in patients with a history of epilepsy and seizures, treating these patients present unique challenges. Risk of injury, oral hygiene challenges, material sensitivity, and bruxism or clenching are just a few of the confounding variables that complicate treatment. This case report describes the treatment of Class III Malocclusions using clear aligners in patients that cannot tolerate traditional fixed appliances. **Case Presentation and Results:** An 11-year-old Hispanic female presented to IUSD Graduate Orthodontic Clinic for orthodontic treatment with a chief concern of “I want to fix my bite”. The patient possessed an Angle’s Class III malocclusion, with moderate maxillary and mandibular crowding, proclined maxillary incisors, proclined and procumbent mandibular incisors, and a reverse overjet of 2mm. Comprehensive orthodontic treatment was indicated, and a TPA/Protraction facemask was delivered. Poor compliance over several months necessitated a review of the treatment strategy. A new treatment plan including a Carriere Motion appliance, and fixed appliances was initiated. Several months into fixed appliance therapy, the patient’s primary physician requested that all metal appliances be removed and discontinued due to the patient’s increase in seizure episodes, which lead to multiple broken brackets. Treatment was transitioned to clear aligner therapy, which supported the successful correction of the patient’s malocclusion, while reducing the risk of broken appliances and the potential for appliance aspiration. Treatment resulted in resolution of maxillary and mandibular crowding, significant increase in overjet, and the correction of her occlusal relationship. Conclusion: This case report demonstrated that the application of clear aligner therapy is an effective alternative to fixed appliance therapy in patients where fixed appliances may contribute to significant medical concerns.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**ORTHODONTICS**

**CC18 Serial Extractions in Orthodontic Treatment: Indications, Outcomes, and Considerations.** K.M. KELLY\*, K.T. STEWART. (Indiana University School of Dentistry)

Early intervention in orthodontics can help manage developing malocclusions and reduce the complexity of future treatment. This case demonstrates the effectiveness of serial extraction, a phased approach involving the planned removal of primary and permanent teeth to alleviate severe crowding and guide proper occlusion. Effective case selection, considering factors such as patient age and growth potential, is crucial for optimizing treatment outcomes. When applied appropriately, serial extractions can lead to more favorable treatment results. Case Presentation: A 10-year-old Hispanic female presented to the IUSD Graduate Orthodontic Clinic with a chief concern of "I have crooked teeth I want fixed." Her medical history was unremarkable, with no contraindications to treatment. She was in mixed dentition with retained maxillary primary canines and maxillary and mandibular first and second molars. The mandibular permanent canines were unerupted due to insufficient space. A clinical examination revealed a Class II division I malocclusion with 4 mm overbite, 8 mm overjet, and moderate-to-severe crowding. Radiographic analysis indicated a hyperdivergent skeletal pattern and a skeletal Class II relationship due to mandibular retrognathia. The orthodontic treatment followed a two-phase approach. Phase one, lasting 27 months, involved fixed appliances on the maxillary incisors, space maintenance with a Nance appliance and a lower lingual holding arch, and serial extractions of maxillary primary canines, maxillary and mandibular primary first molars, and permanent first premolars as they erupted. The patient is now undergoing phase two and progressing toward an ideal occlusion with promising long-term stability. Conclusion: This case report highlights the effectiveness of serial extraction in achieving successful orthodontic outcomes when applied to well-selected patients.

**CC19 Maxillary First Molar Distalization with Tooth-Borne Distal Jet Appliance.** M.C. KESSLER\*, K.T. STEWART (Indiana University School of Dentistry)

Introduction: In patients with Angle's Class II molar relationships, maxillary molar distalization will allow the practitioner to achieve an Angle's Class I occlusion, while not affecting the position of the mandible and potentially eliminating the need for bicuspid extractions. In these cases, the goal of using a distal jet appliance is to move the maxillary first molar into a Class I occlusion and create space to alleviate anterior crowding. This case report describes the treatment of a patient with an Angle's Class II malocclusion with moderate anterior crowding. Case Presentation and Results: A 10-year-old African American female presented to the IUSD Graduate Orthodontics Clinic with a chief concern of "I want my teeth to be straight." The patient previously had interceptive treatment, which included palatal expansion and a reverse pull facemask. The patient exhibited a half-cusp Class II malocclusion with moderate maxillary and mandibular crowding, slightly protrusive upper and lower incisors, overjet/overbite of 2mm, and retained lower second deciduous molars. The distal jet appliance was fabricated, bonded to the occlusal surface of the maxillary first premolars, and placed into the lingual sheaths of the maxillary first molar bands. The appliance was activated for six months and achieved 5mm of molar distalization bilaterally, resulting in a Class I molar relationship. This was followed by complete maxillary and mandibular fixed appliances to achieve proper alignment of the entire dentition. Conclusion: This case report demonstrated that the application of the distal jet appliance in Class II patients, without extractions, can yield good patient outcomes with an acceptable and stable occlusion.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**ORTHODONTICS**

**CC20 Diagnosis, Planning, and Mechanical Management in an Asymmetric Extraction Case.** C. MICLAT SHULTS\*, K.T. STEWART (Indiana University School of Dentistry)

Introduction: The foundation for successful orthodontic treatment lies in a thorough diagnosis, outlining goals, and defining objectives. Orthodontic mechanics planning and management should reflect the objectives, especially when extraction therapy is indicated, and is essential for optimizing outcome. Purpose: This clinical case report highlights the effectiveness of thorough diagnosis, goal-setting, and orthodontic mechanics planning and management when coupled with patient compliance. Results: A 17 year 11-month-old Hispanic female presented to the IUSD Orthodontic Clinic with the chief complaint "My dentist said I need braces, so I don't chip my teeth." She presented with orthodontic bands remaining on #19 and #30 and leftover composite resin on the maxillary incisors from previous orthodontic treatment that was not completed. Facial evaluation revealed a mandibular jaw deviation to the right and a long lower facial third. The patient had an Angle's Class III Subdivision Left malocclusion, 0mm overbite and overjet, a mandibular dental midline deviated to the right 3mm from the maxillary dental and soft tissue midline, fair oral hygiene, and normal TMJ health. Radiographic evaluation revealed all teeth present except third molars with a single, well-defined, round area of dense bone mesial to the apex of #20. After conversation with the family, careful goal setting, and defining specific objectives for orthodontic treatment, a treatment plan was developed that included asymmetric extractions of #13 and 21, bonding of all teeth using .022 American Empower MBT brackets, sliding mechanics, and class III elastic wear on the left side. With low/therapeutic orthodontic forces and excellent patient compliance, all extraction spaces (7mm #13; 7mm #21) were closed and maximum bodily movement achieved within 10 months. Conclusion: This case report demonstrates that thorough diagnosis, goal-setting, and orthodontic mechanics planning contributes to a successful outcome when coupled with patient compliance.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**PEDIATRIC DENTISTRY**

**CC21 Advancing Molar-Incisor Hypomineralization: Digital Dentistry for Precision and Education.** W.J. KOHELL\*<sup>1</sup>, C.J.A. GUILLEN<sup>2</sup>, U.T. MONTEIRO<sup>2</sup>, A.L. DOALTO<sup>2</sup>, J.S. PEREIRA NETO<sup>2</sup>, R.M. PUPPIN-RONTANI<sup>2</sup>, A.R.F. DE CASTILHO<sup>1</sup> (<sup>1</sup>Indiana University School of Dentistry, <sup>2</sup>Universidade Estadual de Campinas)

Introduction: Molar-incisor hypomineralization (MIH) is a prevalent enamel defect among children characterized by hypomineralized enamel which manifests as discoloration, structural weakness, and a predisposition to fractures. Primarily impacting molars, and less often incisors, MIH leads to hypersensitivity and enamel breakdown. A digital dentistry workflow offers a less invasive, time-sparing, and a more tailored approach to solve the case-specific and longevity requirements of MIH-affected teeth yet is not currently emphasized by dental education. Case Presentation and Results: A child with MIH of mixed primary and permanent dentition presented to the IUSD Pediatric Clinic. Affected tooth #30 exhibited extensive structural loss and hypersensitivity with a history of failed direct restorations. Conventional restorative materials experience reduced adhesion due to the reduced hardness, increased porosity, and larger interprismatic spaces of MIH-enamel. A digital workflow was selected to optimize the fit and morphology of a composite-based indirect restoration. This allows for a conservative yet successful restoration while reducing chair time. After selective tooth preparation, to preserve healthy enamel and reduce sensitivity, precise restorative margins were obtained using the Primescan intraoral digital scanner. The indirect restoration was designed using a CAD software and printed with a filled resin on a Photon Mono 2 3D-printer. Following 37% phosphoric acid etching and bonding agent application to both the tooth and restoration, the restoration was cemented using a resin-based adhesive system. Biweekly follow-up appointments reported reduced hypersensitivity within one week, and no signs of wear or failure after one year. Conclusion: This case highlights the educational value of digital dentistry in complex cases such as MIH, allowing for the design and delivery of more conservative, precise, and durable restorations, ensuring successful outcomes.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**PERIODONTOLOGY**

**CC22 Restoring Esthetics and Function with Crown Lengthening: A Case Report.** N. LAKHANI\*, C. BATRA  
(Indiana University School of Dentistry)

Introduction: Clinical crown lengthening is defined as a surgical procedure designed to expose sound tooth structure for restorative purposes by apically repositioning the gingival tissue with bone removal. This case report discusses the esthetic and functional outcomes of a crown lengthening procedure performed due to subgingival margin placement and unesthetic appearance of the restoration. A 45-year-old Caucasian female presented with gingival recession around tooth #13, which had been previously treated with root canal therapy concerned with esthetics. Probing depths (PDs) ranged from 1-2 mm. A crown procedure was discussed which involved subgingival margin placement. Radiographs revealed a proximity between the crown margin and alveolar crest which would have resulted in supra crestal tissue attachment (SCTA) violation. Thus, a functional and esthetic crown lengthening procedure was planned. involving an internal bevel incision (extra-crevicular), followed by a full-thickness flap reflection. Necessary ostectomy and osteoplasty was performed using rotary and hand instruments. SCTA was re-established along with 1 mm sound tooth structure. Flaps were repositioned using 5-0 Glycolon. The patient was seen for an evaluation at 2 weeks and 4 weeks. Results: At nine weeks post-operatively, periodontal tissues were stable with no signs of infection. The distance between the crest of the bone and the new clinical crown margin measured approximately 3 mm. No significant complications were noted during the healing process, and the patient reported satisfaction with the aesthetic outcome. Conclusion: This case report demonstrates that surgical crown lengthening in an aesthetic zone on a root canal-treated tooth can yield desirable results when carefully planned and combined with patient compliance with oral hygiene. Close monitoring of tissue healing is critical to ensuring optimal outcomes, particularly in aesthetic areas where the appearance of gingiva is crucial.

## **ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS PROSTHODONTICS**

**CC23 Allergic Contact Dermatitis from Dental Materials with Methacrylate: Case Report.** O. QADIRI\*, S. ALYOUSEF, J. LEVON (Indiana University School of Dentistry)

**Aim:** To present a case report of dental practitioners exhibiting signs and symptoms of allergic contact dermatitis on their hands due to methacrylate penetration through non-sterile gloves. **Case Presentation:** This report includes two cases involving general dentists working in separate private dental clinics in Madina, Saudi Arabia. Both dentists performed various surgical, periodontal, endodontic, and restorative procedures for under a year. They adhered to standard infection control protocols, including hand disinfection and wearing gloves, masks, and gowns. Both practitioners were medically healthy, with no history of systemic conditions. The first case presented with a skin lesion on the dorsal first web space of the left hand three weeks prior, initially manifesting as dry skin with redness and itching. Symptoms progressed to an eczematous rash with elevated papules and increased itching intensity. The second case presented with an itchy rash localized to the dorsal first web space of the non-dominant hand, noting the lesion would reappear and subside within 2–3 weeks, although previous episodes were accompanied by milder signs and symptoms. Both practitioners reported applying uncured bonding materials on their gloves in the affected area to lubricate instruments during direct and indirect restorations, facilitating composite manipulation or removal of excess bonding agents. Following further evaluation, both cases were diagnosed with allergic contact dermatitis, a delayed Type IV hypersensitivity reaction. Alongside advising them to discontinue this practice, a dermatologist prescribed an over-the-counter topical corticosteroid cream to apply to the affected area. **Results:** Within three weeks, both cases showed a gradual subsidence of signs and symptoms, with no recurrence noted. **Conclusion:** The application of dental bonding materials directly on the skin surface or indirectly can lead to allergic contact dermatitis, regardless the glove type. However, glove type and the particle size of methacrylate contribute to the duration and degree of penetration.

**CC24 Prosthodontic Rehabilitation of Cleft Patient with a Removable Partial Denture.** S. ALYOUSEF\*, O. QADIRI, O. CAYETANO, J. LEVON (Indiana University School of Dentistry)

**Purpose/Aim:** This clinical case reports maxillary prosthodontic rehabilitation using a removable partial denture (RPD) in a cleft lip and palate (CLP) patient. **Case Report:** An 18-years old male patient with Vaeu Class IV cleft lip and palate was referred to the Graduate Prosthodontics Department at IU for prosthodontic management and treatment. He had undergone multiple surgeries at an early age including cleft repair, alveolar bone grafting, and orthodontic therapy. Clinical and radiographic findings revealed a skeletal class III malocclusion, maxillary anterior and posterior crossbite, congenitally missing teeth, retained deciduous teeth, multiple carious lesions, and limited premaxillary bone. **Materials & Methods:** Two treatment options were proposed to the patient: bone grafting then implant-retained fixed dental prosthesis and removable partial denture with cast metal framework to replace the maxillary anterior teeth. Due to numerous challenges associated with his treatment, the most appropriate treatment option was a maxillary RPD to overcome the implant option limitations and patient's financial burden. After extracting all the non-restorable teeth #D, 8, 9, G, a maxillary immediate interim resin-based partial denture was inserted and an RPD was fabricated as definitive treatment after complete healing was achieved. **Results:** Maxillary RPD with a chrome cobalt cast metal framework was fabricated following the surveyed and design cast. The major connector was composed of a horse-shoe major connector with cingulum rests and occlusal rest seats. This RPD design was selected to avoid the palatal defect. The patient reported satisfaction with aesthetics, comfort, and function. **Conclusion:** Cleft patients present complex prosthodontic challenges, including compromised bone, occlusal instability, and soft tissue irregularities. Careful assessment of occlusal interferences, retention, and patient preferences ensures treatment success. A removable prosthesis can be a more viable functional and aesthetic solution than any fixed dental prosthesis. Furthermore, long-term follow-up is essential for ensuring prosthetic success.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**PROSTHODONTICS**

**CC25 Complications in Angled Screw Restoration: A Case Report.** H.S. SANCHEZ-TAGLE\*, Y.C. LIN, C.C. YANG (Indiana University School of Dentistry)

Purpose: Angled screw-retained restorations provide esthetic and functional advantages. A common complication is fracture of the restoration. This clinical case report presents the management of a fractured angled screw-retained zirconia restoration on an apically placed implant. Materials and Methods: A 70-year-old male presented to the Graduate Prosthodontics Clinic with a fractured implant-supported zirconia restoration on #8. Upon examination, the fracture occurred at the buccal cervical margin due to limited thickness, which exposed the angulated screw channel abutment that remained on the Straumann BLT implant. To replace the restoration, intraoral scans were taken using a Straumann NC scan body. A titanium custom abutment was designed to reposition the abutment-crown junction. Subsequently, a screwmentable lithium disilicate restoration with optimized cervical thickness was fabricated and cemented extraorally. At the second appointment, the restoration was tried in and inserted. Results: The custom abutment and lithium disilicate crown enabled improved thickness at the abutment-crown junction, reducing the risk of future fractures. The patient expressed satisfaction with the function and esthetics of the new restoration. Conclusion: Careful case selection, modifications in abutment design and material selection are critical in preventing fractures in angled screw-retained restorations. This case demonstrated the use of custom abutments to ensure adequate material thickness and optimal esthetic restoration.

**CC26 Interdisciplinary Digi-Log Workflow for Anterior Single Implant Placement and Restoration.** D. ASHLEY\*, T. NAGAI, B. HANES (Indiana University School of Dentistry)

Purpose: To provide a detailed explanation of the Digi-Log workflow for anterior single implant patient care, from planning to restoration, in a predoctoral clinical setting. Materials and methods: A patient in the predoctoral clinic sought restoration of missing tooth #9 using a dental implant. An analog preliminary impression was digitized into an STL file for a digital wax-up (CaresVisual, Straumann). Based on this wax-up, restorations for #8 and an implant for #9 were planned. CBCT and STL files were integrated for 3D implant planning (Co-DiagnostiX, Straumann), and a CAD/CAM surgical guide (P30+, Straumann, Clear resin) was fabricated. The implant for tooth #9 was placed using a fully guided approach. After 2-3 months of healing, a provisional restoration was fabricated chairside using a 3D-printed shell (Phrozen LCD printer, NextDent resin) based on the initial wax-up. A mesial composite restoration on tooth #8 was completed to achieve symmetry. A custom impression coping was used for a final analog impression to capture the emergence profile. The final prosthesis, a Ti-base with lithium disilicate, was delivered as a screwmentable restoration. Result: The Digi-Log workflow enhances efficiency in implant and composite restorations, improving student comprehension of 3D implant planning and prosthetic execution. It ensures predictable esthetic outcomes, patient satisfaction, and facilitates high-quality treatment in a predoctoral setting. Conclusions: The Digi-Log workflow streamlines implant and composite restorations, supporting student learning while delivering clinically and esthetically successful outcomes in anterior implant cases, even in predoctoral settings.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**PROSTHODONTICS**

**CC27 Resin-Bonded Fixed Restorations for Anterior Teeth: An Alternative to Implants.** D. BROYLES\*, T. NAGAI (Indiana University School of Dentistry)

Resin-bonded fixed restorations (RBFs) provide a conservative and esthetic solution for anterior tooth replacement when dental implants are not feasible. This case report details the workflow for RBFs, from diagnostics to final restoration, in a predoctoral clinical setting. A patient in a predoctoral clinic presented with missing maxillary lateral incisors (#7 and #10). Initial treatment planning considered dental implants; however, cone-beam computed tomography (CBCT) analysis confirmed inadequate space due to root proximity. The patient declined orthodontic intervention and opted for resin-bonded fixed restorations. Soft tissue development was initiated using an Essix retainer modified with composite resin, shaping the pontic site into an ovate form over six weeks. After soft tissue stabilization, tooth preparations were completed, followed by a final impression. To ensure optimal esthetics and function, two prototypes were designed using CAD software (Exocad) and 3D-printed (Phrozen LCD printer, NextDent resin) for patient evaluation. Upon approval, the definitive restorations—one-wing lithium disilicate (Press-Emax) RBFs for #7-8 and #9-10—were fabricated. Bonding procedures were performed under rubber dam isolation. The restorations were pre-treated with 5% hydrofluoric acid (20s, IPS Ceramic Etching Gel, Ivoclar), followed by silane application (Ultradent™). A resin cement (G-CEM LinkForce®) was used for bonding, with proper etch and bonding procedures on the abutment teeth. Results: The structured workflow, including proper diagnostics and pontic-site development, resulted in highly esthetic and functional restorations. The patient reported high satisfaction, with improved esthetics and quality of life. Conclusion: Dental implants may not always be viable due to space constraints, age, or medical conditions. This case highlights the clinical value of resin-bonded fixed restorations as a predictable alternative when proper pontic-site development and bonding techniques are applied.

**CC28 A Comprehensive Clinical Management of Severe Dental Fluorosis: Case Report.** H.T. ALSHARIF, J.A. LEVON, C.C. YANG (Indiana University School of Dentistry)

Introduction: Severe dental fluorosis presents unique challenges, including compromised enamel structure, discoloration, and functional concerns. This case report describes the comprehensive management of a patient with severe dental fluorosis, focusing on aesthetic and functional rehabilitation through all-ceramic restorations and implant-supported prostheses. Case Presentation and Methods: A patient from Mecca, with prolonged exposure to high-fluoride water from the Zamzam well, presented with severe fluorosis, characterized by multiple missing teeth and brown-yellowish discoloration with pitting. Dean's classification confirmed a severe case, with a Thylstrup-Fejerskov Index (TFI) score of 6. A detailed treatment plan was developed, including smile analysis, occlusal plane assessment, and diagnostic wax-up. Final impressions were taken using the double-cord technique and dual-viscosity materials. A new facebow record, occlusal vertical dimension verification jig, and interocclusal records were used for precise mounting. The master casts were scanned and digitally designed using Exocad. Restoration involved a combination of milled lithium disilicate all-ceramic crowns with cutback and layering for the anterior and premolar teeth, and monolithic zirconia crowns for implant restorations to ensure strength and longevity. Variolink Esthetic LC cement was used for lithium disilicate bonding, while RelyX Unicem was applied for zirconia crowns. Screw-retained prostheses were selected for the implants to allow retrievability. Due to enamel alterations from fluorosis, the total-etch technique with superficial enamel removal was utilized to optimize bonding. Functional harmony was maintained through anterior guidance using Duralay jigs. A protective occlusal splint was provided post-treatment. Results: The treatment successfully restored the patient's smile and functionality. Optimized resin bonding techniques improved adhesion to fluorotic enamel, ensuring a stable, aesthetic outcome. The patient expressed high satisfaction with the results. Conclusion: Severe dental fluorosis requires individualized planning to restore function and esthetics. A meticulous approach ensures durable, patient-centered outcomes.

**ABSTRACTS CLINICAL CASE REPORT POSTER PRESENTATIONS**  
**PROSTHODONTICS**

**CC29 Digital Workflow for Implant-Retained Mandibular Denture after Fibula Reconstruction.** Y.T. LIEU\*, A.K. HERNANDEZ, C.C. YANG, W. POLIDO (Indiana University School of Dentistry)

Purpose: To assess feasibility of incorporating a digital workflow into a full arch mandibular prosthesis in a patient reconstructed with fibula free flap graft. Case History: A patient with a history of mandibular gunshot wound had undergone fibula free flap surgery as part of his mandibular reconstruction in 2019. The patient presented partially dentate, and a decision was made to extract all teeth to create sufficient restorative space. A provisional complete denture was fabricated, and a dual scan was performed. 4 mandibular implants with diameter of 3.75mm and 8mm in length were placed in the mandible. During implant placement, simultaneous debulk of the fibula flap was done to accommodate for the future prosthesis. Immediate loading of the implants was completed by converting the existing mandibular denture to an implant conversion prosthesis. Three months after surgery, implants were stable and osseointegrated. An intra-oral scan using a cross-arch fixation scan body was used to verify the implant positions. This was done to overcome the inaccuracies associated with a conventional intra-oral scan due to the nature of the soft tissue reconstruction. This digitally verified position was used to fabricate a new prototype to ascertain the final aesthetics and to verify passivity of the scan. Prototype was adjusted before fabrication of the final zirconia mandibular implant-supported complete denture. Results: This digitally verified position was then used to fabricate a new prototype to ascertain the final aesthetics and to verify passivity of the scan. Patient was happy with the aesthetics and improved ability to function. Conclusion: Incorporation of digital workflow is feasible for patients with large fibula flap rehabilitations to overcome inaccuracies created by excessive mobile soft tissue.

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## PREVIOUS YEAR SUMMARY:

# IUSD RESEARCH DAY 2024

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The dental school came together to celebrate our research achievements at the 32nd Annual Research Day on April 10, 2024, at the IU Indianapolis Campus Center. One hundred and eleven students, faculty, and staff members presented 94 research projects. Dr. Jane Weintraub, former dean at University of North Carolina at Chapel Hill Adams School of Dentistry, immediate past president of the American Association for Dental, Oral and Craniofacial Research (AADOCR), and the first R. Gary Rozier and Chester W. Douglass Distinguished Professor in Dental Public Health offered the keynote address, sharing wisdom from her 40-year research career in her talk, "The Hunt to Understand and Prevent Oral Disease: Clinical trials, tribulations and other research adventures."

## DENTAL HYGIENE STUDENTS

- IU Indianapolis Dental Hygiene Research Day Award **Marika Herron and Tiana Wright**  
*Honorable Mention: Courtney Sparks and Abilene Drake*
- IU Fort Wayne Oral Health Research Award **Haley Hooley**

## PREDOCTORAL DENTAL STUDENTS

- AADOCR Student Research Day Award **Naomi Riley**
- Cyril S. Carr Research Scholarship **Parham Karimi, Brittany Gehlhausen, Jose Herrera**
- Dean's Award for Research Excellence **Andrew Doan, Navia Novosel**
- Dentsply Sirona/AADOCR SCADA Award Program - Selected Participant **Johnna Snider**
- IDA Student Research Award **Navia Novosel**
- King Saud University Travel Award for Predoctoral Student Research **Parham Karimi**
- Predoctoral Student Best Clinical Case Report Award **Ashley Blankenbaker**
- Recognition of Outstanding Research Engagement **Naomi Riley (D2), Johnna Snider (D3),  
Brittany Gehlhausen (D4)**
- Research Honors Program - Certificate of Achievement **Andrew Doan (DDS), Brittany Gehlhausen (DDS),  
Parham Karimi (DDS), Sara Alhaffar (DDS),  
Carrie Lane (DDS), Aparna Chintapalli (DDS),  
Navia Novosel (DDS), Deepthi Devireddy (DDS),  
Jose Herrera (DDS)**

## GRADUATE DENTAL STUDENTS

- Delta Dental Award for Innovation in Oral Care Research **Jacob Gussert**
- King Saud University Travel Award for Best Clinical Case Report **Matthew Thompson**
- King Saud University Travel Award for Graduate Student Research **Lucy Knippenberg**
- King Saud University Travel Award for PhD Student Research **Drashty Mody**
- Maynard K. Hine Award for Excellence in Dental Research **Giovanna Denucci**
- The Stookey Trailblazer Student Researcher Award **Katie Chester**
- The Stookey Preventive Dentistry Research Award **Giovanna Denucci**

## STAFF

- IUSD Research Staff Award **Lauren Levendoski**

## FACULTY

- IU School of Dentistry Alumni Association Distinguished Faculty Award for Research **Dr. Mythily Srinivasan**
- The Stookey Trailblazer Faculty Researcher Award **Dr. Thankam Thyvalikakath**
-

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to the Indiana University School of Dentistry  
Research Day award recipients and participants.



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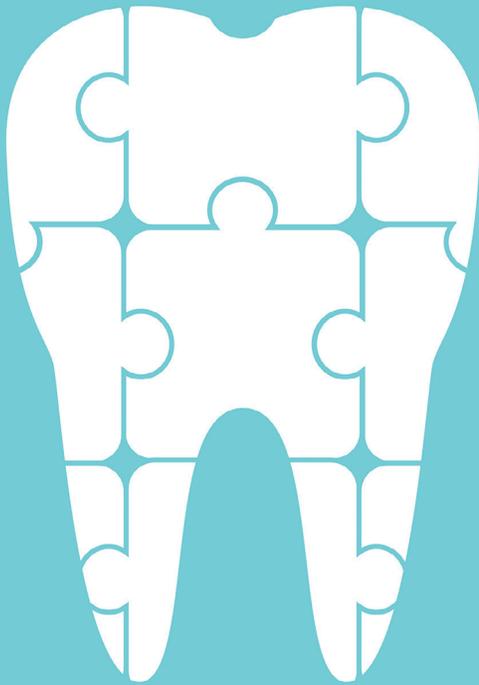
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