

31st HINMAN STUDENT RESEARCH SYMPOSIUM



October 30 - November 1

at the Historic Peabody Hotel – Memphis, TN



31st Hinman Student Research Symposium

sponsored by the

**University of Tennessee
Health Sciences
College of Dentistry**

supported by

**UT College of Dentistry
Alumni Association
Procter & Gamble**

DEAN'S WELCOME



Ken Tilashalski, DMD (Dr. T)

Dean, College of Dentistry
UT Health Sciences

Welcome to the Hinman Dental Student Research Symposium!

On behalf of UT Health Sciences College of Dentistry, I am thrilled to welcome our talented student presenters, dedicated faculty mentors, distinguished judges, and guests.

This symposium is a wonderful celebration of curiosity, innovation, and the bright future of oral health care. We are incredibly proud of each student whose hard work and enthusiasm are showcased here, and grateful to the mentors, organizers, and judges who make this event possible. We are delighted to host you and look forward to celebrating your accomplishments and learning from your work.



Douglas R. Dixon, DMD, MSD, PhD

Associate Dean for Research

Research methodology is the compass of modern medicine and dentistry; without its structured process and critical thinking, clinical curiosity remains just a guess, but with it, discovery transforms into the evidence that improves the lives and wellbeing for our patients.

KEYNOTE SPEAKER



Angela Gullard, DMD, PhD, MDS, FACP

Dr. Angela Gullard is a full-time associate professor in the Department of Prosthodontics at the University of Tennessee Health Sciences here in Memphis. She earned her DMD and PhD in Molecular and Cellular Pathology from the University of Alabama at Birmingham. She then pursued specialty training at the UT Health Sciences College of Dentistry in Memphis and earned a Certificate in Prosthodontics and a Master of Dental Science degree. A board-certified prosthodontist, she serves as the director of implant prosthodontics and head of prosthodontics research, while also treating complex patients in faculty practice. She regularly engages with predoctoral students and postgraduate trainees in the classroom and the clinic. She is passionate about patient care, education, and dental research. Outside of the dental lab and clinic, you'd probably find her working on a craft project, experimenting in the kitchen, or doing home renovation work.

PROGRAM

FRIDAY, OCTOBER 30, 2026

12:00 – 5:00 pm **Registration and Poster Setup**

Mezzanine and Hernando DeSoto Ballroom

6:00 – 7:00 pm **Reception**

Cash Bar, Forest Ballroom

7:00 – 9:00 pm **Welcoming Banquet** | Venetian Ballroom

Keynote Speaker: : Angela Gullard, DMD, PhD, MDS, FACP

Associate Professor and Director, Department of Prosthodontics, UT Health Sciences, College of Dentistry

SATURDAY, OCTOBER 31, 2026

7:30 am **Continental Breakfast** | Forest Room

7:45 am **Late Arrival Registration**

8:00 am **Scientific Session I Oral Presentations** | Venetian Ballroom

10:00 am **Coffee break**

10:15 am **Scientific Session II Oral Presentations** | Venetian Ballroom

12:00 pm **Lunch**

1:30 pm **Scientific Session III Poster Presentations** | Hernando Desoto Room

SUNDAY, NOVEMBER 1, 2026

7:30 am **Continental Breakfast** | Forest Room

8:00 am **Scientific Session IV Oral Presentations** | Venetian Ballroom

10:00 am **Coffee break**

10:15 am **Closing Ceremonies and Awards Presentation** | Venetian Ballroom

Kenneth Tilashalski, D.M.D.

Dean, UT Health Sciences, College of Dentistry

Douglas Dixon, D.M.D., M.S.D., Ph.D.

Associate Dean for Research, UT Health Sciences, College of Dentistry

Anastasios Karydis, D.D.S., M.S., Ph.D.

Interim Associate Dean for Faculty Affairs, UT Health Sciences, College of Dentistry

SCIENTIFIC SESSIONS

SESSION I | ORAL PRESENTATIONS Clinical Research

101. Ana Pagan-Rivera, Mairim Soto-Ortiz, Lydia López-Del-Valle, Maria Saledo, Natalio Debs, Azeez Butali, Carmen Buxó-Martínez.
Maternal Folic Acid and Selected Medication Consumption and Orofacial Clefts
School of Dental Medicine, University of Puerto Rico, San Juan, Puerto Rico

102. Dana Moskowitz, Matthew Finkelman, Adam Lowenstein.
Gingival Recession Varies Among Cardiovascular Disease Patients After Orthodontic Treatment
Tufts University, Boston

103. Kaige Pi, Alice Lin, Ethan Pham, Jacob Einhaus, Austin Davies, Brice Gaudilliere, Dyani Gaudilliere, Xiaoyuan Han.
Systemic Immune Dysregulation in Chronic Periodontitis: A Mass Cytometry Study
Department of Biomedical Sciences, University of the Pacific, Arthur A. Dugoni School of Dentistry, San Francisco

104. Mariah Jordan, Justus Jackson-Allen, Crystal Nwabeke, Janae Zirker, Ethel Harris, Leela Subhashini Alluri, Vladimir Berthaud, David Mott, James Cade, Dollada Srisai, Gunaraj Dhungana, Alexys Ferguson, Cherae Farmer, Derek Wilus, Mohammad Tabatabai, Zaid H. Khoury, India Menefield, Chethan Sampath, Pandu R Gangula.
Race/Ethnicity-Associated Differences in Plasma Biomarkers in Periodontal Disease and HIV
Department of Oral Diagnostic Sciences & Research, School of Dentistry, Meharry Medical College, Nashville

105. Praveen Bhoopathi Haricharan, Belinda Nicolau, Jocelyne Feine, Lamin Juwara, Raphael F de Souza.
Does Oral Disease contribute to Cognitive Impairment?
Causal Insights from the Canadian Longitudinal Study on Aging (CLSA) McGill University, Montreal, H3A 1G1, Canada

106. Purushottam Panday, Gunaraj Dhungana, Chethan Sampath, Pandu R. Gangula
Restoring Nitric oxide Homeostasis Reverse Pg-LPS- Induced Endothelial Dysfunction
Department of Oral Diagnostic Sciences & Research, School of Dentistry, Meharry Medical College, Nashville

107. Rehnuma Rashid, Scott C. Thomas, Fangxi Xu, Samantha Hwang, Orrin Devinsky, Claude Steriade, Deepak Saxena.
Early Gut Microbiota Composition Correlates with Seizure Control in Idiopathic Generalized Epilepsy
New York University, College of Dentistry

108. Tanvi Gupta, Amina Nouri, David Dadoun, Craig Pearl.
3D-Printed Guides Enable Precise Stock TMJ Reconstruction
The University of Texas, Houston School of Dentistry, Houston

109. Tucker Sala, S Shahrabi Farahani.
Diagnostic Insights into Gingival Premalignancy Using Cytokeratin 17 and SOX11 Immunostaining.
College of Dentistry, University of Tennessee Health Sciences, Memphis

110. William Raney, Matthew Kesterke, Shivam Y. Mehta, Sumit Yadav.
Horizontal-Plane Rotational Effects of Maxillary Expansion: RPE versus MARPE
Department of Orthodontics, Texas A&M College of Dentistry, Dallas

111. Zachary Marx, Huifeng Jin, Man Hung.
Advanced Skeletal Maturity Alters Nasal Pressure Response to RME
Roseman University of Health Sciences, South Jordan

SESSION II | ORAL PRESENTATIONS Basic Science Research

201. Aayushi Shah, Allahe Majidi, Shilpa Bhandi, Frank W Licari, Charles Miller, Shankargouda Patil
Genomic Insights Improve Risk Assessment and Planning in Oral Surgery.
Roseman University of Health Sciences College of Dental Medicine

202. Alexander Browning, S Rajasingh, R Johnson.
Osteogenic and Anti-Inflammatory Potential of Oral Mesenchymal Stem Cells Cultured on Collagen and Gelatin Microspheres.
College of Dentistry, University of Tennessee Health Sciences, Memphis

203. Claire Killoran, Marc Shlossman, Ann Spolarich, Adriana Silva, Priscilla Phillips.
Zoonotic Transmission of Periodontal Pathogens Between Humans and Canines
A.T. Still University, Arizona School of Dentistry & Oral Health, Mesa, Arizona

204. Courtland Jackson, Modar Kassan, Mustafa Dabbous, Vrushali Abhyankar, Ammaar Abidi.
Sodium Channel Regulation in Periodontal Inflammation: Implications for CB2 Modulation.
College of Dental Medicine, Lincoln Memorial University, Knoxville.

205. Daniela Marín-Cadavid, Alfredo Sierra-Cristancho, Sushweta Mahalanobish, Angela Bruzzaniti.
Targeting Pyk2 Promotes Bone Gain Without Negative Alveolar Bone Effects.
Indiana University School of Dentistry

206. Jasmeen Kaur
Salivary LL-37 Precedes Dental Caries in Pediatric Kenyan Cohort.
University of Washington School of Dentistry

207. Jonathan Banks, Dakshina Acharya, Mateusz Wietecha, Anne George, David Reed.
NG2/CSPG4 Loss Impairs Mandibular Fracture Healing and Rewires Matrix Signaling
University of Illinois Chicago College of Dentistry, Chicago

208. Kevin Nguyen, Qian Gong, Abdul Ahad Jamshed, Kevin Marc Dioneda, Haoyan Zhai, and Qian Cong
Dysregulated Mineralization and Suture Patency Deficits Following ENPP1 Ablation
Department of Biomedical Sciences, Texas A&M University College of Dentistry, Dallas

209. Philip Merry, Mary Elmeniawi, Gunjan Bhatia, Xiaobin Yu, Jianming Xu, Walid D. Fakhouri
Phosphodeficient TWIST1 mice exhibit craniofacial abnormalities associated with heart defects
Center for Craniofacial Research, Department of Diagnostic and Biomedical Sciences, UTHealth Houston School of Dentistry

210. Sarvenaz Ghorbanian, Joseph Ferracciolo, Michael Rowse, Laura Young, Joshua Thomson, and Eric Krukonis.
Oral Probiotic Inhibits Streptococcus mutans Biofilms and Orthodontic Archwire Colonization.
University of Detroit Mercy School of Dentistry

211. Sophie Schmitz, Francis Boksa, and Julie Olson.
A Novel Immunoregulatory Role for Pregnancy-Specific Glycoprotein-1 in Microglial-Mediated Neuroinflammation.
University of Minnesota, School of Dentistry

SESSION III | POSTER PRESENTATIONS Basic Science Research

1. Abigayle Talbot, Susana Salazar Marocho.
Training in Bonding and Light-Curing across 8-year CODE Reports
University of Mississippi Medical Center

2. Akhilesh Kasula, Alivia Shasteen, Md Ataur Rahman, Modar Kassar, Undral Munkhsaikhan, Mahdiah Alipour.
Determinants of Patient Acquisition and Financial Outcomes in Early-Career Dental Practice Beyond Clinical Competence
Lincoln Memorial University College of Dental Medicine

3. Ally Grace Bounds, SR Clark, D Versluis-Tantbirojn, A Versluis.
Cuspal Flexure of Self-cure, Dual-cure, and Light-cure Core-Buildup Composites
College of Dentistry, University of Tennessee Health Sciences, Memphis

4. Andrew M. Ratz Jr., Vitor L. Ribeiro, Karen V. Swanson, John Wrobel, Tomaz Alves, Kevin M. Byrd, W. June Brickey, Jenny P. Y. Ting, Julie T. Marchesan
IL-18 Prevents Periodontal Inflammation and Bone Resorption Only in Females
Department of Periodontology, Adams School of Dentistry, University of North Carolina

5. Audrey Lessing, Jacob O'Neil, Matthew Bonett, Manita Shakya, Tiafi Bergamin deCastro, Alison J. Scott.
Microglial Cell Lines Accumulate Perilipin-1/2-Positive Lipid Droplets
University of Maryland, Baltimore

6. Bhargavi Motheramgari, S Shahrabi Farahani.
Novel Insights into Oral Squamous Cell Carcinoma Invasion: The Role of Neuropilin-1
College of Dentistry, University of Tennessee Health Sciences, Memphis

7. Carson Stewart, J Brooks, BA Wilson, M Gillespie, Y Zhang
Human Salivary Extracellular Vesicle Tetraspanins as Biomarkers and Therapeutic Targets
College of Dentistry, University of Tennessee Health Sciences, Memphis

8. Christina Hurmis, Joseph Ferracciolo, and Eric Krukonis.
Lactobacillus-based Probiotics Interfere with Porphyromonas gingivalis Biofilm Formation
¹University of Detroit Mercy School of Dentistry

9. Chelsea Guo, Jessie J. Alfaro, Anahit Hovhannisyan, Felix J. Amarista, Daniel E. Perez, Kyle Allen, and Armen N. Akopian.
Elucidating Temporomandibular Joint Retrodiscal Tissue Innervation in Patients with Temporomandibular Joint Disorders.
School of Dentistry, University of Texas Health Sciences at San Antonio

10. Divya Pandey, Shengtong Han.
Pinpointing Causal GWAS Loci for Dental Caries Using Statistical Fine-Mapping.
Marquette University

11. Drew Cuba, Portia Hahn Leat, Brittini Levasseur, Julie Christianson, Erin Ealba Bumann.
Early Life Stress Results in Bone-Specific and Sex-Specific Changes.
University of Missouri-Kansas City School of Dentistry, Kansas City

12. Ellie Anderson, Madeleine Daly, Dustin L. Higashi, Justin L. Merritt.
Parvimonas micra Effector Proteins Modulate Neutrophil Phenotypes.
Oregon Health & Science University, Portland

13. Evan Dean, George R. Bauer, Josh Noll, Zachary Baldwin, Roy Miller, Matthew Gorr, Loren Wold, and James J. Cray.
Prenatal Exposure to Nicotine Free Vape Alters Craniofacial Development
The Ohio State University College of Dentistry, Columbus

14. Gatphan Atassi, Brian Shumway, Sarah Kande, Richard J. Lamont.
Immunological Profiling in Premalignant and Malignant Stages of Proliferative Verrucous Leukoplakia.
University of Louisville School of Dentistry

15. Grace Amour, Quingshun Quinn Li
The Potential Role of mRNA Alternative Polyadenylation in Regulation of Gene Expression in Amelogenesis Imperfecta
Western University of Health Sciences College of Dentistry, Pomona

16. Grace Oh, Hannah Kim, Alex Trostle, Chunbao Rao, Siyu Chen, Aaron W. James, Robert J. Tower, Ginny Ching-Yun Hsu.
Identification of Sex-Dimorphism of Temporomandibular Joint Derived Perivascular Stromal Cell.
Oregon Health & Sciences University, Portland

17. Cibeale Dal Fabbro, Luciano Gasperin Junior, Hana Sassi, Jacques Yu, Dominic Falardeau, Arlette Kolta, Pierre Rainville, Nelly Huynh, Nadia Gargouri, Anaïs Landry-Schonbeck, Ryma Kabir, Guillaume Vallet.
Masticatory Function in Older Adults With Mild Cognitive Impairment.
Université de Montréal, Montréal, Canada

18. Kallen Smith, S Shahrabi Farahani
Immune Microenvironment Signatures in Pediatric Giant Cell Fibroma: An Immunohistochemical Exploration
College of Dentistry, University of Tennessee Health Sciences, Memphis

19. Kate Vinges, Gilliana Rozenblum, Shahram Samy, Amal Sahyoun.
Microbiome-Targeted Prebiotics for Gingival Immune Homeostasis: Emerging Therapeutic Opportunities.
College of Dental Medicine, Lincoln Memorial University, Knoxville

20. Lasya Bhogadi, Henry C. Margolis, Elia Beniash.
Crucial Role of Amelogenin Phosphorylation in Enamel Maturation.
University of Pittsburgh School of Dental Medicine, Pittsburgh, Pennsylvania

21. Leena Eltilib, Aonjittra Phanrungsuwan, Elis Lira dos Santos, Shifa Shahid, Nathália Dantas Duarte, Do-Gyoon Kim, Brian L. Foster.
Targeting Excess Pyrophosphate Rescues Periodontal Defects in X-Linked Hypophosphatemia.
College of Dentistry, The Ohio State University, Columbus

22. Maxym Sutton, Jackson Fife, Zachary Marx, Brandt Stratton, Man Hung.
Heterogeneity in Vital Pulp Therapy Outcome Reporting: A Scoping Review
Roseman University of Health Sciences, South Jordan

23. Megan Chang, Pedro Henrique Carneiro, David Vang, Laura Henao, Aline Cristina Abreu Moreira-Souza, Cassio Luiz Coutinho Almeida-da-Silva.
Cigarette Smoke Enhances Fusobacterium nucleatum Infection Through Aryl Hydrocarbon Receptors.
Department of Biomedical Sciences, University of the Pacific—San Francisco

24. Nadia Milfort, P. Gabriel, B. Lima
Oral Microbiota and Enterococcus faecalis Interactions Promote Reciprocal Chlorhexidine Tolerance.
Department of Endodontics, College of Dentistry, University of Florida

25. Nicholas Daniel Renfree, S Rajasingh, R Johnson
Comparative Evaluation of Collagen and PTFE-Based Biomaterials on the Viability and Osteogenic Differentiation of Dental Tissue-Derived Cells
College of Dentistry, University of Tennessee Health Sciences, Memphis

26. Shivani Patel, Alivia Shasteen, Ammaar Abidi.
GLP-1 Receptor Agonists and Alveolar Bone: A Narrative Review
Lincoln Memorial University, Knoxville

27. Weston Parker, S Rajasingh, R Johnson
Effects of Hydrogen Peroxide and Carbamide Peroxide on the Viability and Inflammatory Responses of Human Gingival Fibroblasts
College of Dentistry, University of Tennessee Health Sciences, Memphis

28. Yuan Hu, Todd M, Parco, Jon D, Wagner, Pratish Parbhoo, Caroline Soviak, John T, Araiza, Colin O' Beirne, Sehrish Javaid, Praveen Parachuru, Matthew Lewis, Carlos A. Acosta, Toshihisa kawai, Umadevi Kandalam.
Micro-CT Evaluation of Calvarial Bone Regeneration in Dual-Lineage Differentiated Gingival Stem Cells
Woody L. Hunt School of Dental Medicine, Texas Tech University Health Sciences Center, El Paso.

29 Ted Pasquette. Christina Casciani, Dr. Eliane Dutra, Dr. Liping Xiao, Dr. Marja Hurley
Effects of Visbiome Treatment in the Temporomandibular Joint Abnormalities of Sickle Cell Disease Mice.
University of Connecticut School of Medicine, and School of Dental Medicine, UConn Health, Farmington

Biomaterials

30. Anaya Zaineb, Rahul Shah, Nina K. Anderson, Georgios E. Romanos
Wettability of Titanium Implants Utilizing Hyaluronic Acid and Bone Grafts
Dept. of Periodontics and Endodontics, Stony Brook University, Stony Brook, NY

31. Tereza Bokal, Carter Cooper, Mahmoudreza Tabatabaeian, Chung Kau.
LIRA: Laser-Induced Reversible Adhesive
University of Alabama at Birmingham School of Dentistry

32. Keaton Brunner, Joel Haug¹, Maria Lozoya¹, Charles Veltri², John Mitchell¹
Effects of Oral Nicotine Pouches on Periodontal Ligament Stem Cells
Department of Biomaterial Sciences, College of Dental Medicine-Arizona, Midwestern University, Glendale

33. Keyu Patel, R Cheema, D Taylor, A Selecman, A Versluis.
Flexural Strength of Conventional, Milled, and 3D-Printed Denture Bases.
College of Dentistry, The University of Tennessee Health Sciences, Memphis

34. Miller Hodge, F Andretti, D Versluis-Tantbirojn, A Versluis.

Bond Quality of Deep Core Build-Up Materials in Pulp Chambers.

College of Dentistry, The University of Tennessee Health Sciences, Memphis

Clinical Research

35. Abdullah Alqattan, Charles Janus, Terence A. Imbery. **Budget Light-Curing-Unit's Photocuring Claim Is Not Supported by Evidence.**

Virginia Commonwealth University School of Dentistry

36. Remi Brebion, Tim Li, and Yuanyuan Liu **Descending Control of Glucagon (GCG) Neurons in the Nucleus Tractus Solitarius (NTS)**

Medical University of South Carolina – James B. Edwards College of Dental Medicine

37. Akansh Mani

Deep Learning-Based Caries Detection in Bitewing and Periapical Radiographs Using Object Detection Models.

WVU School of Dentistry

38. Alyssa Saltz, Oyler, D.R., Rojas-Ramirez, M.V. **Dental Opioid Prescribing Patterns Among Kentucky Adolescents and Young Adults.**

College of Dentistry, University of Kentucky

39. Bhavyasri Gaddam¹, Nini shah*, Himali shah, Gunaraj Dhungana, Dollada Srisai, Chethan Sampath, Ethel Harris, Leela Subhashini Alluri, Vladimir Berthaud, David Mott, James Cade, Alexys Ferguson, Anaite Montes Bu, Derek Wilus, Mohammad Tabatabai, Zaid Khoury, Cherae Farmer-Dixon, Pandu R Gangula.

Differential Salivary Immune and Microbial Profiles in Persons Living with HIV With and Without Periodontal Disease.

Department of Oral Diagnostic Sciences & Research Meharry Medical College, Nashville, TN

40. Billal Anwary, Abel Ayalewu, Neamat Hassan, Hassan Ziada.

Marginal Bone Changes in Natural Teeth Adjacent to Dental Implants

University of Nevada, Las Vegas School of Dental Medicine

41. Brittany McCall, Abimbola Oladayo.

Social Risk and Dental Care Access in an Urban FQHC.

A.T. Still University

42. Camara Ford, Nyah Anderson, Orion Phipps, Abraham Alnossif, Gunaraj Dhungana, Dollada Srisai, Chethan Sampath, India Menefield, Ethel Harris, Leela Subhashini Alluri, Vladimir Berthaud, David Mott, James Cade, Alexys Ferguson, Derek Wilus, Mohammad Tabatabai, India Menefield, Zaid Khoury, Cherae Farmer-Dixon, Pandu R Gangula.

Impact of Age on Salivary Biomarkers and Microbiome in Patients with Periodontal Disease With Or Without HIV Infection.

Department of Oral Diagnostic Sciences & Research, School of Dentistry, Meharry Medical College, Nashville, TN

43. Chikezie Anige, Gunaraj Dhungana, Dollada Srisai, Chethan Sampath, India Menefield, Ethel Harris, Leela Subhashini Alluri, Vladimir Berthaud, David Mott, James Cade, Alexys Ferguson, Derek Wilus, Mohammad Tabatabai, Zaid Khoury, Cherae Farmer-Dixon, Pandu R Gangula.

Age-Associated Differences in Plasma Biomarker Profiles Across Periodontal Disease and HIV Status.

¹Department of Oral Diagnostic Sciences & Research, School of Dentistry, Meharry Medical College, Nashville, TN

44. Edward Kim, Natalia Tjokro, Casey Chen **Taxa Filtering Unmasks Salivary Dysbiosis Signals That Refine Periodontal Diagnosis**

Herman Ostrow School of Dentistry of USC, University of Southern California, Los Angeles

45. Faraz Adibzadeh, Arman Danesh, Gianfranco Patella, & Amal Idrissi Janati.

Products and Activities Associated with Concomitant Facial and Oral Trauma.

Faculty of Dental Medicine and Oral Health Sciences, McGill University, Montreal, Quebec

46. Haylee Krupp, Matthew Mortenson, Tanya Al-Talib, Pouya Momtaz, Neamat Hassan Abubakr.

Comparative Analysis of Color Stability and Surface Roughness of Different Orthodontic Aligner Materials

University of Nevada, Las Vegas School of Dental Medicine

47. Himali Shah, Bhavyasri Gaddam, Ethel Harris, Leela Subhashini Alluri, Vladimir Berthaud, David Mott, James Cade, Dollada Srisai, Gunaraj Dhungana, Alexys Ferguson, Cherae Farmer, Derek Wilus, Mohammad Tabatabai, Zaid H. Khoury, India Menefield, Chethan Sampath, Pandu R Gangula.

Impact of Sex on Salivary Biomarkers and Microbiome in Patients with Periodontal Disease & With or Without HIV Infection

Department of Oral Diagnostic Sciences & Research, School of Dentistry, Meharry Medical College, Nashville, TN

48. Ifeanyi Okoye, Marisol Tellez, Eugene Dunne, Sumant Puri, Yuan Liu.

Breastfeeding Duration and Oropharyngeal Candidiasis Predict Infant Oral Fungal Colonization

Temple University Kornberg School of Dentistry, Philadelphia, PA, USA

49. Jackson Fife, Zachary Marx, Blaze Layton, Man Hung. **Proven but Passed Over: U.S. Endodontists Underuse Intraosseous Anesthesia.**

Roseman University of Health Sciences, South Jordan, UT 84095, USA

50. Karissa Spokane.

Orthodontic Pain Alleviation with Chewing Gum.

West Virginia University School of Dentistry

51. Kenya Williams, Joshua Williams, Gunaraj Dhungana, Dollada Srisai, Chethan Sampath, Ethel Harris, Leela Subhashini Alluri, Vladimir Berthaud, David Mott, James Cade, Alexys Ferguson, Anaite Montes Bu, Derek Wilus, Mohammad Tabatabai, India Menefield, Zaid Khoury, Cherae Farmer-Dixon, Pandu R Gangula.

Differential Plasma Biomarker Profiles in Periodontal Disease Patients With and Without HIV.

Meharry Medical College School of Dentistry

52. Landon Evans, W. Josh Bozeman

Implant and Crown Features and Adjacent Tooth Bone Level Changes.

East Carolina University School of Dental Medicine

53. Lena Huynh, Olga Ensz, Tina Treloar, Yasmin Teixeira das Gracias, Luciana Shaddox.

Radiographic Outcomes of Grade C Molar-Incisor Periodontitis (C/MIP) in Young Individuals

Department of Community Dentistry and Behavioral Sciences, College of Dentistry, University of Florida

54. Makayla Boekes, Grace Schmitt, Jyoti Mago, Sung Kim, Jessica Immonen.

CBCT Flatness Ratios as Predictors of TMJ OA.

University of Nevada, Las Vegas School of Dental Medicine

55. Mary Catherine Carroll, Claude Delille, Amy Chan, Robert McDonough, Marianne Jurasic, Matthew Mara.

Improving Peer Educator Preparedness in Dental Education: A Training Session

Boston University Henry M. Goldman School of Dental Medicine

56. Salma Elwazeer, Melinda Arrieta, Trang Le, Thinh T. Vuong, Kayla Braswell.

Topical Fluoride Use and Vaccination Hesitancy Among Parents and Caregivers in El Paso, Texas: Important Social Determinants Uncovered

Texas Tech Oral Health Clinic, Woody L. Hunt School of Dental Medicine, Texas Tech Health Sciences, El Paso.

57. Megan Naccarato, Man Hung.

Orthodontic Tooth Movement and Oral Bony Exostoses: A Scoping Review.

Roseman University of Health Sciences.

58. Nayeli D. Ayala, Xcaret Castelan, Jeffrey B. Payne, Kaeli K. Samson, Richard A. Reinhardt, Megan M. Christiansen, Laura P. Anderson, Amy C. Killeen.

Periodontal Inflamed Surface Area Remained Stable with Regular Periodontal Maintenance.

University of Nebraska Medical Center (UNMC) College of Dentistry, Lincoln, NE

59. Nisha Parakadavil, Vishwas Wadhwa, Nicole Shlmon, Dr. Jaffer Shariff, Dr. Daniela Gurpegui, Dr. Mark Makiling.

Perceived Impacts of the One Big Beautiful Bill Act on Graduate Education/Healthcare in Underserved Communities.

Touro College of Dental Medicine

60. Rena Zhang, Kathleen Higgins, and Ronald Faram.
Peripheral Giant Cell Granulomas Associated with Dental Implants

The University of Oklahoma Health Campus

61. Sneha Thota, Ashley Sapra.

Association Between Obstructive Sleep Apnea Risk and Dental Caries in Adult Dental Patients.

University of New England College of Dental Medicine

62. Tenzin Namgyal, Cameron Randall, Susan Coldwell.
Dentists' Perspectives on Feasibility of Chemosensory Screenings in Dental Visits

University of Washington, Seattle, WA

63. Troy Bartels, A Al-Dayeh, RA Williams, WH Shintaku.
Sex and Ethnicity Differences in Palatal Bone Thickness and Density

College of Dentistry, University of Tennessee Health Sciences, Memphis

64. W. Josh Bozeman, Landon Evans.

Implant and Crown Features and Adjacent Tooth Restorative Prognosis.

East Carolina University School of Dental Medicine

**SESSION IV | ORAL PRESENTATIONS
Biomaterials/Technology**

401. Brandt Stratton, Zachary Marx, Jackson Fife, Rheannon Ainsworth, Man Hung.

Effects of Nano Silver Fluoride on Demineralized Dentin.

Roseman University of Health Sciences, South Jordan

402. Caydon Norris

Protein-to-Mineral Ratio Determines the In Vitro Bioactivity of Enamel-Derived Biomaterials.

Midwestern University - College of Dental Medicine Illinois

403. Chelsea Mok, Zhiyue Zhu, Craig A. Simmons.
Hybrid Tissue-Polymer Heart Valves with Native-like Mechanical Function.

University of Toronto

404. Christine Tran.

3D-Printed Denture Resin Build Orientation Affects Wettability and Biofilm Formation

University of Oklahoma Health Campus, College of Dentistry, Oklahoma City

405. Kayla Crowley, Alexandria Lo, Chang H. Lee.
Engineering Human TMJ Disc in 3D-Printed Scaffolds with Stepwise Differentiation

Columbia University College of Dental Medicine

406. Mikaela Kutrolli, Noah S. Pereira, Delaram Ghanbariamin, Katherine Arnold, Alix Deymier, Mohamadmahdi Samandari, Ali Tamayol.

Multiscale Sacrificial Sugar Advances 3D-Printed PCL Scaffolds for Bone Tissue Engineering

University of Connecticut Health Center, Farmington, Connecticut

407. Coty Ma, Cibebe Dal Fabbro, Nelly Huynh, Luciano Gasperin Junior, Pierre Rompré .

Detection of RMMA Episodes Using Deep Learning EMG Pipeline

Faculty of Dental Medicine, University of Montreal

408. Pearl Gerald-Emesih, Tai Van, Michelle Thompson, Victoria Vo, Cleverick

(C.D.) Johnson, Gary Frey, Nathaniel Holland, and Ryan Vahdani.

Assessing AI-Generated Onlay Design Accuracy in Reproducing Natural Tooth Anatomy

UT Health Houston School of Dentistry, Houston, Texas

409. Savanna Shaw, A Mohamed, D Versluis-Tantbirojn, A Versluis.

Shrinkage and Mechanical Properties of Composites with Different Curing Mechanisms.

College of Dentistry, University of Tennessee Health Sciences, Memphis

410. Ziqi Zhang, Nalia Gurgel, Kaleigh Warden, Kathy Yerex, Laura MacDonald, Dieter J. Schönwetter.

Beyond Age: AI Adoption in Dental and Dental Hygiene Education

University of Manitoba, Rady Faculty of Health Sciences

SESSION I | ORAL PRESENTATIONS

CLINICAL RESEARCH

101. Maternal Folic Acid and Selected Medication Consumption and Orofacial Clefts

Ana Pagan-Rivera¹, Mairim Soto-Ortiz¹, Lydia López-Del-Valle¹, Maria Saledo¹, Natalio Debs¹, Azeez Butali², Carmen Buxó-Martínez¹

1. School of Dental Medicine, Medical Science Campus,

University of Puerto Rico, San Juan, Puerto Rico.

2. University of Iowa College of Dentistry, Iowa City, Iowa.

Studies suggest folic acid (FA) intake may reduce non-syndromic orofacial clefts (nsCL/P) risk, including cleft lip (CL), cleft palate (CP), and cleft lip and palate (CLP). However, the potential influence of maternal medication consumption including aspirin, antacids, and levothyroxine on FA's protective effect remains unclear. This study aimed to evaluate associations between maternal selected medications use, FA intake, and nsCL/P risk.

FA and selected medication pregnancy use was obtained from questionnaires administered to control (n=242) and case (n=262) mothers from a study of Puerto Rican children (0-18 years). Pearson's chi-square, Fisher's exact tests and logistic regression (R²) were performed for nsCL/P risk factors, with odds ratios (OR) and 95% confidence intervals (CI) using STATAv17.

Among mothers (n=504), mean age was 31.6 ± 7.9 years; most were married (34.2%), had high school education (34.4%), and annual income <\$10,000 (42.4%). Significant differences were observed for maternal education (p=0.002), multivitamin (p=0.002), and folic acid (FA) (p<0.001), but not aspirin (p=0.91), antacid (p=0.91), or levothyroxine consumption (p=0.47). Adjusted models for aspirin (R²=0.04, p=0.05) and antacid (R²=0.04, p=0.05) were marginally significant, while levothyroxine model was significant (R²=0.04, p=0.04). Antacids increased nsCL/P risk, but not significantly (OR=1.21, 95%CI[0.32-4.59], p=0.78). Medication and FA consumption model showed increased odds for FA consumption with aspirin (OR=1.08, 95%CI[0.72-1.61], p=0.72), antacids (OR=1.07, 95%CI[0.72-1.60], p=0.73), and levothyroxine (OR=1.07, 95%CI[0.72-1.60], p=0.74); however, weren't statistically significant. Aspirin and multivitamin model was significant (R²=0.02, p=0.01). Multivitamin consumption significantly reduced risk (OR=0.52, 95%CI[0.33-0.81], p=0.004), but was not significant when consumed with aspirin (OR=0.78, 95%CI[0.46-1.34], p=0.37), antacids (OR=0.78, 95%CI[0.45-1.33], p=0.36) or levothyroxine (OR=0.78, 95%CI[0.46-1.34], p=0.37). Medication and cleft type model was statistically significant (p=0.003). Medication use increased CP (OR=1.09, 95%CI[0.11-10.40], p=0.94) and CLP (OR=1.54, 95%CI[0.33-7.28], p=0.58) odds, but not significantly.

FA and multivitamin consumption statistically decreased nsCL/P risk, while aspirin, antacids, and levothyroxine attenuated risk reduction. Antacids increased nsCL/P risk, although not significantly.

Funding Disclosure: Supported by grants from NIH: R00DE024571, R37DE008559, S21MD001830, and 2P50GM133807.

102. Gingival Recession Varies Among Cardiovascular Disease Patients After Orthodontic Treatment

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Objective: To evaluate whether cardiovascular disease (CVD), accounting for tissue perfusion relevance, is associated with increased gingival recession following orthodontic treatment. **Methods:** This retrospective cohort study analyzed the association between CVD and post-orthodontic gingival recession. Data were obtained from the BigMouth Dental Data Repository, a multi-institution database. Adults who had undergone orthodontic treatment with complete pre- and post-orthodontic periodontal charts were included. CVD was defined as conditions negatively affecting cardiac output and tissue perfusion (CVDs with increased relationships were analyzed separately). Patients were further stratified by medication use, for a total of four groups (Group 1: No CVD, Group 2: hypertension only, Group 3: CVD no medication, Group 4: CVD with medication). Changes in periodontal probing depths were analyzed using generalized linear mixed models (GLMM), adjusting for baseline probing depths and relevant covariates, including diabetes, smoking, age, assigned sex at birth, and duration.

Results: One thousand and forty-two charts were included, with 872 in Group 1, 130 in Group 2, 37 in Group 3, and 3 in Group 4. The respective number of surfaces included by group were 130074, 18780, 5388, and 486, for a total of 154728. Mean (SD) gingival recession values in millimeters were 0.07 (0.76), 0.16 (0.80), -0.02 (0.83), and 0.49 (0.77), respectively. The global test for the difference between groups was significant (p = 0.042), however, pairwise comparisons were not significant when using the Bonferroni correction.

Conclusion: While observed findings warrant additional investigation, further research would be needed prior to altering gold standards of care for orthodontic treatment protocols for patients with CVD. Supported in part by BigMouth through a waiver of database usage fees.

103. Systemic Immune Dysregulation in Chronic Periodontitis: A Mass Cytometry Study

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Introduction: Despite advances in dental care and oral hygiene, the prevalence of chronic periodontitis (ChP) remains high at 47.2% in the U.S. ChP is associated not only with local tissue destruction and tooth loss but also with systemic conditions including diabetes mellitus, adverse pregnancy outcomes, and cardiovascular disease. The mechanisms linking ChP to systemic health remain unclear. In our Phase I, we demonstrated systemic and cell-specific immune dysfunctions in patients with ChP, which can be temporarily reversed by nonsurgical local treatment. In Phase II, we aim to 1) validate these findings in a larger cohort over an extended time course and 2) investigate ChP oral and systemic immunological interactions using multiplex cross-tissue analysis.

Methods: Whole-blood samples from 16 patients with ChP and 12 controls were collected at baseline (n=28), 3 weeks post-ChP treatment (n= 25), and 3 months post-ChP treatment (n= 25) in the Bell Dental Center (San Leandro, CA). Gingival tissue samples from 14 ChP patients and 16 healthy controls at baseline were examined with 48-plex imaging mass cytometry (IMC). Mesmer and Scyan models were performed to identify cells and populations. Spatial analysis was based on generation of tissue section masks and extraction of cell-cell interaction data. Univariate analysis was performed on cell morphology, density, or function in each population within each tissue section between patients with ChP and healthy control.

Results: Updated IMC analysis demonstrated differences in immune cell abundance, function, and spatial distribution between healthy controls and patients with ChP. Elevated CD44 expression in fibroblasts and macrophage presence within epithelial border were observed in patients with ChP compared to healthy controls.

Conclusion: These preliminary findings complement previously reported CyTOF data and underscore systemic and local immune dysfunctions in patients with ChP. Ongoing high-dimensional analyses aim to elucidate oral-systemic immune interactions in ChP.

104. Race/Ethnicity-Associated Differences in Plasma Biomarkers in Periodontal Disease and HIV

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Objectives: This study investigated whether race/ethnicity is associated with plasma biomarker profiles in individuals with periodontitis (PD), with or without human immunodeficiency virus (HIV) infection. We evaluated differences in inflammatory and oxidative stress biomarkers between African American and non-African American participants across HIV and PD groups.

Research Design: Plasma samples from approximately 150 participants were stratified into four groups: HIV-/periodontally healthy (HIV-/PD-), HIV-/periodontitis (HIV-/PD+), HIV+/periodontally healthy (HIV+/PD-), and HIV+/periodontitis (HIV+/PD+). Ninety-six biomarkers were analyzed. Mann-Whitney U tests compared biomarkers by race within each group. Kruskal-Wallis tests evaluated differences across disease groups within each race category, followed by pairwise comparisons.

Results: Of 96 biomarkers, 35 (36.5%) showed significant race-associated differences in at least one group: 10 in HIV-/PD-, 11 in HIV-/PD+, 17 in HIV+/PD-, and 4 in HIV+/PD+. Granzyme A differed by race in three of four groups; no biomarker differed significantly across all groups. Within each category, 11 biomarkers differed across disease groups. Among non-African American participants, differences occurred most frequently between HIV+/PD- and other groups, whereas among African American participants, differences occurred most frequently between HIV+/PD+ and other groups. SDF-1 was the only biomarker significantly different across disease groups in both race categories.

Summary: Plasma inflammatory biomarker patterns associated with HIV and PD may vary by race/ethnicity. KEGG pathway analysis will further evaluate associated signaling pathways.

Conclusion: Race-associated differences in plasma biomarker profiles vary with HIV and PD status, suggesting heterogeneity in systemic inflammatory responses and potential relevance for biomarker-based risk assessment and personalized periodontal disease management.

Funding disclosure: We thank predoctoral students & GPR residents for participating in clinical research rotations each

week and working with patients in consenting, instrumenting oral/dental health surveys, and collecting oral specimens including saliva. We also thank clinical faculty Dr. Anita Sykes-Smith and all others including staff Ms. Yarbrough, Ms. Goodbar, Mr. Byers and his team for their help and support. Dental student research is supported by the HRSA-COE funding (D34HP00002) to the School of Dentistry, Meharry Medical College, and Nashville, Tennessee. NIH- Research reported in this presentation was supported by the National Institute of Dental & Craniofacial Research under award number U01DE033241 (Pandu Gangula) and National Institute of General Medical Sciences under award number R16GM149440 (Pandu Gangula), and National Institute on Minority Health and Health Disparities (NIMHD), USA, Grant (UC2MD019626, PG, Drs. Lindsey and Chearis).

105. Does Oral Disease contribute to Cognitive Impairment? Causal Insights from the Canadian Longitudinal Study on Aging (CLSA)

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Background: Oral health is increasingly recognized as a modifiable risk factor for cognitive impairment in aging populations, with plausible biological pathways namely systemic inflammation, impaired masticatory function, and nutritional deficiency. Longitudinal evidence has relied largely on standard regression approaches that are ill-suited to time-varying confounding, and Canadian population-based evidence remains scarce. We estimated the effect of self-reported oral health (SROH) and masticatory ability (MA) on incident cognitive impairment in middle-aged and older Canadians by employing a causal inference approach.

Methods: We conducted a analysis of three sequential waves of the Canadian Longitudinal Study on Aging (CLSA): Baseline (2011–2015), Follow-up 1 (2015–2018), and Follow-up 2 (2018–2021). The analytical sample comprised 24,155 community-dwelling adults aged 45 to 85 years. Self-reported oral health (SROH) and masticatory ability (MA) were assessed as independent exposures at Baseline. The primary outcome was incident cognitive impairment at Follow-up 2, defined using the CLSA Cognitive Impairment Indicator. Marginal structural models (MSM) with inverse probability of treatment weighting (IPTW) estimated counterfactual risk ratios (RR), with propensity scores derived via XGBoost. Missing data were addressed using multiple imputation by chained equations ($m = 5$), and estimates were pooled using Rubin's rules. E-value and simulation-extrapolation procedures were used as part of the sensitivity analyses.

Results: Poor SROH at Baseline was associated with a higher counterfactual risk of incident cognitive impairment at Follow-up 2 (RR = 1.64; 95% CI: 1.10, 2.46). No association was observed between inadequate MA at Baseline and

incident cognitive impairment (RR = 0.87; 95% CI: 0.59, 1.28). Stabilized weights approximated unity, indicating adequate positivity and covariate balance in the pseudo-population. Sensitivity analyses supported the robustness of the primary findings.

Conclusion: Poor SROH at baseline was associated with a higher population-average risk of incident cognitive impairment among middle-aged and older Canadians. The null finding for masticatory ability likely reflects the limited discriminatory capacity of single-item self-report rather than the absence of a true effect.

106. Restoring Nitric oxide Homeostasis Reverse Pg-LPS- Induced Endothelial Dysfunction

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Background: Periodontal inflammation can extend beyond the oral cavity through circulating bacterial products and inflammatory mediators. Because endothelial nitric oxide (NO) is central to vascular tone, we examined whether *Porphyromonas gingivalis* lipopolysaccharide (Pg-LPS) disrupts this pathway and whether that damage can be reversed.

Objective: To define how Pg-LPS alters endothelial NO homeostasis and test whether restoring tetrahydrobiopterin (BH₄) availability or activating antioxidant signaling improves endothelial function.

Methods: Primary human umbilical vein endothelial cells (HUVECs) were first titrated with Pg-LPS; 10 µg/mL produced a clear inflammatory response while preserving approximately 90% viability. Cells were then exposed to Pg-LPS alone or with L-sepiapterin (100 µM), a BH₄ precursor used to support eNOS coupling, or bardoxolone methyl (CDDO-Me; 100 nM), an Nrf2 activator used to strengthen antioxidant signaling, for 6–48 hours. Nitrite/NO, BH₄, reactive oxygen species (ROS), glucose uptake, gene expression, and protein expression were measured by biochemical assays, quantitative real-time PCR, and Western blotting.

Results: Pg-LPS increased TLR4/NF-κB signaling, ROS, and inducible nitric oxide synthase (iNOS) while suppressing the protective Nrf2/NQO1 pathway. GTP cyclohydrolase 1 (GCH1) and dihydrofolate reductase (DHFR), enzymes essential for BH₄ synthesis and recycling, were disrupted, resulting in lower BH₄ availability, impaired eNOS coupling, and abnormal NO signaling. Pg-LPS also increased PEA-15 and GLUT1, proteins linked to cellular stress and glucose handling, together with glucose uptake, supporting a metabolic shift. Both L-sepiapterin and CDDO-Me reduced inflammatory and oxidative changes and restored key features of BH₄/eNOS/NO signaling.

Conclusion: Pg-LPS drives endothelial dysfunction through linked inflammatory, oxidative, metabolic, and NO-signaling changes. Correcting BH₄ deficiency or activating Nrf2 signaling improved eNOS/NO homeostasis, strengthening the BH₄-eNOS-NO axis as a mechanistic connection between periodontal inflammation and vascular dysfunction.

Funding Disclosure: Dental student research is supported by HRSA-COE (D34HP00002). This research was supported in part by the National Institute of General Medical Sciences (R16GM149440), and National Institute on Minority Health and Health Disparities (UC2MD019626).

107. Early Gut Microbiota Composition Correlates with Seizure Control in Idiopathic Generalized Epilepsy

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Background: Drug-resistant epilepsy remains a major clinical challenge. Recent evidence suggests dysbiosis in gut bacterial communities is linked to various neurological issues, including epilepsy. However, it is not clear whether there is a correlation between patients' drug resistance and gut microbiota composition. Understanding early gut microbiome patterns may inform seizure control decisions, enable early intervention, and improve patient outcomes.

Hypothesis: We hypothesize that gut microbiota composition in early-stage idiopathic generalized epilepsy is associated with subsequent seizure control.

Methods: We conducted a prospective longitudinal cohort study of 48 patients with idiopathic generalized epilepsy (IGE), aged >13 years at enrollment and >6 years at seizure onset. Stool samples were collected for microbiome analysis from both newly diagnosed (<12 months) and treated patients. All participants had clinical histories consistent with IGE. Subjects were recruited across six North American centers as part of Human Epilepsy Project 3 (HEP3).

Results: Patients with newly diagnosed IGE who remained free from generalized tonic-clonic (GTC) seizures for one year exhibited a distinctly different gut microbiome compared to those with GTC ($p=0.001$) or any seizures ($p=0.001$). Age- and sex-adjusted taxonomic analyses revealed that the GTC seizure-free cohort was significantly enriched with specific microbes, namely *Eubacterium rectale*, *Mediterraneibacter faecis*, *Gemmiger formicilis*, and *Bifidobacterium adolescentis*. Furthermore, the microbiomes of seizure-free individuals demonstrated functional enrichment in pathways related to short-chain fatty acid (SCFA) production, vitamin B synthesis, nucleotide metabolism, and amino acid biosynthesis.

Conclusion: Our findings demonstrate that early gut microbiome composition is associated with later seizure control in newly diagnosed IGE, potentially mediated by short-chain fatty acid-producing microbes (especially butyrate). Future studies should explore whether drug resistance in idiopathic generalized epilepsy is microbiome-related, which could enable probiotic interventions and biomarker-based early prediction of treatment response.

Funding disclosure: The HEP3 study is supported by Finding A Cure for Epilepsy and Seizures (FACES), a nonprofit whose funding is derived from philanthropy, foundations, and industry; Jazz Pharmaceuticals; and the One8 Foundation.

108. 3D-Printed Guides Enable Precise Stock TMJ Reconstruction

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Objectives: Alloplastic total joint replacement (TJR) is the definitive treatment for end-stage temporomandibular joint (TMJ) disease. Stock prostheses are immediately available but require intraoperative bone recontouring, whereas patient-specific implants offer a superior fit at the cost of longer fabrication. This study describes a hybrid protocol integrating virtual surgical planning (VSP) and 3D-printed, patient-specific guides with stock alloplastic prostheses and reports the clinical experience of the first consecutive series treated with this technique.

Experimental Methods: We retrospectively reviewed adult patients (>18 years) with end-stage TMJ disease who underwent TJR using stock alloplastic prostheses with preoperative VSP and 3D-printed cutting and positioning guides at a single academic center, February 2021 to December 2024. IRB approval was obtained. Recorded outcomes included operative time, estimated blood loss (EBL), length of stay (LOS), pain (visual analog scale, VAS), maximum interincisal opening (MIO), occlusion, and complications.

Results: The series comprised 29 patients (42 joints); mean age 52.3 years (SD 14.3). Median operative time was 2.5 hours (IQR 2.0–6.6) unilateral and 7.0 hours (IQR 7.0–8.0) bilateral; mean EBL 200.0 cc (SD 115.4); mean LOS 3.7 days (SD 0.9). Mean VAS pain decreased from 5.3 (SD 4.1) to 0.7 (SD 0.8). Mean MIO improved from 18.1 (SD 14.2) to 33.1 mm (SD 4.0). Class I occlusion was achieved in 89.7% of patients. Intraoperative complications occurred in 3.45% and postoperative joint-specific complications in 4.76% of joints, with no implant failures.

Conclusion: This hybrid protocol was technically reproducible with favorable functional outcomes and a low complication rate. Because there is no concurrent control group treated with the traditional freehand technique, comparative claims, including custom, cannot be made from these data; prospective, comparative studies are needed.

109. Diagnostic Insights into Gingival Premalignancy Using Cytokeratin 17 and SOX11 Immunostaining.

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Objectives: Gingival premalignant lesions can be challenging to diagnose, particularly in the presence of inflammation and reactive atypia. Atypical hyperkeratosis without unequivocal dysplasia may be difficult to distinguish from true premalignant lesions. This study aims to provide a clinicopathologic review of gingival premalignant lesions diagnosed in our biopsy service over a decade and evaluate CK17 and SOX11 expression as potential adjunctive markers for early epithelial dysplasia and distinguishing true dysplasia from reactive changes.

Methods: All cases of gingival premalignancy diagnosed by the UT Health Sciences Oral Pathology Division from 2016–2025 were retrieved from AxiUm. Clinicopathologic features, including age, gender, site, signs and symptoms, clinical impressions, and histopathologic findings, were reviewed and analyzed. Fourteen epithelial dysplasia cases with adequate tissue and paraffin blocks, including at least one non-dysplastic lateral margin, were selected for immunohistochemistry. Ten cases of smokeless tobacco keratosis, frictional keratosis, lichenoid reaction with epithelial atypia, and atypical hyperorthokeratosis served as controls. CK17 and SOX11 expression patterns were evaluated and compared.

Results: A total of 553 cases were reviewed over a 10-year period. Patient age ranged from 23 to 90 years (median, 66 years), with a male-to-female ratio of 1.14:1. Lesions most frequently involved the posterior maxillary gingiva (40.6%). The most common clinical impressions were epithelial dysplasia (38.8%), hyperkeratosis (29.5%), and leukoplakia (23.7%), followed by lichen planus/lichenoid mucositis (10.8%). Histopathologically, mild dysplasia predominated (56.3%), followed by moderate (31.3%) and severe dysplasia (11.7%). All cases were negative for SOX11. CK17 expression in epithelial dysplasia varied from focal/patchy to diffuse, with full-thickness staining involving the basal and parabasal layers in 8 of 14 cases. The extent and intensity of CK17 expression correlated with the grade of dysplasia. Except for two cases showing focal weak CK17 positivity in non-dysplastic margins, the margins were negative. In the control group, focal suprabasal CK17 expression was observed in frictional and smokeless tobacco keratoses. Three of five cases of atypical hyperkeratosis were negative or weakly positive, whereas two showed strong, diffuse full-thickness staining. A similar strong and diffuse CK17 staining pattern was observed in both cases of lichenoid mucositis with epithelial atypia.

Conclusions: CK17 is upregulated in oral epithelial dysplasia, with expression correlating with dysplasia grade. Strong, diffuse, full-thickness CK17 expression in some cases of atypical hyperorthokeratosis and lichenoid mucositis with epithelial atypia raises the possibility of underrecognized early dysplasia. The absence of SOX11 expression suggests limited involvement in the pathogenesis of oral premalignant lesions and limited diagnostic utility. Larger studies are

needed to determine whether CK17 can identify early dysplasia and predict progression to OSCC. Further molecular studies, including genetic analyses, may be warranted to better clarify the potential role of SOX11 in oral premalignant lesions.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation.

110. Horizontal-Plane Rotational Effects of Maxillary Expansion: RPE versus MARPE

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Objectives: Transverse discrepancies and maxillary constriction are common among orthodontic patients and can make correcting the maxillomandibular relationship challenging. This study used cone-beam computed tomography (CBCT) to evaluate and compare the center of rotation during maxillary expansion in patients treated with conventional rapid palatal expanders (RPEs), miniscrew-assisted rapid palatal expanders (MARPEs), and an untreated control group.

Methods: Sixty patients were divided into three groups: MARPE (n = 20), RPE (n = 21), and control (n = 19). RPE appliances were anchored to the maxillary molars and premolars. MARPE appliances were secured with two 1.5 × 12 mm miniscrews placed in the palatal bone adjacent to the first molars. Appliances were activated at 0.5 mm per day until overexpansion was achieved, then stabilized with light-cured acrylic. CBCT scans were taken before treatment (T1), 6 months after T1 (T2), and at appliance removal (T3). Using Dolphin Imaging 11.9, axial sections were analyzed for linear (AIMD, PIZD, PITD) and angular (ZTA, ZPA) measurements. Six pterygoid plate distances at upper and lower axial levels were also measured to evaluate skeletal expansion and rotation.

Results: The three groups did not differ significantly at T1. At T2, the groups differed significantly in AIMD (p = 0.003) and right ZPA (p = 0.041), with both the RPE and MARPE groups showing greater expansion than controls. At T3, AIMD remained significantly different (p = 0.008), with both expansion groups exceeding controls. RPE and MARPE did not differ significantly from each other.

Conclusions: RPE and MARPE produced comparable horizontal expansion in growing patients at 6 months (T2), and this expansion was maintained at the end of treatment (T3). Results point towards a fulcrum of rotation of the pterygomaxillary complex at the upper pterygoid plates, and a fulcrum of rotation of the zygomaticomaxillary complex near the zygomaticotemporal sutures.

Funding Disclosure: This study did not receive any external funding.

111. Advanced Skeletal Maturity Alters Nasal Pressure Response to RME

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Objective: Hybrid-Hyrax and Hyrax appliances may differentially affect nasal ventilation following rapid maxillary expansion (RME), but whether their effects vary by skeletal maturity remains unclear. This study evaluated whether pretreatment skeletal maturity, assessed by cervical vertebral maturation (CVM), modifies the effects of Hybrid-Hyrax versus Hyrax RME on computational fluid dynamics (CFD)-derived nasal pressure and maximum airflow velocity in growing patients with maxillary transverse deficiency.

Methods: This study used publicly available randomized clinical trial data from patients treated with Hyrax (n=19) or Hybrid-Hyrax (n=21) expanders. Nasal pressure and velocity were derived from CBCT-based CFD modeling at baseline and 6 months. Multiple linear regression modeled post-treatment outcomes as functions of baseline value, appliance type, CVM stage (reference stage 3), appliance × CVM stage interaction, and expansion amount. Additional models classified maturity as pre-peak (CVM 1-3) versus post-peak (CVM 4-6). Transformations were applied to satisfy model assumptions. The appliance × maturity interaction was the primary parameter of interest.

Results: Forty participants were included; baseline age, sex, CVM stage, and expansion amount were similar between groups. The Hybrid-Hyrax × CVM stage 6 interaction was significant for nasal pressure ($\beta = -0.11$, 95%CI [-0.20, -0.03], $p = .01$) relative to stage 3. No other CVM-stage interaction was significant for pressure, and no interactions were significant for maximum airflow velocity. Pre-peak versus post-peak maturity did not significantly modify pressure ($p=0.48$) or velocity ($p=0.71$).

Conclusions: Skeletal maturity modifies the nasal pressure response to Hybrid-Hyrax versus Hyrax RME at advanced maturity, but not airflow velocity.

Funding Disclosure: This study did not receive any external funding.

SESSION II | ORAL PRESENTATIONS

BASIC SCIENCE

201. Genomic Insights Improve Risk Assessment and Planning in Oral Surgery

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Objective: Individual differences in healing, infection risk, and anesthetic response significantly influence oral surgery outcomes. This study aimed to identify genomic biomarkers and molecular signatures associated with postoperative healing and inflammation using genomics and machine learning, to enable personalized and predictive surgical strategies.

Methods: Genomic and transcriptomic datasets from oral mucosa and wound-healing studies (GEO: GSE23582, GSE55550; dbGaP; 1000 Genomes) were analyzed using limma and edgeR pipelines for differential expression. Variants were annotated with Ensembl VEP and ANNOVAR, focusing on key genes related to inflammation, angiogenesis, collagen synthesis, and drug metabolism (IL1B, IL6, TNF, VEGFA, COL1A1, CYP2D6). Network and enrichment analyses were performed using STRING and clusterProfiler. Machine learning models (Random Forest, XGBoost) integrated genetic and clinical variables (age, sex, smoking, diabetes) to predict delayed healing and complication risks.

Results: Variants in IL1B, VEGFA, and TGFB1 were linked to delayed healing and heightened inflammation through NF- κ B and MAPK pathway activation, with reduced collagen remodeling. Predictive models achieved ROC-AUC values of 0.84–0.89. SHAP interpretability identified IL6, VEGFA, and CYP2D6 as major determinants of individual healing outcomes.

Conclusion: Integration of genomic biomarkers with AI-based prediction can support preoperative genomic screening, personalized anesthetic and wound management, and improved postoperative recovery. These findings advance the translational application of precision oral surgery by linking molecular risk profiles to individualized clinical decision-making.

202. Osteogenic and Anti-Inflammatory Potential of Oral Mesenchymal Stem Cells Cultured on Collagen and Gelatin Microspheres

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Objectives: Mesenchymal stem cells (MSCs) are adult multipotent stem cells widely used in tissue engineering and regenerative medicine due to their capacity for self-renewal and differentiation into osteogenic, chondrogenic, and adipogenic lineages. Clinical applications require optimized delivery systems that mimic extracellular matrix

and provide a suitable environment for cell proliferation and differentiation. We hypothesized that gelatin and collagen microspheres would serve as effective cell delivery system without compromising the cell quality. This study aimed to examine the growth, viability, anti-inflammatory activity and osteogenic differentiation of gingival mesenchymal stem cells (GMSCs) cultured on gelatin and collagen microspheres compared with GMSCs cultured under standard conditions. Methods: GMSCs were cultured alone or in combination with collagen microspheres (CMS-GMSCs) and gelatin microspheres (GMS-GMSCs). Light microscopy was used to verify cell attachment and proliferation. Calcein staining was performed to assess the cell viability. Microspheres with attached cells were transferred to fresh collagen-coated culture plates to evaluate cell migration, proliferation, and distribution. The microsphere-cell constructs were subsequently cultured in osteogenic differentiation medium. Gene expression was examined via quantitative real-time PCR (qRT-PCR). Inflammatory marker (TNF α) and anti-inflammatory marker (TSG-6), Osteogenic markers (RUNX2, DMP1, FGF23, SOST), MSC markers (CD73, CD105) were examined. Protein expression following osteogenic differentiation was assessed by immunofluorescence staining for DSPP and DMP1.

Results: Light microscopy and Calcein AM staining demonstrated that GMSCs successfully attached both collagen and gelatin microspheres and remained viable following transport. qRT-PCR analysis demonstrated that CMS-GMSCs and GMS-GMSCs exhibited decreased TNF α expression and increased TSG6 expression compared with GMSCs cultured under standard conditions. Following osteogenic differentiation, RUNX2, FGF23, DMP1, SOST expression was elevated in CMS-GMSCs, whereas RUNX2, FGF23, and SOST expression was increased in GMS-GMSCs. Immunofluorescence staining demonstrated the presence of DSPP and DMP1 in cells cultured with both collagen and gelatin microspheres following differentiation. Conclusion: Both GMS- and CMS- associated GMSCs demonstrated good viability before and after transport and demonstrated reduced inflammatory marker expression (TNF α), osteogenic differentiation was more pronounced in CMS-GMSCs than in GMS-GMSCs. Nevertheless, osteogenic differentiation was successfully maintained in both groups after transport, indicating the viability of gelatin and collagen microspheres as vehicles for regenerative stem cell therapies.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation.

203. Zoonotic Transmission of Periodontal Pathogens Between Humans and Canines

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Introduction: Close contact between humans and dogs may facilitate the exchange of oral microorganisms, including common human (*T. denticola*) and canine (*P. cangingivalis*, *P. gulae*) periodontal pathogens. This study investigated the presence of human and canine periodontal pathogens (*Porphyromonas gulae*, *Porphyromonas cangingivalis*, and *Treponema denticola*) in individuals by type of dog exposure.

Methods: Participants were categorized by type of dog exposure as current dog owners/ group 1 (n=10); individuals with previous close dog contact (>5 years) but no recent exposure/ group 2 (n=7); and individuals with no close dog contact/ group 3 (n=10). Dental plaque specimens from 27 human subjects and 10 dogs were analyzed. DNA was extracted and standard polymerase chain reaction (PCR) was performed using universal bacterial 16S rRNA and species-specific primers for *P. gulae*, *P. cangingivalis*, and *T. denticola*.

Results: Universal bacterial DNA was detected in all analyzed specimens. *T. denticola* bacteria was positive in a small subset of subjects across all three exposure groups (group 1= 2; group 2=1, group 3 = 3), but negative in all dogs. *P. cangingivalis* was detected in all canine specimens, but was not detected in any matched owners, nor in any other human samples. *P. gulae* was detected in 80% of dogs, but was not detected in human specimens. Among matched dog-owner pairs, 8 (80%) exhibited a dog-positive/owner-negative pattern of *P. gulae* and two were negative in both.

Conclusion: Despite frequent detection of canine-associated periodontal pathogens in dogs (*P. cangingivalis* and *P. gulae*), corresponding detection was not observed in their owners. Type of dog exposure did not influence oral microorganisms detected in humans. Findings suggest no molecular evidence of zoonotic transmission between dogs and humans. Larger studies are needed to further investigate potential human-canine transmission.

204. Sodium Channel Regulation in Periodontal Inflammation: Implications for CB₂ Modulation

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Objective: Periodontal inflammation contributes to tissue destruction, peripheral nociceptor sensitization, and pain through activation of pro-inflammatory signaling pathways. Although voltage gated sodium channels, particularly Nav1.7, are recognized downstream targets of MAPK signaling, their regulation via gingival fibroblasts remains poorly understood. This study investigated whether CB₂ receptor activation

attenuates IL-1 β -induced MAPK signaling and sodium channel-associated transcriptional networks in human gingival fibroblasts, to identify molecular mechanisms that may contribute to inflammatory pain and reveal potential therapeutic targets.

Methods: Gingival fibroblasts were treated with vehicle control, IL-1 β stimulation, or HU-308 (CB₂ agonist) pretreatment followed by IL-1 β stimulation. RNA was isolated after 24 hours, quality verified and analyzed using microarrays. Differential gene expression, pathway enrichment, and network analyses were performed to evaluate MAPK pathway activation, sodium channel-associated genes, and regulatory proteins.

Results: IL-1 β significantly increased SCN9A (Nav1.7) expression, whereas SCN10A (Nav1.8), SCN11A (Nav1.9), and corresponding sodium channel auxiliary subunits expression were not significantly altered. IL-1 β also significantly upregulated genes across the ERK, JNK, and p38 MAPK pathways while downregulating NEDD4L, an ubiquitin ligase involved in sodium channel regulation. Pretreatment with the CB₂ agonist HU-308 attenuated MAPK pathway activation, reduced SCN9A expression toward baseline, and restored NEDD4L expression. These findings support a putative IL-1 β -MAPK-NEDD4L-SCN9A signaling axis in gingival fibroblasts that is transcriptionally modulated by CB₂ receptor activation.

Conclusion: These findings suggest that inflammatory activation of MAPK signaling promotes sodium channel-linked transcriptional remodeling with fibroblasts, contributing to an inflammatory microenvironment that supports peripheral sensitization and pain. CB₂ receptor activation attenuated this response, supporting its role as an upstream modulator of inflammatory signaling and identifying the MAPK-NEDD4L-SCN9A axis as a target for future investigation. While additional protein-level and functional studies are needed, these transcriptomic data provide a foundation for developing CB₂ receptor directed mitigations for inflammation associated orofacial pain.

205. Targeting Pyk2 Promotes Bone Gain Without Negative Alveolar Bone Effects

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Women are more susceptible to bone loss than men, resulting in 2.5-fold higher fracture risk. It is also well known that low femoral bone mineral density (BMD) in osteoporotic patients is correlated with reduced alveolar BMD. We previously demonstrated that Pyk2-deficiency enhances bone mass in female mice; however, whether other skeletal sites and craniofacial regions are affected is poorly understood. In this study, we used micro-CT to compare the effects of Pyk2-knockout (Pyk2-KO) on bone mass of femur, maxilla, and mandible of 16-week, male and female mice (n=10/group/sex). Statistics included two-way ANOVA and student's T-tests (p<0.05). Femoral trabecular bone mass was increased 3.2-fold in female Pyk2-KO females compared to wild-type (WT), with no differences seen in male Pyk2-KO mice. Unexpectedly, alveolar bone mass of maxillae and mandibles was unchanged in male or female Pyk2-KO mice, compared to WT. To better understand this

finding, immunohistochemistry was performed, confirming Pyk2 is broadly expressed in periodontal-alveolar tissues/cells. Next, we examined whether Pyk2-deficiency directly affects osteoblast (OB) activity. Consistent with bone gain in female mice, bone marrow-derived stromal OBs from female Pyk2-KO mice cultured in osteogenic media showed elevated alkaline phosphatase (ALP) activity and mineral deposition, with different changes seen in male Pyk2-KO OBs. In addition, stromal OBs and human dental pulp stem cells (hDPSC) cultured in osteogenic media with the Pyk2-inhibitor, PF-4618433 (0.1, 0.3, or 0.6 μ M) both showed a dose-dependent increase in ALP activity and mineral deposition. In summary, Pyk2 deletion promotes female-specific femoral bone gain and may play a context- or cell-specific function in jawbones. Given current anti-resorptive therapies can have adverse effects on alveolar bone, such as medication-related osteonecrosis of the jaw (MRONJ), we speculate that Pyk2-targeting may offer a novel strategy for treating appendicular bone loss in females, potentially without negative alveolar sequelae.

Funding Disclosures: Grant_NIH-R01AR080076.

206. Salivary LL-37 Precedes Dental Caries in Pediatric Kenyan Cohort

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Objectives: Whether oral innate immune activity precedes dental caries or arises in response to disease remains unclear. The human cathelicidin LL-37 is a salivary antimicrobial peptide central to oral innate immunity, but nearly all prior work has been cross-sectional and cannot establish whether higher LL-37 concentrations precede caries or respond to it.

Methods: We followed 360 three-year-old children in Kisumu, Kenya, over 12 months, with assessments at baseline, 6, and 12 months, equally distributed among children living with HIV (CHIV), HIV-exposed uninfected (HEU), and HIV-unexposed uninfected (HUU) (n = 120 per group). Linear mixed-effects models characterized LL-37 trajectories, and lagged models evaluated the bidirectional relationship between LL-37 and incident caries across consecutive visits.

Results: LL-37 concentrations declined over time ($\beta = -0.143$; $p = 0.003$). CHIV had lower baseline concentrations than HUU children ($\beta = -1.519$; $p = 0.006$) but declined less steeply (time $\times$ HIV: $\beta = 0.158$; $p = 0.010$); HEU children did not differ from HUU children. Among children caries-free at time t, higher LL-37 was associated with -10% lower odds of incident caries at time t + 1 (aOR = 0.907; 95% CI, 0.826–0.997; $p = 0.039$). Prior LL-37 level predicted subsequent LL-37 level ($p < 0.001$), whereas caries, plaque, and salivary pH did not. Salivary LL-37 predicted subsequent caries whereas caries did not predict subsequent LL-37.

Conclusion: These findings support LL-37 as a marker for investigating host susceptibility and the contribution of oral innate immunity to dental caries, rather than simply a marker of existing disease.

Funding Disclosures: This work was supported by

National Institutes of Health/Fogarty International Center R21TW012033 and National Institutes of Health/National Institute of Dental and Craniofacial Research R03DE033631. The funders had no role in the design of the study, in the collection, analysis, or interpretation of data; or in the decision to submit the work for publication. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

207. NG2/CSPG4 Loss Impairs Mandibular Fracture Healing and Rewires Matrix Signaling

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Objectives: Unstable mandibular fractures heal via endochondral ossification, when osteoprogenitors migrate and differentiate into chondrocytes and osteoblasts to repair damaged bone. Neuron-glia antigen 2 (NG2/CSPG4) is a transmembrane proteoglycan and type VI collagen receptor implicated in tissue mineralization and cell signaling during mechanical loading and injury. However, its function during fracture repair remains poorly understood. This study investigated how NG2/CSPG4 regulates cellular differentiation, extracellular matrix (ECM) programming, and intercellular signaling during mandibular fracture healing.

Methods: Mandibular condylar neck surgical osteotomies were performed in male and female skeletally mature C57BL/6J wild-type (WT) and NG2/CSPG4-knockout (NG2ko) mice. Mandibles collected at days 0, 7, and 21 were evaluated using μ CT and histology. 7-day calluses were characterized by single-cell RNA sequencing (10X Genomics platform). Differential expression, gene-set enrichment, module scoring, and descriptive ligand-receptor interaction analyses were used to assess genotype-associated changes in cellular programs and inferred communication networks.

Results: 21-day NG2ko calluses exhibited lower trabecular thickness ($P < 0.0001$), bone volume ($P = 0.0025$), and bone mineral density ($P = 0.033$) than WT calluses in factorial genotype-by-sex comparisons (n=37). Single-cell analysis identified nine broad callus populations, including inflammatory osteochondral mesenchymal (IOM) cells, mineralizing chondrocytes, fibroblasts, and osteochondral progenitors. NG2ko calluses displayed reduced biomineralization and collagen-associated ECM programs across several populations, including mineralizing chondrocytes, IOM cells, and macrophages. Despite these reductions, descriptive ligand-receptor analysis inferred greater overall signaling participation in NG2ko calluses. COLLAGEN, FN1, SPPI, and THBS signaling increased and was redistributed toward fibroblast- and osteochondral-progenitor-associated interactions, consistent with genotype-dependent ECM-network rewiring.

Conclusions: NG2/CSPG4 loss compromises callus mineralization while altering ECM and intercellular signaling programming. The combination of poorer structural repair and amplified, redistributed ECM signaling suggests a

dysregulated or compensatory response during NG2/CSPG4 loss. These findings identify NG2/CSPG4 as an important coordinator of the cellular and matrix signaling networks driving mandibular fracture healing.

Funding Disclosure: NIDCR F30 DE033287 (JB)

208. Dysregulated Mineralization and Suture Patency Deficits Following ENPP1 Ablation

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Objective: Cranial suture development is a tightly regulated process involving a form of calcification called intramembranous ossification, where bone growth proceeds without a cartilage intermediate and relies on a balance of pyrophosphate and phosphate levels. Ectonucleotide pyrophosphatase/phosphodiesterase 1 (Enpp1) is one such protein responsible for maintaining this balance. Mechanistically, it is responsible for the breakdown of extracellular ATP and direct generation of pyrophosphate. Pathogenic deficiencies of Enpp1 have been documented to present through over-mineralization of soft tissues and under-mineralization of skeletal tissues. Although the role of Enpp1 in systematic mineralization has been previously studied to an extent, its role in cranial suture formation is still unknown. In this study, we explored the effects of Enpp1 knockout on the development of mice cranial sutures.

Methods: We generated Enpp1 global knockout mice and studied cranial suture development at various timepoints. We conducted MicroCT scanning of the mice skulls followed by hematoxylin and eosin (H&E) staining. We further performed immunohistochemistry (IHC) to analyze several important markers of mineralization, notably Osterix (OSX). Quantitative Reverse Transcription PCR (qRT-PCR) was used to reinforce our analysis of these markers, including OSX, PDGFR α , Runx2, and Col1a1.

Results: Our MicroCT data revealed a clear phenotype in the Enpp1^{-/-} samples characterized by excess mineralization of the cranial sutures, particularly in the 6-week, 3-month, and 8-month groups. We further confirmed these results with H&E staining, which showed a significant reduction in the sutural width. IHC provided further evidence of overexpressed markers of mineralization. qRT-PCR data indicated heightened expression of OSX, PDGFR α , Runx2, and Col1a1 markers.

Conclusion: Enpp1 has potential regulatory mechanisms in cranial suture development. Our findings enhance the understanding of Enpp1-mediated cranial suture formation and related pathologies.

Funding Disclosures: Supported by the Baylor Oral Health Foundation and TAMHSC Office for Research and Graduate Studies (LBR).

209. Phosphodeficient TWIST1 mice exhibit craniofacial abnormalities associated with heart defects

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Objectives: The TWIST1 encodes a highly conserved basic helix-loop-helix transcription factor essential for early embryonic development in organisms ranging from *Drosophila* to humans. Although phosphorylation of multiple serine and threonine residues regulates TWIST1 activity during cancer metastasis, the *in vivo* role of TWIST1 post-translational modifications remains poorly understood. Using CRISPR/Cas9 genome editing, we generated phosphodeficient Twist1 mouse lines carrying serine-to-alanine substitutions at residues S68 and S127 to investigate the developmental significance of TWIST1 phosphorylation.

Methods: Compound heterozygous and homozygous mutant mouse models (Twist1S127A/S127A, Twist1S127A^{-/-}, Twist1S127A/S68A) were generated to investigate the impact of impaired phosphorylation on protein function during craniofacial development. Histological and skeletal analysis were performed to assess tissue and skeletal defects. Biochemical studies assessed changes in downstream target genes and protein expression. Primary embryonic cells were treated with the pan-AKT inhibitor MK-2206 to determine the contribution of AKT-mediated phosphorylation at S127 to TWIST1 activity.

Results: Targeted sequencing confirmed the specific substitutions, and the founder lines were backcrossed for at least five generations onto a C57BL/6J background to eliminate potential off-target effects. Phosphodeficient Twist1 mice exhibited highly penetrant craniofacial abnormalities, including facial asymmetry, cleft palate, mandibular hypoplasia, and skeletal defects affecting both bone and cartilage. Remarkably, cardiac abnormalities were frequently observed and were strongly associated with left-sided mandibular hypoplasia.

Conclusion: These findings establish a critical role for TWIST1 phosphorylation in craniofacial and cardiac development. Our phosphodeficient mouse models provide mechanistic insight into how post-translational regulation of TWIST1 influences mandibular and cardiac morphogenesis. More broadly, these results suggest a molecular link between craniofacial and cardiac defects observed in congenital disorders such as Goldenhar syndrome and 22q11.2 deletion syndrome

Funding Disclosure: This research was funded by R21CA267006 and R56DE036303 from NIH/NIDCR to W.D.F., and UTHealth President Excellence Accelerator Program (0017324) to W.D.F.

210. Oral Probiotic Inhibits *Streptococcus mutans* Biofilms and Orthodontic Archwire Colonization

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Background: Orthodontic appliances can support cariogenic biofilms. Oral streptococci are competitors of *Streptococcus mutans*.

Objective: Determine whether *Streptococcus oralis*, *Streptococcus überis*, and *Streptococcus rattus*, a three-strain mixture, or a commercial oral probiotic tablet (ProBiora3®) can reduce *S. mutans* biofilm formation, acidification, and colonization of orthodontic archwires.

Methods: *S. oralis*, *S. überis*, and *S. rattus* were isolated from ProBiora3®. Mixed-species biofilms were grown in artificial saliva containing 0.5% sucrose. Probiotics were introduced 3 hours before *S. mutans* strain (ATCC25175), 3 hours after *S. mutans*, or simultaneously. Biofilm biomass was quantified with crystal violet, pH was measured, and abundance of *S. mutans* in mixed biofilms was assessed by qPCR. Colonization of archwires was evaluated by fluorescence microscopy using a green fluorescent protein (GFP)-expressing *S. mutans* and assessing the ability of probiotics to displace *S. mutans*-GFP from archwires. Archwire binding by *S. mutans*-GFP was scored by a blinded evaluator. Statistical significance was assessed using Student's t tests.

Results: Probiotic effects were strain and timing-dependent. When introduced before *S. mutans*, *S. oralis* and *S. überis* produced the greatest inhibition of biofilm formation, reducing biomass by 40%-70%, and inhibited *S. mutans* colonization of archwires. Quantitative PCR and fluorescence imaging showed that addition of all three probiotic strains together or in a ProBiora3® tablet outcompeted *S. mutans* when added at the same time as *S. mutans* or even after initial *S. mutans* growth. Despite these competitive effects, most probiotic-containing biofilms remained acidic, with final pH values below 5.5. Only *S. oralis* alone consistently increased pH toward or above the enamel-demineralization threshold of pH=5.5.

Conclusions: ProBiora3® probiotic strains can suppress or replace *S. mutans* in developing mixed-species biofilms and on archwires; however, efficacy depends on strain identity and timing. Reducing *S. mutans* abundance alone may not eliminate cariogenic potential, since several probiotic strains remained acidogenic.

211. A Novel Immunoregulatory Role for Pregnancy-Specific Glycoprotein-1 in Microglial-Mediated Neuroinflammation

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Objectives: Pregnancy-specific glycoprotein-1 (PSG-1) is a pregnancy-associated protein with established immunomodulatory functions at the maternal-fetal interface, but its role in the central nervous system immune regulation

remains poorly understood. Microglia are the resident immune cells of the central nervous system which become activated following infection or injury. Dysregulated microglia activation contributes to persistent neuroinflammation associated with several neurological diseases. Thus, identifying endogenous regulators of microglial inflammatory signaling may provide insight into mechanisms that promote resolution of inflammation. Therefore, the current studies investigated whether PSG-1 modulates microglial activation and sought to characterize the molecular mechanisms underlying its immunoregulatory effects.

Experimental Methods: Murine microglia were stimulated with lipopolysaccharide (LPS) or interferon- γ (IFN- γ) and treated with recombinant PSG-1. Pro- and anti-inflammatory gene expression was evaluated by quantitative real-time PCR. The dependence of the action by PSG-1 on TGF- β was assessed using a neutralizing antibody, while the structural requirement for PSG-1 activity was evaluated using a B2-domain-deficient PSG-1 construct. Findings were further evaluated in microglia from PSG-1 transgenic and wild-type mice.

Results: PSG-1 treatment reduced expression of the pro-inflammatory mediators IL-12, TNF- α , and iNOS in microglia activated by LPS and IFN- γ . Meanwhile, PSG-1 increased the expression of the anti-inflammatory and reparative markers IL-10 and Arg-1 in the activated microglia. Neutralization of TGF- β attenuated PSG-1-mediated suppression of IL-12 and induction of IL-10. Deletion of the PSG-1 B2 domain similarly attenuated PSG-1-mediated immunomodulatory effects. Microglia from PSG-1 transgenic mice (AcxhPSG1) demonstrated a similar pattern of reduced pro-inflammatory and increased anti-inflammatory gene expression compared to microglia from wild type mice.

Conclusions: Together, these data suggest that PSG-1 is a regulator of microglial activation that promotes an anti-inflammatory and reparative phenotype through mechanisms involving TGF- β signaling and the PSG-1 B2 domain.

SESSION III | POSTER PRESENTATIONS

BASIC SCIENCE

1. Training in Bonding and Light-Curing across 8-year CODE Reports

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Objectives: Composite bonding and light-curing are essential, technique-sensitive dental competencies and among the most frequently performed procedures in dentistry. This study tested the hypothesis that dental students are primarily taught resin bonding and light-curing through traditional lectures, with limited experiential, hands-on learning, using the Consortium of Operative Dentistry Educators (CODE) reports. Also, this study aimed to characterize the curricular allocation devoted to bonding and light-curing instruction.

Methods: CODE reports from 2018-2025 were reviewed. No report was published in 2020. Questions related to bonding and light-curing instruction were only surveyed in 2018, 2019, and 2022; responses were summarized as frequencies and percentages using the total number of responses as the denominator. Wilson 95% confidence intervals (CI) were calculated to characterize the uncertainty associated with affirmative-response proportions (Figure 1A). To identify curricular content corresponding to the investigated topics in the absence of questions, a keyword search was performed (Figure 2A). For each keyword, annual and cumulative frequencies, along with the number and percentage of National Reports containing the keyword, were calculated. The participating schools were categorized according to the six geographic regions defined by CODE for analysis.

Results: Results are shown in the Figure. 2018 CODE report was the only year that inquired about how light-curing is taught among different institutions. Bond strength was discussed in 2019 and 2020. Curricular allocation is shown in Figure 3A. Light-curing and bond strength exercises per region are shown in Figure 4A and 5A.

Conclusion: Both bond strength and light-curing are not strongly taught in the dental curriculum didactically, preclinically, or clinically. Light-curing instruction is included in dental curricula but with a minimal percentage of overall instructional time. Hands-on bond strength testing exercises are scarcely implemented, with a declining trend from 2019 to 2022. Future curricular efforts should prioritize hands-on training in bonding and light-curing.

2. Determinants of Patient Acquisition and Financial Outcomes in Early-Career Dental Practice Beyond Clinical Competence

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Objectives: To synthesize evidence on nonclinical factors that influence patient acquisition and financial outcomes among early-career dentists, including digital visibility, online reputation, geographic accessibility, market competition, practice structure, and business literacy.

Methods: A narrative literature review was conducted using PubMed/MEDLINE, Scopus, Google Scholar, reference lists, and authoritative professional reports. The review included 19 sources, primarily published from 2010 through August 2026, addressing patient decision-making, digital presence, geographic accessibility, workforce distribution, practice models, educational debt, dentist income, and early-career outcomes.

Results: Patient selection was influenced by convenience, cost, communication, referrals, online information, and overall patient experience. Geographic disparities were substantial: approximately 1.7 million U.S. residents lacked access to a dental clinic within a 30-minute drive, 24.7 million lived in dental care shortage areas, and rural areas had approximately one dentist per 3,850 residents compared with one per 1,470 in urban areas. In 2024, 16.1% of U.S. dentists were DSO-affiliated, while private-practice ownership declined from 84.7% in 2005 to 72.5% in 2023. Ownership was 8.8% among dentists younger than 30 and 32.5% among those aged 30-34. Educational debt averaged \$297,800 among indebted 2025 graduates responding to the ADEA survey. In 2025, average inflation-adjusted annual income was \$228,975 for owner general practitioners versus \$160,448 for nonowners.

Conclusion: Clinical competence remains fundamental, but early-career outcomes are also shaped by patient visibility and experience, geographic accessibility, practice structure, and financial context. Dental education may better prepare graduates by complementing clinical training with ethical digital communication, market assessment, practice management, and financial literacy.

3. Cuspal Flexure of Self-cure, Dual-cure, and Light-cure Core-Buildup Composites

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Objectives: Core-buildup composites provide a foundation for fixed dental prostheses but can generate contraction stress that can be detected by deformation of surrounding tooth structure. This study compared cuspal flexure among core-buildup composites with different polymerization mechanisms.

Methods: Maxillary typodont premolars with 4mm-deep MOD preparations were sandblasted and treated with a tribochemical silica coating (Cojet, 3M). A universal adhesive (Scotchbond Universal Plus, 3M) was applied

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before restoration with a light-cure composite: TPH Spectra ST in 2-increments (Dentsply, control), Clearfil Photo Core (Kuraray), SuperCure (Centrix). A dual-cure composite (Build-It, Pentron) and a self-cure composite (Stela, SDI) were placed with their designated adhesives. Sample size was 10 per group. Tooth surfaces were scanned with an optical scanner (COMET xS, Steinbichler) before restoration ('baseline'), and rescanned at 15 minutes, 24 hours, and 7 days after polymerization. Post-restoration scans were aligned to baseline scans using proprietary software (Cumulus). Tooth deformation (cuspal flexure, μm) was calculated using custom developed software (CuspFlex). Bond integrity was verified with dye penetration test, in which the teeth were sectioned and examined under a stereomicroscope. Specimens with bond failure were replaced. Cuspal flexure results were analyzed with two-way ANOVA followed by pairwise comparisons ($\alpha=0.05$).

Results: Cuspal flexure (Table) differed among the core-buildup materials and time points ($p<0.001$). The self-cure composite (Stela) caused the greatest cuspal flexure, which significantly increased at 24 hours. The dual-cure composite caused intermediate cuspal flexure. The light-cure materials caused the lowest cuspal flexure values across all time points.

Table: Cuspal flexure (microns; mean $\pm$ SD).

Core Build-up Composites	15 min	24 hr	7 days
TPH Spectra ST (control)	14.0 $\pm$ 2.0 DEF	15.5 $\pm$ 2.9 DEF	17.5 $\pm$ 3.2 CDE
Clearfil Photo Core (LC)	11.8 $\pm$ 2.2 F	13.6 $\pm$ 1.5 EF	16.9 $\pm$ 2.0 CDEF
SuperCure (LC)	13.4 $\pm$ 1.7 EF	15.6 $\pm$ 2.6 DEF	17.0 $\pm$ 3.0 CDEF
Build-It (dual-cure)	16.8 $\pm$ 3.4 DEF	19.2 $\pm$ 3.1 CD	22.1 $\pm$ 4.1 BC
Stela (self-cure)	25.4 $\pm$ 4.0 B	39.2 $\pm$ 8.3 A	41.8 $\pm$ 9.6 A

Groups with same letter are not significantly different (two-way ANOVA followed by pairwise comparisons, significance level 0.05 adjusted to 0.00625)

Conclusions: Magnitude and progression of cuspal flexure varied significantly among the core-buildup composites with different polymerization mechanisms. The self-cure material generated substantially higher stress-related tooth deformation compared to the dual-cure and light-cure materials, which may reflect differences in polymerization rate, shrinkage, and elastic modulus development.

Funding Disclosure: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation.

4. IL-18 Prevents Periodontal Inflammation and Bone Resorption Only in Females

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Objectives: Periodontitis is sex-biased disease due to unclear biology. Our previous work demonstrated that inflammasome-mediated protection against experimental periodontitis in female mice and is independent of IL-1 β . Whether additional inflammasome-derived cytokine IL-18 contributes to this sex-specific protection remains unknown. We investigated the sex-specific contribution of IL-18 expression, bone loss and gingival epithelial integrity.

Methods: Female and male wild-type (WT) and Il18^{-/-} mice underwent ligature-induced periodontitis. qRT-PCR and single-cell analyses assessed Il18 expression and the primary cellular sources of Il18. A Cell Junction Panel examined cell-junction gene expression, histology evaluated epithelial integrity, and micro-computed tomography quantified alveolar bone loss. IL-18 expression was also evaluated in human gingiva before and after 21 days without oral hygiene.

Results: Il18 expression remained stable during experimental periodontitis in both sexes, and epithelial cells were identified as the main producers of gingival Il18. In females, Il18 deficiency was associated with altered gingival expression of cell-junction genes, including Cldn1, Gjb3, Itgav, and Jup, and greater histological destruction of the gingival epithelium at days 3 and 9 compared with WT controls. The effect of Il18 deletion on periodontal bone resorption differed by sex. Female Il18^{-/-} mice had significantly greater bone resorption than WT females (0.42 $\pm$ 0.09 mm versus 0.38 $\pm$ 0.06 mm), whereas male Il18^{-/-} mice and male WT mice with periodontitis showed no difference in bone resorption. Induction of gingival inflammation did not alter IL-18 expression in humans after 21 days without oral hygiene. Single-cell transcriptomic analysis identified epithelial and myeloid cells as the predominant sources of IL-18 in the human gingiva.

Conclusions: These findings identify a protective role for IL-18 in experimental periodontitis in female, but not male mice. This sex-specific protection occurs despite stable gingival IL-18 expression during inflammation in mice and humans, reinforcing the relevance of sex differences in inflammasome regulation to periodontitis.

Funding Source(s): Research is supported by the National Institute of Dental & Craniofacial Research of the National Institutes of Health under Award Number R01DE032830 (J.T.M.).

5. Microglial Cell Lines Accumulate Perilipin-1/2-Positive Lipid Droplets

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Lipid droplets (LDs) are organelles that regulate lipid homeostasis by storing neutral lipids and sequestering toxic lipids, and they are characterized by the perilipin (PLIN) family of proteins. Accumulation of LDs in the brain has emerged as an avenue to explore aging and neurodegenerative disease, yet the context- and disease-specific molecular pathways for LD induction remain poorly understood. In Alzheimer’s Disease (AD), lipid LDs are reported in microglia, frequently characterized as PLIN2+

LD-associated microglia (LDAMs). Accumulation of LDs is associated with impaired phagocytic function, hindering the ability of microglia to clear β -amyloid plaques, a hallmark of AD. We recently identified a novel population of noncanonical PLIN1+ cells colocalized with microglia and mature amyloid plaques in a mouse model of early-onset AD. As part of the broader project, we aimed to develop an in vitro system to study the role of PLIN1+ LDs in various cell types in the brain. This study establishes an optimized protocol for inducing LD formation in BV2 microglial cells through the activation of regulatory lipid pathways. Here, we treated BV2 cells with free fatty acid (FFA) in addition to three treatments to target receptors on the microglial cells: rosiglitazone, a peroxisome proliferator-activated receptor gamma (PPAR γ) agonist to promote neutral lipid uptake; 22(R)-hydroxycholesterol, a liver X receptor (LXR) agonist that stimulates lipogenesis; and forskolin, an activator of the cyclic AMP/protein kinase A (cAMP/PKA) pathway that promotes lipid metabolic remodeling. These signaling pathways were selected to maximize LD induction and facilitate the accumulation of perilipin (PLIN)-positive lipid droplets. LD characterization was conducted via immunofluorescent (IF) analysis of PLIN-1 and PLIN-2 expression and LD morphology. This study aims to establish a reproducible microglial model of LD formation to provide a platform for investigating PLIN-associated microglial states in efforts to support the development of PLIN-based biomarkers for AD.

6. Novel Insights into Oral Squamous Cell Carcinoma Invasion: The Role of Neuropilin-1

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Objectives: Oral squamous cell carcinoma (OSCC) is the most common malignancy of the oral cavity, with outcomes influenced by clinicopathologic features such as perineural invasion (PNI), perivascular invasion (PVI), and maximal depth of invasion (MDI). Our previous review of OSCC cases from the UT Health Sciences Oral Pathology service identified a significant association between PVI and MDI. In addition, our previous work demonstrated Neuropilin-1 (NRP1) upregulation in oral epithelial dysplasia and OSCC, suggesting a potential role in tumor progression. This study aims to expand our previous OSCC cohort by reviewing cases diagnosed from January 2025 through July 15, 2026, and performing a comprehensive clinicopathologic analysis of the combined cohort, including evaluation of NRP1 expression and its associations with PNI, PVI, and MDI.

Methods: Using AxiUm, all OSCC cases diagnosed by the UT Health Sciences Oral Pathology Division from January 2025 through July 15, 2026, were retrieved. Clinicopathologic features, including age, sex, anatomic site, signs and symptoms, clinical impression, and histopathologic parameters (PNI, PVI, and MDI), were reviewed and statistically analyzed. For NRP1 immunohistochemical evaluation, 26 SCC cases with adequate tissue and high-quality paraffin blocks were selected. Cases were selected to include a range of MDI measurements and PNI- and PVI-positive and -negative cases to assess potential associations between NRP1 expression and these histopathologic parameters. Statistical significance was defined as a p value < 0.05.

Results: A total of 92 cases were reviewed. Patient ages ranged from 30 to 92 years (mean, 67.8; median, 68), with a male-to-female ratio of 1.04:1. The lateral tongue was the most involved site (35.9%), followed by the maxillary alveolar mucosa and buccal mucosa (10.9% each). PNI was identified in 12.0% of cases and PVI in 23.9%. MDI was documented in 31 cases (33.7%). Immunohistochemically, tumor cells demonstrated variable membranous NRP1 staining. Associations between NRP1 expression and MDI, PNI, and PVI are currently under evaluation.

Conclusions: The expanded cohort demonstrates the continued presence of PNI, PVI, and variable MDI among OSCC cases diagnosed at the UT Health Sciences Oral Pathology service. Variable membranous NRP1 expressions were observed in OSCC tumoral cells, supporting further investigation of its potential role in tumor invasion. Ongoing analysis will determine whether NRP1 expression is associated with PNI, PVI, or MDI.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and Tennessee Dental Association Foundation

7. Human Salivary Extracellular Vesicle Tetraspanins as Biomarkers and Therapeutic Targets

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Objectives: Salivary extracellular vesicles (EVs) represent a promising class of non-invasive biomarkers with greater stability, sensitivity, and specificity than whole saliva. Most salivary biomarkers, including microRNAs and proteins, are enriched within EVs. Tumor-derived EVs provide a unique source of biomarkers for cancer detection and monitoring. Tetraspanins, including CD9, CD81, CD63, and CD82, are highly enriched on EV membranes and are widely used as EV markers. Notably, altered expression of EV-CD9 and CD63 has been reported in cancers. This study aimed to optimize methodology and protocols to isolate human salivary EVs and assess the potential of EV-tetraspanins as biomarkers, therapeutic targets and vehicles.

Methods: EVs were isolated from human saliva using Izon qEV 35-nm size-exclusion chromatography. EVs were characterized by Spectradyme particle tracking analysis and transmission electron microscopy. Saliva samples were collected from healthy individuals and cancer patients. EV RNAs were extracted from both resting and stimulated saliva samples using the QIAGEN exoRNeasy kit and subsequently analyzed using the QIAxcel Connect system. Results: 16 resting and stimulated saliva samples from healthy and cancer subjects were used for this study. High-quality salivary EVs were isolated from two resting saliva samples and measured by particle tracking analysis- majority size between 65-100nm, concentration 3.6 and 4.2 x10⁸/ μ L. The morphology of the EV has been characterized by transmission electron microscopy. EV RNAs were successfully extracted from both resting and stimulated saliva samples obtained from healthy individuals and cancer patients. These findings demonstrate the feasibility of isolating intact salivary EVs and EV-derived RNA suitable for downstream EV protein and RNA biomarker analyses.

Conclusions: We have successfully isolated and characterized salivary EVs and EV-derived RNA. This study provides a foundation for further clinical and translational research evaluating salivary EVs and EV-tetraspanins as biomarkers and novel therapeutic targets for oral cancer, neurodegenerative diseases, and autoimmune disorders.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation.

8. Lactobacillus-based Probiotics Interfere with Porphyromonas gingivalis Biofilm Formation

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Background: Several Lactobacillus-based probiotic formulations have been developed to restore a healthy microbiota to the oral cavity and prevent periodontal disease and/or caries. The ability of Lactobacilli to produce acidic environments and in some cases antimicrobial compounds makes them encouraging candidates to reduce the levels of periodontal pathogens such as *P. gingivalis*.

Objective: This study evaluated the ability of three different Lactobacillus-based probiotics to interfere with *P. gingivalis* (Pg) biofilm formation: Biogaia® (*L. reuteri*), Vigiis® (*L. paracasei*), and Stella Life® (a collection of 9 lactobacillus probiotic strains, *Streptococcus salivarius*, and *Bifidobacterium lactis*).

Methods: Biofilms were established in artificial saliva + 0.5% sucrose and 1.4 mg/mL peptone. Overnight cultures (anaerobic for Pg) were washed and resuspended in bacterial growth media at OD600 = 1.0. Equal volumes of Pg and probiotic were added with either Pg added to wells of a 24-well plate (1 mL total) 3 hours before the probiotic, the probiotic being added 3 hours before Pg, or strains added simultaneously. Crystal violet staining was used to measure biofilm biomass, and the pH of the resulting wells after 24 hours was measured. The percentage of the biofilm present comprised of Pg was determined by quantitative PCR (qPCR).

Results: While in many cases addition of a Lactobacillus-based probiotic did not decrease overall biomass based on crystal violet staining, DNA analysis showed that addition of either Biogaia® (*L. reuteri*) or the Stella Life® formulation prior to Pg led to an 80-99% decrease in the level of Pg in the total biofilm microbiota. Vigiis® (*L. paracasei*) showed little to no effect on the level of Pg in biofilms. pH levels dropped in the absence of Pg, owing to acid production by lactobacilli.

Conclusions: Prior addition of two Lactobacillus-based probiotics, Biogaia® and Stella Life®, can significantly reduce Pg levels in biofilms.

9. Elucidating Temporomandibular Joint Retrodiscal Tissue Innervation in Patients with Temporomandibular Joint Disorders

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Temporomandibular joint disorders (TMJDs) are a leading cause of chronic orofacial pain, affecting ~12 million US adults, with women affected at least twice as often as men. TMJ retrodiscal tissue is thought to be central to TMJD initiation and maintenance through excessive mechanical compression; its sensory nerves transmit noxious signals to the brain. However, neuronal subtype composition and plasticity of human retrodiscal tissue remain poorly understood. We characterized sensory and sympathetic nerve populations in retrodiscal tissue from women with painful arthritic TMJD (osteoarthritis [OA] and rheumatoid arthritis [RA]) and non-arthritic TMJD (condylar hyperplasia [CH] and internal derangement), serving as controls.

Human retrodiscal tissue was obtained during total TMJ replacement, cryosectioned, and immunolabeled for protein gene product 9.5 (PGP9.5; sensory nerves), neurofilament heavy chain (NFH; myelinated), calcitonin gene-related peptide (CGRP; peptidergic), tyrosine hydroxylase (TH; sympathetic), and α -smooth muscle actin (α -SMA; blood vessels). Manual quantitative analysis determined sensory nerve density, NFH+/NFH- composition, peptidergic nociceptor populations, and perivascular sympathetic innervation. Data were analyzed by one-way ANOVA with Tukey's post-hoc test ($p < 0.05$).

OA and RA retrodiscal tissue exhibited significantly greater PGP9.5+ sensory nerve density than dysfunction TMJD. Subtype distribution was preserved across groups. NFH- and NFH+ fibers comprised ~60% and ~40% of sensory innervation, and CGRP+ nociceptive fibers represented ~75% regardless of diagnosis. Proportions of A δ peptidergic nociceptors (CGRP+/NFH+), C peptidergic nociceptors (CGRP+/NFH-), and non-nociceptive fibers (CGRP-/NFH+) did not differ among groups. ~80% of TH+ fibers were adjacent to α -SMA+ vessels, with no differences between etiologies.

Human retrodiscal tissue exhibits conserved sensory and sympathetic innervation patterns across TMJD etiologies, but arthritic TMJDs show dramatically increased sensory nerve

density compared to dysfunction. This suggests expansion of existing nociceptive networks, rather than altered neuronal composition, may contribute to TMJD pain, providing a framework for investigating peripheral mechanisms.

10. Pinpointing Causal GWAS Loci for Dental Caries Using Statistical Fine-Mapping

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Dental caries remains one of the most prevalent chronic diseases worldwide, yet the genetic factors contributing to individual susceptibility are not fully understood. Genome-wide association studies have identified loci associated with caries-related traits, but linkage disequilibrium often makes it difficult to determine which variants are most likely driving each association signal. This project applied a Bayesian fine-mapping approach to GWAS summary statistics for three dental traits: decayed, missing, and filled tooth surfaces (DMFS), decayed and filled tooth surfaces (DFSS), and number of teeth (Nteeth). Single-trait fine-mapping was performed using the Sum of Single Effects Regression for Summary Statistics (SuSiE-RSS) framework. Multi-trait fine-mapping using mvSuSiE-RSS evaluated shared genetic signal structure across traits. Single-trait analyses recovered previously reported caries-associated signals, including CA12 and the chromosome 5 PITX1/PITX1-AS1 region. Prioritized genes were also supported by independent dental caries studies, including NAMPT for DMFS and ADGRL2 for DFSS, while identifying CRBN as a candidate nearest-gene annotation for Nteeth. Joint analyses showed the strongest shared signal between DMFS and DFSS. Our analysis enhances previously identified risk variants and genes, further implicating novel genetic risk factors associated with dental caries.

11. Early Life Stress Results in Bone-Specific and Sex-Specific Changes

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Objective: Stress is a physiological response to hardship that impacts physical, mental, and overall health. Early life stress (ELS) is when stress that occurs during childhood and/or adolescence impacts the long-term health of an individual. To study the impact of ELS, a neonatal maternal separation (NMS) mouse model has been established and shown to have brain and nerve changes similar to those in humans. Investigation of NMS mice has shown sex-specific bone differences in the femur, yet further research is needed on NMS/ELS bone. Our objective was to determine the impact of NMS on mandibular bone.

Methods: Our NMS mouse model stresses pups by removing them from the dam for 3 hours per day from postnatal day 1 (P1) to P21. Control and NMS mice were collected and weighed at P56 and skulls imaged by microcomputed tomography using a SkyScan 1275. Mandibles were contoured out, then tissue mineral density (TMD) and bone microarchitecture measurements were collected in

CTAnalyzer. Landmarks were placed using Drishti software, then mandibular centroid and morphological measurements were calculated. Analysis was completed using unpaired, two-tailed t-tests ($p < 0.05$) and percent change.

Results: Male mice impacted by NMS had significantly increased body weight (+16%; $p < 0.005$), mandibular bone volume (+12%; $p < 0.05$) and centroid size (+3%; $p < 0.05$). Female mice impacted by NMS had significantly decreased closed and total porosity (-31%; $p < 0.05$), trabecular connectivity (-21%; $p < 0.05$), and increased Euler number (+20%; $p < 0.05$). The sex-specific mandibular bone changes were different than those seen in the femur. Mice impacted by NMS had no changes in overall mandibular morphology or TMD.

Conclusion: NMS causes sex-specific differences in mandibular bone. NMS has bone-specific effects, impacting the femur and mandible differently. Further studies are needed to see if these bone changes are also present in humans impacted by ELS.

Funding Disclosure: Supported by UMKC SOD Summer Scholars Program and Robert Wood Johnson Foundation (RWJF Harold Amos Medical Faculty Development Program 79430).

12. Parvimonas micra Effector Proteins Modulate Neutrophil Phenotypes

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Parvimonas micra (Pm) is an inflammatory pathobiont strongly associated with oral diseases, such as periodontitis, infected root canals, and odontogenic abscesses, as well as certain cancers. A critical theme uniting these diseases is the interplay between inflammatory immune responses and the overgrowth of inflammophilic (inflammation-loving) bacteria such as Pm. Preliminary data from our laboratory suggests that Pm may be a significant driver of this inflammation. To investigate this further, we employed a search algorithm to identify potential Pm candidate effector proteins that are hypothesized to manipulate host cellular processes. To study these candidate effectors and their role in infection, we: 1) Constructed Pm strains constitutively expressing hemagglutinin (HA)-tagged candidate effector proteins, allowing us to confirm protein expression and cellular localization. 2) Generated Pm deletion mutant strains in the candidate effectors. These mutant strains provide critical tools in the further study of Pm-host interactions and their role in inflammation and disease.

13. Prenatal Exposure to Nicotine Free Vape Alters

Craniofacial Development

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Objectives: Electronic nicotine delivery systems (ENDS) commonly use propylene glycol and glycerol (vegetable glycerin) (PG/VG) as aerosol carriers that are often assumed inert. Emerging evidence indicates these components can influence craniofacial development, even without nicotine, and may do so in a concentration-dependent manner. With ENDS use and sales increasing, delineating developmental risks is critical. This study evaluates the prenatal effects of ENDS aerosol exposure on postnatal facial morphology through an anatomical region specific analysis. We aim to determine whether prenatal exposure to different ratios of PG/VG produces measurable alterations in early facial architecture.

Materials and Methods: Timed-pregnant C57BL/6 mouse dams were exposed prenatally to filtered air (control), 50/50 PG/VG, or 30/70 PG/VG aerosols. Exposure ceased at parturition. Offspring were euthanized at postnatal day 14, skulls isolated, and micro-computed tomography acquired. Three-dimensional reconstructions were analyzed in 3D Slicer v5.8.1 using a predefined set of transverse, vertical, and anteroposterior facial measurements. Landmark placement was both automated and manual. Measurement extraction was automated with a Python-based workflow integrated within Slicer.

Results: Facial analysis is ongoing. Preliminary observations indicate measurable differences across exposed groups versus controls in transverse, vertical, and anteroposterior dimensions, varying by PG/VG ratio and nicotine presence. Early inspection also suggests irregularities near the medial premaxilla-maxillary junction. Targeted quantitative assessments are underway to verify and localize these effects.

Conclusions: These data will advance understanding of how ENDS aerosol constituents, including carrier chemistry, affect craniofacial development during critical prenatal windows. Ongoing analyses will further elucidate the magnitude and regional specificity of these impacts, underscoring the need to evaluate complete ENDS formulations in perinatal health.

14. Immunological Profiling in Premalignant and Malignant Stages of Proliferative Verrucous Leukoplakia

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Introduction: Proliferative verrucous leukoplakia (PVL) is an oral premalignant condition with a high risk (up to 100%) for progression to oral squamous cell carcinoma (SCC), the most common type of head and neck cancer. There is a need to characterize factors related to transformation risk. With immunotherapy unlocking new possibilities for targeted therapies, study of the host response through immunological profiling may yield clues to identify higher risk PVL lesions. Through comparative analysis of immune profiles in patients who progressed from a premalignant state to malignancy, we

will increase understanding of transformation potential in this high-risk population.

Hypothesis: In patients with PVL, immune cell populations will demonstrate compositional changes between premalignant lesions and subsequent SCC lesions in the same patients.

Methods: Formalin-Fixed Paraffin Embedded (FFPE) samples (N=6) were obtained from 3 patients who each had a premalignant (N=3) lesion and who subsequently developed malignancy [i.e. SCC (N=3)] in a similar anatomic location. Samples were collected as part of routine clinical surveillance. A 10x GEM Flex V2 kit prepared the samples for sequencing. Single cell analysis tools included Cell Ranger and R.

Results: Analysis of the cell counts yielded differences in cell populations and distributions between premalignant and malignant samples. Wilcoxon two-tailed paired sample tests suggested that B cells, macrophages and fibroblasts increased in proportional composition, while epithelial cells exhibited a decrease in proportional composition in malignant lesions. Within the epithelial cell population, expression of FLG, KRT1, and DMKN decreased as lesions malignantly transformed.

Conclusions: Despite a low sample number, a positive trend in B-cell and macrophage composition in malignant lesions was observed. However, the reverse appears true for epithelial cells, specifically keratinocytes. Furthermore, consistent changes in expression of specific genes indicate the potential for these genes to be used as diagnostic markers for PVL lesion transformation.

15. The Potential Role of mRNA Alternative Polyadenylation in Regulation of Gene Expression in Amelogenesis Imperfecta

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Amelogenesis Imperfecta is a rare genetic disorder characterized by an abnormal formation of tooth enamel. The enamel produced may be thin, poorly mineralized, improperly formed, or soft. This condition arises from disruptions in gene expression that impair the precise regulation of enamel forming proteins during development. Different mRNA transcripts have cellular functions that each play a unique role in gene expression. One important mechanism that generate different transcripts and regulates gene expression at the post-transcriptional level is alternative polyadenylation (APA). Alternative polyadenylation regulates gene expression by producing mRNA isoforms with different 3'untranslated regions. Although APA has been heavily researched as a post-transcriptional mechanism in genetics, its role in odontogenesis and Amelogenesis Imperfecta is under researched. Proper enamel mineralization relies on interactions between epithelial and mesenchymal layers and is tightly regulated by a mineralization process. This research analyzes the role APA may play in the regulation of known genes associated with Amelogenesis Imperfecta. Using gene expression databases, this study focuses on COL17A1 and KLK4, two verified key genes in Amelogenesis Imperfecta. Some levels of APA are present in these genes that change

the proteins that they produce. These findings suggest that APA might play a potential role in genetic disorders related to odontogenesis and Amelogenesis Imperfecta and provides the foundation for future research to confirm the development of the disease related to APA and the genetic basis of this condition.

16. Identification of Sex-Dimorphism of Temporomandibular Joint Derived Perivascular Stromal Cell

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Objectives: Temporomandibular joint osteoarthritis (TMJOA) is a debilitating condition marked by progressive osteochondral degeneration of the temporomandibular joint (TMJ). It disproportionately affects middle-aged women, who often experience more severe symptoms; however, the biological mechanisms underlying this sex-specific disparity remain unclear. Perivascular stromal cells (PSCs), which exhibit mesenchymal stem cell (MSC) like properties, have been implicated in the regulation of disease progression. Using the burn synovectomy (BS) mouse model, the first established model to recapitulate TMJOA phenotypes, this study aims to elucidate the role of sex-specific TMJ synovium derived PSCs in mediating sexual dimorphism in TMJOA through comprehensive transcriptomic and histological analyses.

Methods: Twenty-four ten-week-old adult male and female PdgfrB-CreERT2-mT/mG mice were used in the study and assigned to either an uninjured control group or a group subjected to BS to induce TMJOA. TMJ samples were collected at 4- and 8-weeks post-injury and compared to uninjured controls. TMJ-derived PSCs were FACS sorted for transcriptomic analysis. To characterize PSC differentiation, condylar phenotypes, and angiogenic changes during TMJOA progression, we employed a combination of histology, micro-computed tomography (μ CT), and optical coherence tomography (OCT) to examine cellular and tissue-level alterations, condylar morphology, and vascular dynamics throughout disease progression.

Results: Flow cytometry analysis revealed a significantly higher number of PSCs in the TMJ of female mice compared to males. Bulk RNA-seq of TMJ-derived PSCs identified sex-specific differences in signaling pathway activity independent of sex hormone effects. Furthermore, histological, optical, and radiological analyses demonstrated sex-dependent differences in PdgfrB⁺ TMJ-PSC cellular activity, condylar morphology, and angiogenesis patterns.

Conclusion: Our findings reveal sex-specific biological differences in TMJ-derived PSC profiles under both uninjured conditions and during TMJOA progression. These differences may help explain the distinct TMJOA phenotypes observed between sexes and highlight the potential for sex-specific therapeutic strategies in the treatment of TMJOA.

17. Masticatory Function in Older Adults With Mild Cognitive Impairment

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Background and Objective: Evidence links mastication with cognition, potentially through increased cerebral blood flow and oxygenation. Although animal experiments support a causal relationship, whether improving mastication preserves cognition in humans remains uncertain. This pilot evaluated the feasibility of a noninvasive assessment protocol and explored masticatory differences between older adults with and without mild cognitive impairment (MCI), laying the groundwork for future prospective intervention studies.

Methods: This cross-sectional pilot targeted 30 adults aged ≥ 65 years (15 MCI; 15 controls). Assessments included a sociodemographic questionnaire, Montreal Cognitive Assessment (MoCA), two-colour gum mixing at 10, 20, 30, and 50 cycles (ViewGum), maximal bite force (Innobyte), and oral examination. Frontal videos captured chewing patterns for DeepLabCut analysis.

Results: Thirty-eight participants completed assessments (12 MCI; 26 controls); MCI recruitment fell below target. The MCI group showed poorer gum mixing at every cycle count; approximate mean hue standard deviations at 50 cycles were 0.61 versus 0.46 in controls (lower values indicate better mixing). Higher MoCA scores tended to accompany better mixing, while bite force and tooth counts differed modestly. These clinical findings await formal statistical testing. Preliminary video analysis suggested that most measures were similar between groups, with possible differences in selected parameters requiring confirmation (data will be available during presentation).

Conclusion: Noninvasive assessment was feasible, and preliminary findings suggest reduced masticatory efficiency in MCI. The pattern raises a testable hypothesis: chewing coordination may help explain the relationship between mastication and cognition. This protocol provides a foundation for testing whether maintaining or improving masticatory function can help preserve cognition.

18. Immune Microenvironment Signatures in Pediatric Giant Cell Fibroma: An Immunohistochemical Exploration

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19. Microbiome-Targeted Prebiotics for Gingival Immune Homeostasis: Emerging Therapeutic Opportunities

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Objectives: The purpose of this literature review is to evaluate the effects of prebiotics on periodontal health. Gingivitis is the earliest, reversible stage of periodontal disease, initiated when oral homeostasis is disrupted. As dysbiosis takes hold, the oral microbiome shifts from a Gram-positive aerobic community to a Gram-negative anaerobic state dominated by key pathogens including *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, and *Tannerella forsythia*. This shift triggers an exaggerated host immune response characterized by elevated pro-inflammatory cytokines, connective tissue destruction, and progressive alveolar bone loss. Standard oral healthcare relies heavily on plaque-control techniques that mechanically remove biofilm rather than restoring overall microbial balance. Consequently, prebiotics have emerged as a targeted therapy to stabilize the oral ecosystem and protect gingival health.

Methods: This literature review synthesizes evidence across in vitro, animal, and clinical studies to evaluate how prebiotics modulate the gingival microbiome and host immunity.

Results: By selectively fostering beneficial commensals, prebiotics alter microbial composition, disrupt pathogenic biofilm organization, enhance microbial diversity, and suppress red-complex and associated pathogens. These microbial shifts reinforce epithelial barrier integrity and recalibrate innate and adaptive immune responses via cytokine modulation. Clinically, prebiotic strategies show strong potential in gingivitis management, adjunctive periodontal therapy, restorative workflows, and implant maintenance via diverse delivery systems including mouthwashes, local delivery gels, and dietary supplementation.

Conclusion: To fully translate these therapies, future research must address current evidence gaps through multi-omics profiling and long-term randomized clinical trials. Ultimately, prebiotic interventions offer a promising, ecological approach to shift dental care from non-specific biofilm clearance toward precision host-microbiome immunomodulation.

20. Crucial Role of Amelogenin Phosphorylation in Enamel Maturation

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Objectives: Dental enamel forms through a highly regulated two-phase process: secretory deposition of a mineral-organic matrix, followed by maturation, during which the organic matrix is removed and replaced with mineral through crystallite overgrowth. Amelogenin (Amelx), the predominant enamel matrix protein, and Amelx phosphorylation at a single conserved residue (Ser16) are essential for proper enamel formation (1). Phosphorylated Amelx, Amelx(+P), stabilizes amorphous calcium phosphate and slows mineralization

during secretory enamel formation (1,2). However, its role during maturation remains poorly understood.

We hypothesize that Amelx(+P) inhibits spontaneous mineralization during maturation, and that this inhibition is progressively relieved through dephosphorylation and proteolytic degradation in a coordinated spatiotemporal pattern that ensures orderly mineralization across the enamel thickness.

Methods: Using developing rat incisors, we examined the relationship between Amelx(+P), total Amelx, phosphatase activity, matrix removal, and mineralization. Because enamel mineral is lost during standard decalcification processing, all histology was performed on non-decalcified specimens using the EXAKT precision system, enabling immunofluorescence assessment of Amelx(+P) and total Amelx, ALP activity assays, toluidine blue staining for organic matrix content, and micro-CT for mineral density, all on intact mineralized tissue.

Results: Amelx(+P) immunosignal disappeared earlier than total Amelx during maturation, indicating early maturation is driven by dephosphorylation rather than complete Amelx removal. This coincided with increased ALP expression and activity across the transition and maturation stages. Toluidine blue staining showed progressive loss of the organic matrix, paralleled by increasing micro-CT radiodensity, consistent with coordinated matrix removal and mineral deposition.

Conclusion: These findings support a model in which orderly enamel maturation is governed by progressive ALP-mediated Amelx(+P) dephosphorylation coupled with proteolytic matrix removal, providing insight into how regulated Amelx processing controls the transformation of secretory enamel into a highly mineralized mature tissue. This study was supported by grant R01DE029211 (EB and HCM) from NIH/NIDCR.

21. Targeting Excess Pyrophosphate Rescues Periodontal Defects in X-Linked Hypophosphatemia

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Objectives: X-linked hypophosphatemia (XLH) is a form of inherited rickets that results from mutations in the PHEX gene. Elevated levels of fibroblast growth factor 23 (FGF23) result in excessive renal phosphate (Pi) excretion and diminished vitamin D production, causing skeletal and dental defects. Current therapeutic approaches exhibit limited efficacy in enhancing skeletal and dentoalveolar outcomes in affected individuals. Excessive production of inorganic pyrophosphate (PPi), a mineralization inhibitor, has been identified as a potential contributor to XLH-associated mineralization defects that is not addressed by current treatment approaches. The progressive ankylosis protein (Ank/ANK) is a transporter that regulates extracellular PPi levels. We hypothesized Ank deletion and the resulting decrease in PPi levels would ameliorate mineralization defects in mandibles and femurs of the Hyp mutant mouse model of XLH.

Methods: Hyp mutant mice and Ank knockout mice were crossed to create Hyp:Ank^{-/-} (double knockout, dKO) mice, single mutant and knockout mice, and wild-type (WT) controls. Mandibles and femurs were analyzed at 60 days postnatal (dpn), by micro-computed tomography, histology, and mechanical analysis (n=4-7/group).

Results: In femurs, deletion of Ank did not dramatically improve trabecular or cortical bone parameters of Hyp mice. In mandibles, deletion of Ank substantially increased acellular cementum thickness, reestablished periodontal ligament attachment to the root surface, increased alveolar bone volume, and partially normalized periodontal mechanical parameters, compared to Hyp controls. Ablation of Ank did not improve dentin volume or alveolar bone density.

Conclusion: The genetic deletion of Ank improved periodontal parameters in Hyp mice, though did not appear to improve dentin or femur parameters. This suggests that elevated PPI levels may be a contributory factor selective tissue types and targeting PPI levels may be a novel adjunct therapeutic approach for some aspects of XLH, particularly periodontal breakdown that is prevalent in adults with XLH.

22. Heterogeneity in Vital Pulp Therapy Outcome Reporting: A Scoping Review

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Objective: To map how treatment success and failure are defined, measured, and reported in the literature on vital pulp therapy (VPT) for permanent teeth.

Methods: A scoping review was conducted using PubMed, Scopus, Web of Science, and Dentistry and Oral Sciences databases. Eligible studies included randomized controlled trials, prospective or retrospective cohorts, and case series containing at least 10 permanent teeth treated with partial or complete pulpotomy. Reviews, case reports, animal studies, and primary tooth studies were excluded. Paired reviewers extracted data on success and failure definitions, clinical, radiographic, histological, and patient-reported criteria, as well as follow-up timing.

Results: Of 88 studies that passed screening, 69 met the inclusion criteria and underwent full data extraction. Definitions of success varied widely across studies. While most studies tracked clinical symptoms, such as pain and swelling, alongside radiographic signs, such as periapical radiolucency, the composite rules determining success differed significantly. Furthermore, a substantial discrepancy existed between outcomes measured and outcomes counted; criteria such as pulp sensibility or dentin bridge formation were frequently measured but excluded from formal success definition.

Conclusions: Outcome reporting in permanent-tooth VPT is highly heterogeneous, with identical clinical measurements

playing different definitional roles across studies. Standardizing definitions and reporting outcomes separately by domain are essential steps toward establishing a core outcome set for VPT.

Funding Disclosure: This study did not receive any external funding.

23. Cigarette Smoke Enhances *Fusobacterium nucleatum* Infection Through Aryl Hydrocarbon Receptors

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Objective: Cigarette smoking is a major risk factor for periodontitis and is associated with altered host-microbial interactions in the oral cavity. *Fusobacterium nucleatum*, a key bridge organism in periodontal biofilms, can invade gingival epithelial cells; however, the mechanisms by which tobacco exposure enhances epithelial susceptibility to infection remain incompletely understood. This study aimed to determine whether cigarette smoke condensate (CSC) increases *F. nucleatum* internalization and whether this effect depends on the aryl hydrocarbon receptor (AhR).

Methods: Human gingival epithelial cells were pretreated with CSC prior to infection with *F. nucleatum*. Bacterial internalization was quantified using antibiotic protection assays leading to colony-forming unit counts and fluorescence microscopy. To assess the role of AhR, loss-of-function approaches were used to generate AhR-deficient epithelial cells, and infection assays were performed under conditions of CSC exposure.

Results: CSC pretreatment significantly increased intracellular *F. nucleatum* load compared to control conditions, as demonstrated by both CFU counts and fluorescence microscopy, indicating enhanced epithelial susceptibility to bacterial invasion. Next, we observed that AhR-deficient cells exhibited a marked reduction in CSC-induced bacterial internalization compared to wild-type cells. These findings indicate that CSC-driven enhancement of *F. nucleatum* invasion is dependent on AhR signaling.

Conclusions: These results identify AhR as a key mediator of cigarette smoke-induced susceptibility to *F. nucleatum* infection in gingival epithelial cells. This work provides a focused mechanistic framework linking environmental exposure to altered host-microbe interactions in periodontal disease.

Acknowledgements: This work was supported by funds provided from The Regents of the University of California, Tobacco-Related Diseases Research Program, grant T34KT8265 to Dr. Cassio Silva.

24. Oral Microbiota and *Enterococcus faecalis* Interactions Promote Reciprocal Chlorhexidine Tolerance

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Aim: To determine how interactions between *Enterococcus faecalis* and a dental plaque-derived polymicrobial community influences susceptibility to chlorhexidine (CHX) under 5% CO₂ and anaerobic conditions.

Methodology: Dental plaque-derived communities (DP), *E. faecalis* OGIRF monocultures (EF), and mixed DP+EF biofilms were established in human saliva conditioned 96-well plates containing SHI medium and incubated for 24h under 5% CO₂ and anaerobic conditions. Biofilms were treated with phosphate-buffered saline (PBS), 0.05% CHX, or 0.1% CHX for 5 mins. Biofilm biomass and metabolic activity were quantified using crystal violet (CV) staining and MTT assays, respectively. *E. faecalis* and total bacterial survival were quantified by colony-forming-unit enumeration on bile-esculine agar (BEA) and SHI agar, respectively. Biofilm architecture was assessed by confocal laser scanning microscopy (CLSM). Each condition included five replicate wells (n=5). Homogeneity of variances was assessed using Levene's test. ANOVA evaluated treatment, atmosphere, biofilm composition, and their interactions. Data were further analyzed by Tukey's post-hoc test when significant differences were detected ($\alpha=0.05$).

Results: BEA enumeration revealed that *E. faecalis* has better survival when growing with the dental plaque community than as a monoculture following CHX exposure. Under 5% CO₂, biomass in DP+EF biofilms was significantly reduced only by 0.1% CHX, whereas 0.05% CHX significantly reduced biomass in the DP biofilm alone. Overall, DP+EF biofilms retained higher total viable bacterial counts following CHX exposure. Pre-treatment CLSM showed that DP+EF biofilms appeared denser than DP biofilms alone.

Conclusion: Although *E. faecalis* is not considered a typical member of the resident oral microbiota, its incorporation into a dental plaque-derived community increased both its own persistence and the resilience of the overall DP+EF biofilm to CHX, highlighting the importance of evaluating endodontic antimicrobials in clinically relevant polymicrobial models.

25. Comparative Evaluation of Collagen and PTFE-Based Biomaterials on the Viability and Osteogenic Differentiation of Dental Tissue-Derived Cells

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Objectives: A wide variety of membranes and matrices being used in guided bone regeneration and guided tissue regeneration, each with different biological and mechanical properties. We hypothesized that gingival mesenchymal stem cells (GMSCs) could be successfully loaded onto membranes and matrices used in bone grafting procedures without compromising their viability or osteogenic differentiation potential, thereby potentially enhancing bone regeneration. This study aimed to evaluate the effects of three commonly used biomaterials such as collagen membrane, collagen

matrix, and polytetrafluoroethylene (PTFE) membrane on GMSC viability, attachment, inflammatory response and osteogenic differentiation.

Methods: GMSC's were initially cultured on collagen coated plates and subsequently transferred onto the membranes/matrices. Calcein staining and fluorescence imaging were performed to evaluate cell attachment and viability. Following cell loading, the membranes/ matrices were then transferred to collagen coated plates and the attached GMSCs were cultured in osteogenic differentiation medium. Gene expression was analyzed by Quantitative real-time polymerase chain reaction (qRT-PCR) for inflammatory (TNF α) and anti-inflammatory (TSG-6) markers, osteogenic markers (RUNX2, DMP1, FGF23, SOST), and MSC markers (CD73, and CD105). Protein expressions were evaluated using immunofluorescence staining.

Results: All three biomaterials successfully supported GMSCs attachment and viability. GMSCs were released from the PTFE membrane onto the collagen-coated plates more rapidly than from the collagen membrane and collagen matrix. Whereas the collagen membrane and collagen matrix appeared to retain GMSCs to a greater extent than the PTFE membrane. None of the biomaterials induced an increase in the expression of the inflammatory marker TNF α while anti-inflammatory marker TSG6 remained high. GMSCs associated with the PTFE membrane and collagen matrix retained their ability to undergo osteogenic differentiation, as demonstrated by the expression of osteogenic markers.

Conclusion: These findings suggest that collagen membranes, collagen matrices, and PTFE membranes can support GMSC loading while maintaining cellular viability and osteogenic potential. The collagen matrix demonstrated the greatest capacity to support osteogenic differentiation among the tested biomaterials, suggesting its potential utility as a cell-delivery platform for regenerative bone applications.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation

26. GLP-1 Receptor Agonists and Alveolar Bone:

A Narrative Review

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Objectives: Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) are widely prescribed for the management of type 2 diabetes and obesity. As their clinical use expands, understanding potential effects beyond glycemic control and weight reduction is increasingly important. Weight loss may adversely affect systemic bone mineral density (BMD), while preclinical studies suggest GLP-1 signaling may also exert anti-inflammatory and osteogenic effects. However, their influence on human alveolar bone and clinical dental outcomes remains incompletely understood. This narrative review integrates human systemic skeletal evidence with preclinical periodontal and mechanistic findings to examine the potential effects of GLP-1 RAs on alveolar bone.

Methods: A literature search was conducted using PubMed/MEDLINE and Google Scholar. Peer-reviewed studies

evaluating GLP-1-based therapies were included if they reported outcomes related to systemic or alveolar bone. Human skeletal studies provided context for systemic effects, while periodontal, implant, extraction-socket, animal, and mechanistic studies were included to assess potential dental implications. Non-English, non-peer-reviewed, and duplicate publications, as well as studies without relevant bone or dental outcomes, were excluded. Of 662 identified records, 53 publications met eligibility criteria and were included in the qualitative synthesis.

Results: Human clinical evidence has primarily focused on systemic skeletal outcomes and remains heterogeneous across patient populations and study designs. Meta-analyses generally report no increased fracture risk with GLP-1 RA use, whereas findings for BMD are less consistent. In contrast, preclinical periodontal and mechanistic studies generally report reduced alveolar bone loss, osteoclast activity, and inflammation. Direct human dental evidence remains limited, with one retrospective peri-implant study and no prospective studies directly evaluating alveolar bone outcomes.

Conclusion: Current evidence suggests GLP-1 receptor agonists may affect systemic and alveolar bone differently. Given limited human alveolar data, GLP-1 RA use should be documented, but current evidence does not support changes to dental treatment planning. Prospective human studies assessing alveolar bone and osseointegration are warranted.

27. Effects of Hydrogen Peroxide and Carbamide Peroxide on the Viability and Inflammatory Responses of Human Gingival Fibroblasts

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Objectives: While orthodontic treatment improves dental alignment and smile esthetics, tooth whitening can provide an additional esthetic benefit for patients seeking an enhanced smile.

Hydrogen peroxide (H_2O_2) and carbamide peroxide (CP) are widely used whitening agents that generate reactive oxygen species to oxidize chromogenic compounds within dental tissues. While effective, these agents may also interact with surrounding gingival tissues, where excessive oxidative exposure could affect cellular viability and promote an inflammatory response. We hypothesized that exposure to clinically relevant concentrations of H_2O_2 and CP would reduce human gingival fibroblasts (GFs) viability and alter inflammatory responses.

This study aimed to evaluate the effects of clinically relevant concentrations of H_2O_2 and CP on the viability and inflammatory response of GFs.

Methods: GFs were cultured under standard conditions and exposed to varying concentrations of H_2O_2 and CP for 10 seconds followed by a 24-hours recovery period. Following peroxide exposure, cellular changes were observed microscopically. Cell viability was evaluated using a fluorescent live/dead staining along with the MTT assay. To assess the inflammatory response, total RNA was isolated and quantitative real-time polymerase chain reaction (qRT-PCR) was then performed to evaluate the expression of inflammatory and anti-inflammatory markers.

Results: Live/dead staining demonstrated that exposure of gingival fibroblasts to H_2O_2 and CP significantly reduced cell viability. Exposure of 1% H_2O_2 resulted in approximately 65-70% cytotoxicity compared with untreated control. A comparable cytotoxic effect was observed following exposure to 5% CP. Furthermore, qRT-PCR analysis showed that H_2O_2 exposure altered the expression of inflammatory and anti-inflammatory genes, with increased expression of TNF- α and decreased expression of TGF β . However, the substantial loss of viable cells following H_2O_2 exposure limited the interpretation of the inflammatory gene expression findings.

Conclusion: The findings demonstrate that peroxide-based tooth-whitening agents can have significant cytotoxic effects and substantial loss of cell viability. Due to the extensive cell death observed across treatment groups, evaluation of subsequent inflammatory responses was limited. These findings suggest the potential cytotoxic effects of direct peroxide exposure on gingival fibroblasts and may contribute to a better understanding of the biological effects of peroxide-based whitening products on gingival tissues and their safe clinical use.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation

28. Micro-CT Evaluation of Calvarial Bone Regeneration in Dual-Lineage Differentiated Gingival Stem Cells

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Objectives: Critical-size cranio-maxillofacial bone defects caused by congenital anomalies, trauma, tumor resection, or infection may not heal spontaneously and require bone grafting. Stem cell-based therapies have emerged as a promising approach to regenerate critical-size defects. However, vascularization remains a challenge. Gingiva-derived mesenchymal stem cells (GMSCs) are readily accessible, can be obtained minimally invasively, and can differentiate into multiple lineages. This study evaluated whether pre-differentiated GMSCs embedded in demineralized bone matrix (DBM) could enhance bone regeneration in a calvarial defect model. We conducted a comprehensive evaluation using microCT.

Methods: We cultured, characterized, and pre-differentiated GMSCs toward osteogenic and angiogenic/endothelial lineages. We created a 4.5-mm calvarial critical-size defect and assigned groups as follows: defect-only, DBM, DBM plus osteogenic GMSCs, or DBM plus osteogenic and angiogenic GMSCs. We reconstructed serial micro-CT datasets in NRecon, visualized them in CTvox, and analyzed them in CTAn using a standardized region of interest. Three-dimensional morphometry included bone volume (BV), bone volume

fraction (BV/TV), trabecular thickness (Tb.Th), trabecular separation (Tb.Sp), and trabecular number (Tb.N). Histology complemented the imaging. One-way ANOVA with Tukey's multiple-comparison test ($\alpha=0.05$) was used to compare the differences among the experimental groups.

Results: The defect model showed minimal healing (0.1-7%) without complete bony bridging at 8 weeks, confirming that the defect was critical size. The DBM group showed greater bone growth than the defect group. Osteogenic GMSCs transplanted into the defect showed enhanced osteogenic differentiation ($P<0.05$). Micro-CT and histology showed enhanced regeneration with pre-differentiated GMSC/DBM constructs, with greater defect filling ($P<0.05$) in the dual-lineage group than in empty defects.

Conclusion: These findings strongly suggest that transplanting a dual-progenitor cell population with angiogenic and osteogenic potential enhances bone regeneration in a bone defect. Transplanting dual-differentiated stem cells is a novel approach to developing vascularized bone tissue regeneration for congenital and acquired craniofacial reconstruction.

Funding Disclosure: Funded by Osteoscience Foundation, grant number:243435

29. Effects of Visbiome Treatment in the Temporomandibular Joint Abnormalities of Sick Cell Disease Mice

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Objectives: Sick cell disease (SCD) is associated with skeletal complications including osteoporosis, osteoarthritis, and chronic pain; however, its effects on the temporomandibular joint (TMJ) remain poorly understood. This study investigates the impact of SCD on TMJ structure using a humanized mouse model in which the abnormal human β -globin gene is knocked into the mouse locus. TMJs from SCD mice and littermate control mice treated with or without the probiotic Visbiome were analyzed. Histological assessments were performed to evaluate structural and pathological differences between groups, providing insight into the role of SCD in TMJ pathology and the potential modulatory effects of probiotic treatment.

Methods: This study utilized three-month-old female mouse tissue obtained from previously completed, UConn Health Animal Care and Use Committee-approved experiments involving Visbiome treatment. Following sacrifice, mouse heads were harvested and stored for analysis. Four experimental groups were included: normal littermate control mice treated with vehicle (medium-chain triglyceride [MCT] oil), normal littermate control mice treated with Visbiome, mice expressing human SCD hemoglobin treated with vehicle, and mice expressing human SCD hemoglobin treated with Visbiome. Temporomandibular joints were dissected and radiographically imaged, after which mandibular condyles and associated tissues were isolated, frozen, and sectioned. Histological slides underwent fluorescent tartrate-resistant acid phosphatase (TRAP), Alkaline Phosphatase, Toluidine

Blue, and Safranin O staining. Immunofluorescence assessed MMP13, Runx2, FGF2, BMP2, PRG4, phosphorylated FGFR1, phosphorylated FGFR3, and Ki67.

Result: Toluidine Blue staining indicated decreased cartilage thickness in SCD mice. Bone mineral density was reduced in SCD mice compared to controls. Decreased Ki67 and PRG4 expression were observed in SCD mice, while Runx2 and phosphorylated FGFR3 expression were increased. Visbiome treatment improved FGF2 expression and increased BMP2 expression in SCD mice.

Conclusion: There are distinct differences in biomarker expression, cartilage thickness, and bone mineral density between control and SCD mice. In some cases, Visbiome modulated expression in SCD mice.

Funding Disclosures: Supported by: UConn School of Dental Medicine Summer Research Fellowship, NIH/NIDDKR01DK129431-01A1 to M. Hurley

SESSION III | POSTER PRESENTATIONS

BIOMATERIALS

30. Wettability of Titanium Implants Utilizing Hyaluronic Acid and Bone Grafts

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Objective: This in vitro study investigates the wettability of titanium implants under the influence of hyaluronic acid (HA) with bone grafting materials.

Materials and Methods: Two groups of titanium implant surfaces in the form of disks: titanium alloy (Ti-alloy) and titanium with sand-blasted, acid-etched surface (Ti-SLA) were treated with six different solutions: HA (Gengigel) (Group 1), 0.9% sodium chloride (NaCl) (Group 2), as well as the residues after mixing bovine grafting material (W-Bone) with HA (Group 3), W-Bone mixed with NaCl (Group 4), algae-based bone graft (AlgOss) mixed with HA (Group 5), and AlgOss mixed with NaCl (Group 6). A pipette was used to dispense 10 μ L of the supernatant onto the center of each implant surface disk (Ti-alloy, Ti-SLA) with 20 trials per surface (n=240). Wettability was assessed by measuring two wetting angles using a goniometer. To determine differences, One way ANOVA with posthoc multiple comparisons was performed.

Results: In group 1, the contact angles were: Ti-alloy $35.7^\circ \pm 3.29$, SLA $43.3^\circ \pm 9.78$, in group 2, Ti-alloy $91.7^\circ \pm 3.45$, SLA $90.0^\circ \pm 7.09$; in group 3, Ti-alloy $33.9^\circ \pm 4.15$, SLA $42.4^\circ \pm 8.39$; in group 4, Ti-alloy $60.4^\circ \pm 18.56$, SLA $85.8^\circ \pm 10.17$; group 5, Ti-alloy $42.6^\circ \pm 8.53$, SLA $49.5^\circ \pm 10.07$ and in group 6, Ti-alloy $84.9^\circ \pm 5.28$, SLA $85.5^\circ \pm 13.93$. The Bonferroni posthoc comparisons revealed significant differences between the groups when HA was used ($p \leq 0.001$).

Conclusion: Within the limitations of this study, the application of HA on titanium implants can have favorable therapeutic outcomes by increasing the wettability of titanium surfaces when mixed with grafting materials.

31. LIRA: Laser-Induced Reversible Adhesive

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Objectives: The two objectives of the study were to evaluate if LIRA provides similar bond strength seen in conventional adhesives and to investigate if LIRA has a significantly lower force required to remove the attachment after laser irradiation.

Methods: Twenty extracted human mandibular canines were prepared and randomly allocated to receive either LIRA (n=10) or a conventional orthodontic adhesive, BracePaste (n=10). In-house designed and 3D-printed resin attachments were bonded to etched enamel surfaces.

Specimens were subsequently divided into four groups: BracePaste without laser irradiation, BracePaste with laser irradiation, LIRA without laser irradiation, and LIRA with laser irradiation. Laser-treated specimens were irradiated using a PicasoPro diode laser at 3 W for 10 seconds with a 400- μ m tip. Shear bond strength (SBS) was measured using a universal testing machine. Due to specimen loss during testing, 3 specimens were evaluated in each of the first three groups and 5 specimens in the LIRA + laser group.

Results: Mean SBS values were 24.21 ± 5.28 MPa for BracePaste, 26.01 ± 5.24 MPa for BracePaste + laser, 23.20 ± 5.37 MPa for LIRA, and 1.36 ± 1.11 MPa for LIRA + laser. No statistically significant difference was observed between BracePaste and LIRA initial bond strength, indicating comparable initial bonding effectiveness. Laser irradiation did not significantly alter BracePaste bond strength. In contrast, laser irradiation produced a significant reduction in LIRA bond strength ($p = 0.018$).

Conclusions: LIRA demonstrated initial bond strength comparable to conventional orthodontic adhesive while exhibiting a substantial reduction in bond strength following laser activation. These findings suggest that LIRA may facilitate more efficient and controlled removal of clear aligner attachments while potentially reducing enamel damage. Further studies with larger sample sizes are warranted to validate these findings and optimize laser activation protocols.

32. Effects of Oral Nicotine Pouches on Periodontal Ligament Stem Cells

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In recent years, the rise of tobacco-free alternatives has led to a major increase in oral nicotine pouch (ONP) use across many demographics, while the long-term periodontal effects of these products remain unclear. Previous studies have demonstrated that pure nicotine can have negative effects on human periodontal ligament stem cells (hPDLSCs), yet the effects of sustained concentrations of nicotine in combination with the pH modifiers, sweeteners, and permeation enhancers found in ONPs has not been widely reported.

The objective of this study was to measure the cytotoxic effects of this combination of ONP constituents on hPDLSCs. Furthermore, we also compared the effects of culturing in complete media (CM) and base media (α -MEM). Treatment media was prepared by

immersing ONPs (ZYN, Pinkerton Tobacco Co. LP., Owensboro, Kentucky) (Wintergreen, 6 mg) into either α -MEM or complete media. Extracts had their nicotine concentrations measured using liquid chromatography with diode-array detection (LC-DAD). Cells were obtained from ATCC (hPDLSCs) and were cultured for 36 hours before being passaged, counted, and seeded at 5,000 cells per well in 24-well plates. Treatments involved replacing growth media with treatment media (at concentrations of 100% 75% or 50% diluted with α -MEM or CM) for one hour. Cell counts were measured using an Alamar Blue assay over a four-day period.

By the final day, the α -MEM 100% extract reduced AB fluorescent values by approximately 50% relative to the positive control, while 75% and 50% extracts remained near control levels. Conversely, in complete media, 100% extract reduced fluorescent values by approximately 15%. Altogether, these results suggest that complete media provided a protective effect against ONP extract on hPDLSC viability.

33. Flexural Strength of Conventional, Milled, and 3D-Printed Denture Bases.30.

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Objectives: Denture base materials must resist fracture under repeated functional loading, yet the flexural performance of newer digital fabrication methods relative to conventional processing requires additional study. This study compared the flexural strength of conventional heat-polymerized polymethyl methacrylate (PMMA), two CAD/CAM-milled materials (AvaDent and Ivotion), and a 3D-printed material (Lucitone Digital Print) to determine whether digital fabrication offers a mechanical advantage over conventional processing.

Methods: Rectangular specimens (25 × 3 × 2.5 mm; n = 20/group) were fabricated per manufacturer instructions and ISO 20795-1 specifications, then stored in distilled water at 37°C for 24 hours before testing. Flexural strength was measured via four-point bending on a universal testing machine at a crosshead speed of 1 mm/min until fracture. Specimen dimensions were recorded, and flexural strength was calculated from maximum load. Data were analyzed by one-way ANOVA with Student-Newman-Keuls post hoc testing (α = 0.05).

Results: Mean flexural strength (MPa $\pm$ SD) was highest for Lucitone Digital Print (130.1 $\pm$ 7.1), followed by AvaDent (126.2 $\pm$ 6.4), Ivotion (123.5 $\pm$ 14.2), and conventional PMMA (102.5 $\pm$ 12.8). PMMA showed significantly lower flexural strength than all three digitally fabricated materials (p < 0.001); no significant differences were found among the milled and 3D-printed materials.

Conclusion: Milled and 3D-printed denture base materials demonstrated significantly higher flexural strength

compared to conventional heat-polymerized PMMA, with no significant difference between fabrication techniques. These findings support the mechanical viability of digital workflows for denture base fabrication and may guide material selection; further studies incorporating clinical function and long-term loading are warranted.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation.

34. Bond Quality of Deep Core Build-Up Materials in Pulp Chambers.

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Objective: Core build-up materials differ in polymerization mechanism and increment thickness, which may affect bonding within the confined geometry of a pulp chamber. This study compares microtensile bond strength of light-cure and dual-cure core build-ups against an incremental control.

Methods: Extracted molars received endodontic access preparations, were sectioned 6 mm above the pulpal floor and assigned to four groups: SBUP, Scotchbond Universal Plus with TPH Spectra ST in 2-mm increments; S3-CPC, Clearfil Universal Bond Quick 2 with Clearfil Photo Core; B1-FR, Bond-I SF with Build-It FR light-cured immediately; B1-DeFR, the same after 4 minutes. Teeth were sectioned into 1x1 ($\pm$ 0.2) mm beams and loaded to failure; recording fracture mode and section level.

Results: Sixty-three beams from 20 teeth were tested: 2 adhesive, 49 mixed, 1 cohesive within composite and 11 cohesive within dentin. Those 11 were the highest values (85.9 $\pm$ 11.5 versus 32.0 $\pm$ 17.1 MPa), excluded as substrate failures. Analyzing the 51 interfacial fractures on tooth means gave 13.1 $\pm$ 10.2 MPa (SBUP), 37.2 $\pm$ 11.9 (S3-CPC), 42.2 $\pm$ 19.8 (B1-FR) and 28.7 $\pm$ 5.7 (B1DeFR); $F(3,15)=4.61$, $p=0.018$. Tukey identified B1-FR versus SBUP as significant (29.1 MPa, $p=0.016$). Kruskal-Wallis agreed; the result survived removal of any single tooth in 18/19 refits. Bond strength did not differ between occlusal, middle and cervical thirds ($p=0.63$), although cohesive dentin fractures rose from 9% to 28% with depth.

Conclusions: The incremental control produced the lowest interfacial bond strength in the pulp chamber, significantly below the immediately light-cured dual-cure build-up; the three 6-mm protocols did not differ. Fracture mode determined the outcome: counting substrate fractures as bond measurements obscures the group difference and creates an artifactual rise with depth. Bond strength was independent of position within the build-up, arguing against light attenuation as limiting. In this sample, bulk placement of a deep-cure core bonded more reliably to pulp chamber dentin than incremental placement.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation

CLINICAL RESEARCH

35. Budget Light-Curing-Unit's Photocuring Claim Is Not Supported by Evidence

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The manufacturer of Woodpecker iLED®, a budget Light-curing-unit (LCU), claims it can photopolymerize a 2-mm increment of resin-based composite (RBC) in 1-second. Purpose: this study measured the radiant exposure (RE) delivered by Woodpecker iLED to simulated Class I and Class III preparations. Goal was to obtain an RE of 16 J/cm².

Material and Methods: Using the Managing Accurate Resin Curing-Patient Simulator (MARC-PS), Class I and Class III simulated preparations were photocured using the iLED LCU on high power mode (mean radiant exitance of 2,550 mW/cm², and mean power of 1020 mW). Class III preparations were photocured with exposure times of 1 to 9 -seconds. Class I preparations were for photocured with exposure times of 1, 2, 3, 6, 9, 12, and 15-seconds. Each exposure was repeated 10 times (160 evaluations). Analysis of variance (ANOVA), linear regression, and standard least-squares analysis evaluated effects of exposure duration and preparation configuration.

Results: Radiant exposure increased significantly with exposure duration for both preparation configurations ($p < 0.001$). Class III preparations received greater RE than Class I preparations at comparable exposure times. Exposure duration, preparation type, and their interaction significantly affected RE (all $p < 0.001$). Mean RE increased from 2.60 ± 0.27 J/cm² at 1-second to 24.82 ± 0.75 J/cm² at 9-seconds for Class III preparations. For Class I preparations mean RE increased from 1.45 ± 0.18 J/cm² at 1-second to 23.21 ± 0.80 J/cm² at 15-seconds. Regression analysis estimated that the 16 J/cm² target was achieved at approximately 5.8 seconds for Class III and 9.8 seconds for Class I preparations. The iLED demonstrated predictable and reproducible performance. However, preparation configuration significantly influenced energy delivery.

Conclusion: A single recommended curing time can't provide equivalent RE across different preparation configurations and do not support a universal 1-second curing time under the conditions tested.

36. Descending Control of Glucagon (GCG) Neurons in the Nucleus Tractus Solitarius (NTS)

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Mentor(s): Yuanyuan Li, Ph.D.

Objective: Determine whether breathing is directly modulated by descending supraspinal NTSGCG neurons.

Background: GCG neurons are a subtype of supraspinal neuron residing in the NTS. Most current literature about GCG neurons concerns eating and appetitive behavior. Recent studies implicate the NTS in sleep apnea likely through control of breathing (Zoccal et. al, 2014). Preliminary anterograde tracing suggests NTSGCG spinal projections contact ChAT motor neurons in the cervical spinal cord which are innervated by the diaphragm.

Methods: Five anesthetized neonatal mice received intramuscular injections of pseudo-typed delta G rabies in the diaphragm. Five anesthetized adult mice received intramuscular injections of Fluoro-Gold in the diaphragm. The mice were incubated for six days and subsequently sacrificed. Intracardial perfusion was performed using 4% PBS/PFA and post-fixation occurred in a 4% PFA solution overnight. Dissection of the central nervous was performed to isolate the spinal cord and samples were sectioned from the cervical spinal cord and the hindbrain. Slides of the sections from both murine models were prepared using a Cryostat then analyzed using confocal microscopy to identify positive Fluoro-Gold, ChAT, GFP, or Synaptophysin-GFP signals in the cervical spinal cord and hindbrain.

Results: Sagittal sections of the adult cervical spinal cord in a murine model demonstrate direct Fluoro-Gold labeled spinal motor neurons. Transverse cervical spinal cord section showed fluorescently-labeled cholinergic neurons and NTS axonal projections, with colocalization in the ventral horn. Fluoro-Gold (FG) labeled motor neurons in the cervical spinal cord confirms a neural synapse between the diaphragm and the central nervous system (CNS). No GCG cell bodies were directly labeled in the NTS.

Conclusions:

1. The colocalization of cholinergic neurons and NTS axons in the ventral horn demonstrates potential innervation of the diaphragm by NTSGCG neurons.
2. The helper virus G protein efficiency may explain the GCG labeling deficiency.
3. The mechanism by which the NTS regulates breathing could be further elucidated by performing retrograde labeling of GCG neurons using an EnvA-pseudotyped retrovirus dG, validating synaptic contacts between GCG and diaphragm motor neurons using an AAV-Syp-mCherry anterograde trace in GCG-Cre mice, and examining the effects of functional manipulation of GCG neurons.

Acknowledgements: Thank you to NIH/NIDCR for this opportunity as part of the Summer Dental Student Award. Thank you to my labmates for their support and guidance.

37. Deep Learning-Based Caries Detection in Bitewing and Periapical Radiographs Using Object Detection Models Akansh Mani

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Accurate interpretation of dental radiographs is essential for diagnosing caries, yet variability among clinicians can lead to inconsistent outcomes. This study evaluated a deep learning-based object detection model for identifying carious lesions on bitewing and periapical radiographs and compared its performance to dental instructors. It was hypothesized that the model would demonstrate comparable diagnostic accuracy with reduced variability. A total of 30 anonymized radiographs were analyzed. A reference standard was established by an independent dentist identifying 98 carious sites. Fifteen dental instructors and the AI model independently evaluated the images. Performance was compared using total detected sites and statistical analysis. The model identified 95 sites, closely approximating the reference standard, while instructors identified a mean of 96.6 ± 3.25

sites. No statistically significant differences were found between groups ($p > 0.05$). However, instructors showed greater variability (range: 89–101), whereas the model demonstrated consistent detection. These findings suggest that deep learning models can achieve diagnostic accuracy comparable to clinicians while reducing interobserver variability. This consistency may support more standardized radiographic interpretation and serve as a valuable adjunct in clinical decision-making. This study did not involve human subjects and did not require IRB approval.

38. Dental Opioid Prescribing Patterns Among Kentucky Adolescents and Young Adults

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Background: Dentists commonly prescribe opioid analgesics to adolescents and young adults (AYA) following tooth extractions, despite evidence indicating non-opioids are safer and more effective. Prescription guidelines from the ADA and CDC recommend the lowest effective dose for the shortest duration. This cross-sectional study aimed to evaluate adherence to opioid prescribing guidelines among AYA undergoing tooth extractions.

Methods: EHR were obtained from three Kentucky dental clinics (C1–C3) over 5 months in 2022. Encounters included complete prescription data and patient demographics. Morphine milligram equivalents (MME) were calculated for all opioid prescriptions. Guideline adherence was assessed using three criteria: 1) prescription duration >3 days, 2) use of higher potency opioids, and 3) dosage >50 MME/day. Prescriptions meeting these criteria were considered non-adherent. Descriptive statistics were used to summarize findings.

Results: Opioid prescribing rates were high: 74.3% (C1, $N=284$), 81.8% (C2, $N=110$), and 67.4% (C3, $N=178$). Most patients were female (45.8–60.1%), with mean age 18.04 to 19.8. C1 (99.5%) and C3 (98.3%) prescribed hydrocodone most frequently, while oxycodone was exclusively prescribed in C2. No prescriptions exceeded 50 MME/day. Higher potency prescriptions were low: 1.9% (C1) and 8.3% (C3). Prescriptions exceeding 3 days occurred in 4.4–8.1% of cases. Overall non-adherence ranged from 4.4% (C2) to 15.8% (C3). Additionally, 32.1% of prescriptions included variable quantity or frequency instructions.

Conclusions: Although non-opioids are recommended as first-line treatment, opioids remain frequently prescribed for AYA receiving tooth extractions. While non-adherence was low, limiting prescriptions to 3 days and avoiding ambiguous instructions may enhance adherence and promote safer prescribing practices.

Funding: The ongoing clinical trial is supported by the National Institute of Dental and Craniofacial Research (NIDCR), with the award number UH3DE032621 and clinical trial number NCT06275191.

39. Differential Salivary Immune and Microbial Profiles in Persons Living with HIV With and Without Periodontal Disease

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Background: Periodontal disease (PD) is a chronic inflammatory condition characterized by oral microbial dysbiosis and altered host immune responses. HIV infection may further disrupt immune regulation and modify periodontal inflammation. This study evaluated salivary periodontal pathogens and immune biomarkers among individuals with and without HIV and PD.

Methods: A total of 149 adults were enrolled (IRB No. IRB23-05-1316) and stratified into four groups according to HIV and periodontal disease status following inclusion and exclusion criteria: HIV–PD– ($n=52$), HIV–PD+ ($n=48$), HIV+PD– ($n=20$), and HIV+PD+ ($n=29$). Salivary levels of 96 cytokines, chemokines, growth factors, and immune-regulatory molecules were quantified using multiplex Luminex xMAP technology. Periodontal pathogens in saliva were quantified using real-time quantitative PCR. Biomarker concentrations were compared among the four groups using the Kruskal-Wallis test with Bonferroni-adjusted pairwise comparisons. Bacterial abundance was evaluated using one-way analysis of variance with Tukey's multiple-comparison test.

Results: Salivary bacterial profiling showed significantly greater abundance of *P. gingivalis*, *T. denticola*, and *T. forsythia* in PD groups compared with periodontally healthy groups, whereas *F. nucleatum* did not differ significantly in one comparison. Immune profiling identified significant group differences across multiple growth factors, interleukins, pro- and anti-inflammatory cytokines, chemokines, and immune-regulatory molecules, including G-CSF, EGF, IL-5, IL-7, IL-13, IL-15, IL-23, TNF- α , IL-1 α , IL-6, IL-17A/F, IL-10, MIP-1 β , IP-10, RANTES, CXCL16, MDC, CTACK, SDF-1, BAFF, perforin, and sCD137. Collectively, these findings demonstrate distinct salivary microbial and immune profiles associated with PD and HIV status, with several biomarkers differing between HIV-negative and HIV-positive participants with PD.

Conclusion: The combined presence of HIV and PD was associated with distinct salivary microbial and immune profiles, characterized by increased periodontal pathogens and altered inflammatory, chemotactic, T-cell-modulatory,

and immune-regulatory mediators. These findings support salivary profiling as a noninvasive approach to characterize HIV-associated periodontal inflammation and identify candidate biomarkers for PD assessment in people living with HIV.

40. Marginal Bone Changes in Natural Teeth Adjacent to Dental Implants

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Background: Dental implants are a predictable option for tooth replacement. Although implant associated marginal bone changes have been widely studied, limited evidence exists regarding longitudinal bone level changes around natural teeth adjacent to implants. Periodontal disease may influence these changes, highlighting the importance of evaluating adjacent dentition.

Objective: To evaluate marginal alveolar bone level changes in teeth adjacent to implants and determine whether these changes were associated with periodontal disease severity. The null hypothesis was that no significant difference in marginal bone levels would occur between baseline and follow up.

Methods: This retrospective cohort study reviewed records and radiographs of patients treated with implants at the University of Nevada, Las Vegas School of Dental Medicine from 2014 to 2025. Thirty patients contributed 49 implant adjacent sites with paired radiographs. Marginal bone levels were measured from the cemento-enamel junction to the alveolar crest. Paired t-tests assessed longitudinal changes, while ANOVA and nonparametric analyses evaluated differences by periodontal classification ($p < 0.05$).

Results: Mean marginal bone level increased from 2.73 mm at baseline to 3.39 mm at follow up (mean change=0.66 mm; 95% CI: 0.51–0.81; $p < 0.001$). Bone level changes differed among periodontal Stages I–III (ANOVA $p = 0.016$; Kruskal-Wallis $p = 0.017$), with greater variability and higher median bone loss in Stage III. No significant difference was observed between Grades A and B ($p > 0.5$).

Conclusion: Within the limitations of this study, natural teeth adjacent to implants demonstrated marginal bone loss between baseline and follow up. Greater bone loss with advancing periodontal stage suggests disease severity may modify longitudinal bone changes, whereas periodontal grade was not associated with bone loss. These findings support consideration of periodontal status when monitoring natural teeth adjacent to implants without establishing a causal effect of implant placement.

41. Social Risk and Dental Care Access in an Urban FQHC

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Objective: To examine the relationship between cumulative social risk and dental care access and explore how patients describe barriers to obtaining care in an urban dental safety-net setting.

Methods: This ongoing pilot study used a convergent mixed-methods design at the St. Louis Dental Center. Adults aged ≥ 18 years completed the 2025 PRAPARE assessment and reported difficulty obtaining dental care and missed or delayed care ($N = 19$). PRAPARE Risk Tally Scores were summarized descriptively and compared by dental access outcomes using Mann-Whitney U tests. Semi-structured individual interviews ($n = 5$) were audio-recorded, transcribed verbatim, and analyzed using Braun and Clarke's six-phase thematic analysis. Quantitative and qualitative findings were integrated to identify convergence and complementary insights.

Results: The mean PRAPARE Risk Tally Score was 7.3. Participants reporting missed or delayed dental care had higher median scores than those without delay (7.5 vs. 5.0; $U = 31.0$, exact $p = .278$). Participants reporting difficulty obtaining care also had higher scores than those without difficulty (11.0 vs. 5.0; $U = 26.5$, exact $p = .196$). Neither comparison reached statistical significance in this pilot sample. Interviews identified four themes: financial and structural barriers, awareness and navigation gaps, psychosocial barriers, and the dental school as an enabling model of care. Mixed-methods integration showed convergence around material hardship, transportation, social isolation, and delayed care. Interviews additionally revealed dental fear, stigma, trauma, and navigation challenges that were not fully represented by structured social-risk screening.

Conclusion: Preliminary findings suggest that dental access challenges may arise from intersecting social, structural, and psychosocial factors. Combining standardized social-risk screening with patient narratives provided a more comprehensive understanding of barriers to care. Continued recruitment will allow more precise estimates and examination of specific social-risk domains.

Funding Disclosure: Supported by the A.T. Still University Community Health Research Fund.

42. Impact of Age on Salivary Biomarkers and Microbiome in Patients with Periodontal Disease With Or Without HIV Infection

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Objective: Periodontal disease (PD) is a chronic inflammatory condition characterized by progressive destruction of tooth-supporting tissues. HIV-associated immune dysregulation may further modify inflammatory

responses in PD. Aging also alters immune regulation; however, its relationship with salivary inflammatory profiles across HIV and PD status remains unclear. This study evaluated age-associated differences in salivary biomarkers among individuals with and without HIV and PD. Methods: Following Institutional Review Board approval (IRB #22-12-1265), 149 participants were categorized into four groups: HIV-/PD-, HIV-/PD+, HIV+/PD-, and HIV+/PD+. Saliva samples were analyzed for 96 inflammatory and immune-related biomarkers. Participants were stratified by age (≤ 50 and ≥ 51 years). Differences across the four clinical groups within each age category were evaluated using Kruskal-Wallis tests ($p < 0.05$), followed by pairwise comparisons. Results: Distinct disease-associated salivary biomarker profiles were observed within both age categories. Among participants ≤ 50 years, 24 of 96 biomarkers differed significantly across HIV/PD groups, including G-CSF, GRO α , IL-1 α , IL-18, and IP-10 (all $p < .001$), as well as IFN- γ and MIP-3 β ($p = .002$). Among participants ≥ 51 years, 24 biomarkers also differed significantly across groups, including Fractalkine and IL-17F ($p = .006$), IL-5 and MCP-3 ($p = .007$), IL-9 ($p = .008$), and IL-18 ($p = .010$). Although the number of significant biomarkers was identical between age strata, their composition differed substantially. G-CSF, IL-1 α , IL-9, IL-18, and TNF- α were significant across clinical groups in both age categories, whereas several other biomarkers were age-specific. The SPSS analysis confirms significant group differences for multiple biomarkers within the ≤ 50 -year stratum. Conclusion: HIV and periodontal disease are associated with distinct salivary inflammatory profiles that vary by age. The persistence of selected biomarkers across age strata, together with age-specific biomarker patterns, suggests both shared and age-dependent immune responses. These findings support consideration of age when evaluating salivary biomarkers for PD in individuals with and without HIV.

43. Age-Associated Differences in Plasma Biomarker Profiles Across Periodontal Disease and HIV Status

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Purpose & Rationale: Aging is associated with changes in immune regulation and chronic inflammation that may influence periodontal disease (PD) and HIV-associated immune dysfunction. This study evaluated age-associated differences in plasma immune and inflammatory biomarkers among healthy individuals and participants with PD, HIV, or both HIV and PD. Methods: Following Institutional Review Board approval from Meharry Medical

College (IRB #22-12-1265), informed consent was obtained from all participants. Plasma samples were categorized into four clinical groups: periodontal healthy, PD+, HIV+, and with both HIV+PD. Participants were stratified by age (18-50 years and ≥ 51 years). Biomarker levels were compared using nonparametric statistical analyses, with statistical significance defined as $p < 0.05$. Pairwise comparisons were performed to characterize age-associated differences within the four clinical groups. Results: Analysis of the 96 plasma biomarkers identified age-associated differences in 45 biomarkers (46.9%) across the clinical groups. The pattern and magnitude of these differences varied according to PD and HIV status. In the PD group, sCD137 (T-Cell activator and survival) was significantly higher among participants ≤ 50 years ($p = .010$), whereas TARC/CCL17 (immune function regulator) was higher among those ≥ 51 years ($p = .017$). Age-related differences were more extensive in the HIV+ and HIV+PD groups. Among participants ≥ 51 years, IFN- β and M-CSF were higher in the HIV group ($p = .006$), while IL-7 and TGF were higher in the HIV+PD group ($p = .006$). In contrast, the periodontal healthy group showed higher levels of TPO ($p < .001$), MIG/CXCL9 ($p = .001$), SCF ($p = .001$), and sFas ($p = .002$) among participants ≤ 50 years. Conclusion: Plasma immune and inflammatory biomarker profiles differed by age across periodontal healthy, PD, HIV+, and HIV+PD groups. Age-associated differences in PD involved biomarkers related to immune regulation and cell recruitment, while broader differences were observed in the HIV and HIV+PD groups. These findings highlight age as an important biological variable when evaluating systemic immune and inflammatory biomarker profiles in PD and HIV.

44. Taxa Filtering Unmasks Salivary Dysbiosis Signals That Refine Periodontal Diagnosis

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Background: Conventional periodontal diagnosis is based on assessing loss of periodontium, pocket depth, and inflammation, with significant overlaps between periodontitis and non-periodontitis. The diagnoses of the same patients could vary widely among clinicians, leading to different treatment recommendations. The oral microbiome is known to be associated with periodontitis. Assessing oral microbiome dysbiosis offers a potential solution to clinical diagnosis.

Objective: To evaluate the relationship between the salivary microbiome dysbiosis by SMDI (<https://bioinformatics.forsyth.org/smdi/index.php>) and periodontal diagnosis.

Materials and Methods: Adult patients at the Ostrow Clinic were recruited (IRB protocol HS-24-00312), excluding subjects with conditions known to affect the oral microbiome (e.g., recent antibiotic treatment). Patients received a comprehensive examination, diagnosis, and treatment plan. Five milliliters of non-stimulated saliva were collected. Salivary DNA was extracted using a standard protocol and subjected to 16S rDNA profiling of the V4 region. The SMDI analysis was performed according to the instructions on the website.

Results: Thirty patients were included, divided evenly between periodontitis and gingivitis/health. SMDI in periodontitis was higher than in gingivitis/health. The differences were statistically significant when rare taxa were excluded from the analysis. For periodontitis and gingivitis/health, the genus-level SMDIs were -1.26 and -7.10, respectively, at a Gini cutoff of 2.0 (t-test, $p = 0.019$). Factors that influenced the diagnostic accuracy of SMDI included the analysis setting, oral conditions (e.g., caries), and calibration in diagnosis.

Conclusion: Microbiome dysbiosis analysis shows promise in improving clinical periodontal diagnosis.

45. Products and Activities Associated with Concomitant Facial and Oral Trauma

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Objectives: Concomitant facial and oral trauma can involve multiple anatomical structures and require coordinated assessment and management, yet associated products and activities remain poorly characterized. This study aimed to identify products and activities associated with increased odds of concomitant facial and oral trauma among patients presenting to U.S. emergency departments (EDs), and to examine demographic variation and temporal trends in product involvement.

Methods: We conducted a cross-sectional analysis of the U.S. Consumer Product Safety Commission National Electronic Injury Surveillance System (NEISS) from 2019–2024. ED encounters involving facial injury, oral injury, or both were identified using standardized body-part codes. Concomitant injury required coding of both the face and mouth. Conceptually related NEISS product codes were grouped into prespecified categories. Logistic regression estimated adjusted odds ratios (aORs) and 95% confidence intervals (CIs) for concomitant injury versus either target site alone, adjusting for age, sex, race/ethnicity, and alcohol, drug, or fire involvement. Subgroup analyses were performed by age, sex, and race/ethnicity, and temporal trends in concomitant injuries were assessed.

Results: Among 274,361 eligible ED encounters, 6,291 involved concomitant facial and oral trauma. Of 132 eligible product groups, 15 were associated with significantly increased adjusted odds of concomitant injury. The strongest associations were observed for power home workshop saws (aOR, 2.90; 95% CI, 1.47–5.70), bicycles and accessories (aOR, 2.65; 95% CI, 2.43–2.88), skateboards/scooters/hoverboards (aOR, 2.62; 95% CI, 2.36–2.90), and cigarettes/lighters/fuel (aOR, 2.59; 95% CI, 1.49–4.50). Associations varied across demographic strata. Temporally, ATVs/mopeds/minibikes and skateboards/scooters/hoverboards increased their share of concomitant cases, whereas bicycles/accessories decreased despite rising case volume.

Conclusions: Distinct products and activities are associated with concomitant facial and oral trauma, with demographic variation and an evolving injury mix. These patterns may inform targeted prevention, consumer safety, and mechanism-informed clinical assessment.

Funding Disclosure: None.

46. Comparative Analysis of Color Stability and Surface Roughness of Different Orthodontic Aligner Materials

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Objective: Clear Aligner Therapy (CAT) serves as an alternative to traditional brackets and allows for a less invasive and aesthetically pleasing form of orthodontic treatment. Their design supports effective dental alignment while reducing disruption to the patient's appearance and daily lifestyle. Varying oral environments may affect clear aligner aesthetics and surface properties. This research aims to compare the surface roughness and color stability of three commonly used clear aligner materials.

Methods: Three aligner materials (Invisalign, Zendura VIVA, Zendura FLX) were measured before and after submergence in neutral (pH 7.0) or acidic (pH 4.5) artificial saliva for nine days at 37 °C. Color stability was measured using the VITA Easyshade V spectrophotometer, and surface roughness (Sa) was measured using the Keyence Optical Profilometer. One-way ANOVA with Fisher's LSD post-hoc comparisons ($\alpha < 0.05$) was performed to evaluate the overall stability of each material across exposure conditions.

Results: Zendura VIVA demonstrated the greatest overall stability with no significant change in color parameters or surface roughness ($p > 0.05$), while Zendura FLX and Invisalign showed significant changes in both color and surface roughness after immersion ($p < 0.05$).

Conclusion: Under the experimental conditions evaluated, Zendura VIVA demonstrated greater color and surface stability, whereas Zendura FLX and Invisalign showed significant changes in both parameters, suggesting that material selection may influence esthetic and hygienic outcomes during therapy.

47. Impact of Sex on Salivary Biomarkers and Microbiome in Patients with Periodontal Disease & With or Without HIV Infection

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Objective: Periodontal disease (PD) is a chronic inflammatory condition characterized by dysregulated host immune responses. People living with human immunodeficiency virus (PLWH) may exhibit altered inflammatory responses that influence periodontal disease progression. This study evaluated salivary inflammatory and immune-related biomarkers across HIV and PD status and investigated sex-based differences in biomarker expression. We hypothesize that salivary biomarkers are distinctly expressed based on sex.

Research Design: Following Institutional Review Board approval (IRB #22-12-1265), 150 participants were recruited from the School of Dentistry clinics and Community Wellness Center. Participants were classified into four groups: HIV-negative without PD, HIV-negative with PD, HIV-positive without PD, and HIV-positive with PD (PD-HIV). Saliva samples were analyzed for 96 biomarkers. Group differences were assessed using the Kruskal-Wallis test with Dunn's post hoc analysis. Sex-based differences were evaluated using the Mann-Whitney U test and sex-stratified Kruskal-Wallis analyses.

Results: Sex-stratified Kruskal-Wallis analysis identified significant differences among the four groups for 13 of 96 biomarkers in males and 40 of 96 biomarkers in females ($p < 0.05$). In males, G-CSF, IL-1 α , and IL-18 showed the strongest group-level differences ($p < 0.001$). In females, IL-9, IL-10, IL-17F, MCP-3, MIP-1 β , TGF α , and TNF α showed significant differences ($p < 0.001$). The Mann-Whitney U test identified 29 significant biomarkers ($p < 0.05$) across the four groups: 3 in Group 1 (MCP-1, MDC, TRAIL), 16 in Group 2 (including FLT-3L, Fractalkine, IL-2, IL-10, IL-17A, IP-10, CTACK, and CXCL16), 3 in Group 3 (BCA-1, CCL28, IL-34), and 7 in Group 4 (including IL-1RA, MIP-1 β , ENA-78, GCP-2, and IL-24). ENA-78 ($p = 0.001$), IL-10 and CTACK ($p = 0.003$), FLT-3L ($p = 0.004$), and CXCL16 ($p = 0.006$) showed the strongest sex-associated differences.

Conclusions: Salivary biomarkers varied by HIV/PD status and biological sex, highlighting sex-specific inflammatory responses and supporting consideration of sex when evaluating biomarkers for PD and HIV-associated inflammation.

48. Breastfeeding Duration and Oropharyngeal Candidiasis Predict Infant Oral Fungal Colonization

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Objectives: To evaluate associations between oral fungal colonization and oropharyngeal candidiasis history, feeding practices, and oral hygiene behaviors in infants.

Methods: A total of 69 caregiver-infant dyads were enrolled in this cross-sectional study. Data on socioeconomic characteristics, medical history (including oropharyngeal candidiasis and medication use), feeding patterns (breastfeeding, bottle feeding, nighttime feeding, and feeding duration), and oral hygiene behaviors were collected. Oral examinations were performed, and swab samples were obtained from three intraoral niches (mucosa, tongue, and plaque) for fungal detection and identification. Descriptive and bivariate analyses using chi-square or Fisher's exact tests were performed, followed by multivariable logistic regression. Statistical significance set at $P < 0.05$.

Results: The mean age of enrolled infants was 13.36 ± 2.83 months, and 55.1% were male. Overall, 52.2% received both breast and bottle feeding, and 49.3% had their teeth brushed at least twice daily. Oral fungi were detected in 35 infants (50.7%). Feeding type, brushing frequency, and other oral hygiene behaviors were not significantly associated with fungal colonization. After multivariable adjustment, infants with a history of oropharyngeal candidiasis had substantially higher odds of oral fungal colonization (OR = 21.58, 95% CI: 4.57-137.91, $P < 0.001$). Breastfeeding for seven months or longer was associated with 86% lower odds of fungal colonization compared with those breastfed for shorter durations (OR = 0.14, 95% CI: 0.03-0.58, $P = 0.009$).

Conclusions: A history of oropharyngeal candidiasis was strongly associated with oral fungal colonization in infancy, whereas longer breastfeeding duration was associated with lower odds of colonization. These findings suggest that early-life oral fungal infection and feeding history may influence subsequent fungal persistence in the oral cavity and may help identify infants at elevated risk for Candida-associated conditions, including early childhood caries.

Funding Disclosure: This research was supported by the NIDCR under Award Number K23DE032419 (PI: Yuan Liu).

49. Proven but Passed Over: U.S. Endodontists Underuse Intraosseous Anesthesia

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Objective: Supplemental bone-perforating intraosseous (IO) anesthesia is among the most effective techniques for achieving pulpal anesthesia in mandibular molars with symptomatic irreversible pulpitis (SIP). This study assessed the frequency and timing of IO use among U.S. endodontists for these teeth and identified factors associated with current use.

Methods: An anonymous, IRB-approved online survey was distributed to U.S. endodontists in 2026 through professional networks and endodontic discussion groups, with snowball forwarding. This preliminary analysis included all completed responses (n=118). IO use frequency, timing, perceived effectiveness, training, equipment availability, and barriers were analyzed descriptively. Current and former IO users were compared using Fisher's exact tests ($\alpha=0.05$).

Results: Most respondents had used IO (89%), rated it effective (90% of those able to assess it), and had equipment available (81%). Yet 83% used IO in 10% or fewer of SIP molar cases. Only 10% used IO routinely alongside an inferior alveolar nerve block, whereas 49% reserved it until another supplemental technique had failed. Of prior IO users, 37% had discontinued it. Current use was associated with equipment availability (98% vs. 64%, $p<0.001$) and rating IO very effective (86% vs. 61%, $p=0.006$), but not with hands-on residency training (58% vs. 68%, $p=0.40$), years in practice, case volume, or region. The leading primary barriers were preference for other techniques (29%) and concern about complications (19%); lack of training (5%) and lack of equipment (5%) were rarely cited.

Conclusions: Despite high perceived effectiveness and broad access, IO remains markedly underused and is often relegated to a rescue technique. The barrier is not access or training, but clinician preference and concern about complications. Bridging this evidence-to-practice gap may be key to moving IO from a last resort to a more routinely considered strategy for difficult mandibular anesthesia.

Funding: This study did not receive any external funding.

50. Orthodontic Pain Alleviation with Chewing Gum Karissa Spokane

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Problem: Orthodontic patients receiving braces express discomfort from tooth movement following bonding and tightening of braces, which negatively impacts the patient's views of the treatment and cooperation with retention.

Hypothesis: Patients that chew xylitol gum will respond more positively (less discomfort and fewer negative emotions) than patients who did not chew gum following initial braces bonding.

Methods: A clinical trial was performed using a sample size of 16. Participants were either given a packet with gum or no gum. Experimental group participants were asked to chew two pieces for 20 minutes 3 times per day. All participants were asked to complete a discomfort index survey at insertion, 4 hours, 24 hours, 48 hours and 7 days after bonding. Inclusion criteria include participants 6-18 years of age undergoing fixed orthodontic treatment.

Results: There were 16 participants that met inclusion criteria. The p-value of gum vs no gum patients was .233, so there is no statistical difference in pain between the two groups. The difference in the change of comfortability over time between the gum vs no gum groups had a p-value of 0.096, which is an insignificant but more notable difference.

Conclusion: Further study with larger sampling is needed to determine the effectiveness of xylitol gum and pain management.

Acknowledgement: This study was funded from WVU Department of Orthodontics. Thank you to Dr. Ngan and the residents for helping recruit patients.

This study involved human subjects and required IRB approval.

Protocol #: 2506181765

51. Differential Plasma Biomarker Profiles in Periodontal Disease Patients With and Without HIV

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Objective: Periodontal disease (PD) is a chronic inflammatory condition characterized by destruction of the supporting structures of the teeth and may be influenced by systemic immune dysregulation associated with HIV infection. Although salivary biomarkers have been extensively investigated in periodontal disease, the systemic plasma immune profile and its relationship to salivary biomarkers in persons living with HIV with or without PD remain incompletely understood. This study aimed to characterize differential plasma biomarker expression among individuals with and without HIV infection and periodontitis and to compare significant immune biomarker patterns between plasma and saliva.

Methods: Following IRB approval and informed consent, participants were stratified into four groups: HIV-/PD- (n=52), HIV-/PD+ (n=48), HIV+/PD- (n=20), and HIV+/PD+ (n=29). Periodontitis was diagnosed according to American Academy of Periodontology guidelines. Unstimulated saliva and blood were collected, and 96 cytokines, chemokines, growth factors, and immune-regulatory molecules were quantified using Luminex xMAP multiplex technology. Biomarker profiles were evaluated across groups and compared between saliva and plasma. Group differences were assessed using Kruskal-Wallis tests with Bonferroni-adjusted pairwise comparisons; $p<0.05$ was considered statistically significant. Analyte concentrations were transformed into square-roots and are presented as median with interquartile range (IQR).

Results: Among 96 plasma biomarkers evaluated across the four HIV/periodontitis groups, 22 (22.9%) showed significant between-group differences by Kruskal-Wallis analysis. These biomarkers represented inflammatory, apoptosis-associated, chemotactic, immune-regulatory, and cytotoxic pathways. IL-5, IL-8, MDC, sCD40L, APRIL, CTACK, CXCL16, lymphotactin, perforin, and SDF-1 showed significant group differences in both saliva and plasma, indicating overlapping oral and systemic immune biomarker patterns. Other biomarkers exhibited compartment-specific differences, supporting distinct systemic (plasma) and oral (salivary) immune profiles associated with HIV infection and periodontal disease.

Conclusion: Differential immune biomarker expression across the four study groups suggests that HIV infection and periodontitis are associated with distinct systemic and oral inflammatory profiles. Evaluating both plasma and salivary biomarkers may improve understanding of immune dysregulation in persons living with HIV and support the future development of biomarkers for periodontal disease assessment and management.

Acknowledgements: We thank predoctoral students and residents for participating in clinical research rotations each week and working with patients in collecting oral and dental health surveys, and oral specimens including plasma. We also thank clinical faculty Dr. Anita Sykes-Smith and all others including staff Ms. Yarbrough, Ms. Goodbar, Mr. Byers and his team for their help and support. Dental student research is supported by the HRSA-COE funding (D34HP00002) to the School of Dentistry, Meharry Medical College, and Nashville, Tennessee. NIH- Research reported in this presentation was supported by the National Institute of Dental & Craniofacial Research under award number U01DE033241 (Pandu Gangula) and National Institute of General Medical Sciences under award number R16GM149440 (Pandu Gangula), and National Institute on Minority Health and Health Disparities (NIMHD), USA, Grant (UC2MD019626, PG, Drs. Lindsey and Chearis).

52. Implant and Crown Features and Adjacent Tooth Bone Level Changes

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Objectives: To evaluate associations between implant crown-related parameters and bone level changes in adjacent natural teeth.

Materials and Methods: This retrospective cohort study included patients with a single implant-supported crown, at least one adjacent natural tooth, and ≥ 18 months of follow-up. Clinical records and radiographs at crown delivery and 18-24 months post-delivery were reviewed. Implant-related parameters included implant-to-tooth distance, vertical implant position relative to the adjacent tooth CEJ, implant platform-to-coronal bone distance, restorative angle, crown-to-implant ratio, interproximal contact status, retention type, and opposing dentition. Bone level changes in adjacent teeth were assessed radiographically. Pearson, point-biserial, and phi correlations were performed ($\alpha=0.05$).

Results: Twenty-two implants were evaluated (mean patient age, 67.77 ± 7.76 years). Mean implant-to-tooth distances were 3.58 ± 1.30 mm mesially and 3.76 ± 1.74 mm distally. Mean vertical implant positions relative to the adjacent tooth CEJ were 4.74 ± 1.76 mm mesially and 3.14 ± 1.97 mm distally. During follow-up, adjacent teeth demonstrated a mean bone gain of 0.02 ± 0.61 mm mesially and bone loss of 0.06 ± 1.27 mm distally. Greater vertical implant position relative to the CEJ was significantly correlated with bone loss in mesial and distal adjacent teeth. Greater implant platform-to-coronal bone distance was significantly correlated with bone loss in distal adjacent teeth. Loss of distal implant crown contact was also significantly correlated with bone loss in mesial adjacent teeth.

Conclusion: Deeper implant placement may be associated with increased bone loss in adjacent teeth, while interproximal contact changes may also play a role in adjacent tooth bone level changes. Larger studies are needed to confirm these associations and their implications for implant treatment planning and long-term maintenance.

53. Radiographic Outcomes of Grade C Molar-Incisor Periodontitis (C/MIP) in Young Individuals

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Background: Grade C molar-incisor pattern periodontitis (C/MIP) is a rare, rapidly progressive form of periodontitis, primarily affecting first molars and incisors in young individuals. Diagnosis is difficult as periodontal probing is not routinely performed at a young age, and mixed dentition/eruption can obscure early diagnosis. The purpose of this study was to evaluate clinical and radiographic outcomes associated with periodontal treatment adherence in C/MIP patients.

Methods: A retrospective chart review was conducted at University of Florida College of Dentistry. Electronic records containing terms related to periodontitis treatment were identified and reviewed. Patients aged 5-25 years with radiographic findings consistent with C/MIP and at least one follow-up examination were included. Ninety-three records were screened, and 23 were included. Clinical attachment level (CAL) at the most severely affected site, radiographic bone-level changes, treatment records, medication history, and supportive periodontal therapy (SPT) attendance were evaluated. Treatment adherence was defined as completion of mechanical debridement and systemic antibiotic regimen. Mann-Whitney U, Fisher's exact, and Spearman correlation analyses were performed between adherent versus non-adherent patients, and SPT was correlated with clinical parameters reductions.

Results: Eighteen patients (78.3%) demonstrated CAL improvement following treatment, three (13.0%) remained stable, and two (8.7%) showed signs of disease progression. Mean CAL reduction at re-evaluation was 1.91 mm. Adherent patients demonstrated greater CAL reduction

than non-adherent patients (2.40 mm vs. 0.63 mm; $p=0.008$) and were more likely to exhibit CAL improvement (93.3% vs. 50.0%; $p=0.033$). Greater SPT attendance was also associated with larger CAL reductions ($p=0.495$; $p=0.022$). Radiographic analysis showed bone fill and sustained stability following recommended therapy and proper SPT.

Conclusions: Adherence to recommended periodontal therapy and ongoing SPT were associated with improved clinical and radiographic outcomes, highlighting the importance of early recognition, timely intervention, and maintenance care to limit C/MIP progression in young individuals.

54. CBCT Flatness Ratios as Predictors of TMJ OA

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Objectives: Temporomandibular disorders (TMDs) are common musculoskeletal conditions in dentistry, affecting more than 10 million individuals in the United States. Osteoarthritis (OA) of the temporomandibular joint (TMJ) is a degenerative condition characterized by cartilage breakdown, inflammation, pain, and reduced mandibular function. Previous cadaveric studies have demonstrated an association between condylar morphology and OA severity, suggesting that specific shapes may increase disease risk. Early identification of morphologic risk factors is important for improving patient outcomes. The purpose of this study was to determine whether cone-beam computed tomography (CBCT) acquired flatness ratios are comparable to gross specimen flatness ratios and whether these measurements may be predictive of TMJ OA severity.

Methods: CBCT imaging was obtained for cadaver heads prior to dissection and analyzed to measure condylar dimensions and calculate flatness ratios. TMJs were then surgically extracted, and gross specimens were photographed and analyzed for corresponding measurements. All measurements were performed in a blinded manner. Statistical analysis included a paired t-test and Spearman's correlation.

Results: Radiology flatness ratios of 11 condyles had an average of 0.2755, while within gross dissection the flatness ratios were 0.2564. These averages were compared using a paired t-test and had a p-value of 0.2039. Flatness ratios from CBCT scans are statistically comparable to flatness ratios within gross dissection. A Spearman's correlation was run and demonstrated a weak correlation between disease severity of both the TMJ condyles and fossas with the radiology flatness ratios. Previous gross dissection research indicates that high-angled condylar shapes present with a higher risk factor for developing OA.

Conclusions: This demonstrates that the gross technique could be used in radiology to effectively predict high-angle morphology and propensity for developing disease. The limitations of the study include: difficulty finding undissected cadaveric TMJs, approval for cadaveric imaging, and population size.

55. Improving Peer Educator Preparedness in Dental Education: A Training Session

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Objectives: Few documented training programs exist for dental peer educators (PEs). A needs assessment identified course director support for a training module providing standardized instruction in key teaching skills, and a 2024 pilot demonstrated increased self-reported preparedness following a training module. This study developed, implemented, and assessed a three-hour training session on emotional intelligence (EI), feedback delivery, and rubric-based evaluation.

Methods: A literature search identified teaching frameworks, and content was adapted for dental education. All upperclassmen predoctoral students ($n=345$) at Boston University Henry M. Goldman School of Dental Medicine were invited to participate in a three-hour in-person PE training session. Data were collected through pre-training and post-training REDCap questionnaires. Open responses were analyzed for recurring themes. Likert scale responses were summarized using descriptive statistics, including pre-training and post-training means. This study was IRB exempt (H-43396).

Results: Seven participants attended and completed the questionnaires. On a 1-5 Likert scale, mean scores increased across categories including overall preparedness (3.43 to 4.14), ability to provide effective feedback (3.86 to 4.43), self-awareness (4.14 to 4.71), self-motivation (4.00 to 4.71), empathy (4.14 to 4.71), and self-perceived ability to provide accurate feedback using a rubric (3.71 to 4.57). Participants most often cited CV-building ($n=7$, 100%) and teaching skills ($n=7$, 100%) as factors promoting attendance, while fewer sought to help peers ($n=6$, 86%) or teach professionally long term ($n=4$, 57%). Key themes included learning to personalize feedback, balance empathy with boundaries, and confidently engage in difficult feedback conversations.

Conclusion: While the findings demonstrated encouraging positive trends and participants rated the training highly, limited participation makes generalizing the study results difficult. Further qualitative research is needed to explore PE perspectives and barriers to participation, providing a deeper understanding of the factors that influence training attendance, engagement, and implementation.

56. Topical Fluoride Use and Vaccination Hesitancy Among Parents and Caregivers in El Paso, Texas: Important Social Determinants Uncovered Background

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Topical fluoride varnish remains a cornerstone of preventive dental care, especially for young children in underserved communities. As dental care providers in one of the many underserved communities in the Southwest, we see the

hesitancy surrounding its use on a daily basis. When it comes to children, it is not the children themselves who hesitate, but those who care for them and their safety. Many parents consent to a dental cleaning but specify no fluoride treatments for their child. In that same child, we may see small carious lesions beginning to form that could potentially be halted with the topical fluoride treatment that was refused. When dental providers discuss fluoride with parents, the hesitancy appears to stem from many different sources. What are the reasons behind this hesitancy, and what other factors may influence their outlook?

Methods: This study aims to assess fluoride hesitancy among parents and caregivers in El Paso, Texas, using the validated Fluoride Hesitancy Identification Tool (FHIT). Participants completed a survey measuring five dimensions: concern that topical fluoride is unnecessary, concern that topical fluoride is harmful, distrust or perceived pressure from dentists and their motives, uncertainty about topical fluoride science, and the belief that topical fluoride should be kept out of a child's body.

Results: Using SPSS statistical analysis software, we found multiple significant factors and varying relationships across the five domains. Education, Hispanic origin, and income showed statistically significant relationships within different domains. Vaccine risk perceptions appeared consistently across the domains, demonstrating a positive relationship with fluoride hesitancy.

Conclusions: By examining patterns of fluoride hesitancy among parents and caregivers in El Paso, Texas, this study aims to inform future research and guide targeted interventions to improve fluoride acceptance and utilization in caries prevention for children, whom are most susceptible to dental caries.

57. Orthodontic Tooth Movement and Oral Bony Exostoses: A Scoping Review

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Objective: Orthodontic forces induce tissue remodeling to facilitate tooth movement. Oral bony exostoses are benign cortical bone growths with multifactorial etiologies, yet changes in their development or prominence have been reported during orthodontic treatment. Whether these represent treatment-associated remodeling or pre-existing anatomical variation remains unclear. This scoping review evaluates clinical evidence on oral bony exostoses during treatment, identifying patterns of occurrence, associated tooth movements, proposed mechanisms and risk factors, clinical course, and management.

Methods: A systematic search of PubMed, Web of Science, Scopus, and Dentistry and Oral Health Science Source identified human clinical studies describing oral or alveolar exostoses and tori during orthodontic treatment or tooth movement. Reference lists identified additional studies. Data included exostosis presentation and timing, orthodontic mechanics, proposed etiologic factors and mechanisms, clinical course, and management. Findings were synthesized qualitatively due to study heterogeneity.

Results: Ten studies were included: seven case reports, two case series, and one retrospective investigation. Reports documented development or increased prominence of labial and buccal alveolar exostoses during or after treatment, frequently following substantial anterior retraction and intrusion. A proposed mechanism was discrepancy between tooth displacement and surrounding alveolar or cortical bone remodeling. Additional contributors included periosteal stress, repetitive mechanical stimulation, age, and genetic predisposition. Conversely, pre-existing exostoses or mandibular tori remained stable during treatment or unrelated to orthodontic therapy. Management included observation or surgical correction for symptomatic, functional, or esthetic concerns.

Conclusion: Alveolar exostoses may develop or become more pronounced following substantial orthodontic tooth movement, but causality cannot be established. Stable pre-existing exostoses indicate that presence during treatment does not necessarily imply orthodontic etiology. Evidence consists primarily of case reports and small case series, leaving incidence, biological mechanisms, and susceptibility factors uncertain. Prospective studies with standardized evaluation of alveolar morphology throughout treatment are needed to identify associated tooth movements and patient characteristics.

58. Periodontal Inflamed Surface Area Remained Stable with Regular Periodontal Maintenance

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Objectives: To quantify the associations between body mass index (BMI) and age, with periodontal inflamed surface area (PISA) at baseline and 12-months, and to quantify longitudinal changes in PISA over 12 months.

Methods: Participants were recruited from the periodontal maintenance population at the University of Nebraska Medical Center College of Dentistry and followed at four-month intervals as part of routine care. Demographic and clinical data, including age, sex, BMI, smoking status, and glycated hemoglobin (HbA1c), when available, were collected. Comprehensive periodontal examinations were performed every 4 months for one year. PISA was calculated, using the method of Hujoel et al., 2001, based on periodontal epithelial surface area and percentage of sites exhibiting bleeding on probing. Descriptive statistics summarized baseline characteristics. Pearson correlation coefficients assessed associations between BMI and age with PISA at baseline and 12 months. A linear repeated-measures model evaluated differences in PISA values over time.

Results: Fifty-four participants (mean age 69.4 ± 7.1 years; mean BMI 27.9 ± 6.1 kg/m²) were included. No significant correlation was observed between BMI and PISA at baseline ($r = -0.00$, $p = 1.00$) or at 12 months ($r = 0.14$, $p = 0.31$). Likewise, age was not significantly associated with

PISA at baseline ($r = -0.00$, $p = 1.00$) or at 12 months ($r = -0.10$, $p = 0.46$). Mean PISA values remained relatively stable throughout the study (baseline: 280.6 mm^2 ; 4 months: 284.8 mm^2 ; 8 months: 302.5 mm^2 ; 12 months: 280.2 mm^2), with no significant change over time ($p = 0.72$).

Conclusion: Among periodontal maintenance patients, neither BMI nor age was significantly associated with PISA at baseline or after 12 months. PISA remained stable throughout the study, suggesting that periodontal inflammation can be effectively maintained over time with regular periodontal maintenance therapy.

59. Perceived Impacts of the One Big Beautiful Bill Act on Graduate Education/Healthcare in Underserved Communities

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Introduction: The One Big Beautiful Bill Act (H.R.1) introduces significant reforms to graduate education financing, including the elimination of federal Grad PLUS loans for medical and dental students. These changes may substantially alter access to professional education, particularly for students from underrepresented and underserved backgrounds.

Objectives: This study aims to assess pre-dental and pre-medical students' awareness and understanding of H.R. 1, evaluate anticipated impacts on their academic and professional trajectories, and identify perceived financial barriers resulting from the elimination of Grad PLUS loans. Additionally, the study seeks to examine how these changes may influence equity and access to professional education and healthcare delivery in underserved populations.

Materials and Methods: Mixed-methods study by using an anonymous Qualtrics survey distributed to pre-professional students. Likert-scale and open-ended questions will assess knowledge of H.R. 1, financial concerns, and anticipated career impacts. Qualitative thematic analysis will be conducted on open-ended responses, and optional follow-up focus groups will further explore emerging themes.

Results: Data collection is currently ongoing, to date 39 participants have completed the survey. Identifying key themes of financial uncertainty, perceived barriers to professional education, and concerns regarding reduced diversity in the healthcare workforce were assessed. The most current data show that over 90% of students who fall within a household income of \$100k stated the loan revisions will affect the school (medical/dental) they choose to attend. Additionally, 75% of the student participants believe these revisions will also impact where they decide to work after the fact (public service, non-profit, or private practice). Quantitative results will assess levels of awareness and perceived impact, while qualitative responses will provide insight into student experiences and anticipated challenges

Discussion/Conclusion: We aim to provide early insight on how federal policy changes can influence access to graduate education and downstream healthcare delivery.

Understanding student perceptions at this early stage is critical to identifying potential barriers and unintended consequences of these policy changes.

60. Peripheral Giant Cell Granulomas Associated with Dental Implants

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The purpose of this study is to investigate the clinicopathological features and potential etiology of peripheral giant cell granulomas (PGCG) associated with dental implants by conducting a retrospective analysis of oral biopsy records obtained from the University of Oklahoma College of Dentistry Oral Pathology Department. A conventional PGCG is a reactive oral lesion often associated with local irritants. Although its occurrence is well documented, its relationship to dental implants remains unclear. This study included a record query from January 1, 2010, to December 31, 2025, to identify all biopsy confirmed conventional PGCG cases. Demographic data, lesional characteristics, and relevant clinical history were collected; no statistical analysis was performed due to insufficient sample size. Findings showed a higher incidence in female patients and predilection for the posterior mandible in conventional PGCG cases. Of 148 cases included, 15 implant-related PGCG cases were identified. Comparisons were made between implant-associated and conventional PGCG cases to better understand differences in etiology, or clinicopathological features. Implant-associated PGCG accounted for ~10% subset of total cases and the observed distribution and clinical characteristics aligned with previously reported trends. Implant-associated PGCG cases had a predilection for posterior regions and a frequent association with bone loss or prior surgical intervention. Many of the identified PGCG cases were associated with clinical findings that further reinforces the importance of identifying and eliminating local irritants and trauma during clinical treatment to prevent the formation of reactive lesions. Future studies should incorporate information regarding the characteristics of dental implants, surgical techniques, and other local or patient-related factors that may influence the development of peripheral giant cell granuloma. Such data may help clarify potential risk factors between dental implant therapy and the development of these lesions.

61. Association Between Obstructive Sleep Apnea Risk and Dental Caries in Adult Dental Patients.

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Obstructive sleep apnea (OSA) is a prevalent yet frequently underdiagnosed sleep-related breathing disorder associated with significant systemic morbidity. OSA has been increasingly linked to oral manifestations including mouth breathing, xerostomia, and altered salivary flow, which may compromise the protective functions of saliva and increase susceptibility to dental caries. Despite the biologic plausibility of this relationship, evidence directly evaluating the association between OSA risk and dental caries remains limited and inconsistent. The purpose of

this study was to investigate the relationship between OSA risk, assessed using the validated STOP-Bang questionnaire, and dental caries experience measured by the Decayed, Missing, and Filled Teeth (DMFT) index. A cross-sectional observational study was conducted among 90 adult subjects. Associations were evaluated using Pearson correlation and one-way ANOVA with Bonferroni-adjusted comparisons. STOP-Bang and DMFT scores were significantly positively correlated ($r=0.501$, $p<0.001$). Mean DMFT differed significantly among OSA risk groups ($p<0.001$), with lower DMFT among low-risk subjects compared with intermediate- and high-risk subjects (both $p<0.001$). These findings demonstrate an association between greater OSA risk and greater dental caries experience and support further investigation of their relationship.

62. Dentists' Perspectives on Feasibility of Chemosensory Screenings in Dental Visits

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The prevalence of taste and/or smell dysfunction increases with age and may be an early indicator of neurodegenerative disease, yet these senses are rarely assessed in healthcare. Healthy People 2030 has set a national goal of increasing the proportion of adults with taste and smell dysfunction who discuss the problem with a provider. This study aimed to assess the feasibility of implementing taste and smell screening during routine dental visits. Ten dentists who worked at least one day per week in private practice were recruited to participate in individual qualitative interviews. The semi-structured interview guide asked about the frequency with which patients raise taste and smell concerns, how they respond to these concerns, and what they see as barriers to implementing taste and smell screening during routine dental examinations. As part of the interview, three brief screening tools (The 4-Item Pocket Smell Test®, Scentinel®, and a three-drop taste test) were demonstrated. Interview transcripts were produced using Rev and verified for accuracy by comparison with audio files. Two investigators independently coded the transcripts using an inductive content analysis. Dentists reported that, since the COVID-19 pandemic, patients rarely, if ever, raise concerns about taste and smell. When concerns are raised, the issue is most often a complaint about a bad taste or odor, rather than a reduction in taste or smell. Dentists responded positively to the brief screening tools and identified ways to incorporate such tests into the appointment workflow. However, they also identified significant barriers to implementing testing, including a lack of knowledge on how to address taste and smell problems, a lack of reimbursement for testing, time constraints, and difficulty making referrals. Dentists are reluctant to implement screening for taste and smell concerns without addressing knowledge gaps, referral systems, and reimbursement.

63. Sex and Ethnicity Differences in Palatal Bone Thickness and Density

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Objectives: To evaluate whether palatal bone thickness (PBT) and palatal bone density (PBD) differ by sex and ethnicity at standardized palatal sites relevant to orthodontic miniscrew placement using cone beam computed tomography (CBCT).

Methods: This retrospective CBCT study included 88 adult, non-growing individuals, with 22 subjects in each subgroup: African American males, African American females, Caucasian males, and Caucasian females. Palatal bone thickness and cortical bone density were measured at eight standardized sites located 4, 8, 16, and 24 mm posterior to the incisive foramen and 3 and 6 mm lateral to the midpalatal suture. Linear mixed-effects models assessed thickness and oral and nasal cortical density, with location, sex, and ethnicity as fixed factors and age and mandibular plane angle (FMA) as covariates. Estimated marginal means with Bonferroni-adjusted pairwise comparisons were calculated for location. Statistical significance was set at $p < 0.05$.

Results: PBT was significantly affected by location, sex, and ethnicity (all $p < 0.001$). Males had greater PBT than females, and African American subjects had greater PBT than Caucasian subjects. Age and FMA were not significant. PBT decreased anterior-to-posterior and was generally greater 3 mm than 6 mm from the midline, except at the two most anterior levels. For oral cortical density, only location was significant; sex approached significance ($p = 0.051$). Density was greater anteriorly than posteriorly, with pairwise differences primarily reflecting anterior-posterior rather than medial-lateral variation. Nasal cortical density was significantly affected by sex and location and showed a similar spatial pattern.

Conclusions: The anterior palate generally demonstrated thicker and denser bone than the posterior palate. PBT was also influenced by sex and ethnicity, whereas cortical density was influenced primarily by location, with sex additionally affecting nasal cortical density. These findings may support site- and patient-specific planning for orthodontic miniscrew placement.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation

64. Implant and Crown Features and Adjacent Tooth Restorative Prognosis

W. Josh Bozeman, Landon Evans

East Carolina University School of Dental Medicine

Objectives: To evaluate associations between implant crown-related parameters and restorative outcomes of adjacent natural teeth.

Materials and Methods: This retrospective cohort study included patients with a single implant-supported crown, at least one adjacent natural tooth, and ≥ 18 months of follow-up. Clinical records and radiographs at crown delivery and 18–24 months post-delivery were reviewed. Implant-related parameters included implant-to-tooth distance, vertical implant position relative to the adjacent tooth CEJ, implant platform-to-bone distance, restorative angle, crown-to-implant ratio, interproximal contact status, retention type, and opposing dentition. Adjacent tooth outcomes included interproximal caries and need for restoration or extraction. Pearson, point-biserial, and phi correlations were performed ($\alpha=0.05$).

Results: Twenty-two implants were evaluated (mean patient age, 67.77 ± 7.76 years). Mean implant-to-tooth distances were 3.58 ± 1.30 mm mesially and 3.76 ± 1.74 mm distally. Mean restorative angles were $22.58 \pm 12.01^\circ$ mesially and $27.20 \pm 14.30^\circ$ distally, and the mean crown-to-implant ratio was 1.02 ± 0.22 . During follow-up, one mesial and six distal adjacent teeth developed caries, and three adjacent teeth required new restoration or extraction. Vertical implant position relative to the adjacent tooth CEJ was significantly positively correlated with the need for restoration or extraction after implant crown delivery.

Conclusion: Deeper implant placement relative to the CEJ of adjacent teeth may be associated with an increased need for restorative intervention or extraction. Larger studies are needed to confirm this association and its implications for implant treatment planning.

SESSION IV | ORAL SESSIONS

IV. BIOMATERIALS/TECHNOLOGY

401. Effects of Nano Silver Fluoride on Demineralized Dentin

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Objective: The purpose of this study was to assess the effect of Nano Silver Fluoride (NSF) on demineralized dentin and to identify methodological gaps in NSF research by comparing biomechanical, structural, and remineralization outcomes across studies.

Methods: A scoping review was performed using: PubMed, Scopus, Web of Science, and Dentistry and Oral Sciences Source. Studies were included if they were peer-reviewed experiments that tested NSF on human or bovine dentin and reported relevant dentin outcomes. Reviews, case reports, conference abstracts were excluded.

Results: Seven articles were included. The most common methods used to evaluate the effects of NSF on dentin included micro-CT, hardness, spectrophotometry, and hydroxyproline assays. When measuring the mean lesion depth, silver diamine fluoride (SDF) and NSF showed similar effectiveness. In mineralization and hardness assessments, NSF restored dentin toward levels observed in sound dentin, with comparable elemental composition and hydroxyapatite crystal size. Hydroxyproline release was also similar between NSF and SDF.

Conclusions: NSF shows potential for arresting caries and limiting further deterioration, although available evidence does not consistently demonstrate effectiveness equivalent to SDF. Standardized experiment protocols and outcome measures are needed to improve comparisons across studies. Clinical studies are also required before NSF can be considered as an alternative treatment for dental caries.

Funding Disclosure: This study did not receive any external funding.

402. Protein-to-Mineral Ratio Determines the In Vitro Bioactivity of Enamel-Derived Biomaterials

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Objectives: Enamel-derived biomaterials recently developed at MWU/CDMI have demonstrated in vitro bioactivity. We hypothesized that this bioactivity is influenced by the material's protein-to-mineral ratio. This study characterized the protein and mineral composition of these biomaterials and evaluated its relationship to bioactivity.

Methods: Two enamel-derived biomaterials were prepared by partial demineralization of enamel powder with citric acid (pH 3.8) or lactic acid (pH 3.7). Demineralized powders, demineralizing solutions, and protein extracts were characterized by ATR-FTIR, SEM/EDS, and BCA assay. Half of each material was subsequently treated with kallikrein-4 to partially remove proteins. Powders and supernatants were analyzed by ATR-FTIR, BCA assay, and optical density (OD-220). Gelatin constructs (0.1%) containing 1% enamel-derived biomaterial, with or without kallikrein digestion, were prepared (n=5). Gelatin constructs with or without 1% hydroxyapatite served as controls. Specimens were incubated in simulated body fluid (SBF) for 28 days for bioactivity assessment according to ISO 23317:2007. Data were analyzed using inferential statistics ($\alpha=0.05$).

Results: ATR-FTIR and SEM/EDS analyses demonstrated significant differences in protein-to-mineral ratios between materials. Citric-acid-treated enamel retained proportionally more protein than lactic-acid-treated enamel. All materials exhibited in vitro bioactivity. Following 28 days in SBF, calcium deposition increased substantially in all enamel-derived biomaterials. Citric-acid-treated samples showed significantly greater calcium intensity than all other groups.

Conclusions: Citric and lactic acid demineralization produce enamel-derived biomaterials with distinct protein-to-mineral ratios. Constructs prepared from protein-rich, non-kallikrein-digested biomaterials exhibited greater in vitro bioactivity after SBF incubation. These findings demonstrate that the bioactivity of enamel-derived biomaterials is influenced by their protein-to-mineral ratio, confirming the study hypothesis.

403. Hybrid Tissue-Polymer Heart Valves with Native-like Mechanical Function

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Objective: Congenital heart disease is the most prevalent congenital disorder worldwide. Congenital pulmonary valve defects are often repaired with synthetic monocusps, but these fail within a few years and cannot grow with the patient. Tissue-engineered heart valves (TEHVs) are promising living replacements. Since extracellular matrix (ECM) components are important for tissue function, this study characterized ECM development in TEHVs cultured in vitro. We hypothesized that prolonged in vitro culture would support cell viability and promote ECM production, yielding mechanically-competent TEHVs.

Methods: Porcine umbilical cord perivascular cells were seeded onto melt-electrowritten polymer scaffolds within a fibrin hydrogel and cultured statically for 28 days. Cell viability was assessed weekly through Live/Dead assays. DNA, sulfated glycosaminoglycans (sGAG) and hydroxyproline content were quantified using biochemical

assays, and α -smooth muscle actin (α -SMA) expression was evaluated by immunofluorescence. Tissue mechanical properties and function were determined using a biaxial tensile tester and a pulse-duplicator bioreactor, respectively.

Results: Cell viability remained high ($\geq 80\%$) throughout culture. DNA, sGAG and hydroxyproline content increased significantly from Week 0 to Week 4 ($p < 0.05$). α -SMA expression decreased significantly after Week 0 ($p < 0.05$), suggesting that myofibroblast activation was not sustained during culture. The resulting hybrid tissues possessed native valve-like mechanical properties and sustained proper pulmonary valve hemodynamic function in a pulse-duplicator bioreactor.

Conclusions: Static in vitro culture of cellularized TEHV for four weeks generated sufficient ECM to yield hybrid constructs with native valve-like mechanical function. These findings support further preclinical evaluation of hybrid TEHV and highlight the potential of biomaterial constructs to generate living hybrid tissues with functional ECM and mechanical properties. Such tissue-engineering strategies may be adaptable to other regenerative applications, including the development of engineered dental soft tissues such as gingiva.

Funding disclosure: Canadian Institutes of Health Research PJT-203687

404. 3D-Printed Denture Resin Build Orientation Affects Wettability and Biofilm Formation

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Objectives: To investigate the effect of build orientation on wettability of water and biofilm formation on additively manufactured denture base resins.

Methods: Three commercial 3D-printed resins were tested: Formlabs Denture Base RP Resin (product-F), NextDent Denture 3D+Resin (product-N) and Rodin Denture Base (product-R). Printing parameters were optimized using a calibration file. Disk-shaped specimens ($n=12$ /product/orientation; 6.0mm diameter, 0.5mm thickness) were fabricated in an AnyCubic Photon-D2 DLP 3D-printer in three build orientations: 0° (parallel to the build plate), 45° and 90°. Specimens of the latter two orientations were 3D-printed with supports. Specimens were washed (isopropyl-alcohol, 5min), post-cured (25W, LED:405nm, 10min) and immersed in ultrapure water (37 $\pm$ 1°C, 24h) for monomer extraction. Wettability of ultrapure water was measured using a goniometer (2 locations/specimen; 37 $\pm$ 1°C) and contact angles (theta; Laplace-Young equation) were calculated at drop placement and after 60s. Biofilm formation was assessed by measuring bioluminescence (BIO) of *S.mutans* biofilms (UA159-ldh-renG⁺, 24h, 37°C, microaerophilic conditions) in relative luminescence units (RLUs) on the surfaces of specimens. Data were analyzed using two-factor General-Linear-Models and SNK post-hoc analyses ($\alpha=0.05$).

Results: Statistically significant differences were noted among the product-build orientation combinations for mean theta values ($p<0.001$). Mean $\pm$ -SD theta values ranged from 69.7 $\pm$ -8.7° (product N-0°) to 92.4 $\pm$ -6.4° (product F-45°).

Statistically significant differences were noted among build orientations ($p<0.0001$) for BIO, but not among products ($p=0.1276$). Mean BIO values for product F-0° (80,516RLU) were statistically significantly higher ($p=0.0102$) than for 45° (58,758RLU) and 90° (46,394RLU) orientations. Mean BIO values for product N-45° (67,887RLU) and 0° (66,888RLU) orientations were statistically significantly higher ($p<0.0132$) than 90° (42,085). Mean BIO values for 0° (61,468RLU), 45° (49,555RLU) and 90° (39,920RLU) orientations of product R were not statistically significantly different ($p=0.1381$).

Conclusions: Wettability and biofilm formation varied based on composition and build orientation of the 3D-printed denture base resins, but a consistent trend was not observed.

405. Engineering Human TMJ Disc in 3D-Printed Scaffolds with Stepwise Differentiation

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Objectives: Temporomandibular joint disorders (TMJDs) affect 5-10% of the U.S. adult population. Our group is developing a TMJ-on-a-Chip (TMJoC) platform to model multi-tissue interactions in TMJ disorders. While our previous system engineered human synovial membrane, fat, and ligaments, it relied on a porcine TMJ disc, limiting translational relevance. To eliminate interspecies variability, this study aims to engineer a human TMJ disc using our well-established 3D printing technique with flexible PBAT-based 3D-printed scaffolds and a stepwise stem cell differentiation protocol. We hypothesize dense tissue development after 4 weeks, and scaffold-supported collagen fiber orientation and growth.

Methods: We used pre-optimized 3D printing parameters to fabricate TMJ disc scaffolds. Human synovial mesenchymal stem cells (syMSCs) (2M/ml) embedded in collagen gel were seeded onto the scaffolds, then cultured with fibrous induction using 100 ng/ml connective tissue growth factor (CTGF) and cartilaginous induction using 10 ng/ml transforming growth factor beta 3 (TGF- β 3), with or without mechanical loading (10%, 1Hz, 30-mins/day, 2 days/wk), and with 10% FBS. After 4 weeks, tissues were assessed via histology and RT-qPCR.

Results: After 4 weeks, we observed dense tissue formation and scaffold-supported collagen fiber organization in both loading and no-loading groups. Histological analysis demonstrated fibrocartilaginous tissue formation, with more mature matrix formation under mechanical loading. qRT-PCR showed that mechanical loading significantly increased COL3A1 and ACAN expression and decreased SOX9 expression, while COL1A1 remained relatively unchanged ($n = 5$ per group; $p<0.01$). These findings suggest physiological loading promotes maturation toward a fibrocartilaginous phenotype.

Conclusions: This study demonstrates that flexible 3D-printed scaffolds with induced fibrocartilaginous differentiation supported human TMJ disc-like tissue formation. Mechanical loading promoted matrix maturation and a fibrocartilaginous gene-expression profile. Our ongoing studies include RNA-seq validation against human tissues, mechanical assessment, and development of a defect-healing model.

406. Multiscale Sacrificial Sugar Advances 3D-Printed PCL Scaffolds for Bone Tissue Engineering

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Objectives: Extrusion-based 3D-printed polycaprolactone (PCL) scaffolds are promising for bone tissue engineering but are limited by dense, nonporous filaments that restrict cell interactions and slow degradation. This study aimed to develop a simple, scalable strategy to introduce hierarchical intra- and extrafilament porosity into 3D-printed PCL scaffolds while preserving printability, mechanical integrity, and biocompatibility.

Methods: Powdered sugar (PS) was uniformly dispersed into a printable PCL ink and removed by aqueous leaching after extrusion printing. Scaffolds containing 30, 50, and 70 wt% PS were fabricated. Microstructure and pore size were characterized using scanning electron microscopy, while Raman spectroscopy assessed PS incorporation and PCL chemistry. Printability was evaluated using filament collapse and fusion tests. Wettability, protein adsorption, mechanical properties, and degradation were measured. Biological performance was evaluated using MC3T3-E1 pre-osteoblasts and human mesenchymal stem cells, including cell attachment, viability, proliferation, osteogenic marker expression, and mineralization.

Results: Sugar leaching generated tunable intrafilamentary pores of approximately 10–110 μm , with pore density and connectivity increasing with PS content. Porous scaffolds exhibited improved apparent wettability, increased protein adsorption, and fivefold faster degradation than bulk PCL under accelerated alkaline conditions. Increasing PS content improved printability by reducing filament fusion and permitting tighter interfiber spacing. Porous scaffolds produced an approximately 3.6-fold increase in early cell attachment ($p \leq .0001$), maintained biocompatibility, and enhanced late-stage osteopontin expression and mineral deposition.

Conclusion: Powdered-sugar porogen leaching provides a robust, cost-effective method for fabricating hierarchically porous, extrusion-printable PCL scaffolds. By improving structural, printing, degradation, and biological properties without chemically modifying PCL, this strategy addresses key limitations of conventional 3D-printed scaffolds and supports further development for bone tissue engineering.

Funding Disclosure: UConn School of Dental Medicine Summer Research Fellowship; National Institutes of Health grants 1T90DE033006-01 and 7R21EB037174-02; U.S. Department of Defense grant HT9425-24-1-0944.

407. Detection of RMMA Episodes Using Deep Learning EMG Pipeline

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Objectives: Manual scoring of rhythmic masticatory muscle activity (RMMA) in overnight electromyography (EMG) is time-consuming and variable. We developed and evaluated an automated pipeline to detect RMMA episodes, delineate their boundaries, and classify them as tonic, phasic, mixed or non-specific masticatory muscle activity (NSMMA).

Methods: We analyzed 101 overnight recordings from 54 patients with four-channel EMG (bilateral masseter and temporalis, 256 Hz) and 6,899 manually scored events. A rule-based detector proposed candidate episodes. Deep networks (temporal convolutional network [TCN], 1D U-Net, multi-task CNN) received 30-s windows of per-channel spectrograms, envelopes and burst features with channel-attention pooling, and jointly predicted episode validity and a per-timestep event mask. A hierarchical TCN classified episodes. Data were split by patient (38 training, 4 validation, 12 test, no overlap), and each model was trained with three seeds (mean $\pm$ SD reported).

Results: The rule-based stage proposed candidates for 82% of scored test events, but only 18% of its 6,200 test candidates were true events. The TCN detector reached an average precision of 0.893 ± 0.005 , raising precision to 0.77 while retaining 89% of valid candidates, with mask Dice 0.88 and median onset/offset errors of 0.35/0.47 s for matched episodes. The classifier separated RMMA from NSMMA with AUC 0.90 and balanced accuracy 0.81, subtype macro-F1 was 0.71 (tonic F1 0.66).

Conclusions: Combining rule-based candidate detection with deep learning increased detection precision more than fourfold on unseen patients and localized episodes within half a second, supporting automated sleep bruxism scoring. Tonic subtype classification remains the main limitation given class imbalance.

408. Assessing AI-Generated Onlay Design Accuracy in Reproducing Natural Tooth Anatomy

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Objectives: Accurate reproduction of natural tooth anatomy is essential for the functional and esthetic success of indirect restorations. Computer-assisted design and computer-assisted manufacturing (CAD/CAM) technologies improved the efficiency and consistency of digital restorative workflows, along with artificial intelligence (AI)-assisted design software further streamlining the process. This study aims to compare the accuracy of AI-generated onlay restorations in reproducing the original anatomy between varying surface preparations.

Experimental Methods: An experienced clinician prepped a typodont mandibular molar tooth #30. Ten teeth were prepped for multiple surface restorations: 3-, 4-, 5-surface which was compared to 10 virgin teeth. All were scanned using a 3Shape E3 scanner. The preparation scans were imported into 3Shape Automate and successfully generated onlay designs were exported. Scans were aligned to the control virgin tooth, and the same transformation workflow was applied to the corresponding AI designs. AI-generated restorations were compared with the control virgin tooth anatomy using cloud-to-mesh analysis in CloudCompare. Statistical analyses were performed using R software, with $p < 0.05$ indicating significance.

Results: ANOVA LR revealed a statistically significant relationship between the surfaces of onlays and the accuracy of AI designs ($p < 0.01$). Tukey's post hoc test revealed that 5-surface preparation designs exhibited significantly greater accuracy compared to the 4-surface preparation designs. Additionally, the AI designs exhibited significantly less accuracy compared to the virgin teeth ($p < 0.05$).

Conclusion: Overall, the null hypothesis that AI-generated onlay design accuracy would not differ among surface preparation groups was rejected. Among successfully generated designs, AI accuracy did not progressively decrease with increasing preparation extent. However, AI generated designs remained significantly less accurate than the virgin tooth anatomy, demonstrating the need for further refinement of AI design software to ensure consistent reproduction of natural tooth anatomy.

Funding Disclosures: This study was supported by the UTSD Student Research Program

409. Shrinkage and Mechanical Properties of Composites with Different Curing Mechanisms

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Objectives: Core build-up composites are commonly placed in thick layers, requiring adequate polymerization at increased depths while minimizing shrinkage and maintaining mechanical properties. This study evaluated post-gel polymerization shrinkage, depth-of-cure, and flexural properties of core build-up composites with different curing mechanisms.

Methods: Stela (self-cure), Build-It FR (dual-cure), SuperCure and Clearfil Photo Core (light-cure), and TPH Spectra ST (control) were evaluated ($n=10/\text{group}$). An additional Build-It group incorporated a 3-minute self-cure period before light curing. Post-gel shrinkage was measured using a strain gauge (%Vol), depth-of-cure by bottom/top ratio of Vickers hardness at 4mm depth, and elastic modulus (GPa) and flexural strength (MPa) by four-point bending. Properties were assessed at 15 minutes after light curing (after additional 3min for Build-It, and at 19 and 60 minutes for self-curing Stela), 24 hours, and 7 days. Data were analyzed using ANOVA followed by pairwise/post hoc comparisons ($\alpha=0.05$). Results: Core build-up composites showed significant differences ($p < 0.001$). Stela demonstrated the lowest post-gel shrinkage but was still increasing after 60 minutes. Build-It had the highest shrinkage but significantly lower with a 3-minute wait protocol. Clearfil Photo Core exhibited the greatest depth-of-cure and the highest elastic modulus. SuperCure and Build-it did not cure sufficiently (< 0.8) at 4mm. All materials demonstrated substantial increases in modulus and hardness at 24-hour, with comparatively smaller increase at 7 days. Stela had the highest flexural strength and SuperCure the lowest.

	Build-it	Clearfil PC	SuperCure	Stela	TPH
Post-gel shrinkage					
15 or 19 min	1.11 ± 0.09 ^F	0.68 ± 0.05 ^D	0.51 ± 0.05 ^C	0.18 ± 0.05 ^A	0.64 ± 0.10 ^D
1 hour				0.26 ± 0.05 ^B	
3 min before LC	0.75 ± 0.08 ^E				
Hardness ratio					
15 or 19 min	0.53 ± 0.15 ^G	0.82 ± 0.04 ^{BCD}	0.48 ± 0.07 ^G	0.75 ± 0.07 ^{CDE}	0.73 ± 0.04 ^{CDE}
24 hours	0.67 ± 0.16 ^{EF}	0.90 ± 0.03 ^{AB}	0.52 ± 0.06 ^G	0.89 ± 0.14 ^{AB}	0.81 ± 0.04 ^{BCD}
7 days	0.70 ± 0.15 ^{DE}	0.93 ± 0.04 ^{AB}	0.57 ± 0.09 ^{FG}	0.96 ± 0.13 ^A	0.83 ± 0.07 ^{BC}
Elastic modulus					
15 or 19 min	5.2 ± 0.3 ^D	13.4 ± 1.3 ^B	3.5 ± 0.6 ^E	4.4 ± 0.8 ^{DE}	4.0 ± 0.5 ^{DE}
24 hours	8.4 ± 0.3 ^C	17.9 ± 2.3 ^A	8.6 ± 0.7 ^C	8.0 ± 1.0 ^C	8.2 ± 0.6 ^C
7 days	8.8 ± 0.3 ^C	18.7 ± 2.4 ^A	9.0 ± 1.2 ^C	8.6 ± 1.2 ^C	8.5 ± 0.7 ^C
Flexural strength	98 ± 28 ^B	106 ± 21 ^B	58 ± 12 ^C	137 ± 26 ^A	120 ± 13 ^{BA}

Properties of groups that share the same letter are not significantly different.

Conclusion: Core build-up composites demonstrated significant differences in polymerization shrinkage, depth of cure, and mechanical behavior, which were more product dependent than determined by curing mechanism. Stela self-cure and Clearfil Photo Core demonstrated reliable depth-of-cure. SuperCure did not cure at 4mm depth and has lowest elastic modulus and strength. A 3-minute wait before light-curing significantly reduced polymerization shrinkage of Build-it. Stela continued shrinking after one hour, which may cause high shrinkage stresses.

Funding Disclosures: Supported by the UT Health Sciences College of Dentistry Alumni Endowment Fund and the Tennessee Dental Association Foundation

410. Beyond Age: AI Adoption in Dental and Dental Hygiene Education

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Objectives: This study investigated differences in generative artificial intelligence (AI) adoption between undergraduate dental, dental hygiene students and academic staff, including patterns of use, perceived benefits and concerns, and comfort and confidence in using AI for academic tasks, while examining whether age contributed to differences in AI adoption and attitudes toward AI in dental education.

Methods: A cross-sectional survey was conducted among 102 students (70.6% dentistry; 29.4% dental hygiene) and 19 academic staff at the University of Manitoba's Dr. Gerald Niznick College of Dentistry. Surveys used Likert-scale items assessing affective, behavioural, and cognitive domains. Welch's independent-samples t-tests, MANOVA, and ANCOVA were used to compare student and academic responses.

Results: Overall perceived AI utility was low among both students and academics, although students reported significantly more frequent AI use than academics ($p < 0.0001$). Despite this difference, both groups reported similar patterns of AI use, primarily for grammar checking, writing assistance, and summarizing readings, while generally avoiding AI for final-product generation, data analysis, discussion generation, grant review, and professional communication. Both groups identified efficiency as a key benefit and shared concerns regarding plagiarism, impact on critical thinking and motivation, and the need for additional AI training. However, academics reported significantly lower comfort navigating AI tools and greater perceived effort in learning to use them. They also expressed greater concern regarding educational outcomes and were more likely to perceive AI as having negative effects on the educational process. Although age was a significant covariate for perceived effort, it did not significantly influence overall utility, comfort, or pessimism regarding AI's educational impact.

Conclusion: Although students and academics demonstrated similar AI use patterns and recognized comparable benefits and concerns, academics reported lower comfort and greater skepticism regarding AI's educational impact. These differences may extend beyond age and reflect broader external factors.



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