



**ADAMS SCHOOL
OF DENTISTRY**

40th Annual Research Day

March 6, 2024



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Chris Pope, Adams School of Dentistry, University of North Carolina at Chapel Hill

Dear Colleagues and Visitors,

We are excited to welcome you to UNC Adams School of Dentistry's 40th Annual Research Day!

For the past 40 years, we've celebrated and recognized innovative and insightful research that moves the oral health profession forward. This is a wonderful opportunity to recognize the hard work of our students, faculty, staff, research fellows, and our colleagues from across the University and the state. It's also a day to recognize the strength of our collaborative partners, both here at the University of North Carolina at Chapel Hill, across North Carolina and the nation, and on a global scale.

In addition to oral and poster presentations, the day's events will include a keynote address titled "*Discovery, Innovation and Dissemination: Realizing the Promise of Science for the Next Generation*" by ASOD alum Jennifer Webster-Cyriaque, DDS, PhD, the deputy director of National Institute of Dental and Craniofacial Research at the National Institutes of Health. An accomplished clinician, researcher and leader, Dr. Webster-Cyriaque also was a faculty member at the UNC schools of dentistry and medicine for more than two decades.

We hope you will have a chance to hear some of the presentations and enjoy the events taking place today, and we hope you will draw inspiration and ideas for your own research and projects. I want to thank everyone who made this day possible – our ASOD organizing committee chaired by Adam Lietzan, PhD, DMD, MS, Apoena Ribeiro, DDS, PhD, MS, and Nishma Vias, DDS '25, the Dental Foundation of North Carolina and our corporate partners.

We are grateful for your commitment to research and innovation, and we are excited to see what's next!



Janet M. Guthmiller, DDS, PhD
Dean

Dr. Claude A. Adams Distinguished Professor
Adams School of Dentistry

Dear Friends and Colleagues,

It is with great pleasure that we welcome you to the 40th Annual Research Day at the UNC Adams School of Dentistry (UNC ASoD). It is a day of celebration that will feature all aspects of scientific discovery. As such, the Research Day Organizing Committee, North Carolina section of the American Association for Dental, Oral and Craniofacial Research (NC AADOCR), and the UNC ASoD Student Research Group are proud to provide this platform to inspire, share, and promote scientific discoveries that will impact the future of dentistry and patient care.

This year represents the 40th anniversary of Research Day, an incredible milestone and reminder of the longstanding commitment that the UNC ASoD has on the scientific advancement of dentistry. This year's scientific program is highlighted by our Keynote Speaker, Dr. Jennifer Webster-Cyriaque, Deputy Director of the National Institute of Dental and Craniofacial Research (NIDCR) at the National Institutes of Health (NIH) and the Vice President of the AADOCR Board of Directors. Dr. Webster-Cyriaque, a fellow Tar Heel and former professor at the UNC ASoD, will present *Discovery, Innovation and Dissemination: Realizing the Promise of Science for the Next Generation*. The scientific program also includes posters and oral presentations from over 60 abstracts. These presentations will spotlight the accomplishments of our students, faculty, staff, research fellows, and visiting scholars. Lastly, this day would not be possible without the generosity from our sponsors, and we encourage everyone to visit the exhibitor tables throughout the day.

We look forward to a day of excitement, camaraderie, and collegial interactions. We sincerely hope that you share our enthusiasm towards this event and enjoy your time at the UNC ASoD.

Warm regards,



Adam Lietzan, PhD, DMD, MS
Assistant Professor
Chair, Research Day Organizing
Committee
Vice President, NC AADOCR



Apoena Ribeiro, DDS, MS, PhD
Associate Professor
President, NC AADOCR



Nishma Vias
3rd Year Dental Student
President, ASoD SRG

40th Research Day Keynote Presentation

Kirkland Auditorium, Koury Oral Health Sciences Building

UNC Adams School of Dentistry

1:30 pm – 2:30 pm, Wednesday, March 6, 2024

Discovery, Innovation and Dissemination: Realizing the Promise of Science for the Next Generation

Jennifer Wester-Cyriaque, DDS, PhD

Deputy Director

National Institute of Dental and Craniofacial Research

National Institutes of Health

Dr. Jennifer Webster-Cyriaque is the deputy director of National Institute of Dental and Craniofacial Research, National Institutes of Health. An accomplished clinician, researcher, and leader, Dr. Webster-Cyriaque had previously served as a faculty member at the University of North Carolina (UNC) schools of dentistry and medicine for more than two decades.



As a tenured full professor at UNC, Dr. Webster-Cyriaque also served as the attending on clinical service at the UNC Hospital's dental clinic. While there, she led research into a potential etiologic agent for salivary gland disease in patients living with HIV, assessed the oral microbiome and its implications for cancer-causing viruses, and studied the impact of the oral microbiome and oral health on HIV outcomes.

In addition to her research, Dr. Webster-Cyriaque has held leadership roles as the chair/vice chair of the Oral HIV/AIDS Research Alliance, as research director at the National Dental Association Foundation, as director of postdoctoral CTSA training, along with multiple roles within the American Association for Dental, Oral, and Craniofacial Research and the International Association for Dental Research. Since 2004, she has led the UNC Malawi project and provided assistance in founding Malawi's first dental school in 2019. She was the 2022 recipient of the IADR Distinguished Scientist Award for Oral Medicine and pathology and in 2023 will be inducted in the National Academy of Medicine for ground-breaking work in oral viral pathogenesis.

Dr. Webster-Cyriaque earned her PhD in microbiology/immunology from the University of North Carolina-Chapel Hill in 1998, her DDS from SUNY Buffalo in 1992, and her BA in biology and interdisciplinary social science from SUNY Buffalo in 1988.

Schedule of Events

Wednesday, March 6, 2024

| Time | Activity and Location |
|--------------------|--|
| 7:00 am - 8:00 am | Poster and Vendor Set-up <i>Main Street and Atrium, Koury Oral Health Science Building, Ground floor</i> |
| 8:00 am - 9:30 am | Registration and Welcome Breakfast (registration required) <i>West Lobby, Koury Oral Health Science Building, First Floor</i> |
| 8:15 am - 8:30 pm | Welcome and Opening Remarks <i>Janet Guthmiller, DDS, PHD</i> <i>Atrium, Koury Oral Health Science Building, Ground Floor</i> |
| 8:30 am - 9:30 am | Oral Presentations Session #1 <i>G405, Koury Oral Health Sciences Building, Ground Floor</i> |
| 8:30 am - 9:30 am | Oral Presentations Session #2 <i>G411, Koury Oral Health Sciences Building, Ground floor</i> |
| 9:30 am - 12:00 pm | Poster Presentations and Sponsors <i>Main Street, Koury Oral Health Sciences Building, Ground Floor</i> |
| 12:00 pm - 1:00 pm | Boxed Lunch Pickup (registration required) <i>G508, Koury Oral Health Science Building, Ground Floor</i> |
| 1:00 pm - 1:30 pm | Awards Ceremony <i>Kirkland Auditorium, Koury Oral Health Sciences Building, First Floor</i> |
| 1:30 pm - 2:30 pm | Introduction by Janet Guthmiller, DDS, PhD Keynote address: Jennifer Webster-Cyriaque, DDS, PhD Deputy Director, National Institute of Dental and Craniofacial Research National Institutes of Health <i>Discovery, Innovation and Dissemination: Realizing the Promise of Science for the Next Generation</i> <i>Kirkland Auditorium, Koury Oral Health Sciences Building, First Floor</i> |
| 2:30 pm - 3:30 pm | Closing Reception <i>West Lobby, Koury Oral Health Science Building, First Floor</i> |

Poster Presentations

9:30 am – 12:00 pm

| Abstract Number | Time | Presenter | Title |
|-----------------|---------|-----------------------|--|
| 1 | 9:30 am | Aya Ali | Synthetic Heparan Sulfate as a Promising Therapeutic for Periodontal Health |
| 2 | 9:30 am | Hannah Archer | Oral Health Content Lacking on Non-Dental Safety Net Clinic Websites |
| *3 | 9:30 am | Christine Bode | Speech in Class III Dentofacial Disharmony Patients following Orthognathic Surgery |
| 4 | 9:30 am | Justin Boyd | Correlating 2D Radiographic Area vs. MicroCT Volume in Anterior Root Canals |
| 5 | 9:30 am | Claire Carney | Pediatric Dental Treatment Patterns in Primary and Early Permanent Dentitions |
| *6 | 9:30 am | Angela Chen | Acidic Stress Exacerbates Microbial Ligand-Induced Human Oral Epithelial Cell Inflammation |
| *7 | 9:30 am | Benjamin Darwitz | Diabetes-induced Hyperglycemia Potentiates Severe Staphylococcus aureus and Pseudomonas aeruginosa Co-infections |
| *8 | 9:30 am | Francesco DeMayo | Comparison of Clinical Outcomes Between GentleWave® and Biolase® |
| 9 | 9:30 am | Nicolette Essian | Metastatic Cancers to the Oral and Maxillofacial Region: Case Series |
| 10 | 9:30 am | Mounika Gadiraju | Mechanical Removal of Root Filling in Endodontic Retreatment: Systematic Review |
| 13 | 9:30 am | Nare Ghaltakchyan | Immune Dysregulation in the Oral Cavity During Early SARS-CoV-2 Infection |
| 14 | 9:30 am | Odjo Gouttia | The MASTL-ENSA-PP2A/B55 Pathway Modulates Cisplatin Resistance in Oral Cancer |
| 15 | 9:30 am | Elmira Hazarkhani | Unlocking the Biological Factors in Oral Health Among Hispanic Adults |
| 17 | 9:30 am | Justin Hunt | Periodontal Impact Of Orthodontic Incisor Retraction Beyond A Biological Boundary |
| 19 | 9:30 am | Tala Jazairi | Gene-environment Interaction in Early Childhood Caries and Bedtime Feeding Practices |
| 20 | 9:30 am | Liesl Jeffers-Francis | Salivary Gland Cells as a Reservoir for Human Coronavirus Replication |
| 21 | 9:30 am | Jennifer Judd | Methods of Evaluating Anxiety Levels in Pediatric Dental Patients |
| 22 | 9:30 am | Adi Kakkar | Surface Deterioration of Dental Materials: In Vitro Study |

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|------------|---------|--------------------------------|---|
| 23 | 9:30 am | John Kwiatkowski & Luke Heaton | Effect of Gabapentin on opioid use after orthognathic surgery |
| 24 | 9:30 am | Seth Lachacz | Oral Health for Hispanics: Surveying the Present, Plan the Future |
| 25 | 9:30 am | Colin J. LaPrade | Dose Effects of Suboptimal Positioning for CBCT and Panoramic Imaging |
| 26 | 9:30 am | Jackie Le | The Staining Susceptibility of additive manufactured Dentures following post-processing techniques. |
| 27 | 9:30 am | Xin Li | Targeting Aurora kinases to overcome cisplatin resistance in oral squamous cell carcinoma |
| 28 | 9:30 am | Dariel Liakhovetski | Evaluating Dental Students' Perceptions of Implant Dentistry Education |
| 30 | 9:30 am | Fernanda Mariano Frizoni | Sectional Matrix Systems: Ring Retention, Proximal Contour and Overhang. A Comparative Assessment |
| 31 | 9:30 am | Jacqueline Massouda | Evaluating effects of animal assisted therapy on pediatric dental patients |
| 32 | 9:30 am | Jay Patrick | Borderline Extraction Cases in Orthodontics and Second Molar Eruption Disturbances |
| *33 | 9:30 am | Abhinaya Perumbedu | Near-Infrared Imaging Efficacy to Detect Demineralized Enamel on Interproximal Surfaces. |
| 34 | 9:30 am | Olivia Prevette | Validation of a Melanocortin 4 Receptor Mutant Zebrafish Line |
| 35 | 9:30 am | Thao Quynh Ngo | Efficacy of Mouthrinses against SARS-CoV-2: Blinded Randomized Clinical Trials |
| *36 | 9:30 am | Sylvette Ramos-Diaz | Exploring the Link Between Microbiota & Caries in Hispanic Adults |
| 38 | 9:30 am | Lauren Ryall | Dental Anxiety Management Techniques of North Carolina Dental Hygienists |
| 39 | 9:30 am | Yingning Sang | Dynamic Orexinergic Responses to Environmental Stressors in the Zebrafish Gut |
| 40 | 9:30 am | Jackson Seagroves | Profiling of Inflammatory Cytokines in External Cervical Resorption |
| 41 | 9:30 am | Ayumi Shoji | Evaluating Impacts of Orthognathic Surgery on Lingual Gestures During Speech |
| 42 | 9:30 am | Damian Slaczka | Training Endodontic Access Cavity Preparation Using Typodonts and Simodont Dental Trainer: A Comparison of Student Performance and Acceptance |
| 44 | 9:30 am | Leandro Soares | Influence of Cut-Out-Rescan and Data Exchange on CAD/CAM Crown Fit |
| 45 | 9:30 am | Negin Soghli | Proteomic and Phosphoproteomic Analysis of Cisplatin Resistance in Oral Squamous Cell Carcinoma (OSCC) |

| | | | |
|------------|---------|-----------------------|--|
| 46 | 9:30 am | Sungmin Sohn | Perceived Barriers to Dental Care among Foster Parents in North Carolina |
| 48 | 9:30 am | Jazmin Ibarra Soltero | Confident Care, Healthier Smiles: Improving Spanish-Language Oral Health Education |
| *49 | 9:30 am | Tunwarut Srimuang | Removal Methods of Tricalcium Silicate Endodontic Sealer: Micro-CT Assessment Review |
| 50 | 9:30 am | Sabita Thapa | Antioxidant activity of Tetrahydrocurcumin as it relates with immune function |
| *51 | 9:30 am | Olivia TumSuden | Impacts of Class III Dentofacial Disharmony Surgical Correction on Vowels |
| 52 | 9:30 am | Mark Veazie | Transition of Dental Care for Individuals with Developmental Disabilities |
| 53 | 9:30 am | Vineetha Vijayakumar | Migraine and Headache Attributed to TMD |
| 54 | 9:30 am | Angela (Ye) Wan | Dental Hygiene Students' Opinions on Interprofessional Simulated Patient Case Activity |
| 55 | 9:30 am | Beatrice Williams | Families Experiences with Tooth Autotransplantation for Replacement of Maxillary Incisors |
| 56 | 9:30 am | Jesse Woon | North Carolina Dentists' Perceptions Towards Recommending and Administering HPV Vaccination |
| 57 | 9:30 am | Yurong Yan | MASTL Regulates the cGAS/STING/IRF3/STAT1 Pathway in Oral Cancer |
| 58 | 9:30 am | Anna Zheng | Impact of Viral Infections on Oral Health Outcomes: Bibliometric Analysis |
| *59 | 9:30 am | SM Ziauddin | Pulp Regeneration by Stem Cells from Deciduous and Permanent Teeth |
| 60 | 9:30 am | Landon Guy | Accuracy of Intraoral Scanners for Digitizing Edentulous Impressions for Digital Denture Fabrication |

****Turner Award, AADOCR Award, or SCADA Award Finalist***

Oral Presentation Session #1

8:30 am – 9:30 am

| Oral Presentations Session #1 G405, Koury Oral Health Sciences Building, Ground floor | | | |
|--|-------------|-------------------------|--|
| Abstract Number | Time | Presenter | Title |
| *37 | 8:30 am | Erika Silva Rezende | Assessing Vowels in Anterior Open Bite Patients Undergoing Orthognathic Surgery |
| *47 | 8:45 am | Abhishikt David Solomon | Gamma Tubulin is Required for DNA Repair |
| *18 | 9:00 am | Deepika Jayaprakash | RNF25 and PIAS1 Promote Replication Stress Tolerance on WEE1 Inhibition |
| *11 | 9:15 am | Christopher Genito | Increased Emergence of Antibiotic-Resistant Staphylococcus aureus in the Diabetic Host |

****Turner Award or AADOOCR Award Finalists***

Oral Presentation Session #2

8:30 am – 9:30 am

| <i>Oral Presentations Session #2</i> G411, Koury Oral Health Sciences Building, Ground floor | | | |
|---|-------------|------------------|--|
| Abstract Number | Time | Presenter | Title |
| *29 | 8:30 am | Bijan Mahboubi | PD-L1 Gene Therapy Rescues Sjogren's Syndrome Symptoms in Mice |
| *43 | 8:45 am | Breanne Smith | Development and Testing of Machine Learning-Based Models for Caries Experience |
| *16 | 9:00 am | Adam Hoxie | Near-Infrared Imaging in Intraoral Scanners for Early Interproximal Caries Detection |
| *12 | 9:15 am | Joy Gerasco | Commensal Microbiota Effects on Craniofacial Skeletal Growth and Morphology |

****Turner Award or AADOOCR Award Finalists***

Abstracts

Abstract # 1 Synthetic Heparan Sulfate as a Promising Therapeutic for Periodontal Health

Elnaz Gharah Bash¹, Marta Musskopf¹, Vinicius de Paiva Goncalves¹, Angeliz Rivera-Concepcion¹, **Aya Ali**¹, Jian Liu¹, Patricia A. Miguez¹

¹University of North Carolina at Chapel Hill

Objectives: Heparan sulfate, a glycosaminoglycan (GAG) in the periodontal ligament, has exhibited the ability to stabilize the gingival inflammatory infiltrate and curb alveolar bone resorption. Our study explores the potential of a synthetic low molecular weight heparin (LMWH) as a therapeutic option for periodontitis.

Methods: The model of periodontitis was created by using silk ligature strip in C57/BL6 male mice to induce bone loss. The length of the GAGs used was 18 mer based on our previous data showing anti-clastogenic effects. The mice were divided into no treatment (negative control), ligature only, ligature + heparin (>50 mer length) and ligature + LMWH (18-mer). Injection of vehicle, heparin or S18-mer between molars was done daily (5 days) (n = 7). At 5 days, mice were sacrificed, and maxillae harvested for microcomputed tomography and quantification of bone loss performed by volumetric analyses. Raw cells were treated with the oligosaccharides daily for 5 days and TRAP staining for osteoclast activity was done.

Results: Statistical difference is shown between no-ligature and all groups and ligature and treated groups heparin and S18-mer ($p < 0.05$). Quantification of osteoclasts/mm³ area showed that compared to control, S18-mer showed the largest decrease in osteoclast numbers and differentiation at two different concentrations (1 and 10 μ g), which was statistically significant ($p < 0.05$). Heparin significantly diminished osteoclast numbers at only one concentration (10 μ g).

Conclusions: These results indicate that S18-mer show a promise as a therapeutic treatment for periodontitis.

Support Funding Agency: National Institutes of Health, UM1TR004406; National Science Foundation Materials Innovation Platform, DMR-1933525

Abstract # 2 Oral Health Content Lacking on Non-Dental Safety Net Clinic Websites

Hannah Archer¹, Zachary Brian², Brady Blackburn³, Jane A. Weintraub²

¹Adams School of Dentistry, University of North Carolina at Chapel Hill; ²Division of Pediatric and Public Health, Adams School of Dentistry, University of North Carolina at Chapel Hill; ³North Carolina Oral Health Collaborative, Cary, NC

Objectives: Safety Net Clinics (SNC) provide healthcare to vulnerable populations and SNC websites are an important source of information. In North Carolina (NC), all 100 counties are Dental Health Professional Shortage Areas, yet 91 of 317 SNCs are non-dental (ND-SNC). Our goals were to: 1) assess the presence and type of oral health (OH) information on ND-SNC websites; 2) develop and distribute an OH education webpage to ND-SNCs and track its use.

Methods: The search function was used with lay dental terms to evaluate the presence of OH content on each ND-SNC website. Key representatives from ND-SNCs were surveyed to assess patient care and willingness to implement an OH webpage. Webpage topics included oral hygiene and a map of NC dentists that provide services to low-income patients. Google Analytics was used to track consumer webpage engagement including acquisition source (AS), average time on page (AT), and unique page views (UPV).

Results: Of the 91 ND-SNCs websites, none contained OH education; 15% had information about nearby dental providers. For the 40 ND-SNCs using our webpage, January–December 2022, the primary AS for new webpage users was referrals; 72.5% of users were coming directly from ND-SNC websites. Statewide AT was 2 minutes and 30 seconds (SD=58 seconds), 2.88 times longer than the 52-second threshold marketing experts use to establish genuine user engagement. There were 1,364 UPVs statewide for 2022.

Conclusion: Our results suggest a need for OH education content on ND-SNC websites, as users are searching for and engaging with this information.

Support Funding Agency: N/A

Abstract # 3 Speech in Class III Dentofacial Disharmony Patients following Orthognathic Surgery

Christine Bode¹, Erika Rezende Silva^{1,2,3}, Nare Ghaltakhchyan^{1,3}, Timothy Turvey³, George Blakey³, Ray White³, David Zajac⁴, Jeff Mielke⁵, Laura Jacox^{1,3}

¹Division of Craniofacial and Surgical Care, Oral and Maxillofacial Surgery and Orthodontics Groups, Adams School of Dentistry, University of North Carolina at Chapel Hill; ²Oral and Craniofacial Biomedicine Program, Adams School of Dentistry, University of North Carolina at Chapel Hill; ³Division of Oral and Craniofacial Health Sciences, Adams School of Dentistry, University of North Carolina at Chapel Hill; ⁴Division of Craniofacial and Surgical Care, Speech Pathology Group, Adams School of Dentistry, University of North Carolina at Chapel Hill; ⁵English Department, North Carolina State University

Objectives: The primary objective of this research was to quantitatively determine effects of orthognathic surgery on speech distortions in the Class III DFD population at 3- and 12-months postoperatively.

Methods: Orthodontic records, including occlusal measurements, dental models, photos, panoramic and cephalogram radiographs were collected on 47 Class III DFD patients and 49 Class I control subjects. Audio and video recordings were also obtained. Full clinical records and speech pathology recordings were collected 1-3 months prior to jaw surgery (T0), 2-5 months (T1), and 9-12 months post-operation (T2) for Class III DFD patients. These time points were selected to co-occur with standardized patients' surgical check-ups to ensure reliable data collection. Perceptual speech analysis was performed by an experienced Speech Language Pathologist who was blinded with recordings randomized from all time points. Spectral Moment (SMA) and Multitaper Analyses were completed.

Results: Our results indicate significant normalization of speech by some Class III DFD patients post- operatively. Specifically, the center of gravity (first spectral moment), peak frequency and peak amplitudes of consonants produced by Class III participants after surgery approached the values of Class I controls.

Conclusions: Outcomes indicate a functional benefit of jaw surgery, providing guidance for care of DFD subjects with speech concerns.

Support Funding Agency: Southern Association of Orthodontists Research Award (C.B.); American Association of Orthodontists Foundation Research Aid Awards (C.B.); National Institutes of Health, 1K08DE030235-01A1 (L.J.); National Institutes of Health, R03DE028983 (D.W.)

Abstract # 4 Correlating 2D Radiographic Area vs. MicroCT Volume in Anterior Root Canals

JD Boyd¹, Gurmukh Dhaliwal¹, Alice Song¹, Tunwarut Srimuang¹, Carlos Camargo¹, Carolyn Primus², Avery Green³, Aya Takase⁴, Takashi Komabayashi¹

¹Adams School of Dentistry, University of North Carolina at Chapel Hill; ²Augusta University; ³Covalent Metrology; ⁴Rigaku America Corporation

Objectives: Non-Surgical Root Canal Treatment (NSRCT) relies on a thorough understanding of root canal systems for success, commonly determined with conventional two-dimensional (2D) radiographs. However, 2D radiographs have limitations in discerning anatomy. This study aims to investigate the relationship between root canal surface areas in 2D radiographs and volumes measured in micro-CT scans.

Methods: 48 fully erupted, non-carious human upper anterior teeth were selected for the study. The crowns were removed, and root canals were cleaned and shaped to 16 mm using ProTaper Ultimate size 30/F3 files (Dentsply-Sirona). Radiographs were taken from the facial view, and the surface area of the canals was measured using Image-J software. Each tooth was scanned and reconstructed with micro-CT at a 20 μm voxel size, 130 kVp, 61 mA, with a 1 mm aluminum filter (CT Lab HX, Rigaku Americas). The root canal volume was measured using Imaris Viewer Software. Regression analysis was performed, and correlation coefficients were determined for surface area and volume.

Results: The average (SD) area (mm^2) and volume (mm^3) were 12.06 (1.18) and 13.02 (4.30), respectively. The 2D radiographic surface area and micro-CT volume had a modest, positive correlation with a Pearson correlation coefficient (r) of 0.478.

Conclusions: This indicates even in teeth with noncomplex root anatomy, 3D imaging may significantly enhance treatment accuracy.

Support Funding Agency: John C. Brauer DDS Short-Term Research Fellowship Award; Dr. Shizuko Yamauchi Endodontics Graduate Student Award; NuSmile; Rigaku America/Covalent Metrology

Abstract # 5 Pediatric Dental Treatment Patterns in Primary and Early Permanent Dentitions

Claire Carney¹, Martha Ann Keels¹, Kimon Divaris¹, Mark Casey², Scott Cashion¹

¹Department of Pediatric Dentistry and Public Health, University of North Carolina at Chapel Hill; ²Division of Medical Assistance North Carolina Department of Health and Human Services

Objectives: To examine trends in primary and early permanent dentition treatment patterns and the relationships between them.

Methods: A secondary data analysis was performed on Medicaid claims from 2011-2022 for North Carolina children ages 0-12. Trends and expenditures of two primary dental treatment patterns were analyzed over time: early childhood caries (ECC), defined as treatment to primary maxillary incisors and/or first primary molars in 0–5-year-olds, and late childhood caries (LCC), which comprised treatment to the proximal surfaces of primary molars in 6-12-year-olds. Trends in four early permanent dentition restorative treatment patterns were analyzed over time: 1. mesial surfaces of the first permanent molars 2. Pits-and-fissures of the first permanent molars 3. maxillary anterior teeth and 4. maxillary anteriors and first permanent molars. No treatment to primary and permanent teeth was analyzed for comparison. The likelihood of children who had the listed restorative treatment to their early permanent dentition also having ECC and/or LCC treatment was investigated.

Results: The proportion of children with LCC treatment and the yearly treatment expenditure were consistently double of that associated with ECC treatment throughout the 12-year period. Each year, the most common early permanent dentition restorative treatment pattern was treatment to pits-and-fissures of first permanent molars. Children who had early permanent dentition restorative treatment were on average two times as likely to have had LCC treatment than ECC treatment.

Conclusions: Future prevention and education strategies should target LCC due to its increasing cost and relationship with future restorative treatment in the early permanent dentition.

Support Funding Agency: N/A

Abstract # 6 Acidic Stress Exacerbates Microbial Ligand-Induced Human Oral Epithelial Cell Inflammation

Angela Chen¹, Shannon Wallet², Christina L. Graves¹

¹Division of Oral and Craniofacial Health Sciences, Adams School of Dentistry, UNC Chapel Hill; ²Department of Oral Biology, College of Dentistry, University of Florida

Objectives: The oral cavity is exposed to countless environmental stressors such as acid stress and constant microbial challenge. Evidence indicates oral cancer development and progression are associated with pH disruption and dysbiotic microbial toll-like receptor (TLR) interactions. Yet, little is known about the combined effects of acid stress and TLR engagement on human oral epithelial cell (HOEC) responses. This study aimed to determine the impact of acidic stress on HOEC's metabolic and immune transcriptional profile under microbial TLR stimulation *in vitro*.

Methods: Primary HOEC cultures were grown to 80% confluence. Experimental cultures (n=3) were exposed to 1.0 N hydrogen chloride at working pH=3. All groups were stimulated with either flagellin (1 ug/mL) or Pam3CSK4 (100 ng/mL). RNA was isolated and assessed for quantity and purity. NanoString nCounter® Human Immunology and Metabolic Panels were used to profile transcriptional changes. Data were analyzed using the ROSALIND platform with HyperScale architecture; normalization, fold changes, and P-values were calculated using standardized NanoString specifications. P-value adjustment was performed using the Benjamini-Hochberg method of estimating false discovery rates. The Gene Ontology platform was used to analyze pathway enrichment.

Results: Acid exposure with TLR simulation resulted in the significantly differential expression of 197 metabolic and 43 immune-related genes. Noteworthy upregulated proto-oncogenic genes include MYBL1, MYBL2, HRAS, and BRAF. Pathway analysis revealed that acid exposure exacerbates pro-inflammatory responses to ligand stimulation, enhanced TH1/TH17-cell differentiation and lineage commitment, affecting cell-cycle transition, and mesenchymal stem cell differentiation.

Conclusions: Greater transcriptional changes in the metabolic pathway compared to the immune indicate heightened metabolic engagement in response to acidic stress. Our results suggest that acid stress alters HOEC's TLR transcriptional response to a pro-oncogenic phenotype. These results will support future studies in elucidating host-pathogen mechanisms associated with diseases linked to acidogenic environments like oral cancers.

Support Funding Agency: 2023-2024 Grover C. Hunter DDS Short-Term Research Fellowship (A.C.), UNC Adams School of Dentistry.

Abstract # 7 Diabetes-induced Hyperglycemia Potentiates Severe *Staphylococcus aureus* and *Pseudomonas aeruginosa* Co-infections

Benjamin P. Darwitz^{1*}, Christopher J. Genito^{2*}, Lance R. Thurlow^{1,2}

¹Department of Microbiology and Immunology, University of North Carolina at Chapel Hill School of Medicine; ²Division of Oral and Craniofacial Health Sciences, University of North Carolina at Chapel Hill Adams School of Dentistry; *contributed equally

Objectives: Individuals with unmanaged diabetes mellitus frequently contract bacterial infections, as hyperglycemic tissues promote microbial proliferation and virulence. *Staphylococcus aureus* and *Pseudomonas aeruginosa* frequently co-infect diabetic skin wounds. During non-diabetic co-infections, *P. aeruginosa* inhibits *S. aureus* growth using various secreted respiration inhibitors. Because glucose is the preferred carbon source of *S. aureus*, we hypothesized that hyperglycemic environments allow *S. aureus* to overcome growth inhibition mediated by secreted *P. aeruginosa* respiration inhibitors during diabetic co-infections. Our objectives were to 1) assess whether hyperglycemic environments rescue *S. aureus* growth in the presence of *P. aeruginosa*-derived respiration inhibitors and 2) evaluate the growth and dissemination of *S. aureus* and *P. aeruginosa* during mono- and co-infection of non-diabetic mice and diabetic mice.

Methods: We grew *S. aureus* (USA300) in *P. aeruginosa* (MPAO1) culture supernatants supplemented with or without glucose and measured bacterial growth using drip plates. For *in vivo* experiments, we infected catheters subcutaneously implanted in male C57BL/6J mice with USA300 or vehicle control (PBS). After four days, we co-infected a subset of catheters with MPAO1 or PBS. Streptozotocin was used to induce diabetes in a subset of mice. We removed catheters and surrounding tissue seven days thereafter to quantify bacterial burden.

Results: We show that glucose and functional glycolysis allow *S. aureus* to overcome growth inhibition caused by secreted *P. aeruginosa* respiration inhibitors *in vitro*. Corroborating these observations, *S. aureus* exhibits greater growth within and dissemination from catheters in diabetic mice and reduced *P. aeruginosa*-mediated growth inhibition during diabetic co-infections compared to non-diabetic co-infections. Surprisingly, secreted *P. aeruginosa* aerobic respiration inhibitors are not responsible for *S. aureus* growth inhibition during co-infection in non-diabetic and diabetic mice.

Conclusions: The diabetic infection microenvironment allows *S. aureus* to resist *P. aeruginosa*-mediated growth inhibition, and *P. aeruginosa* respiration inhibitors are not responsible for *S. aureus* growth inhibition during co-infections within catheters.

Support Funding Agency: NIH NIAID grants R01AI173004 and R21AI174088 (L.R.T.)

Abstract # 8 Comparison of Clinical Outcomes Between GentleWave® and Biolase®

Francesco DeMayo¹, Glen Karunanayake¹, Rishma Shah², Lisiane Susin¹,
Fatemeh Sayyady³

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Objectives: This randomized controlled clinical trial aimed to evaluate patient and operator centered outcomes of root canal treatment (RCT) using the GentleWave® system (GWS) (Sonendo, Inc., CA) or Waterlase iPlus® (WL) (Biolase, Inc., CA) as compared to a control group utilizing passive ultrasonic instrumentation (PUI) (IrriSafe™, Acteon, Aquitaine, FR).

Methods: Following ethical approval (IRB #21-2960), 120 patients meeting the inclusion criteria, including pre-operative apical radiolucency, were consented to the study and randomly allocated to either the GWS, WL or PUI group. Pre-operative pain level was recorded. Following root canal preparation, the allocated disinfection approach was used prior to RCT completion. Patients were sent electronic surveys to record: 1) pain during and following treatment, 2) perception of the technology used. Operators (n=6) were surveyed on their preference for GWS, WL or PUI.

Results: Electronic surveys (n=109) showed patients perceived their treatment was improved through use of WL and PUI. The mean reduction in pre-operative pain following treatment with GWS, PUI or WL was 18.0%, 32.2%, and 58.5%, respectively. However, there is no significant difference among the different modalities concerning change in pain levels ($p>0.05$ one-way ANOVA). Provider surveys (n=120) indicated providers felt comfortable using PUI and WL, but less so with GWS. Providers reported all three technologies improved their treatment quality.

Conclusion: This study provided important patient and operator outcomes for evaluating technologies for RCT. Patients and providers were more accepting of PUI and WL compared to GWS. WL showed the greatest reduction in post-operative pain.

Support Funding Agency: N/A

Abstract # 9 Metastatic Cancers to the Oral and Maxillofacial Region: Case Series

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Objectives: Metastatic cancers to the oral and maxillofacial region are relatively uncommon occurrences and often constitute a diagnostic challenge for oral pathologists. We report a retrospective analysis concerning 26 cases of confirmed metastatic cancers to the oral soft tissues and jaws.

Methods: After IRB approval, archived cases from the UNC Oral Pathology laboratory were retrieved. Cases of cancer that metastasized to facial skin or cervical lymph nodes were excluded from this study.

Results: Our archives contained 26 cases that met our inclusion criteria that were diagnosed between 2006 and 2023. Fourteen (54%) were in females and twelve (46%) were in males. The median age at the time of diagnosis was 71 (range = 46-96 years). Twenty two cases (85%) metastasized to the jaws and four (15%) to soft tissues. The primary sites that metastasized to the jaws included the breast (n=6, 23%), lung (n=3, 15%), prostate (n=2, 7.6%), pancreas (n=2, 7.6%), kidney (n=2, 7.6%), and the liver (n=1, 3.5%). Out of the four cases that metastasized to oral soft tissues, two went to the maxillary gingiva: one from the esophagus (n=1, 3.5%) and one from the bladder (n=1, 3.5%). One case involved buccal mucosa from a stomach primary (n=1, 3.5%), and one involved the tongue from a skin melanoma primary (3.5%). Five (19%) cases that metastasized to the jaws were from unknown primaries, due to either inadequate tissue samples or limited ancillary studies. Nine (35%) patients had no known history of primary cancer, and nine (35%) cases were associated with inaccurate clinical impressions that did not include malignancy.

Conclusions: The most common cancers that tend to metastasize to the oral and maxillofacial region have a tendency to involve the jaws, particularly the mandible, and are often misinterpreted as infectious processes. Therefore, it is critical that clinicians remain alert of uncommon presentations, submit biopsies in a timely manner, and include metastatic cancer in the differential diagnosis of aggressive or atypical lesions, despite whether there is known history of a primary cancer.

Support Funding Agency: N/A

Abstract # 10 Mechanical Removal of Root Filling in Endodontic Retreatment: Systematic Review

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Objectives: Several studies have investigated various files in the mechanical removal of root canal filling material during endodontic retreatment. However, a comparison of these retreatment file systems is insufficiently documented. This systematic review aims to assess rotary, reciprocating, and manual retreatment files in root filling material removal of Micro-CT studies.

Methods: A PubMed database search identified studies comparing different retreatment files in the mechanical removal of root filling material of extracted human teeth using Micro-CT. Keywords included 'Root filling removal' OR 'mechanical removal of GP' AND 'Micro-CT' AND 'Retreatment' to find full-text online articles published between 2008 and 2024. Two reviewers retrieved articles independently, consulting a third reviewer as needed.

Results: Out of the 115 articles reviewed, 52 met the inclusion criteria: 37 solely compared retreatment files and 15 compared both retreatment and supplementary techniques. These 52 studies utilized 40 types of rotary, reciprocating, and manual file systems. The file systems [number of studies] include: Reciproc [23], ProTaper Universal Retreatment (PTUR) [21], Reciproc Blue [13], ProTaper Next (PTN) [8], WaveOne Gold (WOG) [8], WaveOne (WO) [7], Mtwo Retreatment [5], D-RaCe system [4], K-file [4], PTUR+PTG [3], XP-endo Shaper (XPS) [3], Hedstrom (H-file) [3], Gates-Glidden+H-File [2], Mani NRT [2], TRUShape [2], ProDesign R (PDR) [2], PTUR+PTN [2], 2Shape [2], R-Motion [2], EdgeFile X [2], One Shape [1], One Curve [1], Gates-Glidden+K-file [1], XPS+XP-endo Finisher (XPF) [1], TF Adaptive [1], Hyflex EDM [1], R-Endo [1], FragRemover [1], Self-Adjusting-File (SAF) [1], Fanta-AF-One (FAFO) [1], Tango-Endo (TE) [1], Hyflex Remover+Hyflex CM [1], ProTaper Gold (PTG) [1], FlexMaster (FM) [1], Gates-Glidden+H-File [1], ProDesign Logic [1], F6 SkyTaper [1], HyFlex NT [1], VDW.ROTATE [1], ProFile [1].

Conclusions: Reciproc was the most (20%) utilized amongst the retreatment file systems reported in the mechanical removal of root filling material.

Support Funding Agency: Dr. Shizuko Yamauchi Endodontics Graduate Student Award (GD)

Abstract # 11 Increased Emergence of Antibiotic-Resistant *Staphylococcus aureus* in the Diabetic Host

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Objectives: The emergence of antimicrobial resistance is considered a top public health threat by The World Health Organization. Antibiotic-resistant bacteria are often isolated from patients with diabetes, a disease which afflicts 11.6% of the U.S. population and 537 million individuals worldwide. *Staphylococcus aureus*, one of the antimicrobial resistance threats causing the most deaths worldwide, frequently infects diabetic wounds. We sought to model the emergence of antibiotic-resistant *S. aureus* in the diabetic environment to further understand its increased prevalence in patients with diabetes.

Methods: Treatment of *S. aureus* skin and soft tissue infection (SSTI) with the antibiotic rifampicin was modeled in diabetic mice. Resulting rifampicin-resistant colonies were isolated on antibiotic plates after 5 days of infection and daily treatment with rifampicin. A subsequent experiment used nondiabetic mice treated with the mTOR suppressor rapamycin to model diabetic immune suppression and determine its contribution to antibiotic resistance. *S. aureus* metabolic mutants with known defects in central metabolism were grown *in vitro* in the presence of elevated glucose and rifampicin to elucidate how increased glucose presence in diabetic hyperglycemia influences the emergence of antibiotic resistance.

Results: Antibiotic-resistant *S. aureus* colonies were isolated from ~90% of diabetic mice (n=14), with several infections resulting in a completely rifampicin-resistant population of *S. aureus*. In contrast, no rifampicin-resistant mutants were isolated from control nondiabetic animals. Follow-up experiments modeling diabetic immune suppression with rapamycin resulted in minor emergence of rifampicin-resistant *S. aureus*. Experiments with known *S. aureus* mutants revealed that the presence of glucose and metabolism involving the TCA cycle is paramount for the expansion of rifampicin-resistant mutants in the diabetic environment.

Conclusions: The emergence of antimicrobial resistance can be modeled in a mouse model of diabetes. Rapid expansion of antibiotic-resistant *S. aureus* during infection and treatment is directly supported by the hyperglycemic diabetic host environment.

Support Funding Agency: NIH NIAID R01AI173004

Abstract # 12 Commensal Microbiota Effects on Craniofacial Skeletal Growth and Morphology

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Objectives: Collections of microbes colonize anatomical sites to form microbiota communities (i.e., oral microbiota, gut microbiota). We and others have shown that the commensal gut microbiota regulates postnatal bone growth and maturation at non-craniofacial skeletal sites. Diverse genetic and environmental factors impact craniofacial development. However, no known prior studies have investigated commensal gut microbiota effects on craniofacial skeletal growth processes. Study purpose was to discern whether commensal gut microbes influence normal postnatal craniofacial skeletal development.

Methods: The project laboratory's prior work revealed that segmented filamentous bacteria (SFB), a commensal gut bacterium that colonizes rodents and humans, modulates commensal gut microbiota actions on non-craniofacial skeletal maturation. Female C57BL/6T germ-free mice, excluded-flora mice (specific-pathogen-free mice devoid of SFB), and murine-pathogen-free mice (specific-pathogen-free mice colonized by SFB) were acquired from Taconic Biosciences. Animals were euthanized at age 9-weeks; skulls were dissected for analyses (n=8-11/gp). Micro-CT reconstructions were used for craniometric and bone mineral density measurements. One-way ANOVA (tukey) was used for statistical comparisons between groups; $P < 0.05$.

Results: EF versus GF mice exhibited an elongated gross skull length, enhanced frontal bone length and reduced cranial base length. The shortened cranial base in EF mice was attributed to decreased presphenoid, basisphenoid, and basioccipital bone lengths. MPF versus EF mice had reduced frontal bone length and increased cranial base length. The elongated cranial base in MPF mice was due to enhanced presphenoid bone length.

Conclusions: This work introduces the commensal gut microbiota as a novel regulator of craniofacial skeletal growth and maturation. Orthodontics and dentofacial orthopedics are commonly employed to correct dental and craniofacial discrepancies. Considering that specific microbes modulate commensal gut microbiota effects on craniofacial skeletal growth, this underscores that non-invasive interventions in the pediatric gut microbiome (i.e., probiotics, prebiotics) could be employed as adjuncts to support orthodontic treatment outcomes.

Support Funding Agency: ASBMR Rising Star Award; NIH/NIDCR K08DE025337; NIH/NIGMS P20GM130457-01A1; NIH/NIDCR P20GM121342-03; NIH/NIDDK P30DK123704-01; NIH/NIDCR T32DE017551; NIH/NIDCR F30DE027290

Abstract # 13 Immune Dysregulation in the Oral Cavity During Early SARS-CoV-2 Infection

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Objectives: Tissue-specific immune responses are critical determinants of health-maintaining homeostasis and disease-related dysbiosis. In the context of COVID-19, oral immune responses reflect local host-pathogen dynamics near the site of infection and serve as important “windows to the body,” reflecting systemic responses to the invading SARS-CoV-2 virus.

Methods: This study leveraged multiplex technology to characterize the salivary SARS-CoV-2-specific immunological landscape (37 cytokines/chemokines and 11 antibodies) during early infection. Cytokine/Immune profiling was performed on unstimulated cleared whole saliva collected from 227 adult SARS-CoV-2+ participants and 37 uninfected controls.

Results: Statistical analysis and modeling revealed significant differential expression of 25 cytokines (16 downregulated, 9 upregulated). Pathway analysis demonstrated early SARS-CoV-2 infection is associated with local suppression of oral Type I/III Interferon and blunted Natural Killer (NK)/T-cell responses, reflecting a potential novel immune-evasion strategy enabling infection. This virus-associated immune suppression occurred concomitantly with significant upregulation of pro-inflammatory pathways including marked increases in the acute phase proteins Pentraxin-3 and Chitinase-3-like-1.

Conclusions: Altogether, our findings highlight saliva as a stable and accessible biofluid to monitor SARS-CoV-2 progression, including early tracking of cytokines associated with mortality in later stages of disease. Beyond diagnostics and prognostics, saliva has the potential to reveal fundamental biological mechanisms of health and disease, including tissue-specific host resistance factors and viral evasion strategies.

Support Funding Agency: Southern Association of Orthodontists (E.B.), American Association of Orthodontists Foundation (AAOF) Resident Research Aid (E.B.), Robert Boyd Biomedical Research Award (L.J.), NIH NIDCR 1K08DE030235-01A1 (L.J.), 1R03DE031301 (L.J.), and R03DE028983 (D.W.)

Abstract # 14 The MASTL-ENSA-PP2A/B55 Pathway Modulates Cisplatin Resistance in Oral Cancer

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Objectives: Cisplatin and other platinum-based medications are essential components of chemotherapy regimens for treating a variety of cancers, including oral squamous cell carcinoma (OSCC). These drugs confer cytotoxicity in cancer cells by inducing DNA damage, particularly interstrand crosslinking (ICL). However, OSCC are often resistant to the treatment, resulting in generally poor treatment outcome which has not been improved over decades. Thus, it is important to identify mechanisms that render OSCC resistant to cisplatin, for example, via ICL repair. In turn, the knowledge can be translated into enhanced treatments, by combining cisplatin with targeted therapy that disables these specific resistant mechanisms.

Methods: OSCC clinical data were collected at The Cancer Genome Atlas (TCGA) database and analyzed; DNA repair and damage responses were dissected at the molecular level using molecular and cellular techniques.

Results: MASTL (Microtubule Associated Serine Threonine Like kinase) phosphorylates ARPP19 (cAMP regulated phosphoprotein 19) and ENSA (Endosulfine Alpha) which inhibit protein phosphatase 2A coupled with B55 subunits (PP2A-B55). This kinase-phosphatase pathway has been shown to promote mitotic progression. Remarkably, downregulation of PP2A/B55 and overexpression of MASTL and ENSA/ARPP19 are frequent in OSCC. Resistance to cisplatin in established OSCC cell lines is correlated with increased expression of MASTL and ENSA and decreased expression of B55 genes. The stable expression of MASTL in OSCC cells promotes cell survival and proliferation during cisplatin treatment, with a dependence on ENSA. In contrast, overexpressing B55 or deleting MASTL or ENSA increases sensitivity to cisplatin and correlates with higher activation of caspase and accumulation of DNA damage signals. Our single-cell gel electrophoresis research reveals a direct role for the MASTL-ENSA-PP2A/B55 pathway in regulating the repair of DNA interstrand crosslinks (ICL) caused by cisplatin. Mechanistically, B55 blocks the mono-ubiquitination of the Fanconi Anemia proteins FANCI and FANCD2, which is an essential stage in ICL repair, whereas MASTL promotes it.

Conclusions: Our findings indicate an important role of the MASTL-ENSA-B55 pathway in platinum-based cancer treatment and suggest its therapeutic targeting to overcome OSCC resistance.

Support Funding Agency: National Institutes of Health (CA233037, DE030427)

Abstract # 15 Unlocking the Biological Factors in Oral Health Among Hispanic Adults

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Objectives: Dental caries is the most common chronic disease worldwide and affects 80% of the U.S.A. population. This burden falls disproportionately on economically disadvantaged families, such as Latinx populations, whose lack of access to medical and dental cares affects their quality of life. Our aim is to present the findings of biological factors (biofilm and saliva) associated with oral health and disease prevalence (caries and periodontal disease) among patients enrolled in the Hispanic Oral health Prevention & Education Program (H.O.P.E.).

Methods: This cross-sectional study evaluated data obtained for 72 Hispanic adults living in Siler City, North Carolina, U.S.A., enrolled in the Hispanic Oral health Prevention & Education (H.O.P.E.) Program. A comprehensive oral exam was performed to evaluate biofilm (BI), caries status (ADA classification), bleeding on probing (BOP), probing depth (PD), and salivary parameters (flow and buffering capacity). (UNC IRB # 21-1358)

Results: The majority of the patients (67%) presented thick and firmly attached biofilm (scores 3-5 BI). Caries experience was extremely high, with 97% of patients presenting cavitated lesions; 36% of patients having 11-15 teeth with carious lesions, and 15% had carious lesions on over 16 teeth. 93% of the patients had DMFT (decayed, missing, and filled teeth) score greater than 5. 97% of patients presented BOP, with 15% of them presenting at least 21 bleeding sites. 70% of patients were found to have PD of greater than 3mm, with 38% of patients presenting with probing depths between 5-6mm. Salivary evaluation revealed that 24% of the patients presented low salivary flow (<1ml/min) and 6% presented low buffering capacity.

Conclusions: Within the limitations of this study, we conclude that the Hispanic adult population evaluated has poor oral health and unbalanced biological factors that is contributing with oral disease development.

Support Funding Agency: NC Albert Schweitzer Fellowship

Abstract # 16 Near-Infrared Imaging in Intraoral Scanners for Early Interproximal Caries Detection

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Objectives: Intraoral scanners commonly used in orthodontic offices now offer near-infrared imaging (NIRI) technology, advertised as a screening tool to identify interproximal caries. This study aims to evaluate the reliability and validity of NIRI detection of interproximal carious lesions in a common intraoral scanner (iTero Element 5D, Align Technology, US) with and without bitewing radiograph (BWR) complement, compared to a micro-computed tomography (micro-CT) gold standard.

Methods: Extracted human posterior teeth (premolars and molars) were selected for early (non-cavitated) interproximal carious lesions (n=39) and sound control surfaces (n=47). The teeth were scanned via micro-CT for gold standard evaluation by two blinded evaluators using consensus scoring. The teeth were mounted to simulate anatomic interproximal contacts, underwent NIRI scan using iTero Element 5D and bitewing radiographs. Two trained, calibrated examiners independently evaluated: 1) near-infrared images alone with clinical photo, 2) bitewing radiograph alone with clinical photo, and 3) near-infrared image with bitewing radiograph and clinical photo in combination, following at least a 10-day washout period between each evaluation.

Results: Inter-rater reliability was highest for NIRI alone ($k=0.533$) compared to BWR alone ($k=0.176$) or in combination ($k=0.256$). NIRI alone showed high specificity (0.83-0.96) and moderate sensitivity (0.42-0.63) compared to micro-CT gold standard. Dentin lesions were significantly more reliably detected than enamel lesions.

Conclusions: Following rigorous training and calibration, NIRI can be used with moderate reliability, high specificity, and moderate sensitivity to detect non-cavitated interproximal carious lesions.

Support Funding Agency: American Association of Orthodontists Foundation, American Academy of Cariology, Southern Association of Orthodontists, and the Dental Foundation of North Carolina

Abstract # 17 Periodontal Impact of Orthodontic Incisor Retraction Beyond A Biological Boundary

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Objectives: The aim of this study is to evaluate the periodontal impact of mandibular incisor retraction beyond the lingual cortical plate.

Methods: 41 patients treated with first bicuspid extractions and skeletal anchorage for maximum incisor retraction were evaluated in this study. Cone Beam Computed Tomography (CBCTs) were taken pre-treatment (T1) and post-treatment (T2). Regional mandibular superimpositions were performed using ITK-SNAP and the outline of the lingual cortical plate was segmented. T2 incisor retraction beyond the T1 lingual cortical plate was recorded. Dehiscence and change in alveolar ridge thickness were measured. The differences between T1 and T2 were analyzed by a paired t test, while the comparisons between subgroups utilized a two-sample t test, and correlations between initial conditions and outcomes were assessed using linear regression analysis.

Results: Dehiscence was observed in 73% of patients during treatment. Our data suggest that the amount of incisor retraction (Mean= 5.05 mm, SD = 1.78 mm), the degree of lingual border violation, and the amount of crestal bone loss during treatment (Mean= 0.78 mm, SD = 0.54 mm) are correlated with the introduction of dehiscence. Age, treatment duration, and gender showed no such correlation.

Conclusions: Retraction of the mandibular incisors beyond the lingual cortical plate led to dehiscence and alveolar bone loss. Future studies are needed to evaluate the long-term impact of these periodontal defect on the mandibular incisors.

Support Funding Agency: N/A

Abstract # 18 RNF25 and PIAS1 Promote Replication Stress Tolerance on WEE1 Inhibition

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Objectives: Pancreatic Ductal Adenocarcinoma (PDAC) is a deadly disease with a 5-year survival at a dismal 10%. Small molecule inhibitors of the WEE1 protein kinase are emerging drugs for treatment of several malignancies, including PDAC. However, efficacy of PDAC chemotherapy is limited by drug resistance. Therefore, to elucidate additional potential therapeutic vulnerabilities in PDAC, we interrogated components of ubiquitin signaling pathways (E3 ligases), which are often rewired pathologically in neoplastic cells.

Methods: We performed a CRISPR-Cas9 E3 ligase gene drop out screen targeting 317 Ring and Sumo E3 ligases in two PDAC cell lines with/without WEE1 inhibitor (WEE1i). The resulting data was computationally analyzed using Völundr algorithm. Top hits from the screen were validated by clonogenic survival assay and tested for mechanism of WEE1i tolerance, by immunoblotting and flow cytometry assays, and live cell imaging.

Results: By following up on the CRISPR screen results, we identify RNF25 and PIAS1 as candidates that protect PDAC cells from WEE1i induced DNA damage. Specifically, RNF25^{-/-} and PIAS1^{-/-} PDAC cells exhibited increased accumulation of DNA damage, particularly the single stranded DNA tracts on WEE1 inhibition ($p \leq 0.0001$). Cell cycle progression was hampered, with accumulation of cells in S and G2/M phase in RNF25^{-/-} and PIAS1^{-/-} PDAC cells with WEE1i. Furthermore, RNF25^{-/-} and PIAS1^{-/-} PDAC cells exhibited modest or low sensitivity to other genotoxin treatments routinely used in PDAC chemotherapy like gemcitabine, 5-FU and paclitaxel, indicating the specificity of these genes in conferring WEE1i tolerance. Additionally, by tracking live cell imaging data we demonstrate that RNF25^{-/-} cells acquire significant increase in mitotic defects while PIAS1^{-/-} cells show higher rates of cell death in mitosis on WEE1 inhibition.

Conclusions: Our data indicate that the anticancer activity of WEE1 inhibitors could be improved with concurrent inhibition of the E3 ligases namely RNF25 and PIAS1 in PDAC cell lines.

Support Funding Agency: R01 ES029079 and CA215347, National Institutes (C.V.)

Abstract # 19 Gene-environment Interaction in Early Childhood Caries and Bedtime Feeding Practices

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Objectives: Early childhood caries (ECC) is a multifactorial disease with a substantial public health burden. Both genetic and environmental factors have been implicated in its etiology. Among the environmental factors, night-time feeding practices in children, especially breast- and bottle-feeding with sugary liquids have been linked to ECC. In this study, we examine potential interactions between common genetic variation and bedtime feeding practices and leverage this potential interaction effect to aid the discovery of ECC-associated novel genetic variants.

Methods: The analytical sample comprised 6,103 multiethnic preschool children (3-5 years old) from a community-based study. We obtained information on ~14 million genetic polymorphisms. ECC was measured by trained and calibrated examiners using the ICDAS criteria (dmfs index). History of bedtime feeding was assessed through a parent questionnaire. We used two approaches, the joint (2-degree-of-freedom) test and the stratified genome-wide association (GWA) analysis, to explore gene-environment interactions using linear-mixed models adjusting for age, sex, race/ethnicity, genetic ancestry, and relatedness. We utilized a genome-wide significance threshold of $P < 5 \times 10^{-8}$.

Results: Our study identified five novel risk loci associated with ECC. The joint test identified a marker on chromosome 14 (locus: *RP11-991C1.1*, rs118093451), while the stratified GWA analysis identified 4 additional loci. These include *FN3KRP* (chromosome 17, rs73361142), *C7orf66* (chromosome 7, rs58004675), *SCARA3* (chromosome 8, rs3824099), and *AP000459.7* (chromosome 21, rs142594000). *SCARA3* encodes a macrophage scavenger receptor-like protein, contributing to the innate immune response, and is upregulated in dental pulp compared to periodontal ligament tissue, suggesting a potential role in tissue mineralization and regeneration.

Conclusions: These findings provide insights into the etiology of ECC, particularly in line with the role of gene-environment interaction with bedtime feeding practices. This could enhance future risk stratification and interventions at individual and population levels.

Support Funding Agency: NIH/NIDCR - U01DE025046

Abstract # 20 Salivary Gland Cells as a Reservoir for Human Coronavirus Replication

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Objectives: This study aimed to establish an in-vitro model of human coronaviruses (HCoVs) infected salivary gland cells (SGCs) to investigate the replication kinetics and potential pathological changes caused by HCoVs.

Methods: Human salivary glands were utilized as the primary source, and were infected with various human coronaviruses, including HCoV-229E, HCoV-OC43, and HCoV-NL63. i) Replication kinetics were assessed through timed-infection assays, employing Reverse Transcription Polymerase Chain Reaction (RT-PCR) for accurate monitoring. ii) The regulation of gene expression was studied using RNA sequencing to elucidate any differential patterns caused by HCoV infection. iii) The expression of receptors, including hACE-2, TMPRSS, CD147, and hAPN, was detected using direct immunofluorescence assays. iv) Flow cytometry was employed to detect cell surface expression levels of hACE-2, TMPRSS, CD147, and hAPN proteins, providing insights into potential variations induced by HCoV infection.

Results: Our findings confirm the establishment of an in-vitro model demonstrating the replication of human coronaviruses within salivary gland cells. Timed-infection assays revealed distinct replication kinetics for HCoV-229E, HCoV-OC43, and HCoV-NL63. Ongoing studies are currently underway to investigate the gene expression profile of coronavirus-infected salivary gland cells. Preliminary findings indicate a complex and dynamic interplay between the viral infection and the host cell, with potential implications for the understanding of the molecular mechanisms involved in coronavirus replication within salivary gland cells.

Conclusions: This study underscores the significance of salivary gland cells and saliva as potential reservoirs for coronavirus transmission. The observed replication of human coronaviruses within salivary gland cells suggests a plausible route for viral dissemination and infection. The establishment of an in-vitro model for studying coronavirus infection in salivary gland cells opens avenues for testing drug therapies targeting coronaviruses within the oral cavity. This model provides a valuable platform for further investigations into the development of targeted interventions against coronavirus infections in the oral mucosa, contributing to the broader effort in combating viral transmission.

Support Funding Agency: NC A&T State University

Abstract # 21 Methods of Evaluating Anxiety Levels in Pediatric Dental Patients

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Objectives: Dental anxiety (DA) is a pervasive issue impacting 23.9% of pediatric patients. Dentistry would benefit from non-pharmacological anxiety control techniques to provide safer and less expensive options for patients with DA. To evaluate anxiety control techniques in children, researchers need reliable and efficient ways to measure DA. A pilot study on animal-assisted therapy (AAT) was conducted to evaluate methods for measuring DA using objective, physiologic measures along with subjective, self-reported scales.

Methods: Subjects were consecutively enrolled and randomized into AAT (n=18) and control groups (n=21) as part of a prospective trial. An invasive dental procedure was performed involving a handpiece. Salivary samples, galvanic skin response (GSR), heart rate, video data, and self-report scales were collected during the visit. Experimental approaches were evaluated for their feasibility and reliability.

Results: Heart rate, coded videos, and self-reported anxiety and pain scales were the most consistent and reliable sources of data, with high feasibility. GSR, salivary amylase and cortisol data exhibited high variability and limited feasibility.

Conclusions: Data from this pilot will help inform future investigations into non-pharmacological management of DA in pediatrics.

Support Funding Agency: Southern Association of Orthodontics Research Award (to J.M.), American Association of Orthodontics Foundation Resident Research Award. NCATS, NIH (UL1TR002489), NIDCR (K08DE030235; L.J.), (R03DE032768 to L.J.)

Abstract # 22 Surface Deterioration of Dental Materials: an In Vitro Study

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Objectives: The presence of fluoride and the abrasiveness of each oral hygiene product might lead to surface modifications capable of impacting esthetics and most importantly, biofilm adherence to dental materials. The aim of this study is to evaluate the impact of a non-fluoride toothpaste and mouthwash on the surface roughness, color, translucency, and gloss of ceramic, zirconia, and titanium materials.

Methods: A pilot study was conducted to elect the method to evaluate differences in surface roughness (atomic force microscope x profilometer) using 1 sample of each material and 2 different toothpastes to test the toothbrush simulator protocol comparing spectrophotometer parameters. A protocol using a KLA-Tencor P-6 profilometer was developed. Baseline measurements were performed for 29 10x10x1 mm ceramic samples. A template was used to standardized sample positioning and an average of 3 lines (1 mm each) per sample was used to evaluate roughness. For the spectrophotometer evaluation, a Konica Minolta Sensing CM700d reflection spectrophotometer was used to measure surface color, translucency, and gloss.

Results: The pilot test determined that the profilometer would capture differences in surface roughness generated by the study protocol and that 20k cycles in the toothbrush simulator would yield a difference in the spectrophotometer parameters. Briefly, titanium had a significant color change after 20k cycles (-2.14 in CW and -2.22 in CB) and zirconia presented minimal color change (+0.04 in CW and -0.04 in CB). Following the pilot study, baseline measurements of ceramic samples were obtained, and preliminary results for surface roughness showed Ra= 318.15mm (±237.32) and Rq= 237.32mm (±255.24).

Conclusions: The pilot study allowed the development of an appropriate protocol to evaluate surface roughness and color, translucency and gloss. Baseline results for ceramic samples were considered appropriate and samples will be submitted to the main study experiment in the following weeks.

Support Funding Agency: Grover C. Hunter DDS Short-Term Research Fellowship award.

Abstract # 23 The Effect of Gabapentin on Post-operative Pain and Opioid Use After Orthognathic Surgery

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Objectives: Considering the current opioid crisis in our nation, clinicians have been attempting to find alternatives to manage post-operative pain.

Methods: A total of 43 patients from two senior surgeons were enrolled in a prospective study to assess the effect of gabapentin on the reduction of opioid consumption and post-operative symptoms after orthognathic surgery. 23 patients were enrolled in the study group and 21 in the control. Post-op symptoms were listed in diaries. Pain was recorded on a 7 point Likert scale (1 = no pain; 7 = worst pain) while all other symptoms were measured on a 5 point scale ranging from not at all (1) to a great deal (5). The study group was given 11 tabs of 300 mg of gabapentin to take over the first 5 days after surgery with one dose (300 mg) on the night of surgery and two doses (600 mg) on days 2-5. The first three days after surgery were assessed. Bivariate analyses to assess the effect of group on the outcomes were performed using exact chi-square and Mantel-Haenszel tests for categorical and quantitative variables, respectively. Level of significance was set at 0.05 for all analyses.

Results: 62% of subjects in the control group completed the patient diaries along with 64% in the study group. Regarding numbness, 92% reported a 4 or 5 on POD 1 in the study group vs. 75% in the control group. ($p=0.0006$). On POD 2, the percentage in the study group stayed at 92% while that in the control group decreased to 50% ($p=0.0003$). On POD 3, the percentage in the study group decreased to 72% and decreased to 33% in the control group ($p=0.0123$). With regard to nausea, a significant difference was observed for POD 3 with 86% of the study group reporting no nausea while only 23% in the control group. Although a higher percentage of the study group reported elevated swelling on POD 1 and 3, the percentage difference was only statistically significant on POD 2 ($p=0.0016$). There was no statistically significant difference in pain scores between the two groups during POD 1-3. Opioid use was increased in the study group compared to the control group during POD 1-3, however only POD 1 was statistically significant.

Conclusions: Opioid consumption was slightly decreased or unchanged in the control group compared to study group. The side effects of gabapentinoids should be considered when trying to address post-surgical symptoms.

Support Funding Agency: N/A

Abstract # 24 Oral Health for Hispanics: Surveying the Present, Plan the Future

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Objectives: Oral health literacy pertains to an individual's ability to obtain, comprehend, and apply oral health information for informed health decisions. We surveyed an adult population of Hispanics to assess their knowledge on caries prevention and maintenance of oral health.

Methods: A cross-sectional survey was conducted in 69 Hispanic patients (ages between 18-83, 47 females) residents in Siler City, North Carolina, USA, using a questionnaire with 10 close-ended questions, in Spanish. Each question was analyzed using a progressive, points-driven strategy, to discriminate between low, moderate, and high literacy related to oral health. After the survey, all participants were enrolled in the Hispanic Oral health Prevention & Education (H.O.P.E.) Program, developed to educate the Latinx community in their native language about oral health. (UNC IRB # 21-1358)

Results: With a maximum health literacy survey score of 11, we defined the parameters as low (0-3.5), moderate (3.51-7.5), and high (7.51-11). The survey resulted in a mean score of 4.46. 32% of the participants scored low, 65% moderate, and 3% high scores for oral health literacy. No significant differences were observed among genders. The main gaps of knowledge were related to the use of dental floss and amount of toothpaste to use.

Conclusions: The current status of oral health literacy from the predominantly Hispanic population sampled in Siler City is moderate to low. Whether these results are due to available informational materials lacking options in their native language, lack of sufficient person-centered care, lack of dental providers, or a combination of factors, this survey only highlights the disparity that exists in many underserved communities. The survey provides a clear baseline to how a program like H.O.P.E. can further plan strategies to enhance oral health literacy in community settings, particularly targeting vulnerable risk groups.

Support Funding Agency: NC Albert Schweitzer Fellowship

Abstract # 25 Dose Effects of Suboptimal Positioning for CBCT and Panoramic Imaging

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Objectives: The aim of this study was to examine the effects of various changes in patient positioning on radiation exposure for panoramic and CBCT extraoral radiographic examinations. Specific objectives included measuring effective dose (E) as well as dose to specific organs – including the thyroid gland – by means of radiation dosimetry.

Methods: Panoramic and CBCT radiographic examinations at optimal positioning in addition to several suboptimal positions (anterior, posterior, and lateral shifts by 1 cm as well as head rotation, flexion, and extension by 10 degrees) were completed using a tissue-equivalent phantom. Adjunctive materials produced by means of 3D printing were used to simulate flexion and extension with the thyroid gland in a physiologically representative position. Dosimetry was acquired using optically stimulated luminescence (OSL) dosimeters placed at 24 anatomical sites in the head/neck region. Exposures were made with the RayScan Alpha Plus x-ray unit using the following exposure parameters (panoramic: 13.9 s, 80 kVp, 14 mA; CBCT: 14.0 s, 90 kVp, 11 mA). Five CBCT and ten panoramic exposures, respectively, were made to ensure adequate exposure to all sites of interest. Statistical significance was assessed with Tukey p-values (<0.05) and ANOVA analysis.

Results: No increases in E were determined for suboptimal panoramic conditions. E for anterior shift and posterior shift demonstrated statistically significant decreases when compared to optimal positioning ($P < 0.001$). For CBCT, no statistically significant increases or decreases for E were determined. Head extension simulated using 3D printed adjunctive materials significantly reduced exposure to the thyroid gland ($P < 0.001$).

Conclusions: Suboptimal positioning did not result in significant increases in E for either CBCT or panoramic imaging. Results suggest that head extension may decrease exposure to the thyroid gland for CBCT imaging.

Support Funding Agency: N/A

Abstract # 26 The Staining Susceptibility of Additive Manufactured Dentures Following Post-processing Techniques

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Objectives: This pilot study aims to investigate the color stability and gloss retention of 3D-printed dentures compared to milled dentures after the use of various post-processing techniques.

Methods: Square 10mm x 10mm x 2mm denture base and denture teeth samples were milled and printed for this study. Polymethyl methacrylate discs were utilized to mill specimens for preparation and printed samples were printed on carbon utilizing stereolithography (SLA). Wet pumice was applied to half the samples and polished on a lathe for 10 seconds and OPTIGLAZE™ was applied to the second half of the sample group and light-cured for 3 minutes. Specimens were incubated at 37°C for 24 hours for baseline color measurements. The solution that will be used consists of hot black coffee (Starbucks French Roast at 55.5°C) made by mixing one packet of 3.3g coffee grounds with 8 oz of boiling water. The samples were placed in 20mL glass vials and filled with 10mL of the solution. Before recording measurements, teeth were placed in an ultrasonic bath with distilled water for 5 minutes. The color parameters of each specimen were measured using a bench-top spectrophotometer at baseline, 1 day, 7 days, and 14 days. Data was analyzed using a paired t-test to determine the mean difference between the variables for this subject.

Results: A total of 240 color measurements were recorded for 60 samples used in this study. Paired t-test were utilized to analyze results. The results indicated a statistical difference between the staining susceptibility of printed dentures and milled dentures using different polishing techniques.

Conclusions: Due to susceptibility for staining based on the polishing method, the clinician should specify to their lab what material they are utilizing and how they would like it finished and polished, rather than delegating the decision to the lab technician.

Support Funding Agency: Grover C. Hunter DDS Short-Term Research Fellowship award

Abstract # 27 Targeting Aurora Kinases to Overcome Cisplatin Resistance in Oral Squamous Cell Carcinoma

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Objectives: Cisplatin-based chemotherapy has significantly improved the prognosis of patients with advanced recurrent oral squamous cell carcinoma (OSCC). However, the intrinsic and acquired resistance of tumor cells to platinum chemotherapy, and its toxicity to normal tissue are the bottlenecks that limit the effectiveness and application of this treatment. Aurora kinases are well-established in regulation of G2/M transition, mitotic spindle assembly, and other aspects of mitotic progression. However, the precise role of Aurora kinases in cisplatin resistance remains unknown, given that cisplatin confers toxicity primarily in cells undergoing DNA replication.

Methods: We performed a small molecule inhibitor library screen to identify novel drugs that sensitize resistant OSCC to cisplatin. We conducted in vitro experiments using SCC11b and SCC38 cell lines, examining cell viability, apoptosis, DNA damage repair, and kinase activity under various treatments, including Aurora A inhibitors and cisplatin, both alone and in combination. Additionally, in vivo studies were conducted on SCC7 tumors to evaluate the impact of this combined treatment on tumor size.

Results: We found that among top candidates from drug screen were several inhibitors of Aurora kinases, especially Aurora A. This finding is consistent with the association between Aurora A expression and poor patient survival in oral cancer. Interestingly, inhibition and lockdown of Aurora kinases induced replication stress, as indicated by RPA32 phosphorylation and sensitized response to cisplatin, increasing cell viability. The combinatorial treatment of Aurora inhibitions and cisplatin augmented the induction of cell apoptosis, DNA damage, and impaired DNA damage repair, thus decreasing the SCC7 tumor size compared to cisplatin treatment alone.

Conclusions: Taken together, we identified Aurora kinase inhibitors as new therapeutics with synergistic antitumor effects with cisplatin in OSCC. This therapeutic effect is likely due to a newly identified function of Aurora kinases in DNA replication stress. Our findings support the potential clinical application of Aurora kinase inhibitors that are already under clinical investigations for cancer therapy.

Support Funding Agency: National Institutes of Health (CA233037, DE030427)

Abstract # 28 Evaluating Dental Students' Perceptions of Implant Dentistry Education

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Objectives: Managing edentulism is a core task of the profession, with increasing demand for dental implant-supported prostheses. Limited data exists on students' experiences and self-perceived confidence based on didactic and clinical curriculum in implant dentistry. This study's purpose was to determine perceptions of senior dental students' education and their confidence.

Methods: Fourth-year students at UNC Adams School of Dentistry voluntarily participated in an anonymous survey to assess perceptions towards implant dentistry education. Students' self-assessments of the entrustable professional activities (EPAs) associated with the management of edentulism through implant dentistry were examined, including diagnosis, treatment planning, surgical placement, restoration, & case selection. Confidence was determined on a 5-point scale ranging from "totally confident & independent" to "not confident at all." Descriptive analysis with relative & absolute frequencies were utilized. A Fisher's Exact analysis was used to assess statistically significant differences in gender, age, plans after graduation, & perceived confidence. The level of significance was set at 0.05.

Results: Seventy-six percent of respondents indicated that implant dentistry was "very important." Eighty-four percent of respondents reported having a high interest in improving their skillset/desire to become experts in implant surgery, & seventy-nine percent in restoring single implants. Two trends were noted: learners who planned to practice as generalists, as opposed to specialists, were three times more likely to place implants during dental school, & older students (≥ 31 years) were 11 times more likely to place implants ($p=0.0035$). Furthermore, 87% of participants expressed high interest in improving their skillset/desire to become experts in treating prosthetic complications, & 84% in managing peri-implantitis. There were no statistically significant differences between genders for surgical placement, restoration, or treatment planning of single implant cases.

Conclusions: According to our data examining one school's experience, dental curriculum should benefit from a stronger emphasis on implant dentistry, particularly for students pursuing careers as generalists. With curriculum time being a premium, individualization of curriculum experiences should be considered for learners seeking additional expertise in implant dentistry.

Support Funding Agency: John C. Brauer DDS Short-Term Research Fellowship

Abstract # 29 PD-L1 Gene Therapy Rescues Sjögren's Syndrome Symptoms in Mice

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Objectives: Sjögren's syndrome is the second most common autoimmune rheumatic disease characterized by lymphocytic infiltration of salivary and lacrimal exocrine glands. Dry eyes and mouth are the two most common symptoms with no effective treatment options. However, advancements in gene therapy technology to deliver and stably express genes for therapeutic utility have made it a promising approach to limit disease progression. PD-L1, a human encoded protein in the immune suppressive pathway, represents a promising candidate for AAV-mediated gene delivery. To combat progression of immune-mediated dry mouth, we exogenously expressed PD-L1 in Sjögren's syndrome mouse model salivary glands to dampen the immune response and effectively reduce lymphocytic infiltration.

Methods: A Sjögren's syndrome mouse model was generated by chemical induction using an adjuvant cocktail to stimulate an autoimmune response against salivary glands. ELISA was used to confirm the production of anti-Ro60 autoantibodies, a biomarker of autoimmune induction, in the treated mice. Salivary glands were then transduced with *PD-L1* packaged AAV particles to locally express PD-L1, which was verified by immunofluorescent staining. To see if PD-L1 protects Sjögren's syndrome mice from chronic progression of symptoms, over the course of a month, salivation and tear production was measured by Phenol Red Thread test. Additionally, lymphocytic infiltration was determined by Hematoxylin and Eosin staining.

Results: Immunized mice presented Sjögren's syndrome characteristics which include the autoimmune biomarker, lymphocytic infiltration, and reduction in lacrimal gland secretion. Compared to the empty particle control, exogenous expression of PD-L1 in mice significantly reduced lymphocytic infiltration.

Conclusions: Delivery of *PD-L1* through AAV particles shows promise as a long-term and cost-effective gene therapy option for those suffering from Sjögren's syndrome. Further studies will focus on optimization, stable expression of *PD-L1*, and measuring additional markers of chronic progression of symptoms, such as MHCII, apoptosis, and α -fodrin.

Support Funding Agency: NIH 5R01HL144661

Abstract # 30 Sectional Matrix Systems: Ring Retention, Proximal Contour and Overhang. A Comparative Assessment

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Objectives: To assess the ring retention of different sectional matrix systems. To evaluate the proximal contour and overhang of different sectional matrix systems

Methods: Three different sectional matrix systems were evaluated: STRATA-G, Garrison; Complete Biofit HD, Bioclear; and Palodent Plus, Palodent. For ring retention, each sectional matrix system was placed to restore a DO cavity-prepared ivory plastic lower first molar. The typodont was fixed to the base of a universal testing machine. The force (N) required to dislodge the ring was recorded. Forty-five teeth were restored with composite resin (Filtek One, 3M) using the sectional matrix systems (15/system). Each tooth was scanned with a lab scanner (E4, 3Shape). Proximal contour and overhang were assessed by superimposing the scans on a master unprepared tooth scan. Ring retention (N), deviation of the proximal contour (mm), and marginal overhang (mm) were analyzed using Graphpad Prism software. A one-way ANOVA and Tukey's post-hoc test ($\alpha = 0.05$) were used to analyze the data.

Results: Garrison sectional matrix ring required higher force to dislodge (7.04N) compared to Bioclear (5.39N) and Palodent (3.27N). All the sectional matrix systems did not show a statistically significant difference in deviation of the proximal contour and the average of marginal overhang and flashes. Garrison and Palodent showed superior proximal contour while Bioclear had less proximal overhang.

Conclusions: The Garrison matrix system showed higher ring retention. The proximal contour and overhang of composite resin were comparable between the different matrix systems. Multiple factors impact the outcome of proximally extended cavities. Ring retention may differ and is manufacturer dependent. Restoring the proximal anatomy and contact relies on the clinician's skill to properly adapt the matrix system.

Support Funding Agency: N/A

Abstract # 31 Evaluating Effects of Animal Assisted Therapy on Pediatric Dental Patients

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Objectives: A striking 50-80% of adults and 6-22% of children suffer from dental anxiety which leads to disruptive behavior during appointments and avoidance of regular dental care. Data from various healthcare settings show reductions in pain and stress indicators in patients after implementation of a therapy dog for appointments. To identify a low-risk, non-pharmacological approach to anxiety and pain management, a cross-sectional prospective pilot trial was conducted; the pilot was aimed at determining best practices for evaluating efficacy of animal assisted therapy (AAT). The effects of AAT on pediatric patients was measured by comparing physiologic measures of anxiety (heart rate, salivary amylase and cortisol), along with self-reported measures of anxiety and pain (validated scales), during an invasive dental procedure.

Methods: Subjects were consecutively enrolled into AAT (n=18) and control groups (n=22). An invasive dental procedure was performed involving a handpiece or an extraction. Salivary samples, heart rate, and self-report scales were collected at specific intervals (T1: Baseline, T2: Intervention, T3: Post-Injection, and T4: Post procedure). Bivariate and descriptive statistics were used to compare groups.

Results: We observed that HR varied less in the AAT group than in the control group. There was a significant difference in pain between the groups at post-procedure with the control group reporting more pain. There was a higher, more positive score in the Next Visit Expectations questionnaire among AAT participants suggesting a reduction in anticipatory anxiety for future appointments, though not statistically significant.

Conclusions: AAT may be an effective therapy for alleviating anticipatory anxiety in pediatric dental patients.

Support Funding Agency: NIH RO3, NCTRACs, AAOF

Abstract # 32 Borderline Extraction Cases in Orthodontics and Second Molar Eruption Disturbances

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Objectives: To evaluate the effects of extraction versus non-extraction orthodontic treatment on second molar eruption for adolescents with borderline crowding.

Methods: Patients were grouped by maxillary and mandibular crowding, including mild crowding without extractions, borderline crowding without extractions, and borderline crowding with extractions. All 535 of the evaluated arches were from patients age 10-15 years old with unerupted second molars at treatment start. Frequency and severity of second molar eruption disturbances were scored in final records using a severity classification based on a modified Archer scale and a hybrid Archer Pell Gregory system. Results were statistically compared using Fisher's Exact Test.

Results: In the maxilla, 20.0% of borderline crowding cases without extractions had second molar eruption disturbances compared to 5.2% of borderline crowding cases with extractions ($p=0.0102$). In the mandible, 27.6% of borderline crowding cases without extractions had second molar eruption disturbances compared to 7.14% of borderline crowding cases with extractions ($p=0.0059$). There were significantly fewer second molar eruption disturbances with extraction treatment in borderline crowding cases. There was no difference in the frequency of impaction between mild crowding without extractions and borderline crowding without extractions. Although the frequency of second molar impactions was lower in patients with mandibular borderline crowding with extractions than non-extraction cases, the severity of the impactions was greater with extractions ($P=0.0053$).

Conclusions: In the maxilla and mandible, extraction treatment in borderline crowding cases reduces the risk of second molar eruption disturbances, decreasing the need for additional interventions.

Support Funding Agency: Southern Association of Orthodontists

Abstract # 33 Near-Infrared Imaging Efficacy to Detect Demineralized Enamel on Interproximal Surfaces

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Objectives: Near-infrared technology (NIRI) is now offered in intraoral scanners and is advertised as a method to detect interproximal lesions. However, the level of demineralization that this technology can detect in initial caries is currently unknown. This study aims to utilize micro-computed tomography (micro-CT) analysis to identify how mineral density affects NIRI interproximal caries detection.

Methods: Extracted permanent human teeth with non-cavitated interproximal lesions (n=39) and sound control surfaces (n=47) were selected and scanned via micro-CT. The micro-CT data was then reconstructed using ImageJ software and the loss of mineral density was calculated as area under the curve (AUC) of the outermost 96 µm of enamel. The teeth were mounted to simulate anatomic interproximal contacts and underwent a NIRI scan using iTero Element 5D. Two trained and calibrated examiners independently evaluated the NIRI images paired with clinical images and graded the surfaces as carious lesions or sound.

Results: Inter-examiner reliability for NIRI showed moderate agreement (k=0.53). Lesions that were unanimously detected by both examiners using NIRI (n=7) had a mean AUC of 225.05 gHA/cm² (+/-9.48). Surfaces unanimously scored as sound by both examiners using NIRI (n=10) had a mean AUC of 246.01 gHA/cm² (+/-8.68).

Conclusions: This study demonstrated quantifiable differences in micro-CT mineral densities for surfaces identified by NIRI as carious and non-carious surfaces. Lesions that were unanimously identified using NIRI had a lower mineral density in the outer 96 µm of enamel. Establishing a threshold at which NIRI technology is most efficient in detecting non-cavitated carious lesions can help improve its use as a diagnostic tool in a clinical setting.

Support Funding Agency: This work was supported by the American Association of Orthodontists Foundation, American Academy of Cariology, Southern Association of Orthodontists, and the Dental Foundation of North Carolina.

Abstract # 34 Validation of a Melanocortin 4 Receptor Mutant Zebrafish Line

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Objectives: Melanocortin 4 receptor (MC4R/*mc4r*) is a highly conserved melanocortin receptor regulating metabolism and stress responses. Evidence from large-scale molecular epidemiologic studies supports an association of common variation in the vicinity of the human *MC4R* locus with tooth morbidity (i.e., dental caries and tooth loss), altered bone density, obesity, and anxiety. To validate and elucidate these observational findings, several mechanistic knowledge gaps need to be addressed. Specifically, there is a need to characterize MC4R expression and function in tissues and biological processes of interest and identify relevant functional gene polymorphisms in the *MC4R* locus. Our long-term goal is to develop a gene validation pipeline using the zebrafish model system to ultimately characterize the role of *mc4r* in dental, oral, craniofacial (DOC), adiposity, and behavioral phenotypes. In this study, we sought to implement and optimize a new multi fluorescence qPCR-based genotyping protocol.

Methods: We genotyped 10 fish from an *mc4r*^{Δsa148} outcross of unknown genotype using a standard ROX KASP assay with primers designed specifically for our target sequence.

Results: In a trial run with known genotyped samples, we were able to distinguish heterozygotes with 100% accuracy and homozygotes with 81% accuracy. Genotyping results for the *mc4r* line yielded 40% *mc4r* +/- and 60% *mc4r* +/+, with expected frequency being 50% for each genotype. We expect that our study will illuminate the impact of melanocortin signaling pathway disruption because of *mc4r* loss. Most heterozygotes of both fish sexes are greater than or equal to in standard length than their wildtype counterparts, mildly suggesting *mc4r* involvement in adiposity.

Conclusions: Though in the early stages of developing this project, we are well on our way toward our long-term goal of characterizing whether *mc4r*^{-/-} fish exhibit age-dependent hyperphagia and obesity, increased exploratory behavior, and disruptions in DOC phenotypes.

Support Funding Agency: Funding provided by the Adams School of Dentistry through Start-up funds to Dr. Graves.

Abstract # 35 Efficacy of Mouthrinses against SARS-CoV-2: Blinded Randomized Clinical Trials

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Objectives: Evaluating the antiviral potential of commercially available mouthrinses on SARS-CoV-2 holds potential for reducing viral transmission, particularly as novel variants emerge. Because SARS-CoV-2 is transmitted primarily through salivary and respiratory secretions and aerosols, strategies to reduce salivary viral burden in an antigen-agnostic manner are attractive for mitigating spread in dental, otolaryngology and orofacial surgery clinics where masks are removed.

Methods: Patients (N=322) within 10 days of a positive COVID-19 test were enrolled in a RCT of FDA-approved mouthwashes. The rinses contained active ingredients, including Ethanol + Essential Oils, Cetylpyridinium Chloride (CPC), Hydrogen Peroxide, Povidone-Iodine, Chlorhexidine Gluconate, or Placebo (Sterile water or Saline). Patients provided baseline saliva before a 60-second rinse with one of the randomized mouthwashes and gave post-rinse saliva samples at 15-minute intervals for an hour. To assess the potential of mouthwashes in reducing salivary viral load, quantitative RT-PCR was performed, and an adjusted linear mixed effect model was utilized to compare post-rinse viral loads with baseline levels.

Results: The rinse containing CPC significantly reduced salivary SARS-CoV-2 viral load 30 minutes post-rinse relative to baseline, whereas no other rinse studied significantly affected viral load at 30 minutes after rinsing. At 60 minutes post-rinsing, no group had a significant reduction in SARS-CoV-2 copy number relative to baseline, indicating a rebound in salivary viral load over a 1-hour window. Participants indicated a fair to good rinsing experience with the CPC product and high willingness to use oral rinses before and during dental and medical healthcare visits.

Conclusions: Our findings suggest that preprocedural oral rinsing could be implemented as a feasible, inexpensive approach to mitigate spread of SARS-CoV-2 and potentially other enveloped viruses for short periods of time, which is particularly relevant to clinical settings and procedures involving the nasal and oropharyngeal region.

Support Funding Agency: Southern Association of Orthodontists Research Award, AAOF Resident Research Aid Awards, Robert L. Boyd Biomedical Research Award, and NIH awards 1R03DE031301-01 and 1K08DE030235-01A1.

Abstract # 36 Exploring the Link Between Microbiota & Caries in Hispanic Adults

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Objectives: In the United States, Hispanic population are at highest risk for poor oral health, caries, oral disease, and poor access to dental care. The most prevalent chronic disease worldwide is dental caries, which is characterized by a dysbiosis between the commensal microbiota, specially mutans streptococci and lactobacilli, and the host. New insights also show the role of *Candida albicans* in the caries process. This study aimed to investigate if salivary and biofilm mutans streptococci, lactobacilli and *C. albicans* counts are associated with caries experience and disease severity in Hispanic adults.

Methods: A cross-sectional survey was conducted in 69 Hispanic adult patients, residents in Siler City, North Carolina, USA. All participants were enrolled in the Hispanic Oral health Prevention & Education (H.O.P.E.) Program, developed to educate the Latinx community in their native language about oral health. Stimulated saliva and biofilm were collected. Salivary and biofilm mutans streptococci (MS), lactobacilli (L) and *Candida albicans* (CA) counts were obtained. An oral exam was performed to evaluate biofilm (BI) and caries experience (DMFT - decayed, missing, and filled teeth). (UNC IRB # 21-1358)

Results: Biofilm classified as thick and firmly attached (scores 3-5 BI) was associated with high counts ($> 10^6$ CFU/ml) of MS in biofilm. Caries experience was extremely high, with 93% of the patients having DMFT score greater than 5. The most severe cases were associated with high counts of MS in saliva and biofilm, and moderate ($>10^4$ - 10^5 CFU/ml) to high ($> 10^5$ CFU/ml) of lactobacilli in biofilm. Low prevalence of *C. albicans* was observed.

Conclusions: Biofilm MS and lactobacilli counts were associated with biofilm maturation, caries experience and disease severity, and should be considered as caries indicators in this Hispanic population.

Support Funding Agency: NC Albert Schweitzer Fellowship

Abstract # 37 Vowels in Anterior Open Bite Patients Undergoing Orthognathic Surgery

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Objectives: Craniofacial disproportions seen in patients with Anterior Open Bite (AOB) negatively impact esthetics, oral function, and speech. Speech distortions are present in 83% of AOB Dentofacial Disharmonies (DFD) patients seeking orthognathic surgery. Speech disorders affect patients' self-esteem, quality of life, peer perceptions, and long-term career performance. However, limited data are available on vowel articulation by AOB patients, with most studies focusing on consonants and without longitudinal post-operative assessment. We aim to characterize vowel formants in AOB DFD patients before and after jaw surgery.

Methods: Vowel formant frequencies were measured in 12 patients with Class III AOB before surgery, and at 3- and 12-months after surgery using PRAAT software. Participants were recorded speaking phrases containing the corner vowels /æ α u i/ in similar phonetic contexts. Audio recordings were analyzed by measuring the first two formants (F1 and F2) of the vowels using PRAAT software. Using R software, a linear mixed effects regression model (with the word and patient as random variables) was used to explore relationships between the formants of vowels and occlusal/skeletal cephalometric dimensions.

Results: Preliminary data indicate DFD subjects with AOB present with significant postoperative changes in vowel formants.

Conclusions: Results suggest that surgical correction of AOB impacts vowel production during speech, based on a sizable cohort with post-operative data.

Support Funding Agency: NIDCR K08 Grant 1K08DE030235-01A1

Abstract # 38 Dental Anxiety Management Techniques of North Carolina Dental Hygienists

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Objectives: The purpose of this study was to evaluate dental anxiety management techniques (DAMTs) utilized by dental hygienists (DHs) in North Carolina (NC); to (1) determine which DAMTs are most frequently utilized; and (2) gauge knowledge, willingness to implement, and confidence level of DHs with DAMTs.

Methods: This study (UNC IRB #23-2406) included a single Qualtrics survey that collected quantitative and qualitative data regarding NC DH's experience with DAMTs. Question types included multiple choice, select-all, Likert-scale, and open-ended on the following categories: demographics, knowledge, education, clinical experience, confidence, and willingness. The survey was distributed to 7,732 NC registered DHs by email using a list procured from the NC dental board. Descriptive statistics, multivariate analysis, and thematic analysis were used to analyze data.

Results: Survey participants included 632 NC DHs. Most (99%) reported treating a patient with dental anxiety and an average of 8.67 patients with dental anxiety per week. The most common signs observed were nervous expression (93%), fidgeting (88%), and sweating (56%). Respondents selected scaling and root planing (83%, 91%), local anesthesia (81%, 69%), and the use of ultrasonic scalers (59%, 75%) as procedures most associated with dental anxiety and utilization of DAMTs, respectively. Over one-third (36%) reported lack of education on DAMTs at their educational institution and ranked preparedness with utilizing DAMTs post-education as an average of 4.90 on a 1-10 scale. The following DAMTs were most recognized and utilized by participants: positive reinforcements and trust building (98%), information and explanation (96%), and music (88%). Participants reported confidence (99%) in treating patients with dental anxiety in practice and willingness (99%) to modify care using DAMTs.

Conclusion: Although participants reported regularly treating patients with dental anxiety, there was limited knowledge and utilization on the various available DAMTs. Respondents expressed a general interest in continuing their dental anxiety management education.

Support Funding Agency: Alexandre Honors Carolina Fund administered by Honors Carolina

Abstract # 39 Dynamic Orexinergic Responses to Environmental Stressors in the Zebrafish Gut

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Objectives: The hypothalamic hypocretin (hcrt)/orexinergic system modulates sleep/wake cycles, arousal, and feeding. While orexinergic circuits have been well described in the central nervous system, debate remains whether a bona fide circuit exists in the enteric nervous system. The primary objective of this study was to investigate the expression of hcrt and the hcrt receptor (hcrt2) in the zebrafish gut using transcriptomic approaches; the secondary objective was to determine whether gut hcrt/hcrt2 expression is modulated by chronic stress or feeding state.

Methods: Gut and brain tissue were collected from wild-type zebrafish at different stages of development, feeding conditions and early life stress. Hcrt and hcrt2 were measured by qRT-PCR. Gut and/or brain Hcrt and hcrt2 expression in juveniles subjected to 30 days of chronic stress (n=5) were compared to unstressed controls (n=5). ~1-year-old adult gut tissues were used to determine the impact of feeding on hcrt/hcrt2 expression (n=5 overnight fast; n=5 fed). Kruskal-Wallis with Dunn's multiple comparisons test was used to compare differences between groups; p<0.05 was considered statistically significant.

Results: qPCR analysis revealed robust transcription of hcrt and hcrt2 in the zebrafish gut, with significantly higher expression in the distal gut compared to the proximal gut. We also found that an overnight fast significantly increased expression of gut hcrt and hcrt2 and that the distal gut is more responsive to the feeding state than proximal gut. Moreover, both brain and gut hcrt/hcrt2 transcription was significantly impaired in fish exposed to chronic early life stress.

Conclusions: Our results describe for the first time the presence of an orexinergic system in the zebrafish gut, and that local expression is responsive to feeding state and is reduced following chronic stress.

Support Funding Agency: This research was funded in part by a Summer Undergraduate Research Fellowship to Y.S. from the Office for Undergraduate Research at the University of North Carolina at Chapel Hill.

Abstract # 40 Profiling of Inflammatory Cytokines in External Cervical Resorption

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Objectives: The etiology of external cervical resorption (ECR) is poorly understood. This pilot study aimed to profile inflammatory cytokines in gingival crevicular fluid (GCF) from ECR-affected teeth.

Methods: Consented patients (IRB #21-2741) with clinical and radiographic diagnosis of ECR were planned for extraction or root canal treatment and resorption repair. Patients undergoing restorative treatment were recalled at 3 months. ECR severity was classified. GCF was collected using PerioPaper® strips and quantified using the Periotron 8010 Micro Moisture Meter. A Luminex multiplex immunoassay panel quantified inflammatory cytokines following protein elution, and the Mann-Whitney test was used to analyze data.

Results: All ECR lesions (n=3) were apical to the bone crest and extended into the root coronal third, had circumferential spread $\geq 180^\circ$, and probable pulpal involvement. The immunoassay panel found IL-8, chemotactic for neutrophils, basophils, and T-cells, and IL-6, known to have a pleiotropic effect on inflammation, were expressed at greater levels in diseased teeth than control teeth ($p > 0.05$). IL-10, an inhibitor of cytokine synthesis especially in activated macrophages, also had greater expression in diseased teeth ($p > 0.05$). IL-1b, a proinflammatory cytokine expressed by activated monocytes/macrophages, was reduced in diseased teeth compared to control teeth ($p > 0.05$). At 3 months post-treatment, IL-1, IL-6, IL-8, IL-10 had reduced expression in ECR-affected teeth ($p < 0.05$) whereas levels in control teeth remained relatively stable.

Conclusions: Preliminary data showed ECR-affected teeth had a different inflammatory cytokine profile compared to healthy teeth. Expression of inflammatory cytokines decreased in affected teeth following treatment.

Support Funding Agency: Yamauchi Endodontics Student Award and American Association of Orthodontists Foundation.

Abstract # 41 Evaluating Impacts of Orthognathic Surgery on Lingual Gestures During Speech

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Objectives: Patients with dentofacial disharmony (DFD) exhibit a high prevalence of speech-sound disorders, which can impact self-esteem and development. Speech distortions occur 20 times more frequently in patients with severe skeletal malocclusions than in the general population. As orthognathic jaw surgery alters the relationship between the tongue and passive articulatory structures of the mouth, we hypothesize that patients will undergo changes in their tongue posture after surgery. To evaluate this hypothesis, advanced lingual imaging techniques are necessary to evaluate lingual gestures before and after jaw surgery. However, there are few imaging analyses that have been developed to understand mechanisms underlying speech disorders in DFD patients.

Methods: Orthodontic records and ultrasound video of the tongue were collected from DFD subjects (N=18) at 1-month pre-operation, and at 3 and 12-months post-op. Tongue, palate, and occlusal splines were tracked and corrected using Articulate Assistant Advanced software. Tongue splines were analyzed in R (using Smoothing Spline Analysis of Variance) to compare differences before and after surgery in the tongue shapes during consonant production. To spatially align vocal tract data produced from different sessions in which the spatial relationship between articulators changed due to surgery, we aligned the hard palate and alveolar ridge and then interpreted changes in tongue position relative to the vocal tract, hard palate and alveolar ridge.

Results: Ultrasound was successfully applied to compare lingual gestures before and after surgery, and notable changes in tongue gestures were identified.

Conclusions: The development of this novel method to compare lingual gestures across time can offer valuable insights into the impacts of orthognathics on speech in DFD patients and provides an approach to evaluate the effects of clinical interventions for the treatment of severe malocclusions and other orofacial malformations. (300/300)

Support Funding Agency: This study was supported by National Institute of Health (NIH), specifically the National Institute of Dental and Craniofacial Research (NIDCR), through a K08 award (to LJ), with a grant award number 1K08DE030235- 01A1.

Abstract # 42 Training Endodontic Access Cavity Preparation Using Typodonts and Simodont Dental Trainer: A Comparison of Student Performance and Acceptance

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Objectives: Endodontic access cavity preparation necessitates key motor and visualization skills which are traditionally learned using mannequin (typodont)-based plastic or natural teeth. Simodont® (Nissin, NL) is a virtual reality haptic handpiece offering learners an alternative means for simulation and training. This study aimed to evaluate performance of learners trained to prepare access cavities incorporating the use of Simodont®.

Methods: Pre-clinical dental students (n=40) with no prior endodontic training were given instruction through verbal presentation and video demonstration on access cavity preparation of tooth #19. Thereafter, they prepared an endodontic access cavity on a typodont tooth #19, which provided a baseline assessment. Participants were then randomly assigned to the typodont (TG) or Simodont group (SG). The TG was trained using typodont #19 teeth for a period of 1-hour with instructor feedback. Equivalent training time and feedback were provided for SG participants who used Simodont® for access preparation of tooth #19. Subsequently, both groups prepared an access cavity on a typodont tooth #19. This provided the re-evaluation assessment. Two calibrated examiners graded the baseline and re-evaluation teeth using rubric criteria. The examiners were blinded as to which group the graded teeth belonged.

Results: The improvement in performance, from baseline to re-evaluation, was determined by calculating the difference in grade. No statistically significant difference was found between SG and TG (p=0.27). The kappa values for intraexaminer and inter-examiner agreement were 1.00 and 0.73 respectively.

Conclusions: To our knowledge, this is the first study evaluating Simodont® for access cavity training. Simodont® seems to be a valid adjunct to conventional typodont based simulation.

Support Funding Agency: N/A

Abstract # 43 Development and Testing of Machine Learning-Based Models for Caries Experience

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Objectives: The purpose of this study was to develop and evaluate the properties of a machine learning-based predictive model for caries experience among adults.

Methods: In this cross-sectional study, we used clinical, demographic, and questionnaire data from 19,592 adults ages 30-80 who participated in the latest 4 cycles of the National Nutrition and Health Examination Survey (NHANES), which examined representative samples of community-dwelling individuals in the United States between 2011 and 2020. To develop predictive model of caries experience (i.e., the DMFS index), we used information on participants' age, and answers to 10 questions on subjective aspects of oral health (e.g., self-ratings of oral health, painful symptoms), oral hygiene, dental visits, and associated barriers. We implemented and contrasted 13 approaches (i.e., neural networks, trees, and regression-based methods) in 3 random subsets of the sample, used for model training (60%), validation (15%), and testing (25%). We compared models' predictive performance in terms of the root average error of approximation (RASE) and R^2 . Analyses were undertaken using JMP Pro 17.1.

Results: Participants' mean (standard deviation) age and DMFS were 55 (15) years and 48 (39), respectively. Boosted neural (mean RASE=26.7), boosted tree (26.8), and bootstrap forest (27.0) were the 3 best performing classifiers, with significantly lower RASE compared to all other methods (ANOVA Tukey HSD $p < 10^{-4}$) in the test sample. When applied to the entire NHANES dataset, DMFS values predicted by the bootstrap forest and boosted tree algorithms showed the highest correlations with clinically measured DMFS ($r=0.75$, $R^2=0.56$).

Conclusions: The results of this study illustrate the potential utility of using machine learning-based predictive models for caries experience using demographic and self-reported data commonly collected in national surveys. This approach may enable inferences regarding caries experience in cohorts and samples that did not undergo clinical examinations but provided self-reported oral health data.

Support Funding Agency: N/A

Abstract # 44 Influence of Cut-Out-Rescan and Data Exchange on CAD/CAM Crown Fit

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Objectives: Evaluate the impact of adjustment procedures, specifically cut-out-rescan (COR) and data exchange by over-scanning (DEOS) techniques through CAD/CAM software, on the marginal fit outcome of all-ceramic crowns.

Methods: Twenty-eight de-identified leftover specimens were adapted in a mandibular typodont set. Tooth #19 was prepared for an all-ceramic lithium disilicate crown. Seven groups (n=10) were generated based on COR or DEOS techniques in different rescanned areas created on the typodont using an IOS. Subsequently, 70 crowns were milled, and their marginal fit was assessed through micro-computed tomography (micro-CT) scanning.

Results: Significant differences ($p < 0.05$) were observed between the groups for MGB and MGM with p-values of 0.003 and 0.029, respectively. FLB and FLM had no significant difference between the groups. Post-hoc comparisons showed that the G3 group had the highest average for MGB. The G4 group was significantly different from group G6. For MGM, the G0 group was significantly different from G5 and G6, while the G2 group was significantly different from G5.

Conclusions: Despite a statistically significant difference in certain groups for both techniques, COR and DEOS are valid procedures for editing images during the acquisition process, allowing for the fabrication of monolithic ceramic crowns with acceptable values of marginal gap manufactured with a chairside CAD/CAM system, considering the ideal vertical misfit up to 75 μm .

Support Funding Agency: 2023 Ralph Phillips Student Research Award sponsored by the Founders' Fund of the Academy of Operative Dentistry (AOD)

Abstract # 45 Proteomic and Phosphoproteomic Analysis of Cisplatin Resistance in Oral Squamous Cell Carcinoma (OSCC)

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Objectives: Oral cancer, affecting the mouth and adjacent areas, relies heavily on DNA damage and repair mechanisms in its development. Our study aimed to comparatively analyze cisplatin-induced phosphorylation changes in SCC11A and SCC11B cells, two cell lines derived from the original and recurrent oral tumors of the same patient. This method will potentially identify pathways linked to treatment resistance and tumor recurrence. Functional validation of these pathways are proposed to unveil potential therapeutic targets for enhancing cisplatin-based chemotherapy.

Methods: We utilized advanced phosphoproteomic analysis to profile DNA damage-induced protein phosphorylation in oral cancer cell lines (SCC11A and SCC11B). Using scaffold software, we explored relationships and overlaps between contigs to understand altered phosphorylation patterns, shedding light on responses to DNA damage and mechanisms of recurrent tumor resistance. Enrichr facilitated pathway analysis, while a two-sample T-test (SCC11A vs. SCC11B) provided results displayed on a volcano plot.

Results: Proteomic results revealed significant impacts on the "ATM Signaling Pathway" and "RAC1/PAK1/p38/MMP2 Pathway" in SCC11A and SCC11B, respectively. Phosphoproteomic analysis indicated substantial effects on the "DNA Replication" and "Phosphonate and Phosphinate Metabolism" pathways in SCC11A and SCC11B, respectively, both in control and cisplatin-treated cells. These findings highlight pathways crucial in Oral Squamous Cell Carcinoma (OSCC).

Conclusions: Our data pinpoint key pathways involved in OSCC, particularly as related to treatment resistance and tumor recurrence. Further experiments are essential for delineating specific biomarkers influencing cancer progression and metastasis, and characterizing novel drug targets to prevent treatment evasion and tumor recurrence.

Support Funding Agency: N/A

Abstract # 46 Perceived Barriers to Dental Care among Foster Parents in North Carolina

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Objectives: Access to dental care remains inconsistent and unreliable for many children in foster care despite comprehensive dental coverage through state programs. This qualitative study identifies oral health needs of foster children and barriers to dental care perceived by caregivers in North Carolina.

Methods: Based on a semi-structured questionnaire, 30 foster parents in North Carolina were interviewed via video conferencing platform. The interviews were audio-recorded and transcribed. An inductive thematic analysis was used to derive recurring themes from the data.

Results: Lack of comprehensive medical and dental history of their foster children was a common concern. Of the caregivers interviewed, 50% reported their foster child had untreated cavities upon placement into their homes. Limited time, managing school absences, lengthy travel distances, limited provider availability, and lack of providers accepting Medicaid were reported as barriers to care. Many caregivers expressed difficulty obtaining authorization to proceed with dental treatment from their child's legal guardians. Caregivers of older teenagers shared concerns regarding orthodontic care and aging out of Medicaid benefits.

Conclusions: The experiences and concerns highlighted in this study present various opportunities for providers and foster agencies to improve access to dental care. Additionally, understanding perceived barriers to care may encourage better utilization of dental Medicaid benefits.

Support Funding Agency: Department of Pediatric Dentistry, UNC Adams School of Dentistry

Abstract # 47 Gamma Tubulin is Required for DNA Repair

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Objectives : Gamma-tubulin (γ -tubulin, or Tubg1), a major microtubule nucleation factor, is one of the key proteins to regulate microtubule dynamics. Interestingly, the efficient recruitment of repair proteins, and completion of DNA double strand break (DSB) repair likely involve complex, inter-organelle communication and coordination of cellular components. We are in particular interested in the new role of nuclear microtubule (MT) component in DSB repair. Here, we show that γ -tubulin is recruited to the site of DNA Damage and is required for efficient repair of the DNA via both NHEJ and HR.

Methods: Immunofluorescence was performed to study the effect of recruitment of γ -tubulin and relevant DNA damage markers on laser microirradiation. TUBG1 siRNA targeting 3'UTR was used to deplete endogenous γ -tubulin, and the extent of DNA damage was analyzed by repair kinetics experiment. To study DNA damage foci, mApple-53BP1 trunc. mutant constructs were transfected into cells and formation of 53BP1 foci was induced by X-ray Irradiation. The mobility of these foci was measured by microscopy. The recruitment of repair factors of HR and NHEJ was determined by chromatin fractionation.

Results: The inhibition of γ -tubulin and its function impedes DNA repair and exacerbates DNA damage accumulation. Consistently, γ -tubulin facilitates the recruitment of DSB repair proteins of the HR and NHEJ, where its inhibition impairs efficient DSB repair at both cellular and chromatin level and lead to persistent DNA damage. Moreover, γ -tubulin inhibition reduces the mobilization of DNA damage foci in the cell, and impairs the formation of DNA damage foci, leading to inefficient DSB repair through both NHEJ and HR repair pathways. Pharmacological inhibition of γ -tubulin sensitized cancer cells to radiation and DNA damaging drugs.

Conclusions: Our findings characterize γ -tubulin as a new factor that mediates DSB mobilization and repair, and suggest γ -tubulin as a potentially effective anti-cancer drug target.

Support Funding Agency: Financial support was provided by the National Cancer Institute, (NCI), NIH; Grants: 5R01CA233037-03; 3R01CA233037-03S1

Abstract # 48 Confident Care, Healthier Smiles: Improving Spanish-Language Oral Health Education

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Objectives: With a rapidly growing Hispanic population in the state of North Carolina, dental (DDS) and dental hygiene (DH) student preparation in dental Spanish is crucial. Resources for dental Spanish may be lacking and inconsistent resulting in limited confidence with treatment and delivery of oral hygiene instructions (OHI) to Spanish-speaking patients. The purpose of this study was to determine the confidence levels of student providers when treating and delivering OHI to Spanish-speaking patients.

Methods: Pre-post surveys were administered to DDS and DH students at the UNC Adams School of Dentistry (ASOD) prior to- and following a Spanish-language OHI lesson. Lesson structure included a pre-post assessment to test knowledge and a presentation on common OHI terminology. Surveys collected demographic information, previous experience with dental Spanish, confidence levels related to treating Spanish-speaking patients, and willingness to utilize dental Spanish resources. Survey question types included multiple choice, Likert scale, and open ended. Descriptive statistics and thematic analysis were used to analyze survey results.

Results: Survey participants included 55 pre-survey, 63 post-survey, and 42 matched survey respondents including DDS and DH students. The majority (71%) of pre-survey participants reported treating at least one Spanish-speaking patient per semester. Pre-survey respondents reported “not confident at all” for confidence in using dental terminology with Spanish-speaking patients (75%) and providing OHI to Spanish-speaking patients (67%) while post-surveys reported at least “somewhat confident” for the same categories respectively (98%, 92%). Pre-post knowledge assessments on basic OHI terminology completed during the lesson included 65 pre-lesson, 67 post-lesson, and 61 matched assessments increasing from an average score of 89% to 98%.

Conclusions: DDS and DH students expressed an overall increase in knowledge on basic dental Spanish OHI terminology and confidence with using dental Spanish terminology following the lesson. Participants suggested that students at ASOD would benefit from continued dental Spanish lessons.

Support Funding Agency: Alexandre Honors Carolina Fund - Honors Carolina

Abstract # 49 Removal Methods of Tricalcium Silicate Endodontic Sealer: Micro-CT Assessment Review

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Objectives: Various studies have examined different approaches to removing gutta-percha and tricalcium silicate sealer in endodontic retreatment cases; however, preliminary literature research showed the absence of any systematic reviews regarding removal methods from the root dentin surface. The aim of this systematic review is to use Micro-CT to assess the different tricalcium silicate sealer removal techniques in endodontic retreatment.

Methods: Using the PubMed database, an electronic search was performed to locate studies that used Micro-CT to assess methods of tricalcium silicate endodontic sealer removal. Keywords included 'remove, tricalcium silicate, sealer, and Micro-CT' to access English-written, full-text online articles. Analysis was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, and the review protocol was registered at PROSPERO (CRD469579). Two independent reviewers retrieved articles published between 2008 and 2023, and the third reviewer was consulted as needed.

Results: A total of 81 articles were reviewed, and 50 studies were excluded due to misclassification of material used; therefore, 31 studies were included. Twenty-nine studies were conducted *in vitro* using extracted human teeth, and two studies used artificial teeth. EndoSequence BC sealer (Brasseler, USA) was the commercial brand used the most frequently. In the 31 studies, rotary files were initially used to remove the gutta-percha and sealer. To remove the sealer from the root canal systems, the following techniques (number of the studies) were used: Passive Ultrasonic Irrigation (12), different retreatment rotary files (12), XP-Endo finisher R (6), conventional syringe-based irrigation (4), Shock Wave Enhanced Emission Photoacoustic Streaming (3), Photon-Induced Photoacoustic Streaming (2), commercial root canal brush (2), chemical solution (2), sonic activation (1), and agitation device (1).

Conclusions: Passive Ultrasonic Irrigation and retreatment rotary files were the most (38.7%), sonic activation, and reciprocating agitation device were the least utilized (3.2%) among removal techniques of tricalcium silicate sealer in retreatment.

Support Funding Agency: Royal Thai Government Scholarship Program

Abstract # 50 Antioxidant Activity of Tetrahydrocurcumin as it Relates with Immune Function

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Objectives: Tetrahydrocurcumin (THC), a natural compound found in turmeric, possesses anti-inflammatory and antioxidant activity which neutralizes the reactive molecules that can damage cells. This study investigated the model of oxidative stress activation by exposing human gingival fibroblasts (HGF) with H₂O₂ or lipopolysaccharide (LPS) and tested whether re-treatment of the cells with the natural agent: Tetrahydrocurcumin (THC), led to inhibition of the process. Additionally, this study investigated the potential anti-inflammatory effect of THC on HGF cells by Caspase 1 activity test.

Methods: Cell viability and cytotoxicity of gingival fibroblasts were tested under different concentrations of THC, H₂O₂, and LPS. Three common oxidative biomarkers, including, Superoxide dismutase (SOD), dichlorodihydrofluorescein diacetate (DCFDA), and glutathione (GSH) were used to measure the oxidative stress levels in treated and control groups. Cells treated with or without varying concentrations of compounds for 24 hours were collected. Oxidative biomarkers in these treatment groups were measured by using SOD, DCFDA, and GSH test kits. The fluorescence intensity of Caspase 1 was analyzed under confocal microscopy after pretreatment of the cells with THC before and after stimulation with bacterial endotoxins. Statistical analysis of data was performed with ANOVA. ($p \leq 0.05$).

Results: The following concentrations of THC 2.5 μ M, H₂O₂ 50 μ M, and LPS 100 μ M had a non-toxic effect on gingival fibroblast cell culture. Cell viability remained higher when compared to the control groups. Assessment of oxidative biomarkers indicated a significant difference in the oxidative stress levels in the treated cells and the control group. H₂O₂ induced Caspase-1 activation in HGF cells. Tetrahydrocurcumin partially inhibited Caspase-1 activation at various levels in response to oxidative stress.

Conclusions: While additional research is needed to fully understand THC properties and functions, the data suggests that it has potential antioxidative and anti-inflammatory effects on human gingival fibroblasts, when pre-treated with THC and stimulated by LPS and H₂O₂.

Support Funding Agency: Colgate-Palmolive Company

Abstract # 51 Impacts of Class III Dentofacial Disharmony Surgical Correction on Vowel Sounds

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Objectives: Patients with severe malocclusions due to Dentofacial Disharmonies (DFD) are over fifteen times as likely to develop speech disorders compared to the general population. Speech disorders negatively impact self-esteem and quality of life, making them common motivators for DFD patients to pursue orthognathic jaw surgery. Existing data reveal speech differences in Class III DFD subjects compared to Class I controls, but there is a lack of postoperative longitudinal data. Here we present an analysis of formant frequencies in Class III DFD patients to determine impacts of corrective jaw surgery on vowel sound production to guide evidenced-based recommendations for managing care of DFD patients with speech distortions.

Methods: Preoperative, 3- and 12-month postoperative speech recordings and records were obtained from 36 Class III DFD patients. Vowels /æ, α, u, i/ were analyzed by measuring formants, F1 and F2, at the 50% time point using PRAAT. F1 and F2 are the first two resonant frequencies of a given vowel sound, representing the vertical and anterior-posterior dimensions of the oral cavity, respectively. These measurements were used to produce a linear mixed effects regression model and plotted on vowel diagrams for each speaker to show changes over time.

Results: Significant post-operative changes in formant frequency were observed 3 months post-operatively, with the most common patterns including a decrease in F2 for /æ/ and an increase in F1 for /α/. Some subjects maintained these vowel sound changes at 12 months post-operatively, while others returned closer to baseline.

Conclusions: Changes in the tongue position and size of the oral cavity from orthognathic surgery can impact vowel production in Class III DFD patients, however in the long-term some patients may use compensatory mechanisms to produce vowel formants closer to those seen in preoperative speech patterns.

Support Funding Agency: ASoD DDS Short Term Research Fellowship

Abstract # 52 Transition of Dental Care for Individuals with Developmental Disabilities

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Objectives: The aim of this qualitative research study was to examine families' experiences and stakeholders' views regarding dental care transitioning from pediatric to a general dentistry for individuals with intellectual and developmental disabilities (IDD) in North Carolina.

Methods: Semi-structured interviews were carried out with IDD individuals' families (n=19), pediatric and general dentists (n=9), and 3 state- or national-level policymakers and experts. Participants were identified through agreements with IDD advocate organizations. An inductive coding process was employed to identify major emerging themes using MAXQDA software.

Results: Families reported facing multiple barriers to accessing adult oral healthcare, including finding providers comfortable with treating IDD individuals, providers accepting Medicaid, and having to travel long distances. Many families no longer attempt accessing oral healthcare services due to frustrations over long waitlists, providers not accepting new patients, or due to other high-priority needs including housing and behavioral/physical therapy. Dental providers implicated low reimbursement rates and cumbersome administrative costs as reasons for low Medicaid participation and suggested that most providers and their staff lack training and equipment to properly care for IDD populations. Policymaker and expert interviews illuminated multiple system-level barriers to dental transition, including offices using discriminatory practices of accepting new patients, imbalanced distribution of dental providers particularly in rural areas, and lack of IDD-related education within dental school curricula.

Conclusions: IDD individuals face many barriers when attempting to transition dental care. The study's results highlight several areas that must be addressed to increase successful dental care transition for this vulnerable population.

Support Funding Agency: N/A

Abstract # 53 Migraine and Headache Attributed to TMD

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Objectives: Migraines are highly comorbid with temporomandibular disorder (TMD). However, the association between Headache Attributed to TMD (TMDH), which is a secondary headache, and migraine, a primary headache, is unknown. To investigate the presence of migraine in patients with chronic TMD with and without TMDH.

Methods: This is a cross-sectional case-control study. The cases had TMD and TMDH (TMD+TMDH), while the controls had TMD without TMDH (TMD-TMDH). All subjects completed questionnaires that screened for primary headaches, widespread pain, anxiety, depression, pain intensity, and pain interference. Statistical analysis was conducted using the Chi-square test.

Results: A total of 15 cases and 15 controls were included in the study. 87% (n=13) of cases and 93% (n=14) of controls were females, with a mean age of 41 years (range:18-66 years) for the cases and a mean age of 48 years (range:18-69 years) for the controls. 93% (n=14) of the cases and 87% (n=13) of the controls had both myalgia and arthralgia. The mean TMD pain duration for cases and controls was 9.75 (range of 3 months to 25 years) and 7.41 (range of 4 months to 31 years) years respectively. The mean TMD pain intensity for the cases and controls was 6 (range of 3 to 8) and 5 (range of 3 to 10) respectively. Self-reported migraine was not significantly different between cases [60% (n=9)] and controls [40% (n=6)] (p=0.273).

Conclusions: The high prevalence of migraine in patients with TMD is independent of the presence of TMDH.

Support Funding Agency: American Academy of Orofacial Pain

Abstract # 54 Dental Hygiene Students' Opinions on Interprofessional Simulated Patient Case Activity

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Objectives: The objective of this pilot study was to explore dental hygiene (DH) students' perceptions and attitudes toward an interprofessional (IP) activity that utilized a virtual case scenario to simulate a dementia patient encounter at a dental clinic.

Methods: Upon completion of a recorded lecture about dementia, eight DH students voluntarily participated in a virtual case activity where they collaborated with two social work (SW) students, creating two teams (4 DH:1 SW). A nine-question electronic survey was administered through Qualtrics to assess participants' knowledge, confidence, and attitudes about the IP activity. Additionally, a group interview that consisted of five open-ended discussion questions, developed using the Kirkpatrick model, was conducted to assess the impact of the IP dementia case activity. Thematic analysis was used to examine student responses.

Results: All DH participants reported that the IP activity enhanced their knowledge of potential challenges and ways to communicate with patients who have dementia. Participants also reported feeling more confident in treating patients with dementia. Seventy-five percent (75%) of participants expressed that this IP dementia case activity would be useful during the beginner and competent stages of learning and/or delivering patient care. Overall, participants reported that they enjoyed the experience of collaborating with SW students and learning about the perspectives of another healthcare discipline. Participants recommended including physicians, nurses, pharmacists, dentists, occupational therapists, and physician assistants in future iterations of this IP activity.

Conclusions: Dental hygiene students responded that the IP dementia case activity was a positive learning experience and furthered their knowledge on collaborative patient care.

Support Funding Agency: National Center for Dental Hygiene Research & Practice Graduate Dental Hygienist Research Grant

Abstract # 55 Families' Experiences with Tooth Autotransplantation for Replacement of Maxillary Incisors

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Objectives: To examine families' experiences, including motivation and barriers to undergoing tooth autotransplantation (AT), and their perceptions of associated esthetic and functional outcomes.

Methods: Transcribed guided interviews were coded and analyzed inductively using MAXQDA Plus and a qualitative description methodology. Inference was based on reporting of main themes and illustrative quotes.

Results: Families (N=20) pursued AT as an early intervention, to mitigate negative psychosocial effects, and in anticipation of positive outcomes lasting into adulthood. Barriers to AT included the lack of awareness of AT option, large number of appointments, travel, and fear of complications.

Conclusions: The study's results demonstrate that AT is favorably considered by families of young children for the replacement of maxillary incisors and highlight factors that may act as motivators or barriers to its adoption.

Support Funding Agency: Southern Association of Orthodontists; American Association of Orthodontists Foundation

Abstract # 56 North Carolina Dentists' Perceptions Towards Recommending and Administering HPV Vaccination

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Objectives: Human papillomavirus (HPV) infection causes oral papillomas and promotes oropharyngeal carcinogenesis. Dentists are trained to identify oropharyngeal cancers, but their role in promoting HPV vaccination remains poorly defined and differs among states. We explored knowledge and attitudes towards oral cancer prevention through HPV vaccination among dentists in North Carolina (NC), a state in which dentists are not yet authorized to administer vaccines.

Methods: Data were collected through an electronic cross-sectional survey sent to actively practicing dentists listed in the NC Dental Society directory from July to August 2023. We used descriptive statistics to characterize the sample and conducted bivariate comparisons between respondent characteristics and willingness to discuss or deliver HPV vaccination using a chi-squared test ($\alpha=0.05$).

Results: A total of 3,283 licensed NC dentists were invited to complete the survey, with 241 (7.3%) providing consent and 174 (5.3%) completing the survey. Of the respondents, 57.5% were female and most self-identified as general/restorative dentists (65.7%). In total, 121 (69.5%) respondents reported that dentists have a somewhat or very important role in HPV prevention, and respondents were equally willing to discuss HPV vaccination with adult patients and with caregivers of pediatric patients (62% each). Half of respondents reported willingness to deliver HPV vaccination in office; however, lack of education/training (n=141) and lack of professional guidelines (n=105) were the highest reported barriers to doing so. We did not observe statistically significant differences in willingness to discuss or administer HPV vaccination by provider sex, year of last formal dental training relative to HPV vaccine licensure, or the age distribution of their patient population.

Conclusions: Despite recognizing the importance of HPV prevention, lack of formal training and professional guidelines prevent dentists from delivering HPV vaccination. Lessons learned from experiences in other states can guide policy and practice in NC.

Support Funding Agency: National Institutes of Health grant TR002489-03S2

Abstract # 57 MASTL Regulates the cGAS/STING/IRF3/STAT1 Pathway in Oral Cancer

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Objectives: Oral squamous cell carcinoma (OSCC) stands as a prominent global cancer type, with its development intricately linked to the dysregulation of DNA damage and repair pathways. Microtubule-associated serine-threonine kinase-like (MASTL), a serine/threonine kinase known for its involvement in cell cycle regulation, is observed to be upregulated in OSCC. Our group recently revealed a new connection between MASTL and the DNA damage and repair pathway; emerging evidence suggested the activation of the cGAS/STING/IRF3/STAT1 innate immune response pathway upon DNA damage. Interestingly, our preliminary data suggested a regulatory and inhibitory role of MASTL in DNA damage-induced STAT1 activation. Thus, our ongoing research is proposed to investigate the interplay between MASTL and cGAS/STING/IRF3/STAT1 pathway in the context of both the inflammatory response and DNA repair.

Methods: Gene depletion or overexpression is used in cultured human cells for functional analyses. Protein expression and phosphorylation are studied by immunoblotting. An IRF3/NFkappaB dual reporter cell line is used to measure pathway activation.

Results: MASTL was identified as an inhibitory regulator of STAT1 phosphorylation and activation after DNA damage. This regulation is achieved through the conventional MASTL downstream pathway involving PP2A/PPP2R2A. Overexpression of MASTL led to a reduction in IRF3 levels while maintaining STING expression. Knockdown of IRF3 resulted in decreased phosphorylation of ATM/ATR and chk1/chk2, impairing DNA repair in OSCC cells subjected to ionizing radiation or cisplatin-induced DNA damage. Conversely, overexpression of IRF3 yielded contrasting outcomes.

Conclusions: This study unveiled the intricate regulatory network involving MASTL and the cGAS/STING/IRF3/STAT1 pathway, providing new insights into the molecular mechanisms governing oral cancer development and potential therapeutic targets.

Support Funding Agency: NIH R01DE030427

Abstract # 58 Impact of Viral Infections on Oral Health Outcomes: Bibliometric Analysis

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Objectives: Viral infections during pregnancy can lead to preterm labor and adverse fetal outcomes but its effect in the infant's oral health is poorly understood. We aimed to identify global trends in scientific evidence and gaps in knowledge regarding the impact of viral infections during pregnancy on infant oral health.

Methods: Searches were conducted in PubMed and Scopus including terms for viral infections, comprising but not limited to, herpes simplex virus, human immunodeficiency virus, SARS-CoV-2, human papilloma virus, influenza, as well as pregnancy, infant, oral health. Studies were limited to clinical trials using a validated filter. Data extracted included title, authors, year, journal of publication, and first author's affiliation country. Studies were categorized according to viral infections' type/transmission and health outcomes.

Results: From the database searches, 779 citations were identified and screened, and 24 studies met inclusion criteria. Most studies included intraoral examination of deciduous teeth (n = 9). The "International Journal of Paediatric Dentistry" was the most published journal (12.5%) with a significant portion of research occurring in the last decade (58.3%). HIV was most studied in relation to its direct effect on infant oral health (n=8), and the most studied outcome was early childhood caries (ECC). A gap of knowledge was observed for HSV, HPV, influenza, and SARS-CoV-2 in relation to the viruses' direct association with infant oral health outcomes. Most studies related to virus' vertical transmission and their systemic effects on the fetus.

Conclusions: This bibliometric review provided a comprehensive overview of viral infections' research and its impact on infant oral health outcomes. Results show an increased interest in this topic over the last decade, while there is a shortage of clinical studies on HSV, HPV, influenza, and SARS-CoV-2. The multifactorial nature of viral infections and its impact on both mother and fetus should be further explored.

Support Funding Agency: UNC ASOD DDS Short-term Research Fellowship

Abstract # 59 Pulp Regeneration by Stem Cells from Deciduous and Permanent Teeth

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Objectives: We have previously demonstrated that dental pulp stem cells isolated from permanent teeth (PT-DPSCs) are safe and efficacious for complete pulp regeneration in mature pulpectomized permanent teeth. Recently, it was discovered that dental pulp stem cells from deciduous teeth (DT-DPSCs) are also useful for pulp regenerative cell therapy in immature permanent teeth. However, direct comparison of DT-DPSCs and PT-DPSCs from the same individuals in pulp regenerative potential have not been investigated. Thus, the aim of the present animal model was to examine the difference of DT-DPSCs and PT-DPSCs in stem cell properties and pulp regenerative potential.

Methods: DT-DPSCs were isolated at 4 months and PT-DPSCs were at 9 months from the same individual dogs, respectively. The expression of stem cell markers, proliferation and migratory activities, angiogenic/neurotrophic factors and the effect of the conditioned medium on angiogenesis, neurite outgrowth and immunosuppression were examined *in vitro*. Autologous transplantation of DT-DPSCs and PT-DPSCs was performed in pulpectomized teeth. Those teeth were extracted at 4 weeks, and the regenerated pulp tissue were qualitatively and quantitatively compared by histomorphometric analyses.

Results: DT-DPSCs showed some superior stem cell properties such as migration activity, and enhanced cell proliferation, migration and angiogenesis of conditioned medium, compared to PT-DPSCs *in vitro*. There was no difference in the quality and quantity of regenerated pulp tissue, neovascularization and re-innervation between DT-DPSC and PT-DPSC transplants.

Conclusions: These results demonstrated that DT-DPSCs could be a potential clinical alternative to PT-DPSCs for pulp regenerative therapy. The isolated DT-DPSCs could be preserved in a stem cell bank in advance for future pulp regenerative therapy whenever needed.

Support Funding Agency: This work was supported by a Joint Research and Development between National Center for Geriatrics and Gerontology and Air Water Inc.

Abstract # 60 Intraoral Scanner Accuracy for Digitizing Edentulous Impressions

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Objectives: To compare the accuracy (precision and trueness) of various intraoral scanners compared to a standard extraoral (benchtop) scanner for digitizing edentulous impressions. To see if operator experience correlates to scan accuracy.

Methods: Alginate impressions were made of a maxillary typodont, and a custom tray was fabricated using conventional techniques. This tray was impressed with polyvinyl siloxane following conventional methods. The typodont and impressions were scanned with a bench top scanner (inEos, Dentsply Sirona) as a reference scan. The impression was scanned with four intraoral scanners (IOS), creating 1 experimental group for each scanner (Trios, 3shape; PrimeScan, Dentsply Sirona; Emerald, Planmeca; Shining3D, MiDenta). Five dental students performed ten scans of the impression per scanner and recorded the amount of time needed for completion. The experience range of those individuals spans from first to fourth-year students. All digital STL files of scans were exported from each application to be statistically analyzed for trueness and precision.

Results: 200 data points were collected for this study. Student t-tests, ANOVA, and Mann-Whitney U test were run in the SPSS 20.0 statistical software to measure the trueness and precision of each intraoral scanner. The average outcome between the Emerald and Trios scanners are significantly different with the Emerald scanner resulting in 24.7 units more than the Trios scanner (95% CI: 7.4 - 41.9). The mean score using Trios was 50.9 micrometers (95% CI: 41.1 - 60.6), while Emerald's mean was 26.8 micrometers (95% CI: 17.1 - 36.6). The analysis of the data highlighted a positive association between operator experience and scanner precision.

Conclusions: Operator experience does not appear to impact overall intraoral scanner accuracy, however, the provider must understand that the intraoral scanner selected to fabricate removable prostheses will determine the quality and speed at which the impression is obtained.

Support Funding Agency: N/A

Acknowledgements

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Audiovisual Support

Tarri Morley, Chris Pope

Dental Foundation of North Carolina

Paul Gardner

Support Services

Doug Brockett

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Janet Guthmiller, Mary Erskine, Annalise Bebe

All students, faculty and staff of the UNC Adams School of Dentistry and UNC-CH
campus for their participation and contribution to the UNC Adams School of Dentistry's
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