CDM Research Day

Wednesday, June 5th, 2024
9:00 AM – 5:00 PM
Fort Lauderdale Campus
Tampa Bay Regional Campus

College of Dental Medicine
NOVA SOUTHEASTERN UNIVERSITY

NSU Florida

CDM Research Day	Wednesday, June 5th, 2024 9:00 AM – 5:00 PM	Ft. Lauderdale Campus Tampa Bay Regional Campus
8:30 AM	Breakfast at Morris Auditorium Foyer	
9:00 AM Opening	Drs. Cristina Godoy and William Parker Introduction of Keynote Speaker: Dr. Godoy	
9:05 AM Keynote Speaker	Nancy Klimas, M.D. Assistant Dean, Research/Director, INIM/Professor Dr. Kiran C. Patel College of Osteopathic Medicine	
Oral Presentations	Morris Auditorium	
09:20 AM	Motoki Okamoto	
09:35 AM	Akiva Lautman	
09:50 AM	Sally Claassen	
10:05 AM	Katherine Lemoine	
10:20 AM	Jonathan Lucas	
10:35 AM	Anastasia Tsolaki	
10:50 AM – 11:00 AM	Morning Intermission	
Oral Presentations	Morris Auditorium	
11:00 AM	Elaheh Dalir Abdolahinia	
11:15 AM	Carly Chaplin	
11:30 AM	Keith Chiarello	
11:45 AM	Christopher Garcia	
12:00 PM – 1:00 PM	Lunch Break	

Poster Presentations	Jonas/2106 Aud.	Melnick/2109 Aud.
1:00 PM	D. Romero, C. Kallis, M. Martinez-Pimienta	Abdulmuhsen Marafi
1:05 PM	Carlo DeCandia	Jennifer Chung
1:10 PM	Joseph Finelli	Shohei Yamashita
1:15 PM	Vivek Manda	Risa Shindo
1:20 PM	A. Armenteros, S. B. Pinera	Maria Rita Pastore
1:25 PM	C. Le-Lassiter, Y. Rivas	Alexander Bontempo
1:30 PM	Robert Kelley	Young Park
1:35 PM	Megan Leyva	John Voudouris
1:40 PM	Wadiah Almadani	
1:45 PM	Discussion, Questions and Answers	
Oral Presentations	Morris Auditorium	
2:00 PM	Harini Chitta	
2:15 PM	Andrea Lima	
2:30 PM	Alejandro Baez-Gutierrez	
2:45 PM	Ovadia Chocron	
3:00 PM	Maria Sepulveda-Figueroa	
3:15 PM	Julia Segal	
3:30 PM – 3:45 PM	Afternoon Intermission Refreshments at Morris Auditorium Foyer	
Oral Presentations	Morris Auditorium	
3:45 PM	Neeraj Surathu	
4:00 PM	Abdulaziz Mandani	
4:15 PM	Awards Drs. C. Godoy and W. Parker Closing Remarks – Dr. Maria Hernandez	

IN-VITRO ASSESSMENT OF THE ANTIMICROBIAL ACTIVITY OF CANDIDA ALBICANS IN MIXTURES OF VARYING CONCENTRATIONS OF POLYETHYLENE GLYCOL 1000 (PEG 1000) AND CALCIUM HYDROXIDE ($CA(OH)_2$) FOR ENDODONTIC USE

Romero, D., Benjamin, Y., Heidari, A.

OBJECTIVES:

The aim of this study was to test the antimicrobial activity of Polyethylene glycol (PEG) and calcium hydroxide ($Ca(OH)_2$) at concentrations of: 75% PEG 1000 and 25% $Ca(OH)_2$, 50% PEG 1000 and 50% $Ca(OH)_2$, 25% PEG 1000 and 75% $Ca(OH)_2$) of PEG 1000 and calcium hydroxide against Candida albicans

METHODS:

Twenty-seven agar plates were prepared and inoculated with Candida albicans. Each plate was divided into four sections (Figure 1) and assigned to 1 of 3 groups. All plates were tested against controls of saline and 2% Chlorhexidine. Group 1 tested a 1:1 $Ca(OH)_2$:PEG 1000 ratio against Candida albicans, Group 2 a 1:3 $Ca(OH)_2$:PEG 1000 ratio, and Group 3 a 3:1 $Ca(OH)_2$:PEG 1000 ratio. These mixtures were prepared under appropriate safety measures and environmental controls. Each inoculation was repeated 3 times for a total of 9 trial runs per group.

RESULTS:

A Welch ANOVA test for overall group differences was performed (Table 1). Post-hoc pairwise comparisons were conducted using a Tukey HSD Test (Table 2). The Omega-Squared indicates that the fixed effect of solution accounted for 98% [95% CI: 97% - 99%] of the variance.

CONCLUSION:

The results of this study indicate that a mixture of $Ca(OH)_2$ and PEG, regardless of composition, has ineffective antimicrobial activity against Candida albicans. Solutions that included 2% Chlorhexidine proved to have effective antimicrobial activity against Candida albicans. Further research and clinical trials are warranted to test the antimicrobial activity against bacteria commonly found in teeth warranting root canal therapy such as enterococcus faecalis.

SUPPORT:

Funded by the Health Professions Division, NSU.

IN-VITRO ASSESSMENT OF THE THERMAL STABILITY OF MIXTURES OF VARYING CONCENTRATIONS OF POLYETHYLENE GLYCOL 1000 (PEG 1000) AND CALCIUM HYDROXIDE ($CA(OH)_2$) FOR ENDODONTIC USE

Kallis, C., Benjamin, Y.

INTRODUCTION:

Calcium hydroxide (Ca(OH)2) is a commonly used intracanal medicament in endodontics due to its antimicrobial properties and physical barrier function. The mechanism of action is based on the release of hydroxyl ions, which are highly reactive and cause damage to the bacterial cytoplasmic membrane, DNA, and proteins. However, improper placement of calcium hydroxide as an intracanal medicament can have negative consequences for the patient. The aim of this research was to determine the concentration of polyethylene glycol (PEG) 1000 and calcium hydroxide at which the mixture is solid at room temperature (68-72°F) and liquid at body temperature (97-99°F). This information will be used to facilitate the placement and delivery of calcium hydroxide as an intracanal medicament in endodontic procedures.

OBJECTIVES:

1: To evaluate the thermal stability of various concentrations (75% PEG 1000 and 25% $Ca(OH)_2$, 50% PEG 1000 and 50% $Ca(OH)_2$, 25% PEG 1000 and 75% $Ca(OH)_2$) of PEG 1000 and calcium hydroxide.
2: To determine the consistency (solid vs. liquid) of different concentrations of PEG 1000 and calcium hydroxide.
3: To identify the concentration at which the mixture of PEG 1000 and calcium hydroxide is solid at room temperature (between 68-77°Fahrenheit (20-25° Celsius)) and liquid at body temperature (between 97 and 99° Fahrenheit (36.1-37.2°C).

METHODS:

Samples were be combined in a glass container using a glass rod, and the total weight of each mixture was measured to 10 grams. The concentrations tested were 75% PEG 1000 and 25% $Ca(OH)_2$, 50% PEG 1000 and 50% $Ca(OH)_2$, and 25% PEG 1000 and 75% $Ca(OH)_2$. The temperature was incrementally increased from room temperature 20°C to 40°C, with recordings taken of the minimal temperature at which each concentration becomes liquid. The data obtained was be analyzed using regression analysis to identify any relationships or trends between temperature and concentration.

RESULTS:

When employing a composition comprising 75% CaOH and 25% PEG 1000, achieving a consistency other than solid proved impracticable since it prevented proper mixture of the two components. Thermal stability of the 50% CaOH/50% PEG 1000 mixture yielded a paste-like consistency within the temperature range of 25°C to 40°C. This showed enhanced manipulability, potentially circumventing undesired material extrusion throughout the apex of the tooth during clinical deployment, however it did not turn to a more liquid state when reaching body temperature.

Blending 25% CaOH with 75% PEG 1000 yielded a solid-state composition that remained stable until reaching the critical temperature threshold of 30°C. Beyond this point, the mixture transitioned into a liquid state. This specific concentration offers clinical benefits as it maintains its structural integrity during placement, and then transforms into a liquid state, allowing for infiltration into dentinal tubules, isthmuses, and challenging dental anatomical regions.

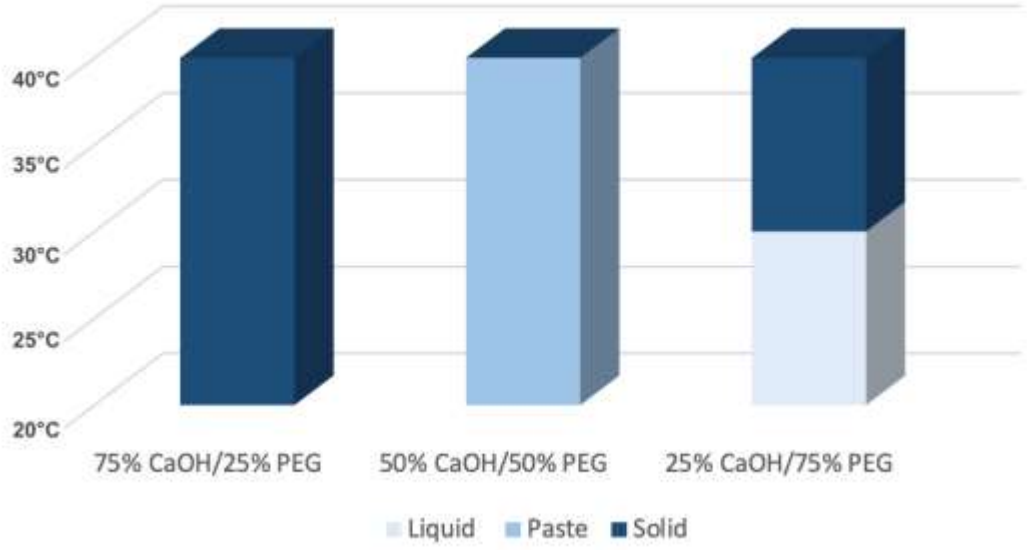


FIGURE 1: *Representation of the effect of temperature on the physical state of varying mixtures of CaOH and PEG*

CONCLUSION:

Future clinical investigations could explore different ratios of the mixture to identify a concentration with both the desired thermal properties and optimal pH level, thus offering potential viability for endodontic applications.

SUPPORT:

Funded by the Health Professions Division, NSU.

IN-VITRO ASSESSMENT OF THE PH OF MIXTURES OF VARYING CONCENTRATIONS OF POLYETHYLENE GLYCOL 100(PEG 1000) AND CALCIUM HYDROXIDE ($CA(OH)_2$) FOR ENDODONTIC USE

Martinez, M., Benjamin, Y.

INTRODUCTION:

Calcium Hydroxide (Ca(OH)2) formulation has been used not only as an intracanal medication but also as a pulp-capping agent, root canal sealer, and for root perforations, root fractures, root resorption, and in dental traumatology for tooth avulsion and luxation injuries. Previous studies have shown that it is stable for long periods and has bactericidal effects in a limited area. Polyethylene Glycol 1000 (PEG 1000) is a colorless, water-soluble, and hygroscopic polymer that is homogeneous when mixed with water in all proportions and biocompatible. PEG is an organic solvent with a neutral pH.

OBJECTIVE: The aim of this study was to evaluate the pH values of Calcium Hydroxide mixed with Polyethylene Glycol 1000 (PEG 1000) as a solvent at different concentrations: 75% PEG 1000 and 25% $Ca(OH)_2$, 50% PEG 1000 and 50% $Ca(OH)_2$, and 25% PEG 1000 and 75% $Ca(OH)_2$, to determine which concentration would have a higher pH. A higher pH allows for the extended release of active ingredients that act as antibacterial and antifungal agents.

METHODS:

Four distinct concentrations of calcium hydroxide and Polyethylene Glycol (PEG) 1000 were prepared in ratios of 75% PEG 1000 and 25% $Ca(OH)_2$, 50% PEG 1000 and 50% $Ca(OH)_2$, and 25% PEG 1000 and 75% $Ca(OH)_2$. These mixtures were then combined under appropriate safety measures and environmental controls. Subsequently, the mixtures were exposed to room temperatures ranging from 20°C to 40°C until reaching body temperature. pH measurements were obtained for each concentration separately using color-coded pH test strips. The strips were immersed in the mixture and allowed to stabilize for 15 seconds before recording the pH readings.

RESULTS:

Analysis revealed significant variations in pH levels among the different mixtures. Notably, the mixture comprising **50% $Ca(OH)_2$ and 50% PEG 1000** demonstrated the highest level of basicity among the compositions tested. Conversely, the composition of **75% PEG 1000 and 25% $Ca(OH)_2$** exhibited the lowest basic pH among the tested compositions, although it still showed alkalinity. However, its basicity was notably lower compared to the composition of **75% $Ca(OH)_2$ and 25% PEG 1000.** (Please refer to Figure 1)

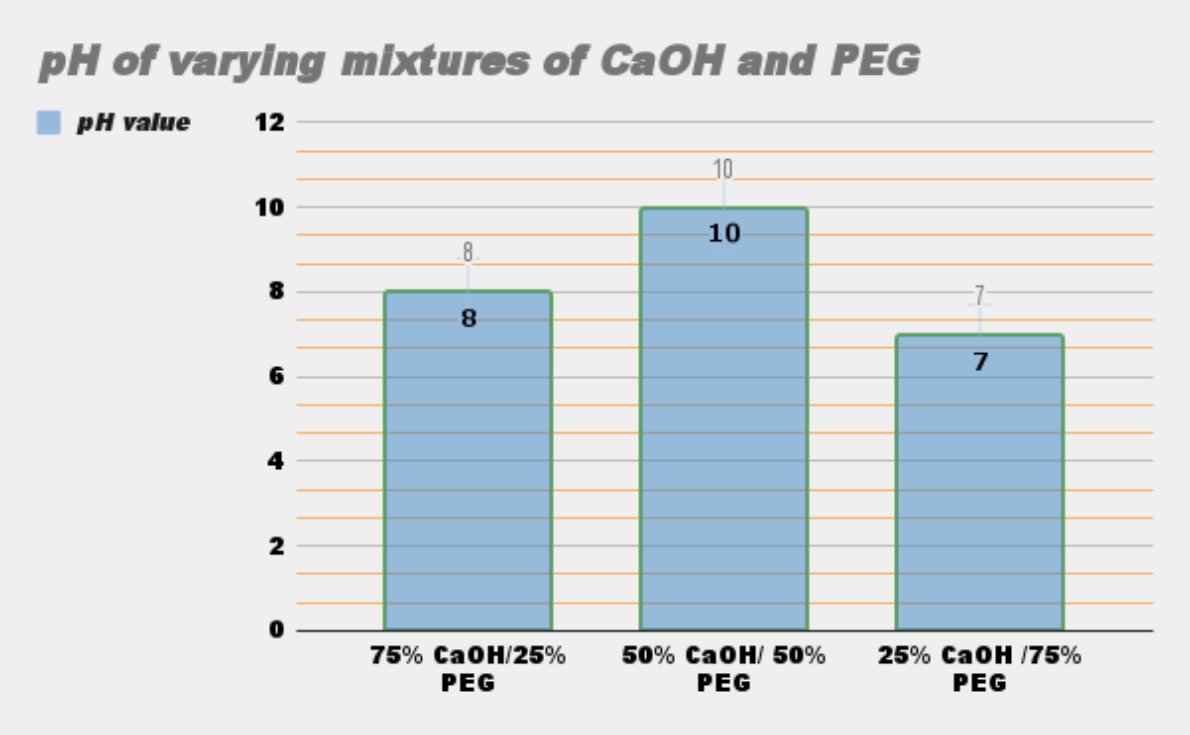


FIGURE 1: *Representation of different mixtures of CaOH and PEG and their impact on pH levels.*

CONCLUSION:

In conclusion, this research study evaluated the pH levels of mixtures containing various proportions of $Ca(OH)_2$ and PEG 1000, and their potential efficacy in root canal treatment. The results revealed significant variations in pH among the different compositions, with the mixture comprising **50% $Ca(OH)_2$ and 50% PEG 1000** exhibiting the highest level of basicity. This composition offers promise for root canal treatment due to its ability to create an alkaline environment, which is known to inhibit bacterial growth and promote bacterial elimination. Additionally, the antimicrobial properties inherent in calcium hydroxide further enhance the antibacterial efficacy of this mixture. These findings underscore the importance of composition in influencing the pH and antimicrobial activity of root canal medicaments. Further research and clinical trials are warranted to validate these findings and explore the practical applications of these mixtures in endodontic practice, potentially offering improved outcomes for patients undergoing root canal therapy.

SUPPORT:

Funded by the Health Professions Division, NSU.

THE USE OF CBCT AS A RADIOGRAPHIC AID TO INITIATE ROOT CANAL TREATMENT

Lautman, A., Zeim, J., Hardigan, P.

OBJECTIVES:

To determine how many endodontists employ the use of CBCT for posterior cases and to change our perspective on the use of CBCTs (Cone Beam Computed Tomography) and their effectiveness in correctly diagnosing teeth that need root canal treatment.

METHODS:

A qualitative study was conducted to see how many endodontists who are members of the AAE (American Association of Endodontists) are using a CBCT as a preoperative image in posterior teeth NSRCT clinical situations. A seventeen-question survey was designed to address the 2016 AAE guidelines for the Use of Cone Beam Computed Tomography in Endodontics. The survey included demographic questions. We then proceeded to inquire if they were comfortable using and reading CBCT for preoperative preparation and if they use it daily. It was also designed to question if they have not adopted these new recommendations, and if so, why not. A full list of approximately 8,000 active members of the American Association of Endodontics was obtained. The survey was sent via email to these members. All members were notified that all responses would be made anonymous to help with any biased responses. Members had three months to send in their responses. After the first month, those members who did not send in a response were sent a reminder. Once the three months had passed, all responses were collected and analyzed.

RESULTS:

84 responses were recorded, and the data was analyzed from that. The results of this survey shed light on endodontic demographics, the utilization of CBCT in endodontic offices, and the perceptions of its value. Most respondents were male aged 41-60 that graduated from endodontic post-graduate programs between 1980 and 2010. Most respondents were either in full-time private settings or in academics. Nearly all reported having a CBCT machine in their office. When using CBCT, many dentists opted for it with every patient, and most felt confident interpreting the scans themselves. While a majority preferred CBCT for all posterior treatments, a considerable number used it on a case-by-case basis as opposed to just an all or nothing procedure. Cost and radiation exposure were the main concerns regarding CBCT use. However, most dentists believed CBCT saved treatment time and improved outcomes even with those concerns. Interestingly, only a moderate number felt a patient's refusal for a CBCT significantly impacted diagnosis and treatment. This is a small sample size therefore; the statistical significance is low to very low.

CONCLUSION:

Based on the collected data, we can extrapolate that even though there are still some concerns regarding the adoption of CBCT technology in our field, there is an upward trend in its utilization and standard in our treatments. This can be seen by nearly all respondents stating that they have a CBCT machine in their offices and that they use it on every patient.

As this technology grows and improves and is taught more in dental programs around the country, it will continue to see an upward trend in its every day and every patient's use.

SUPPORT:
Funded by the Health Professions Division, NSU.

AN EVALUATION OF THE FREE AVAILABLE CHLORINE (FAC) OF 5.0% SODIUM HYPOCHLORITE IN PREPARED SYRINGES UNDER COMMONLY PRACTICED DISPENSING AND STORAGE CONDITIONS.

DeCandia, C., Zeim, J., Benjamin, Y.

OBJECTIVES:

Sodium hypochlorite has become the irrigant of choice to dissolve vital and non-vital tissue as well as reduce or eliminate bacterial load during root canal therapy. A 5.25% NaOCl concentration has become the gold standard due to its bactericidal effect. However, the drawback lies within the limited shelf life of sodium hypochlorite. Highly concentrated solutions of NaOCl have less FAC2 when exposed to light, air, metals, and organic matter as the chlorine anion becomes unstable.3 Improper storage and handling of the solution can ultimately compromise treatment goals. As noted above, the individual influences of environmental conditions have been well documented in the literature, yet no study has analyzed the combination of these effects on sodium hypochlorite in the clinical dental office setting. The purpose of this study was to evaluate the FAC of NaOCl after storage and handling within dental clinics. A protocol needs to be set in place within the dental practice for the handling and dispensing of sodium hypochlorite.

METHODS:

The experiment was outlined as follows using dental supplier professional brand 5.0% sodium hypochlorite (Edge Endo): There were eight total groups with ten syringes (plastic) assigned to each group. Four groups had 10 ml syringes filled with 5.0% sodium hypochlorite in syringes and the other four groups had 3 cc syringes filled with 5.0% sodium hypochlorite. The 10 ml and 3 cc syringes were then assigned to their designated variable. One group (ten 10 mL syringes and three 3cc syringes) was exposed to room light and had no side vented needle cap. The second group (ten 10 mL syringes and ten 3cc syringes) was exposed to room light and had a 27-gauge side vented needle cap. A third group (ten 10 mL syringes and ten 3cc syringes) was kept in a dark cabinet and had no needle cap. The fourth group (ten 10 mL syringes and ten 3 cc syringes) was kept in a dark cabinet and had a 27-gauge side vented needle attached. Table 1 and 2 illustrates the designations. The FAC of each syringe was calculated and recorded using the Model RC-37P residual chlorine meter after 6 hours, 12 hours, 24 hours, 48 hours, 72 hours, 96 hours, 120 hours, and 168 (1 week), 336 hours (2 weeks), and 504 hours (3 weeks). For the syringes placed in a dark cabinet, aluminum foil was wrapped around the syringe in order to prevent the penetration of light during FAC readings.

RESULTS:

After three weeks' time, the sodium hypochlorite solution concentration became nearly 4% when exposed to air and light in 10 mL and 3cc syringes. Analysis revealed this decrease in FAC to be of significant difference. However, within one-week time, there was no statistical difference in FAC when 5% NaOCl was exposed to light and air. This goes to show that after one week, the 5% hypochlorite was stable but after 3 weeks the solution began to lose its strength (FAC) and stability. A two-week analysis is currently being performed in order to determine if a statistical difference exists.

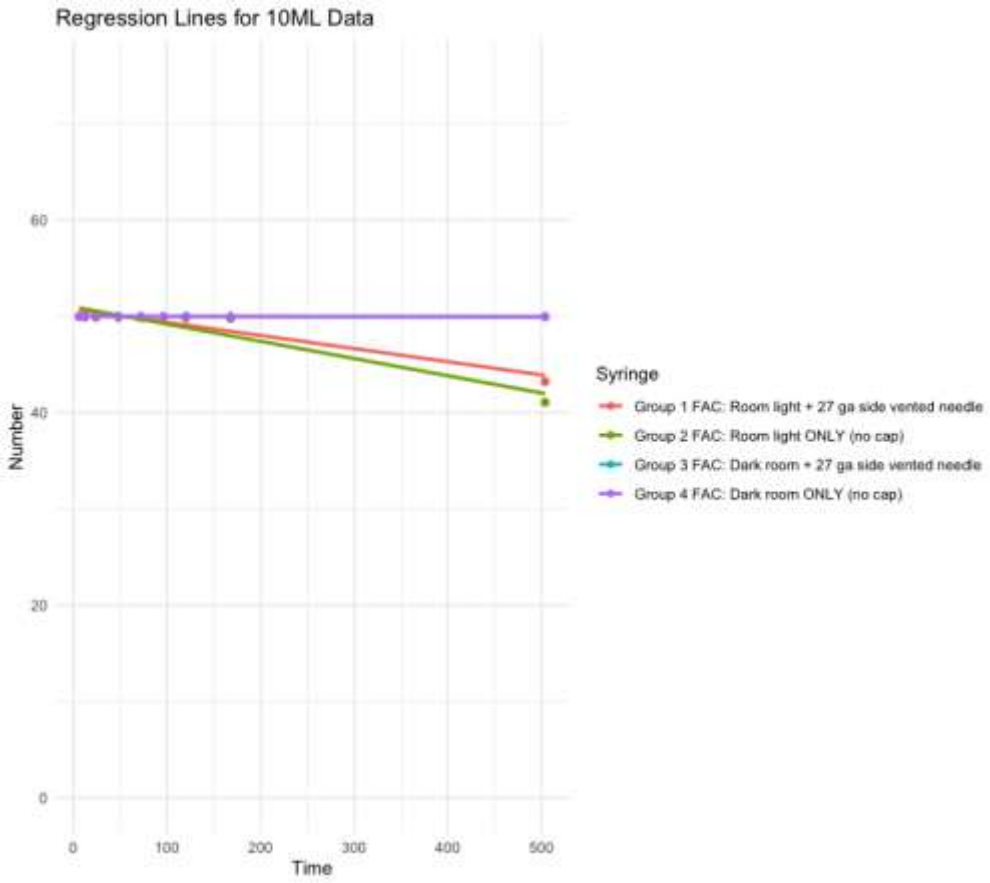


***Figure 1**: Regression lines for 10 mL Data*

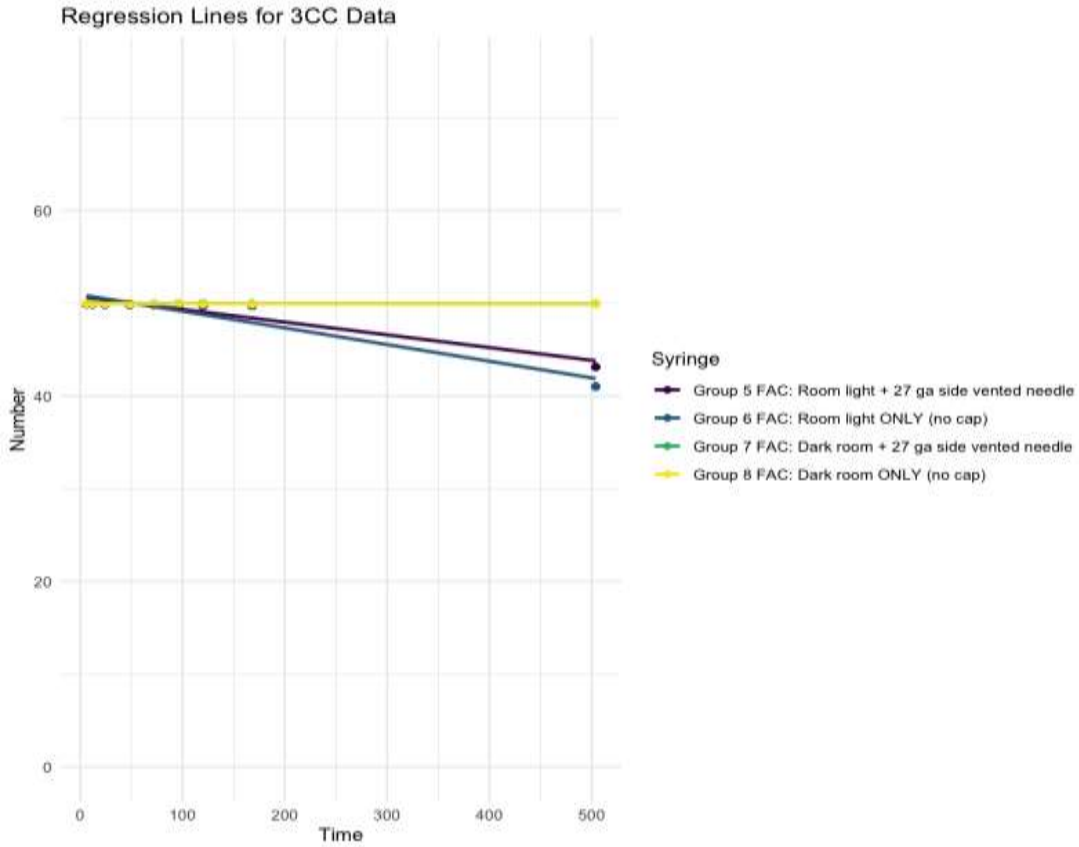


***Figure 2**: Regression lines for 3 cc data*

CONCLUSIONS:

This study showed that the shelf life of 5% sodium hypochlorite is diminished after three weeks when exposed to room light and air in 10 mL and 3 cc syringes. Surveys captured from practicing dentists conveyed that premade sodium hypochlorite syringes are fabricated in bulk quantity in order to provide easy accessibility for root canal therapy. The same practitioners are also using a lower strength in sodium hypochlorite and less volume during irrigation. Knowledge of sodium hypochlorite's chemical instability and shelf life, along with its loss of FAC under varying dispensing conditions can allow clinicians to have a more enhanced irrigation protocol that effectively detoxifies the root canal system, thus increasing their success rates in root canal therapy.

SUPPORT:

Funded by the Health Professions Division, NSU.

PREVALENCE OF ENDODONTIC TREATMENT ON PATIENTS AT RISK OF MEDICATION-RELATED OSTEONECROSIS OF THE JAW

Segal, J., De La Espriella, C.

OBJECTIVES:
The aims of this study were to determine the prevalence of how often endodontists are involved in treating patients at risk of developing medication-related osteonecrosis of the jaw (MRONJ), and to determine how likely endodontists are to treat teeth with "questionable" or "unfavorable" prognosis in such a patient cohort.

METHODS:
A survey questionnaire through REDCap software was created and uploaded onto the American Association of Endodontists (AAE) website.

PRELIMINARY RESULTS: Most endodontists treat 1-4 patients taking RANK-L medication for osteoporosis/osteopenia (53.13%) monthly. Most endodontists never treat patients taking romosozumab medication for osteoporosis/osteopenia monthly. 93% of endodontists are likely to treat teeth with "questionable" prognosis if the patient is taking an antiresorptive medication due to a history of osteonecrosis of the jaw (ONJ), or if the patient is taking the antiresorptive medication for cancer treatment, osteopenia/osteoporosis, or for other medical reasons. Endodontists are likely to treat teeth with "unfavorable" prognosis if the patient is taking an antiresorptive medication due to ONJ (75.76%), or if the patient is taking antiresorptive medication for cancer treatment (72.73%), for osteopenia/osteoporosis (45.45%), or for other medical reasons (51.52%). Most endodontists treat 1-4 patients taking bisphosphonate medication for cancer treatment (51.52%), for osteoporosis/osteopenia (35.35%), or for other medical reasons (36.36%) monthly. Most endodontists treat 1-4 patients taking bisphosphonate and RANK-L medications monthly and never treat patients taking romosozumab. Endodontists are likely to treat teeth with "questionable" and "unfavorable" prognosis if the patient is taking an antiresorptive medication.

SUPPORT:
Funded by the Health Professions Division, NSU.

MANDIBULAR INCISOR CROWDING ANALYSIS: A CONTRAST OF METHODS OF LITTLE'S IRREGULARITY INDEX AND MERRIFIELD'S SPACE ANALYSIS USING DIGITAL METHODOLOGY

Claassen, S., Hardigan, P., Lima, A., Contasti, G., Lin, C.

OBJECTIVES:

The objective of this study was to use intraoral scans and digital measurements to determine the difference between two frequently used practices, Little's Irregularity Index (LII) and Merrifield's Space Analysis (MSA), that evaluate mandibular incisor crowding.

METHODS:

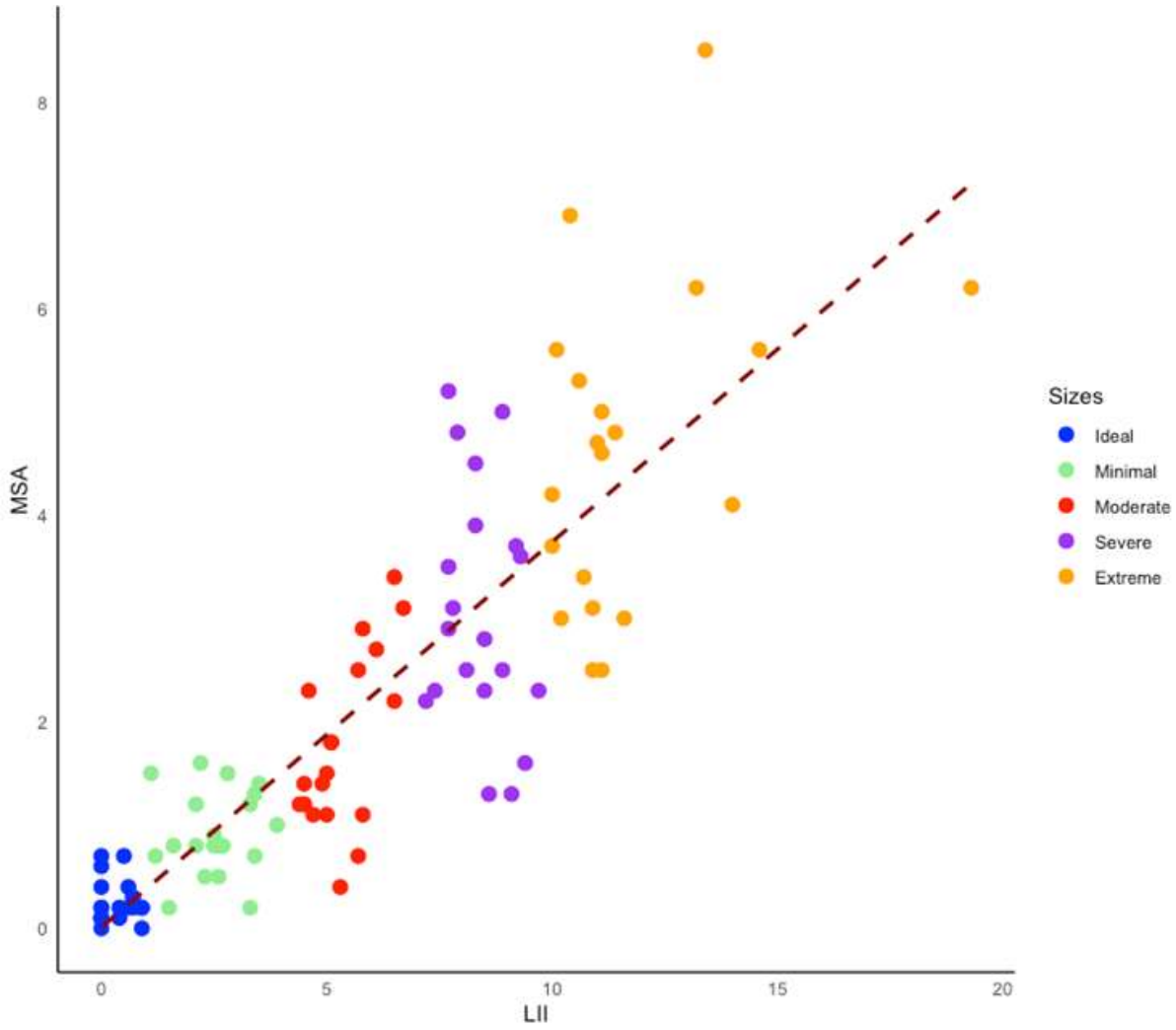
In this retrospective study, 100 digital model samples were collected from NSU's postgraduate orthodontic iTero scanners, in which 20 samples were allocated into each of the five incisor irregularity categories: ideal alignment (0-0.9mm); minimal (1-3.9mm), moderate (4-6.9mm), severe (7-9.9mm), and extreme (more than 10mm) irregularities. Both LII and MSA were used to measure mandibular incisor crowding on digital models using Dolphin Imaging 11.95 Premium software. Data were analyzed by use of the general linear model and a paired t-test was used to compare LII to MSA for each of the five irregularity index categories. Intra-and inter-rater reliability were confirmed by a concordance correlation coefficient.

RESULTS:

The general linear model found LII to have a significant effect on MSA ($P < 0.001$) with a slope estimate of 0.37, while the intercept ($P = 0.955$) was found to be non-significant. Except for the ideal alignment category of LII, MSA and LII measurements were statistically different. The average difference of (LII-MSA) measurements were 0.2mm (ideal), 2.0mm (minimal), 3.6mm (moderate), 5.6mm (severe), and 7.6mm (extreme).

CONCLUSIONS:

There is a difference between LII and MSA measurements for the categories: mild, moderate, severe, and extreme irregularities when obtained digitally. 2) LII and MSA should not be used interchangeably to calculate mandibular incisor crowding unless the incisor irregularity index is "ideal." 3) As the irregularity index increases, the dispersion between LII and MSA measurements increases. 4) As LII increases, MSA increases but not as significantly (slope estimate of 0.37).



SUPPORT:
Funded by the Health Professions Division, NSU.

INFLUENCE OF DRY MOUTH MEDICATIONS ON FRICTION DURING ORTHODONTIC SLIDING MECHANICS

Finelli, J., Premaraj, T., Thompson, J.Y., Hardigan, P.C.

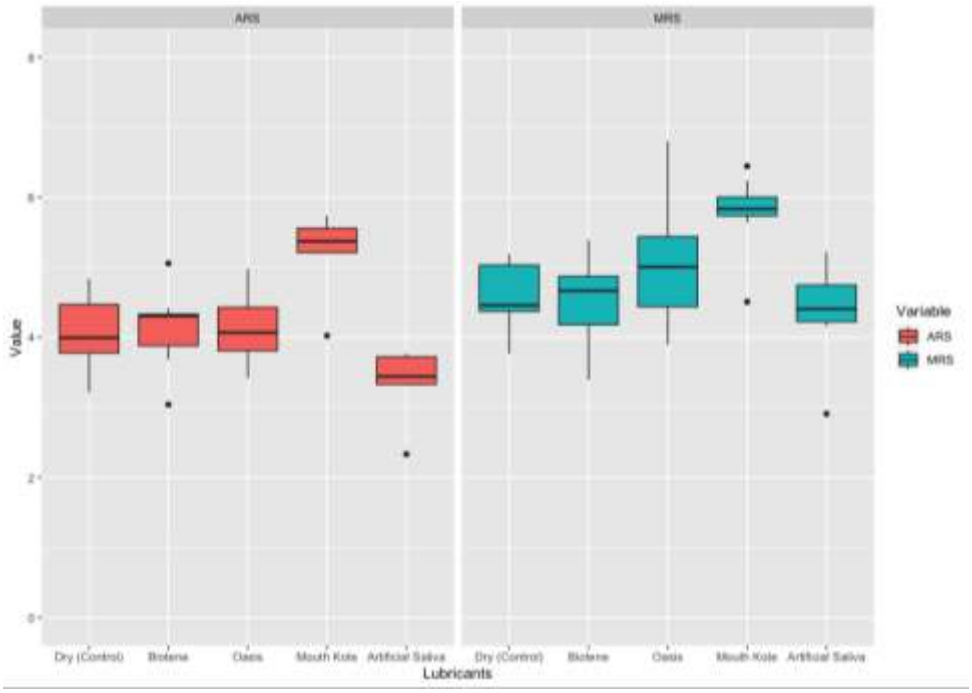
OBJECTIVES:
To compare the resistance to sliding of orthodontic archwires in different bracket angulations while immersed in over-the-counter (OTC) dry mouth liquid medications.

METHODS:
In this in vitro study, metal braces and stainless steel (SS) wires were used. Three groups of 0.019"x0.025" stainless steel orthodontic arch wires with 022 slot (0.022 inches) brackets with MBT (McLaughlin, Bennet and Trevisi) prescription was utilized to assess the effects of three different brands of OTC dry mouth liquid medication: Biotene Dry Mouth Spray (Group B), Oasis Dry Mouth Spray (Group C), and Mouth Kote Dry Mouth Spray (Group D). These groups were compared to using artificial saliva (Group E) and under dry conditions (Group A). Maximum resistance to sliding (MRS) and average resistance to sliding (ARS) were measured by sliding the archwires through 0.022 inch slot stainless steel brackets in separate passive (0°) and active (5°) configurations using an Instron Universal testing machine. The data was analyzed with a two-way ANOVA with independent variables of lubricant type as well as active and passive configuration of the bracket-wire system.

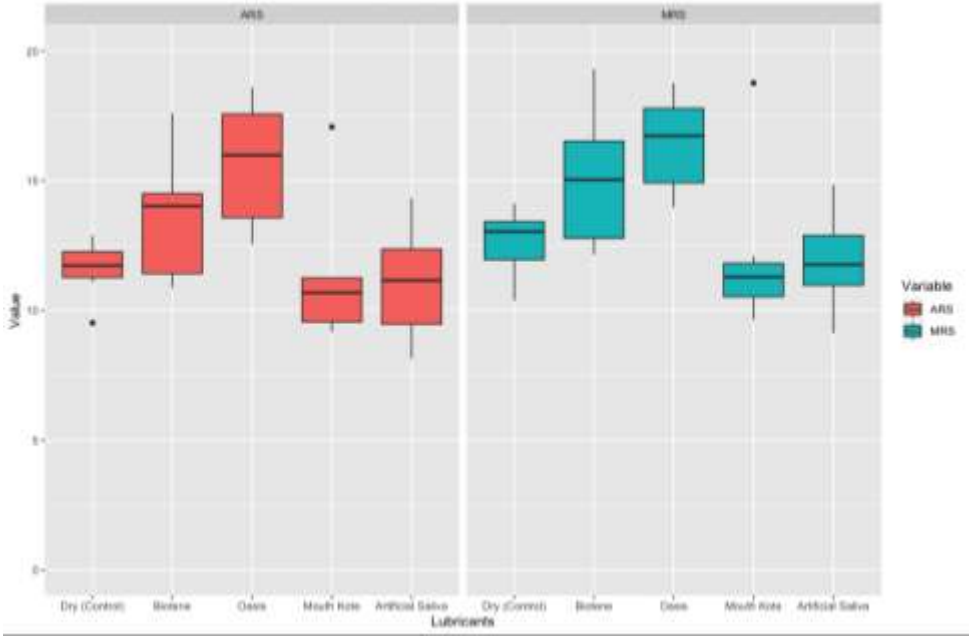
RESULTS:
Both independent variables (lubricants as well as active and passive wire configurations) had a significant effect on resistance to sliding. Post-hoc analysis of MRS at an active 5° contact angle, which represented the commonly occurring scenario in orthodontic sliding, revealed that Group D exhibited the lowest values while Group C exhibited the highest values. Group B also showed significantly higher values for MRS than Groups D or E. However, Groups A, D, and E did not show any significant difference when compared to each other. ARS at the active 5° contact angle showed similar results.

CONCLUSIONS:
Biotene, Oasis, and Mouth Kote Dry Mouth Sprays offer negligible reduction in resistance to sliding compared to either dry conditions or a simulated oral environment containing artificial saliva. Biotene and Oasis Dry Mouth Sprays may actually increase resistance to sliding in these conditions.

Comparison of ARS and MRS by Lubricants (Passive Configuration):



Comparison of ARS and MRS by Lubricants (Active Configuration):



SUPPORT:
Funded by the Health Professions Division, NSU.

SPATIAL RELATIONSHIPS OF LOWER INCISOR TO ALVEOLAR HOUSING AND SYMPHYSIAL ANATOMY IN UNTREATED SKELETAL CLASS I AND CLASS II MALOCCLUSION – A CBCT STUDY

Lemoine, K., Premaraj, T., Kim, S., Vazquez, J.

OBJECTIVES:
To evaluate and compare the lower incisor position and its relationship to the inclination of the alveolar housing relative to the Mandibular Plane Angle in patients with untreated Skeletal Class I and II malocclusion.

METHODS:
Sixty-nine pre-treatment CBCTs of Skeletal Class I (n = 35) and Skeletal Class II (n = 34) patients were reviewed. For each patient, the lower incisor to mandibular plane angle was determined by measuring and averaging the angle between tooth #24 (IMPA #24) and # 25 (IMPA # 25). The inclination of the alveolar housing to the mandibular plane angle was determined by two methods: (1) bisecting the angle from most posterior point of the symphyseal bone, to the most superior part of the inter-crestal bone of lower incisors to the B-point (AH-MPA-1), and (2) bisecting an angle created from the lingual aspect of the alveolar housing at the level of the lower incisor apex, to the lower incisor tip, to the buccal aspect of the alveolar housing at the level of the root apex (AH-MPA-2). The convexity of the alveolar housing to symphyseal bone was also determined by finding the angle formed from the inter-crestal bone, the alveolar width midpoint, and Menton. Descriptive statistics and pairwise comparisons using Pearson's correlation test and paired-t test were calculated.

RESULTS:
Within both the Skeletal Class I and Class II groups, there was a statistically significant difference between the Average IMPA and the AH-MPA-1, as well as between AH-MPA-1and the AH-MPA-2 ($p < 0.001$). No statistically significant difference was found between the Average IMPA and the AH-MPA-2. Between Skeletal Class I and Class II, a statistically significant difference ($p < 0.001$) was seen with all measurements, with the Skeletal Class II group having overall higher values of Average IMPA, AH-MPA-1, and AH-MPA-2. Skeletal Class I group had a statistically significant lower symphyseal convexity, indicating a more upright symphysis to the mandibular plane.

CONCLUSIONS:
The first method to determine alveolar inclination, AH-MPA-1, did not reflect the average IMPA as closely as the second method, AH-MPA-2, likely due to variations that may exist in the morphology of the posterior symphysis. In both skeletal classes, the lower incisor was in harmony with the alveolar housing; however, there was a significant difference between Skeletal Class I and Class II patients with all measurements, with the Skeletal Class II group demonstrating more proclination of the alveolar housing relative to the mandibular plane angle and the IMPA. These results show that dental compensation of the alveolar bone exists in untreated Skeletal Class I and Class II patients with alveolar housing appearing to conform to the inclination of the lower incisor.

However, the convexity of alveolar housing to symphysis (symphyseal convexity) reflected the morphing of alveolar bone along with the proclination of lower incisors.

SUPPORT:
Funded by the Health Professions Division, NSU.

COMPARISON OF RESISTANCE TO SLIDING OF THREE DIFFERENT BRACKET SYSTEMS AFTER VARIOUS SLIDING DISTANCES

Lucas, J., Lin, C., Thompson, J., Hardigan, P.

INTRODUCTION:

Resistance to sliding (RS) is the major impedance to orthodontic tooth movement when an orthodontic wire slides through a bracket slot. Past literature has focused on the affects that resistance to sliding has on altering the surface properties of wires, but few have investigated the change in bracket slot surface properties, such as RS, during sliding mechanics.

OBJECTIVES:

The objective of this study was to compare the resistance to sliding of an arch-wire passing through stainless steel, ceramic, and plastic three-bracket system at various sliding distances.

METHODS:

RS of the bracket groups was measured by sliding a segment of 0.019"x0.025" stainless-steel (SS) wire through a 0.022-inch slot in a three-bracket system. Total sample size n=96 was equally distributed into three groups of metal, ceramic, and plastic brackets. The wires were pulled at pre-set distances of 0mm, 2mm, 4mm, and 6mm. After the brackets were subsequently subjected to the experimental conditions, a new 0.019"x0.025" SS wire was ligated and pulled for the measurement of the maximal (MRS) and average resistance to sliding (ARS). The data was then analyzed with a two-way ANOVA of the two independent variables (bracket material and sliding distance) and post-hoc Tukey analysis.

RESULTS:

According to the results of two-way ANOVA, only bracket type, not sliding distance or interaction between the two independent variables, played a significant role in resistance to sliding in MRS and ARS. At all four sliding distances there was a significant difference in MRS and ARS values when comparing metal to ceramic brackets and when comparing ceramic to plastic brackets, with ceramic brackets having the highest MRS and ARS values. At all four sliding distances, metal and plastic brackets behaved similarly with no statistical difference in MRS and ARS values.

CONCLUSIONS:

A sliding distance of up to 6mm does not have a significant effect on the MRS and ARS values when brackets are engaging with the arch-wire in an active configuration 2) In sliding mechanics, stainless-steel and plastic brackets have similar RS while ceramic brackets have a statistically significant larger RS 3) In the clinic, plastic brackets may be a better esthetic alternative to metal or ceramic brackets in consideration of RS.

SUPPORT:

Funded by the Health Professions Division, NSU.

COMPARISONS OF RESISTANCE TO SLIDING OF DIFFERENT EDGEWISE BRACKETS WITHIN A BRACKET SYSTEM

Manda, V., Lin, C., Thompson, J., Hardigan, P.

OBJECTIVES:

Bracket design contributes to resistance to sliding, including bracket width. There is inconclusive evidence in the literature of the resistance to sliding as bracket slot width changes.

This study aimed to understand whether there is different resistance to sliding of different brackets within the same bracket system and whether there is an association between bracket slot width and resistance to sliding.

METHODS:

For this experiment, four groups of 022 slot size brackets, maxillary central incisor, maxillary lateral incisor, maxillary canine, maxillary premolar were used. Three-bracket system was constructed by bonding three brackets on a customized holder at the distance of 8 mm between the centers of neighboring brackets. Each group will be set in the active and passive configuration. Maximum resistance to sliding and average resistance to sliding were recorded. The data was analyzed with a two-way ANOVA, linear regressions and post-hoc Tukey analysis.

RESULTS:

According to the two-way ANOVA analysis, bracket type, configuration and their interaction played a significant role in MRS and ARS. Based on the linear regression models, bracket width is a significant factor in resistance to sliding in the active and passive configuration with MRS, and active configuration with ARS. In the active configuration, there is a positive and linear relation between bracket slot width and resistance to sliding. Post-hoc Tukey shows that UR4 generally experienced less resistance to sliding compared to UR3, UR2 and UR1.

CONCLUSIONS:

A consistent trend across all bracket widths: brackets configured in the active configuration experienced a higher resistance to sliding compared to those in the passive configuration. A positive and linear correlation between bracket slot width and resistance to sliding, in both the active and passive configurations. Bracket type, the configuration and their interaction play a significant role in resistance to sliding.

SUPPORT:

Funded by the Health Professions Division, NSU.

COMPARISON OF ORTHODONTIC LOAD SYSTEMS CREATED DURING CORRECTION OF CLASS II MALOCCLUSIONS USING MAXILLARY SEGMENTAL DISTALIZERS (MSDS): A FINITE ELEMENT ANALYSIS (FEA)

Tsolaki, A., Wang, L., Dong, P., Premaraj, T., Voudouris, J., Gu, L., Premaraj, S.

OBJECTIVES:

The objective of this Finite Element Analysis (FEA) was to determine and compare the forces and moments of forces (Mf) exerted by three different types of Maxillary Segmental Distalizers (MSDs): JVBarre® 4D -metallic (JVB), Carriere® Motion 3D™ Appliance -metallic and clear (CMA) in conjunction with Class II elastics on the following teeth: upper right canine (UR3), upper right first molar (UR6), lower right first molar (LR6), and lower right second molar (LR7) Additionally, the Von Mises stress and displacement maps of the MSDs were characterized. Specifically, CMA is an MSD used in the initial phase of correction of Class II malocclusions and is associated with documented side effects of CMA include extrusion of U3s and distal tipping of U6s. JVB is a new MSD that was designed to minimize the above side effects and is expected to produce bodily movements of teeth.

METHODS:

MSDs were bonded to UR3 and UR6 of a life-size, plastic model of human skull. Anterior bite turbos were bonded on maxillary central incisors, and buttons were bonded on the LR6 and LR7 for Class II elastics application: 1/8", 6 ½ oz and 3⁄16", 8 oz on the MSDs. FEA 3D model was generated using the digital scan of the skull and patient-specific CBCT images. Using the FEA, forces and the Mf along three planes of space were quantified and compared between different MSDs. Displacement and Von Mises stress maps of the MSDs were generated.

RESULTS:

Metallic CMA exerted 24.6% and 7.6% more distally directed forces on the UR3 and UR6 respectively compared to that of JVB, when the elastics were placed on LR6. Both types of CMAs produced 15.3% and 10% more mesially directed forces on LR6, and 45.5% and 48.5% more medially directed forces on LR7, respectively than that of JVB. JVB exerted 19% less extrusive forces on UR3 compared to metallic CMA when the elastics were placed on LR6. JVB exerted less mesio-buccally directed moment of force on UR3 and UR6, and less distal crown tipping of UR3 compared to that of both CMAs. The elastic forces produced were higher when the elastics were placed on LR7 instead of LR6, and with the 1/8", 6.5 oz the 3⁄16", 8 oz. The 1/8", 6.5 oz elastics exerted a statistically significant higher extrusion force on the LR7 than the 3⁄16", 8 oz elastics. Displacement in JVB was less than that of both types of CMAs, while the clear CMA showed the least Von Mises stress. For MSDs, the highest stress and displacement were observed at the hooks of the structures.

CONCLUSIONS:

Compared to JVB, both types of CMAs are capable of producing greater mesio-buccal rotations of UR6 and exerting larger mesially directed forces on lower molars.

In contrast, compared to metallic CMA, JVB could correct the Class II buccal segment relationship with minimal extrusion of maxillary canines and minimal distal tipping of maxillary canines and molars. Wearing of 1/8", 6.5 oz elastics on lower second molars produced Class II forces of greater magnitude.

SUPPORT:
Funded by the Health Professions Division, NSU.

PARENTAL SATISFACTION IN TASK STRIP UTILIZATION IN IMPROVING ORAL HYGIENE IN CHILDREN WITH AUTISM.

Armenteros, A., Barrios Pinera, S., Chung, J., Levi-Minzi, M., Ocanto, R., Kabot, S.

OBJECTIVE:
Task strips help children follow a consistent routine and enhanced oral hygiene regimen when completing daily activities. The purpose of this study was to examine the extent of parental satisfaction with task strip utilization to improve the oral hygiene of children with autism.

METHODS:
Convenience sampling was used to identify 30 children with ASD under the age of 8 receiving care at the Mailman Segal Center (MSC) dental clinic. Participants with moderate and high plaque levels as measured by the Silness-Löe plaque index were selected. Fifteen patients received parent training and the visual task strip to use at home, and the other 15 received treatment as usual (no take home task strip or parent training). Parents were surveyed on at-home hygiene satisfaction in their child during the 3-month study. Upon completion of data collection, patient age and parental attitudes toward oral care practice will be reported as means and standard deviations. A mixed ANOVA will be used to examine whether any change in plaque level took place over time as a result of the use of the task strip and parental education.

RESULTS:
Based on the one-way repeated measures ANOVA, there was a statistically significant difference between the different time points on caregiver oral health habit satisfaction, $F(1.46, 29.19) = 4.06$, $p = 0.04$. In other words, the use of the task strip brought forth statistically significant changes in caregiver satisfaction in their child's oral hygiene over time. Post hoc analysis with a Bonferroni adjustment indicated that caregiver oral hygiene satisfaction did not significantly increase between the individual timepoints. The use of the task strip lead to a statistically significant difference between the different time points in caregiver rating of child behavior during at home brushing $F(2, 40) = 4.53$, $p = 0.02$. Post hoc analysis with a Bonferroni adjustment indicated that the increase of caregiver rating of child behavior during at home brushing was statistically significant. Caregiver rating of behavior increased significantly between baseline and 2nd follow up appointment, $p = 0.05$. Although the mean rating of child behavior increased between baseline and the 1st follow up, the difference was not statistically significant, $p=0.77$.

CONCLUSION:
Based on results, there was an increase in parental satisfaction of their child's oral health resulting from the use of the task strips in children diagnosed with ASD. The task strips play an important role in parental satisfaction with oral hygiene habits.

SUPPORT:
Funded by the Health Professions Division, NSU.

TASK STRIP IN IMPROVING ORAL HYGIENE IN CHILDREN WITH AUTISM

Barrios Pinera S., Chung J., Levi-Minzi M., Ocanto R., Kabot S., Ghodasra, S., Padilla, O., Sheehan, T., Gruzmark, M., Ranjan, P.

OBJECTIVE:
Patients with Autism Spectrum Disorder (ASD) often struggle with oral hygiene, so effective oral care strategies are needed. This pilot study aimed to measure plaque change in children with ASD using a visual task strip at home to help them follow brushing steps over 3 months. Plaque scores using the Silness-Löe Plaque Index were recorded. Comparative evaluations implementing visual task strips determined the improvement of oral hygiene among ASD patients.

METHODS:
The study sample was comprised of 46 patients with ASD (26 test subjects and 20 control subjects) under the age of 8 being treated at the MSC dental clinic. Patients who had moderate and high plaque scores corresponding to a Silness-Löe Plaque Index of 2 or higher, were invited to participate in the study. The study used a yoked control design. Baseline plaque scores were recorded using Silness-Löe Plaque Index at baseline and then, at intervals of 1 month and 2 months along with a follow-up questionnaire at the end of each visit. Mean plaque index scores were calculated, and two-way mixed ANOVA was conducted to examine differences in plaque scores among groups over time.

RESULTS:
Most patients were male (N=35; 76.1%) and more than half reported Hispanic ethnicity (N=37; 78.7%). The baseline mean plaque level for all patients was 1.5. Overall plaque scores decreased from 1.5 at baseline to 0.8 at the 2nd follow-up. Plaque decreased significantly between the baseline and 1st follow-up appointment and between the baseline and 2nd follow-up appointment in the experimental group. Based on the two-way mixed ANOVA test, there was a statistically significant interaction between the use of the task strip and time on plaque score. In other words, the mean plaque score changed over time depending on whether the task strip was used or not.

CONCLUSION:
For children with autism, this approach helps emphasize preventive oral care at home with the help of parents and caregivers who struggle to provide home oral hygiene care, creating a protocol that can be used for at-home oral hygiene between dental appointments. These designed strips are based on clinical procedures specific to dentistry. Findings illustrate a reduction in the plaque score of patients using task strips as a positive indicator of the improvement of oral health demonstrating the effectiveness of its use in patients with Autism Spectrum Disorder.

SUPPORT:
Funded by the Health Professions Division, NSU.

ASSESSING DENTAL STUDENTS' WILLINGNESS TO DISCUSS HPV AND HPV VACCINATION WITH PATIENTS IN THE DENTAL SETTING

Chaplin, C., Chung, J., Singer, R., Levi-Minzi, M., Ocanto, R.

OBJECTIVE:
The purpose of this study was to determine if increased knowledge about HPV (Human Papillomavirus) impacts dental students' willingness to discuss HPV and HPV vaccination with patients in the dental setting. This study aimed to emphasize the importance of including the topic of HPV and HPV vaccination in the dental school curriculum, thereby providing the foundation for the pivotal role dentists must play in HPV primary prevention.

METHODS:
Second-year predoctoral dental students received a pre-lecture assessment of their knowledge and attitudes regarding HPV. An educational lecture about HPV was delivered. A post-lecture assessment was then delivered to evaluate changes in knowledge level and attitudes regarding HPV. Participants received a 1-month post-lecture knowledge assessment test to evaluate the level of knowledge retention. Paired t-tests were used to assess changes in knowledge level. Wilcoxon signed-rank tests were used to assess changes in attitudes related to HPV. A multivariable logistic regression analysis was conducted to examine the relationship between HPV knowledge and willingness to discuss the topic with patients.

RESULTS:
Results show a significant 11.4% increase in knowledge between pre- and post-lecture assessments ($p < .001$). There was no significant difference between the mean post-lecture knowledge score immediately following the intervention (18.17, SD = 2.94) and the mean knowledge score at 1-month follow-up (18.17, SD = 3.03); $p = 1$. Survey responses that showed a significant median increase in attitude by level of agreement with the statements, "I am able to provide accurate and compelling information about the HPV and the HPV vaccine to patients to aid in making the decision to vaccinate" ($z = 3.967$, $p < .001$), and "I believe my patients will be comfortable discussing HPV and HPV vaccination with their dentist" ($z = 3.35$, $p < .001$). There were no statistically significant median differences before vs. after the intervention related to changes in willingness toward discussing HPV or HPV vaccination with patients in the dental setting. There were no statistically significant associations between knowledge scores and willingness before and after the intervention.

CONCLUSIONS:
This study highlights the successes and challenges in improving dental students' knowledge and attitudes regarding HPV. While the intervention increased knowledge and certain attitudes, willingness to discuss HPV or HPV vaccination with patients did not change significantly as a result of the intervention. As evidenced by the pre-lecture assessment, second-year students demonstrated a predisposition to discuss HPV with patients, likely attributed to their level of education and altruistic tendencies towards

patient care. Gaps in HPV understanding persist, highlighting a need for targeted education. Addressing stigma and providing communication training can likely enhance discussions about HPV in dental settings, fostering better overall understanding.

SUPPORT:
Funded by the Health Professions Division, NSU.

COMPARISON OF PEDIATRIC DENTAL CARE BEFORE AND AFTER COVID-19 PANDEMIC

Chiarello, K., Chung J., Levi-Minzi M., Ocanto R.

PURPOSE:

The purpose of this study was to better understand the effects of the Covid-19 Pandemic on pediatric dentistry provision and approach to care. In order to achieve this, the clinical care provided to pediatric dental patients was measured by both quantities of specific procedures (codes) completed, as well as specific types of procedures (codes) completed, were compared both before and after the Covid-19 pandemic.

METHODS:

Completed clinic codes from NSU's KID and Joe DiMaggio clinics were reviewed, with codes completed between March 2018 to the end of February 2020 being considered the Florida "pre-pandemic" group, and codes completed from June 2020 to the end of May 2022 as the "post-pandemic" group. Completed codes were further subdivided based on procedure type (i.e., diagnostic, preventive, restorative, behavior management, and extractions) to note occurrence patterns of the various dental services utilized. Procedures completed were also compared based on the characteristics of patients receiving the procedures (i.e., age, sex, race, ethnicity, marital status of parents, language spoken at home, and whether patient is special needs). Descriptive statistics were used to report dental visit treatment types and patient demographics. A multivariate analysis was performed using the Pearson chi-square and t-tests to make comparisons between treatment types and patient demographics.

RESULTS:

Between March 2018 and end of February 2020, there were a total of 42,159 procedures. Prior to COVID, there were a total of 20,498 treatment codes completed for 2,849 patients. After COVID, a total of 21,661 treatment codes completed for 2,525 patients. Chi-square tests were conducted between time period and procedure type. There was a statistically significant difference between time period and procedure type for diagnostic (significantly higher post COVID, $p=0.004$), preventative (significantly lower post COVID, $p=<0.001$), restorative (significantly higher post COVID, $p=<0.001$), behavior management (significantly higher post COVID, $p=<0.001$), and SDF procedures (significantly higher post COVID, $p=<0.001$). Similarly, there was a statistically significant difference in number of treatment codes between time period by the following patient characteristics: male gender (significantly higher post COVID, $p=0.002$); female gender (significantly higher post COVID, $p=0.002$); white race (significantly higher post COVID, $p=<0.001$); black race (significantly higher post COVID, $p=<0.006$); other race (significantly higher post COVID, $p=0.006$); multi race (significantly higher post COVID, $p=<0.001$); and Latino and other race were also significantly higher post COVID. Those with special needs had significantly fewer procedures post COVID ($p=<0.001$).

CONCLUSIONS:
There was a statistically significant increase in treatment completed in the post-covid time period for Total and for all procedure type subgroups except for Extractions. There was a similar statistically significant increase in treatment completed in post-covid time period for each demographic when broken into various Gender, Race and Ethnicity subgroups. Contrary to expectation, children with special needs had significantly fewer procedures completed post-covid compared to pre-covid.

SUPPORT:
Funded by the Health Professions Division, NSU.

EXAMINING THE IMPACT OF UNFLAVORED TOOTHPASTE ON PLAQUE REDUCTION AMONG CHILDREN WITH AUTISM SPECTRUM DISORDER-CROSS-SECTIONAL STUDY

Chitta, H., Chung, J., Ocanto, R., Padilla, O., Levi-Minzi, M.

OBJECTIVES:
Many individuals with autism experienced sensory processing difficulties, impacting their sensitivity to tastes, textures, and smells. This study aimed to assess the impact of unflavored toothpaste on plaque reduction among children with ASD. Specific objectives included evaluating caregivers' knowledge of brushing preferences, measuring changes in plaque scores, assessing brushing time, and evaluating improvements in brushing compliance.

METHODS:
Study in process. This cross-sectional study recruited participants aged 3 to 10 years with mild to severe plaque levels from Mailman Segal Dental Clinic. Pre-intervention questionnaires and baseline assessments, utilizing the Silness-Löe plaque index, were conducted. Parents received education on the importance of color change, OHI and brushing techniques. Participants were given toothpaste for a month; one group received flavored toothpaste (control) and the other unflavored toothpaste (experimental). Post-intervention assessments included plaque index and satisfaction/compliance questionnaires. Demographics and caregiver knowledge were reported as frequencies and percentages; plaque level, brushing time, and compliance were reported as means and standard deviations. A mixed ANOVA will be used to examine changes in plaque level among the two groups over time.

RESULTS:
Results are forthcoming and will be used to determine the effectiveness of unflavored toothpaste in reducing plaque levels among children with ASD. In addition, caregivers' knowledge of children's brushing preferences/habits, changes in plaque scores, brushing time, and improvements in brushing compliance will be assessed.

CONCLUSIONS:
If successful, the study could lead to improved oral hygiene for children with ASD, potentially reducing uncooperative behavior during dental treatment and enhancing the overall quality of care for the children and their families. This research aims to contribute valuable insights into sensory interventions for oral care routines in this population.

SUPPORT:
Funded by the Health Professions Division, NSU.

ELECTRONIC SUPPORT SCHEDULE EFFECT ON CHILDREN WITH AUTISM STRESS MARKERS

Le-Lassiter, C., Rivas, Y., Chung, J., Culver, A., Gonzalez, A.,
Ocanto, R., Padilla, O., Sheehan, T., Levi-Minzi, M.

OBJECTIVE:
The aim of this study was to determine the effects of an electronic visual support application on the stress markers of children with autism spectrum disorder (ASD) during 6 monthly desensitization dental visits.

METHODS:
Twenty-two new pediatric patients with ASD were recruited for monthly desensitization dental visits at NSU's Mailman Segal Center. An electronic visual support application depicting various tasks asked of the patient (i.e., sit down, dental mirror, open mouth, etc.) was used as behavior management in this randomized crossover study. The level of stress the patients experienced during the dental visit was measured using heart rate and salivary cortisol biological markers at the start and end of the 1st and 6th visit and compared to Tell-Show-Do (TSD) behavior management. In addition, the perception of the patient's behavior using Likert and Frankl were assessed by parents and an applied behavior analyst (ABA).

RESULTS:
T-tests were conducted to examine differences in mean scores between the intervention (app) and control group. There were no statistically significant differences between the intervention (app) and control group on any of the measures including cortisol levels, heart rate, anxiety scale, frankl score, number of tasks completed, or parent perception of child behavior.

CONCLUSION:
Visiting a dentist can be a stressful and challenging task for patients with autism. We expected that our findings will show a positive improvement in behavior and stress during a dental visit with the use of electronic visual support. However, the result showed that there were no statistical differences. This was possibly due to low sample size, increased time between each visit, scheduling appointments at varying times and days, and other variables. Future studies could be performed to account for these variables. We still believe that visual supports are effective tools that can be used by dentists to improve the behavior of patients with autism during dental appointments and possibly reduce the need to complete care in a hospital setting.

SUPPORT:
Funded by the Health Professions Division, NSU.

ACCEPTANCE OF SEDATIVE GUMMY BEARS: A CONTINUATION STUDY

Lima, A; Padilla, O; Levi-Minzi, M; Pino, D; Chin, J

OBJECTIVE:
To determine the acceptability of the gummy bear drug delivery platform with patients on the autism spectrum and neurotypical children. This project was a continuation of a clinical trial begun in 2019 by NSU Department of Pediatric Dentistry.

METHODS:
A total number of eighty study subjects were divided into forty subjects as a control group where liquid midazolam was administered. Forty subjects were given midazolam gummies and a combination of midazolam and hydroxyzine as an experiment. During the administration of the sedative medication, subjects were evaluated for acceptability using a 5-point hedonic response scale. Multiple other criteria for sedation were recorded including onset, vital signs, sedation levels, duration and behavior, every five minutes. Multiple analyses were used to compare to prior sedations using sedatives in liquid form.

RESULTS:
The results indicated that there was not a statistically significant difference in acceptability among those who received the gummies for sedation (N=28) as compared to the control group patients (N=15). Although more patients fully accepted the gummies, the difference was not significant, indicating that among the whole sample, the use of the gummies did not produce higher acceptance.
When measuring sedation parameters after administration of hydroxyzine and midazolam gummies by oral route, results suggest the gummies provided a higher level of sedation as compared to the liquid.
When examining form of medication and time to sedation, Gummies had a quicker onset of sedation, but t-test results indicate that the difference was not statistically significant ($p=0.060$). Pending more results.

CONCLUSION:
The clinical study did not yield any statistically significant results, likely because of the low number of participants. Although the data was not statistically significant, there was a trend of patients liking gummy bears more than syrup. The participants also showed more enthusiasm and compliance prior to ingesting the gummy bears in comparison with the syrup. An added benefit which is clinically relevant was that if patients spit out a portion of the liquid medication, the dose is usually lost, and we are unable to administer an additional dose which likely compromises the success of the sedation. However, if the patient spits out the medicated gummy bear, it is possible to recover it and re-administer, allowing us to proceed with sedation appointment. Liquid medications are often rejected or spit out, compromising the success of the sedation. For pediatric patients, it is necessary to formulate an alternative that is effective and well accepted by children undergoing sedation in comparison to the respective liquid medication.

Compounding medications is a viable alternative that must continue to be researched. More clinical trials with the pediatric population are necessary to make the adjustments to the final product.

SUPPORT:
Funded by the Health Professions Division, NSU.

OUTCOMES OF IMPLANTS PLACED IN AUGMENTED SINUSES AT THE NSU DEPARTMENT OF PERIODONTICS

Baez-Gutierrez, A., Koutouzis, T.

OBJECTIVE:
The purpose of this retrospective study was to evaluate surgical complications and implant outcomes for patients treated with either lateral wall or crestal approach sinus augmentation techniques at NSU Dental Clinic.

METHODS:
Patient's records from 2012 to 2022 at Nova Southeastern University College of Dental Medicine were reviewed. Inclusion criteria comprised adults ≥21 years old with at least one year follow-up post-surgery. Clinical parameters including age, gender, smoking status, ASA classification, and surgical complications were recorded. Biological complications of implant placement in grafted sinuses were assessed. Mean values, frequencies, and standard deviations were calculated, and statistical analyses were performed, including parametric or non-parametric tests to compare complications between procedures, Fisher's exact test to evaluate differences in complication frequencies.

RESULTS:
A total of 131 patient's records were reviewed from the ages of 37 to 90 years old. The results showed no statistically significance differences in age distribution ($p=0.919$) or gender distribution ($p=0.896$) between treatment groups. Similarly, factors such as smoking status, ASA classification, penicillin allergy, periodontal diagnosis, and degree of edentulism did not differ significantly between the groups ($p=0.229$; $p=0.274$; $p=0.274$; $p=0.089$; $p=0.158$; $p=0.483$). However, complications rates between the lateral and crestal group were found statistically significant. Complications rates for lateral wall and crestal approaches were 36.4% and 8.2%, respectively ($p < 0.001$). Schneiderian membrane perforation was found to be the most common complication, with rates of 29.1% for lateral wall and 7.3% for crestal approach ($p<0.001$). Biological complications and implant removal rates were not significant different between groups ($p=0.820$; $p=0.721$) A total of 194 implants were placed, 62 in the lateral wall group and 132 in the crestal group. Ten implants were removed in the lateral group and 18 in the crestal group, resulting in survival rates of 83.88% and 86.37%, respectively ($p=0.645$). And a total survival rate of 85.06%.

CONCLUSION:
Patients treated with lateral wall sinus lift approach had significantly higher surgical complications compared to patients treated with crestal lift approach. The study failed to support the hypothesis that sinus lift surgical approach had an effect on implant survival rates.

SUPPORT:
Funded by the Health Professions Division, NSU.

OUTCOMES OF GTR PROCEDURES AT THE NSU DEPARTMENT OF PERIODONTICS

Chocron, O., Koutouzis, T.

OBJECTIVES

To evaluate outcomes of Guided Tissue Regeneration procedures at the Nova Southeastern University Department of Periodontics using parameters such as PPD, CAL and radiographic defect resolution. The secondary aim was to evaluate if these parameters differ significantly when growth factors are employed.

METHODS

This was a retrospective analysis using electronic patient (Axium and XDR) records from the Nova Southeastern University Department of Periodontics. Patients having received periodontal regenerative procedures on teeth in the Periodontics clinic were included in the analyses. Mean values, standard deviations and frequencies were calculated. The primary outcome variables were changes in PPD and CAL before and after treatment. Parametric tests were used to evaluate differences in PPD, CAL before and after treatment and differences between 2 groups receiving different biologic materials, Amelogenin (EMD) and PDGF-BB (GEM). Binary logistic regression analysis was formulated to analyze possible interactions of type of treatment, tooth location, use of barrier membrane, radiographic defect resolution, smoking and ASA status to pocket closure (PD less than 5 mm). A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 103 defects were included in the study. There was a statistically significant decrease in PD and increase in CAL for both EMD and GEM groups. 70- 76.2 % of defects had pocket closure (PD less than 5 mm). There were no statistically significant differences between groups for pocket closure. 60-62.9% of defects had radiographic resolution of defects with no significant differences between groups. The results of the binary logistic regression analysis showed that achieving defect resolution radiographically and treatment of maxillary premolar teeth were associated with pocket closure.

CONCLUSION

Regenerative procedures at the Nova Southeastern Department of Periodontics were found to have success rates as defined by pocket closure of 70-76.2%. Statistically significant decrease in PD and increase in CAL were found following treatment. No differences were found when comparing the use of 2 different biologic growth factors (Amelogenin and PDGF-BB). Regression analysis revealed that radiographic defect resolution and maxillary premolar teeth were associated with pocket closure.

SUPPORT:

Funded by the Health Professions Division, NSU.

SUBMERGED VS NON SUBMERGED HEALING OF IMPLANTS SUBJECTED TO CONTOUR AUGMENTATION

Kelley, R., Alramli, H., Sofos, S., Koutouzis, T.

INTRODUCTION:

Although there are several studies that demonstrate predictable outcomes of non-submerged implant placement with simultaneous contour augmentation. To our knowledge there are no studies comparing these two techniques directly, using CBCT analysis.

OBJECTIVES:

The primary and secondary objectives of the present study were to compare vertical and horizontal facial bone dimensional changes around implants subjected to contour augmentation at the time of implant placement in a submerged and non-submerged treatment approach after 4 months of healing.

METHODS:

A total of twenty eight patients in need of single tooth replacement were recruited and distributed into submerged and non-submerged groups using block randomization (n=14 for control group, n=14 for test group). Astra EV implants were placed with simultaneous guided bone regeneration using mineralized cortical bone allograft particles and a non-cross linked collagen membrane. Clinical and radiographic measurements were performed at baseline and at four months. At baseline, the following parameters were measured intraoperatively; vertical defect height (VDH), horizontal defect depth (HDD), horizontal defect width (HDW), intra-bony component of the defect (INTRA) and soft tissue thickness (STT). In addition, a CBCT was taken immediately after completion of the surgery to show the volume of the augmented area. At four months, a CBCT was taken to evaluate healing and amount of bone regeneration and remodeling at different levels of the defect.

RESULTS:

When comparing intra-surgical measurements at day 0 between submerged and non-submerged groups, no statistically significant differences were observed. At four months follow up, all twenty eight implants integrated successfully with uneventful healing. Results demonstrated statistically significant bone remodeling within the groups. However, no statistically significant differences were observed in mean changes in vertical bone height (ΔRVBH) between submerged (-0.64 (1.10)) and Non submerged (-1.26 (1.87)) groups. Additionally, no statistically significant differences were observed in mean changes in vertical bone gain (VGAIN) over the implant surface between submerged (3.04 (1.66)) and Non submerged (2.0 (1.38)) groups.

CONCLUSION:

A non-submerged approach is a predictable method for implant healing with simultaneous contour augmentation. The study failed to find significant differences in bone and soft tissue responses between groups.

SUPPORT:
Funded by the Health Professions Division, NSU.

RETROSPECTIVE ANALYSIS OF MULTIPLE GINGIVAL RECESSION DEFECT TREATMENT WITH CONNECTIVE TISSUE GRAFTS AND SOFT TISSUE ALLOGRAFTS

Leyva, M., Koutouzis, T.

OBJECTIVE:
The purpose of this retrospective study was to compare the effectiveness and stability of complete root coverage achieved in multiple adjacent gingival recessions treated by CTG or ADM, over a 36-month observation period.

METHODS:
Clinical records of 58 subjects with multiple adjacent recession defects that underwent root coverage using two different techniques were reviewed. Clinical outcomes (PD, Rec, CAL, KT) were retrospectively evaluated and compared over a 36-month postoperative period. Patient and site related factors affecting recession reduction and complete root coverage evaluated with multiple and binary regression analysis .

RESULTS:
Of the 58 patients with multiple adjacent recession defects, 31 received connective tissue grafts and 27 patients were treated with acellular dermal matrix. The average recession depth for both groups was 2.2 mm. Mean root coverage achieved at 12-months 44.2% for ADM and 38.8% for CTG, and approximately 50% for both groups at 36 months postoperatively. The mean recession reduction at 12 months was observed to 1.0 mm in both ADM and CTG groups, with no significant difference between groups. Defect location (maxilla vs mandible) and surgical flap design (Tunnel vs Coronally Advanced Flap) were factors significantly associated to the effectiveness and stability of CTG and ADM over the observation period.

CONCLUSION:
The study failed to support the hypothesis that the type of graft material (Allograft vs CTG) has an effect on recession treatment outcomes over a period of 36 months.

SUPPORT:
Funded by the Health Professions Division, NSU.

EVALUATE SURVIVAL RATE OF IMPLANTS SUPPORTING COMPLETE FIXED REHABILITATIONS IN THE MAXILLARY ARCH AT THE NSU DEPARTMENT OF PERIODONTICS

Sepulveda Figueroa, M.C., Koutouzis, T.

OBJECTIVES:
Rehabilitation of edentulous maxilla can present a range of challenges, risks, and complications. Most concerning is that the impact of an edentulous maxilla extends from everyday life activities to psychosocial aspects tapping into an individual's quality of life. The primary aim of the study was to evaluate the survival rate of implants supporting complete fixed rehabilitations in the maxillary arch. Secondary aims was the evaluation of the incidence of complications (biologic and technical).

METHODS:
This retrospective study was conducted by evaluating the electronic accounting patient record system (Axium) from the Department of Periodontology at the Nova Southeastern University School of Dental Medicine. The study included 78 adult patients [mean age = 72.23 (11); 56.4% male] who underwent complete fixed implant supported maxillary prosthesis placement.

RESULTS:
Among these patients, 74.4% of patients experienced no implant loss, according to the number of failed implants. A total of 338 implants (anterior: 186, posterior: 186) were placed with a significant proportion of implants (73.4%) free of complications (success) and an overall survival rate of 90.9%. Notably, 49.3% of the patients exhibited at least one implant with bone loss greater than 3mm. In addition, 63.2% of the patients exhibited at least one prosthetic complication. Furthermore, the study found that patient-level characteristics (e.g., smoking, ASA classification, medications, diabetes, periodontal status) did not significantly influence the total biological complications observed in these patients.

CONCLUSIONS:
The study highlights that a considerable proportion of patients rehabilitated with complete fixed prosthesis experienced biological and technical complications in an educational setting.

SUPPORT:
Funded by the Health Professions Division, NSU.

INVESTIGATING IMMEDIATE COLOR EFFECTS OF SURFACE TREATMENTS ON ZIRCONIA CROWNS (IN VITRO)

Almadani, W., Joshi, N., Feit, D., Bendayan, A.

BACKGROUND:

Zirconia crowns are a significant advancement in restorative dentistry due to their durability and compatibility with the human body. However, maintaining their color stability after surface treatments is crucial for ensuring aesthetic appeal and patient satisfaction. Surface treatments play a pivotal role in enhancing the properties of zirconia crowns, but they can also impact their color stability. These treatments might involve procedures like polishing, glazing, or the application of different coatings. Each method can potentially influence the crown's color in various ways, affecting its appearance both immediately after treatment and over time. This in-vitro study involved a process of testing different surface treatments on zirconia crowns and evaluating their immediate impact on color stability. This included using standardized color measurement tools to quantify and compare color changes before and after each treatment.

OBJECTIVE:

To assess and compare how various surface treatments affect the immediate color stability of zirconia crowns.

METHODS:

This study is still in process. The methodological framework will involve the systematic fabrication of 30 zirconia crowns with precise dimensions and consistent material composition to ensure sample homogeneity. These crowns will be randomly allocated into three distinct treatment groups: No treatment (n=10), Polishing (n=10), and Glazing (n=10). Each treatment group will undergo specific surface modifications following standardized protocols. The Polishing group will receive meticulous polishing procedures aimed at refining the crown surfaces. The Glazing group will undergo a meticulous glazing process to achieve a smooth and glossy surface finish. Immediate color assessments will be conducted using spectrophotometry, a precise and objective measurement method. This process will evaluate color variations pre- and post-treatment by analyzing parameters within the CIE Lab* color space. Spectrophotometry ensures accurate quantification of subtle color changes. The data gathered will undergo statistical analysis. A paired t test will be used to determine whether the difference in the total color change of a zirconia crown is because of the polishing or glazing treatments. A 1-way analysis of variance (ANOVA) and the Scheffé post hoc test (SPSS Statistics v20; IBM Corp) will be used to identify significant differences in L*, a*, and b* values among groups (a=.05).

EXPECTED RESULTS:

We expect that the polished surfaces of zirconia crowns could be rougher than glazed surfaces, which might result in larger and more perceptible color differences between no treatment and polishing.

EXPECTED CONCLUSION:

This investigation may significantly contribute to refining treatment selection protocols, empowering dentists and technicians to choose surface modification techniques that not only maintain color stability but also optimize biocompatibility and mechanical resilience.

SUPPORT:

Funded by the Health Professions Division, NSU.

ALVEOLAR CANAL DISSECTION APROACH FOR DATA COLLECTION ON ALVEOLAR CANAL BONE STATUS

Mandani A., Bittner, N., Joshi, N.

OBJECTIVE:

There are variations to the bone architecture surrounding the inferior alveolar canal in dentate and edentulous mandibles in dissected cadaver specimens. The purpose of this series of dissections was to visualize, observe pattern, compare, and measure the thickness of the alveolar canal bone lining layer.

METHODS:

14 fresh frozen cadaver head specimens were used. The dissection took place in Miami Anatomical Research Center. Information of age, gender, presence of molar tooth, & edentulism were included. Panoramic and Cone Beam Computed Topography (CBCT) were obtained for each specimen. The dissection was executed with extraoral surgical access of the mandibular body. A long U-shaped vestibular cortical bone access was inverted, standardized from proximal distal access of mental foramen ending at the medially and anteriorly to the extension of the canal hosted within the ramus on the vestibular plate. The dissected inferior alveolar canals were between 40 and 50 mm long. Measurements of External Canal Width (ECW), Internal Canal Width (ICW), & Canal Cortical Thickness (CCT), were obtained using a digital caliper. ECW was measured between the superior and inferior cortical borders. ICW was measured from the superior and inferior canal borders (Figure 1). CCT was calculated by subtracting ICW from ECW (CCT = ECW – ICW). Canal widths were measured at the posterior segment of the IAC.

RESULTS:

After completing the dissection of all 14 specimens, it was realized that all IACs had a layer of sponge-like cancellous bone around them with different degrees of thickness and density. The lowest Cortical Canal Thickness (CCT) observed was 0.1 mm in specimen D12. The highest CCT recorded was 1.5 mm in specimen N3. The most frequent CCT calculated was 0.2 mm in 4 specimens (D9, D13, N4, & D8) followed by 0.7 mm in 3 specimens (D7, N1, & N10). Specimens D4 and D14 showed CCT of 0.6 mm. For specimens D2 and D11, the CCT was 0.5 mm. Specimen N7 showed CCT of 0.4 mm. ECW, ICW, and CCT values are reported in Table I.

Table I. Age, gender, ECW, ICW, and CCT of each specimen

Sample ID	Age	Gender	Molar Present?	ECW (mm)	ICW (mm)	CCT (mm)
D2	83	M		3.6	3.1	0.5
D4	87	M	Yes	4.9	4.3	0.6
D7	90	F		5.3	4.6	0.7
D8	68	M		3.5	3.3	0.2
D9	74	M	Yes	4.2	4.0	0.2
D11	97	F		3.5	3.0	0.5
D12	47	M		3.9	3.8	0.1
D13	80	F		4.4	4.2	0.2
D14	99	F		4.7	4.1	0.6
N1	75	F	Yes	4.5	3.8	0.7
N3	81	F		6.2	4.7	1.5
N4	91	F		3.9	3.7	0.2
N7	59	F		4.4	4.0	0.4
N10	60	F		3.9	3.2	0.7

CONCLUSION:

Despite the differences of age, gender, and edentulism, The IAC is surrounded by cancellous bone with a maximum thickness of 1.5 mm.

SUPPORT:

Funded by the Health Professions Division, NSU.

SHADE COMPARISON OF ZIRCONIA SPECIMENS TO VITA CLASSICAL SHADE GUIDE USING A DIGITAL SPECTROPHOTOMETER

Marafi, A., Joshi, N., Feit, D., Bendayan, A.

OBJECTIVES:

To evaluate if different zirconia specimen thicknesses will affect the resulting shade in comparison to the Vita Classical shade guide.

METHODS:

A total of 96 3Y-TZP zirconia (Dental Direkt BioZx, Spenge, Germany) specimens will be milled in 4 different shades. There will be a total of 4 groups (n=4) based on a specific shade; A1, A2, B1, C1. Each group will include 2 different thicknesses, 2 mm and 4 mm. Twelve specimens of each thickness will be milled. The Vita Easyshade will be used to evaluate and quantify the Vita classic shade guide tabs with the corresponding shades used and the zirconia specimens. The trueness and precision of the shade and l*a*b* values will then be compared. Statistical analysis will be conducted to complete the comparison.

EXPECTED RESULTS:

The predicted results of this study will be that between 2- and 4-mm thickness zirconia specimens, there should be significant difference in terms of shade.

EXPECTED CONCLUSIONS:

The predicted conclusions based on the predicted results would be different thicknesses of zirconia will produce a different shade. Taking that into account, when selecting the final shade of a zirconia prosthesis, many factors should be considered, one of which is the thickness of the material.

SUPPORT:

Funded by the Health Professions Division, NSU.

A COMPARATIVE EVALUATION OF THE DIMENSIONAL ACCURACY OF CBCT AND IMPRESSION INVERSION IN GENERATING WORKING MODELS FOR FULL ARCH IMPLANT RECONSTRUCTIONS

Surathu, N., Joshi, N., Feit, D., Guerrero, M.

OBJECTIVE:
The use of CBCT to generate a digital model from a PVS impression of a standardized physical model. The aim is to determine if the digital model generated from a CBCT scan of a PVS impression of the physical model shows comparable accuracy to a digital model generated from an extraoral desktop scanner of the same model.

METHODS:
Standardized typodont models from Kilgore International, Inc. will be ordered for maxillary and mandibular complete dentate models. Teeth will also be removed as needed and root socket plugs will be used to simulate partially edentulous scenarios. Stock trays coated with PVS adhesive will be used to make PVS impressions of typodont models. PVS impressions will be digitized using a CBCT machine to later generate an STL file; and also scanned using an extraoral desktop scanner. Typodont models will also be scanned using the extraoral desktop scanner. Amongst the three digital files generated (STL from CBCT of impression, STL from extraoral desktop scan of PVS impression and STL from extraoral desktop scan of typodont model), the STL file generated from extraoral desktop scan of typodont model will be considered as the control for this comparative study. All STLs files will be taken into a reverse engineering software, Geomagic Control X for comparative evaluation of accuracy.

RESULTS:
Based on the literature review for the purpose of this study, I expect there to be comparable accuracy between the CBCT scan of a PVS impression and that of an extraoral scan of the reference model.

CONCLUSION:
The digital model generated from the CBCT scan of the PVS impression is an alternative diagnostic method that can be used for implant planning for the purpose of guided surgery.

SUPPORT:
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COOPERATION AMONG CHILDREN WITH SHCN DURING FIRST VISIT AT SPECIAL NEEDS CLINIC

Chung, J., Levi-Minzi, M.A., Taylor, M., Ocanto, R.

OBJECTIVE:

The goal of this study was to document patient characteristics of children with special healthcare needs (SHCN) receiving care for the first time at a special needs clinic. In addition, potential associations between patient characteristics and cooperation during the first dental visit, as measured by Frankl score were examined.

METHODS:

IRB approval was received for this study. Caregivers of patients attending a special needs clinic completed a pretreatment form collecting demographics, health information (i.e. services received, co-morbidities, at home dental care), and behavior (i.e. ability to communicate, level of cooperation. Descriptive statistics (N=197) and t-tests were calculated to examine patient health and behavior characteristics on the primary outcome variable: level of cooperation as measured by the Frankl scale; the Frankl scale was recoded to represent a score range of 1-4, with higher values representing more cooperative behavior:

RESULTS:

Most patients were diagnosed with ASD (95.9%). Patients received speech therapy (54.7%), followed by occupational therapy (OT; 8.2%); 39.6% had speech delay, and 25.9% reported developmental delay. The mean Frankl score was 2.8 (SD=0.8). Those receiving the following services were significantly less cooperative: speech (2.63 versus 3.04, $p<.001$), ABA (2.62 versus 2.91, $p=0.01$), OT (2.56 versus 3.02, $p<.001$). Those reporting speech delay were also less cooperative (2.65 versus 2.89, $p=0.03$). In terms of dental care, those using a manual toothbrush were less cooperative (2.64 versus 3.00, $p=0.001$). In terms of behavior, caregivers reporting challenging behaviors 1-2 times daily also had significantly lower scores (2.64 versus 2.93).

CONCLUSION:

Children receiving services, those using a manual toothbrush, and those engaging in challenging behaviors daily were less cooperative during the first visit. These results suggest that collecting pretreatment data in advance can be useful for providers in order to best tailor the first visit to the child's needs.

SUPPORT:

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IL-10 AND PD-L1 SYNERGISTICALLY ENHANCE MACROPHAGE PD-1 EXPRESSION AND M2 POLARIZATION

Abdolahinia, E.D., Memida, T., Huang, S., Ruiz, S., Shindo, S., Kawai, T., Han, X.

OBJECTIVE:

Previous studies have shown that programmed cell death-ligand 1 (PD-L1) and interleukin-10 (IL-10) alone can drive macrophage differentiation toward the M2 phenotype. In this study, the synergistic effect of IL-10 and PD-L1 on PD-1 expression and M2 polarization was evaluated in macrophages by adding PD-L1/IL-10 recombinant proteins and co-culturing with the IL-10-producing subset of regulatory B cells.

METHODS:

A 12-well plate was seeded with 1×10^5 THP-1-derived macrophage cells. Furthermore, CD24CD38 B cells were isolated from human peripheral blood mononuclear cells (PBMCs). Subsequently, the macrophage cells were treated with IL-10 (20 ng/mL), PD-L1 (2 µg/mL), and a combination of both for a duration of 48 hours. At the same time, the remaining cells were co-cultured with CD38+CD24+B10 cells for the same duration. During the blocking stage, 5 µg/mL of anti-IL-10 and anti-PD-L1 were added to M0+CD38+CD24+B10 cells. Finally, M2 polarization was assessed using flow cytometry, with fluorescent-labeled anti-CD206/CD11b serving as markers. Additionally, the alteration in pro-/anti-inflammation was evaluated through qPCR.

RESULTS:

The combination of PD-L1/IL-10 treatment effectively increased the M2 cell population compared to PD-L1 treatment and M0 (*$p<0.05$). The treated groups were evaluated for anti-inflammatory genes, such as IL-10 and TGF-beta. Significantly higher expression of IL-10 was observed in PD-L1/IL-10 treated group compared to other, along with a similar trend for TGF-beta, suggesting effective inflammation regulation by PD-L1 and IL-10. The group receiving the combination of PD-L1 and IL-10 exhibited the highest level of PD-1 expression, confirmed through RNA and protein analyses ($p<0.05$), contrasting with the PD-L1-treated group and control group. However, PD-1 surface expression in the IL-10/PD-L1-treated group did not significantly differ from the IL-10-treated group. Pro-inflammatory genes MMP-2 and CXCR-4 were assessed, showing a significant decrease in expression with both PD-L1 and IL-10 treatment, indicating their contribution to downregulating inflammation-related genes.

In the co-culture study, direct interactions between M0 and B10 cells resulted in a significantly greater increase in the M2 population compared to M0 (*$p<0.05$). PD-1 expression consistently exhibited the highest levels in the M0+B10 group at both RNA and protein levels. Although there was a tendency towards higher expression of TGF-beta genes in the interaction group, the difference was not statistically significant. In the co-culture of the CD38+CD24+B10 and macrophages, the expression of CXCR-4 did not significantly change despite a decreasing trend in direct co-culture compared to the investigated groups.

However, the expression of the MMP-2 gene significantly decreased in the co-culture group compared to control. Blocking IL-10 and PD-L1 in CD38+CD24+B10 cells resulted in a significant decrease in the M2 population compared to other groups.

CONCLUSION:

CD24+CD38+ B10 cells regulate M2 polarization through IL-10 secretion and PD-L1/PD-1 ligation.

SUPPORT:

This study was supported by NIH NIDCR grants: DE-025255 PI Xiaozhe Han, and DE-029709 PI Toshihisa Kawai

FLUORIDE SUSCEPTIBILITY CHANGES BETWEEN ADOLESCENT AND MATURE MICE

Yamashita, S., Okamoto, M., Fujiwara, N., Roger, Z., Marion, C., Mendonca, M., Brueckner, S., Everett, E.T., Suzuki, M.

OBJECTIVE:

The optimal fluoride inhibits or reverses the initiation and progression of dental caries and stimulates new bone formation. Public Health Service (PHS) recommends public water fluoridation to prevent caries and the optimal recommended fluoride concentration in drinking water is 0.7 ppm. On the other hand, excessive exposure to fluorides can lead to disturbances of bone homeostasis (skeletal fluorosis) and enamel development (dental/enamel fluorosis). Fluoride metabolism and absorption in mineralized tissues (teeth and bones) change with age. In young children, fluoride is taken up by mineralized tissues more than in adults. We expect that excessive fluoride exposure may have more harmful effects on children than adults. However, studies on age-related fluoride health effects on mineralized tissues are limited. Here, we investigated age-related fluoride effects on teeth and bone in mouse dental fluorosis model.

METHOD:

C57BL/6 mice (Male: Adolescent 5-9 weeks, and Mature 10-23 weeks) were given water containing fluoride (0, 50, 100, or 125 ppm) for six weeks. The mice were then euthanized, the maxillary and mandibular incisors and the femurs were extracted. The maxillary incisors were used for microhardness and histological analysis. The mandibular incisors were subjected to Quantitative light-induced fluorescence (QLF) analysis to determine fluorosis levels. The femurs were analyzed for micro-CT, and three-point bending testing.

RESULTS:

Enamel: In adolescent groups, fluoride (all doses) significantly decreased microhardness compared to control (0 ppm). Whereas in mature groups, microhardness was reduced only by 125 ppm fluoride. In adolescent groups, fluoride (all doses), significantly increased QLF, while no significant differences were observed by fluoride in mature groups. Histological analysis showed that in adolescent mice, fluoride damaged ameloblast in the maturation stage more severely.

Femur: Micro-CT results showed fluoride (all doses) significantly increased bone mineral density (BMD) in adolescent groups. While, intriguingly, BMD significantly decreased in mature groups at fluoride concentrations of 100 and 150 ppm. Three-point bending test showed that in adolescent groups, fluoride at 125 ppm significantly decreased the maximum load (N) and stiffness (N/mm), whereas no changes were observed in mature groups (all doses).

CONCLUSION:

Our studies showed that enamel formation and bone strength were more severely impaired by high-dose fluoride in adolescent mice compared to mature mice. These results suggest that fluoride biological effects can change over the lifespan.

This study warrants further investigation for optimal age-related fluoride levels to keep benefits and prevent fluoride adverse health effects, especially for young children.

SUPPORT:
NIH R01 Grant (PI: Dr. Suzuki, DE27648) provided support for this study.

MICROSTRUCTURAL ANALYSIS OF DENTIN-PULP COMPLEX AFFECTED BY FLUORIDE IN A MOUSE EXPERIMENTAL MODEL.

Okamoto, M., Yamashita, S., Mendonca, M., Brueckner, S., Achong-Bowe, R., Thompson, J., Everett, T.E., Suzuki, M.

OBJECTIVES:

Fluoride has caries-preventive effects and is applied in dental treatment and dental-related products. To prevent dental caries, the optimal fluoride concentration in the public water supply in the U.S. is 0.7 ppm. However, it is also well known that excessive consumption of fluoride can cause dental fluorosis. There are studies investigating the effects of fluoride on enamel and enamel-forming cells, ameloblast cells, while for dentin, there is only reports just evaluating the effect of fluoride on dentin matrix histologically. Namely, no report about the effect of fluoride on dentine-pulp complex microstructure. Here, we performed a microstructural analysis of how dentin is affected by fluoride in an experimental animal dental fluorosis model.

METHODS:

C57BL/6 mice (Six to nine-week-old males) were randomly divided into four groups (NaF; 0, 50, 100, or 125 ppm, n = 4/group). Mice were fed water containing fluoride (NaF) as drinking water daily for 6 weeks with fluoride-free food. Thereafter, mandibular incisors were collected. Enamel phenotypes were evaluated using light microscopy, quantitative light-induced fluorescence (QLF) to evaluate dental fluorosis levels. Dentin phenotypes were evaluated using micro-CT (whole dentine structure, dentine mineral density, dentine volume, pulp volume), scanning electron microscopy (SEM), SEM-EDX (energy-dispersive X-ray), microhardness test, and histological image (H-E staining and Immunohistochemistry against MMP-20).

RESULTS:

Mice treated with NaF displayed enamel hypoplasia in mandibular incisors manifested as chalky white enamel and white spots. Micro-CT image revealed that high-dose NaF caused external root resorption (4/4). Parameters of dentin mineralization (dentin mineral density, dentin volume and dentin thickness) were significantly decreased compared to the control (NaF 0 ppm). Pulp volume was significantly increased than control group. SEM images showed the wider predentin and abnormalities of secreted calcified matrix vesicles derived from odontoblasts in the high-dose group (NaF 125 ppm). Elemental analysis by SEM-EDX showed characteristic elemental distribution depending on NaF concentration. Vickers microhardness values of dentine significantly decreased in the high-dose group compared to the control. Fluoride-induced enamel and dentin hypoplasia were shown concentration dependence of NaF. In the histological evaluation of the dentin-pulp complex, MMP-20 (an odontoblast marker) positive cells, wider predentin, and inflammatory-related cell infiltration were observed.

Fluorine-induced dentin dysplasia revealed by microstructural analysis was similar to the dentin structure of hypophosphatasia. Fluoride is also known as a phosphatase inhibitor. In the future, we will elucidate the mechanisms of fluoride-mediated dentin dysplasia focusing on the relationship between fluoride and alkaline phosphatase.

CONCLUSIONS:

This study is the first report to provide evidence of fluoride-induced dentin hypoplasia and the detailed microstructural analysis in a mouse model. Unlike enamel formation, dentin formation is a lifelong event and the time period to be aware of is not limited to childhood. Although optimal fluoride is beneficial for caries prevention, this study suggests the potential adverse effects of excessive fluoride on dentin-pulp complex as well as enamel.

SUPPORT:

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TYPE H VESSEL FORMATION DECREASES IN THE DEVELOPMENT OF LIGATURE-INDUCED PERIODONTITIS IN MICE

Shindo, R., Shindo, S., Park, Y., Voudouris, J., Nakamura, S., Heidari, A., Pastore, M.R., Kawai, T.

OBJECTIVES:

Periodontitis is characterized by irreversible inflammatory bone resorption caused by polymicrobial infection. Type H vessels were recently identified in bone tissue as specialized microvascular structures closely related to bone formation. Vascular endothelial cells (ECs) with type H phenotype, characterized by the expressions of CD31, a marker of vascular differentiation, and Endomucin (EMCN), which is found in highly vascularized bone tissues, cause a coupling between angiogenesis and osteogenesis. Although type H vessels are also found in normal alveolar bone, the expression pattern and role of type H vessels in the context of periodontitis is totally unknown. Therefore, this study aimed to investigate the expression pattern of type H vessels in a ligature-induced mouse model of periodontitis.

METHODS:

Silk ligature (5-0) was placed in the murine second maxillary molar for 7 days to induce periodontitis. Gene expression associated with inflammation in gingival tissue was monitored by qPCR. A micro-CT was employed to evaluate bone resorptive activity. Tissue clearing technology (X-clarity) was used to monitor CD31 and EMCN double-positive vascular formation in alveolar bone. Immunofluorescence-based whole tissue labeling was performed to detect CD31 and EMCN in murine alveolar bone. Images were obtained by confocal microscopy (Zeiss, LSM880). Primary culture of murine bone marrow-derived ECs was purchased from Cell Biologics. The effect of TNF-α (100 ng/ml) or IL-1β (100 ng/ml) on the expression of protein or mRNA for EMCN in ECs was monitored by qPCR or flow cytometry.

RESULTS:

Ligation of silk to the maxillary second molar for 7days significantly upregulated bone resorption, as well as levels of IL-1β and TNF-α mRNA expression in murine alveolar bone and gingiva ($P<0.05$). Vascular formation double-positive for CD31 and EMCN was downregulated in ligature-induced periodontitis, whereas the generation of vessels positive for CD31 alone was observed in gingival tissue. TNF-α or IL-1β stimulation to ECs decreased the production of EMCN protein, but not CD31 protein ($P<0.05$). The latter finding was further confirmed by flow cytometry.

CONCLUSIONS:

Our results show that the inflammatory response induced in PD may be associated with the diminished expression of EMCN in CD31+ microvessels in PD lesion, suggesting that type H vessel formation is attenuated in response to the induction of PD. Future studies will focus on approaches to restore type H vessel formation in PD in an effort to induce bone regeneration in the affected alveolar tissue.

SUPPORT:

This study was supported by NIH grants DE-027851, DE-028715, DE-029709, DE-032907 and GM-150469.

COBINAMIDE, A VITAMIN B12 PRECURSOR, INHIBITS INFLAMMATION AND RANKL-MEDIATED OSTEOCLASTOGENESIS

Pastore, M.R., Shindo S., Nakamura S., Castellon M., Bontempo A., Heidari A., Deth R., Kawai T.

OBJECTIVE:

Emerging evidence supports that prescription metformin, used to treat high blood sugar, is a prime factor associated with vitamin B12 (Cobalamin) deficiency among patients with type-2 diabetes which is also a well-known risk factor for periodontitis. Cobalamin, a water-soluble vitamin with a rare metal cobalt, reportedly possesses anti-inflammatory effect. However, the effect of cobalamin on inflammatory periodontitis is largely unknown. Interestingly, cobinamide, a late precursor in cobalamin biosynthesis, lacks the dimethylbenzimidazole tail present in Cobalamin. Accordingly, cobinamide is smaller in size and more positively charged compared to Cobalamin, suggesting that cobinamide may exhibit a stronger anti-inflammatory effect than that of cobalamin. Therefore, this study aimed to examine the anti-inflammatory and anti-osteoclastogenesis effects of cobalamins, in comparison to cobinamides, with implications for the development of novel therapeutic drugs.

METHODS:

THP1 human monocyte-like cells were stimulated with or without LPS (E. coli) in the presence or absence of 3 different subtypes of cobinamides (2OH-Cbi, Me-Cbi, and 2CN-Cbi; 10, 50, 100 ug/ml, respectively) or cobalamins (OH-Cbl, Me-Cbl, and CN-Cbl; 10, 50, 100 ug/ml, respectively). ELISA monitored IL-1β and IL-18 produced by THP1 and HL-60 cells and IL-6 and TNF-α produced from THP1 cells. A q-PCR was employed to monitor Il-1β, Il-18, Il-6, tnf-α, nf-kb1, nf-kb2 and cox-2 mRNA expression in THP1 stimulated with or without LPS in the presence or absence of 2OH-Cbi. Immunofluorescence and confocal microscopy were used to investigate the nuclear localization of NF-kB p65 in THP1 cells. Murine RAW264.7 macrophage-like cells were stimulated with or without RANKL (1 ng/ml) in the presence or absence of 3 different subtypes of cobinamides or cobalamins. Osteoclastogenesis and resorption pit formation were evaluated after 4 days for TRAP staining and after 7 days for the pit formation assay. A q-PCR was conducted to quantify oc-stamp, dc-stamp, cathepsin-k, nfatc1, mmp9, acp5, and nf-kb1 mRNA expression in RAW264.7 cells primed with or without RANKL in the presence or absence of various concentrations of 2OH-Cbi. Cell proliferation was investigated using WST-8 assay. Statistical analysis was performed by ANOVA, followed by Tukey post-hoc tests.

RESULTS:

Exposure of THP1 cells to 2OH-Cbi significantly decreased LPS-dependent and -independent production of IL-1β, IL-18, IL-6 and TNFa ($P<0.05$). Me-Cbi reduced IL-1β and IL-6 production from LPS-stimulated THP1 cells ($P<0.05$), whereas OH-Cbl suppressed only IL-1β production from LPS-stimulated THP1 cells ($P<0.05$). 2OH-Cbi downregulated Il-1β, Il-6, tnf-α, nf-kb1, and cox-2 mRNA expression in LPS-stimulated THP1cells.

According to fluorescence confocal microscopy, LPS-dependent induction of NF-kB p65 nuclear translocation was remarkably suppressed by treatment with 2OH-Cbi compared to THP1 cells stimulated with LPS alone. Moreover, 2OH-Cbi, 2CN-Cbi, 2OH-Cbl and Me-Cbl significantly suppressed RANKL-induced osteoclastogenesis ($P<0.05$). However, RANKL-induced pit formation was suppressed only by 2OH-Cbi ($P<0.05$). Expression patterns of oc-stamp, nfatc1, mmp9, acp5 and nf-kb1 mRNAs in RANKL-stimulated RAW264.7 cells were downregulated by 2OH-Cbi ($P<0.05$). Acp5 and nfatc1 mRNA expression decreased in RAW264.7 cells, even without RANKL stimulation.

CONCLUSION:

The results demonstrated that both cobinamides and cobalamins downregulated inflammation and RANKL-induced osteoclastogenesis, whereas only 2OH-Cbi suppressed pit formation by osteoclasts. A decrease of NF-kB1p65 nuclear translocation in THP1 stimulated with LPS indicated that 2OH-Cbi might act on upstream cell signaling. Future studies will elucidate the molecular mechanism underlying 2OH-Cbi-mediated anti-inflammatory activity and anti-osteoclastogenesis effects.

SUPPORT:

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HIGHLY ANTIGENIC NOVEL SOLUBLE HIV-1 CLADE C 1086.C ENV TRIMER VACCINE CANDIDATE.

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There is an accruing body of evidence that suggest that an HIV-1 envelope glycoprotein-based vaccine that can elicit broadly neutralizing antibodies (bnAbs) or anti-V2 apex antibodies that mediate ADCC that are likely to be effective against HIV. We generated a novel HIV-1 transmitted-founder (T/F) clade C 1086.c SOSIP gp140 trimer as a vaccine immunogen. In a comprehensive antigenicity study, the 1086.c SOSIP trimer bound with considerable affinity to 16 of 19 bnAbs that recognize conserved epitopes in the V2 apex, CD4 binding site, and V3/glycan patch. The 1086.c SOSIP trimer overall exhibited a complementary antigenicity profile with BG505 SOSIP.664 trimer, but a similar antigenicity profile for certain bnAbs. Distinct from previously constructed trimers, the 1086.c SOSIP trimer displayed potentially protective epitopes in the V2 apex that were recognized with high affinity by functional RV144-related V2p antibodies. Interestingly, the PG09 bnAb as well as the RV144-related CH58 and CH59 antibodies bound strongly to the 1086.c SOSIP trimer, suggesting that the trimer contains a dynamic V2 apex structure. The observed preferential binding of anti-V2 apex bnAbs including the 4trimer-specific PGT145 as well as V2p antibodies to the 1086.c SOSIP trimer over the 1086.c gp120 and gp140 non-trimer counterparts underscores the fundamental role of the native trimer structure in the proper presentation of not only bnAb epitopes but also potentially protective V2p epitopes. Fine structural analysis of the 1086.c SOSIP trimer's dynamic V2 apex and preclinical assessment of the novel trimer's ability to elicit bnAb and potentially protective non-neutralizing anti-V2 apex antibody responses are warranted.

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ACTIVATION OF PIEZO1-EXPRESSED IN ENDOTHELIAL CELLS PROMOTES TYPE-H VESSEL POLARIZATION IN PERIODONTITIS

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OBJECTIVES:
Type H blood vessels, characterized by the CD31 and Endomucin (EMCN) double positive endothelial cells (ECs), are involved in promoting bone regeneration. Piezo1 mechanosensitive receptor, expressed in ECs, plays a crucial role in angiogenesis and homeostasis of vasculature. However, the role of Piezo1 expressed in ECs in type H vessel formation in periodontitis remains elusive. We aim to establish that Piezo1 activation in ECs induces type H vessel polarization, which in turn inhibits osteoclast infiltration in periodontitis.

METHODS:
bEnd.3 ECs were obtained from ATCC. ECs were stimulated with Yoda1 (10 uM), a Piezo1 chemical activator. For loss of function assay, siRNA specific for Piezo1-silenced ECs were stimulated with shear stress generated by a microfluidics system (ibidi). The expression of CD31 and EMCN was determined by flow cytometry and immunofluorescence. Type H vessel markers, HIF-1a and VEGF mRNA expressors, were measured by qPCR. Both Yoda1-mediated tube formation as well as adhesion ability between Yoda1-treated ECs and RAW264.7 cells were evaluated. To determine the effect of Yoda1 administration on bone type H vessels in periodontitis, ligature-induced periodontitis of mice was employed.

RESULTS:
Yoda1 treatment induced CD31 and EMCN double positive cells, along with HIF-1a and VEGF mRNA expression in ECs ($P<0.01$). siRNA for Piezo1 counteracted HIF-1a and VEGF mRNA expression induced by shear stress ($P<0.01$). Yoda1 upregulated both tube and branch formation in ECs ($P<0.01$). Yoda1 treatment against ECs inhibited RAW264.7 cells' adherent activity ($P<0.01$). Finally, type H vessel formation was diminished in periodontitis of mice, while Yoda1 systemic administration upregulated both bone formation and the number of CD31 and EMCN double-positive cells ($P<0.01$).

CONCLUSIONS:
Our study demonstrated that Piezo1 activation induced type H vessel polarization in ECs, indicating that induction of type H vessels by Piezo1 activation might be a novel therapeutic approach for bone regeneration in periodontitis.

SUPPORT:
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INCORPORATION OF TECHNOLOGY IN ORAL SURGERY THROUGH THE VESALIUS MOBILE APP FOR ORAL AND DENTAL SURGICAL PLANNING AND TREATMENT.

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OBJECTIVE:

To evaluate the dental professional's perception of the effectiveness of the mobile application "Vesalius" when incorporated in oral surgery, for planning and oral/dental surgical treatment.

METHODOLOGY:

A 15 closed-question questionnaire was administered to dental students and faculty of the Universidad Iberoamericana (UNIBE) Dental School in Dominican Republic during May-August 2020. The questionnaire consisted of three sections:

- Section 1: Demographic information (gender, location, types of smart devices, internet access, dental app usage)
- Section 2: Student perception of dental education with respect to dental apps
- Section 3: Student perception of the ideal dental app and recommendations

The questionnaire's reliability was assessed using Cronbach's alpha with a value of 0.977014, considered in the "excellent" range, indicating the validity and reliability of the survey instrument. A five-point Likert Scale was used to score each question. A numerical value was assigned for this: 1. Totally disagree; 2. Disagree; 3. Unsure; 4. Agree; and 5. Totally agree. A total of 48 participants completed the survey. Responses were extrapolated to Exel and descriptive analysis was conducted.

RESULTS:

The majority of participants were female (73%) between the ages of 18-24 (65%). Most participants used Apple devices (80%) and had access to Wi-Fi (71%).

The most useful areas of the app were identified as "Drugs" (45% agree, 37% strongly agree) and "Flap" (46% agree, 18% strongly agree).

CONCLUSIONS:

Participants were generally positive about the Vesalius application, finding it to be a helpful tool for identifying forceps and medications and a valuable resource for overall oral surgery education.

SUPPORT:

This study was unfunded.

LOCAL INFLAMMATORY BONE RESORPTION FROM LIGATURE-INDUCED PERIODONTITIS ACCELERATES OSTEOCLAST ACTIVITY IN SYSTEMIC BONE MARROW

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OBJECTIVES

It is well established that periodontal disease (PD) and Rheumatoid arthritis (RA) are inflammatory bone lytic diseases (IBLDs), each a risk factor for the other. Importantly, emerging theory supports that secondary effects of periodontitis indirectly promote the inflammatory bone resorption induced in RA. Two working hypotheses accounting for the above noted theory were established, including,1) dysbiosis of gut microbiome caused by periodontal pathogens, such as P. gingivalis, results in diffusion of gut microbial inflammatory metabolites to peripheral joint bones, 2) maladaptive innate immune training of myelopoiesis, especially neutrophils, in PD lesion upregulates the proinflammatory responses in peripheral joint bones. Osteoclasts (OCs) derived from hematopoietic stems cells that possess biphasic characteristics of bone cells (bone resorbing function) and innate immune cells (inflammatory cytokines production) play key roles in both homeostatic bone remodeling in healthy bone and pathogenic bone resorption in IBLDs. To date, however, the role of osteoclasts (OCs) has been overlooked as an etiologic contributor in PD-associated RA. Therefore, it is herein hypothesized that induction of PD could alter the capacity of OC-precursors in femur bone marrow (BM) to differentiate into mature OCs, which was tested in the present study by ex vivo examination of pre-OCs isolated from BM of a ligature-induced PD (LIP) mouse model.

METHODS

A silk ligature (5-0) was placed in the murine second maxillary molar for 28 days to induce the chronic phase of periodontitis. Bone resorption was evaluated by micro-CT, and qPCR was conducted to monitor the gene expression associated with inflammation, as well as OC-genesis. BM mononuclear cells (BMMCs) were isolated from femur and tibia bone marrow in control or LIP group, followed by the application of MCSF with or without RANKL to induce OC differentiation. TRAP staining, pit formation assay, and qPCR were performed to assess OC activity.

RESULTS

Silk ligature attachment for 28 days induced significantly elevated periodontal bone resorption, as well as gene expression levels of both inflammatory cytokines (Il1b and Tnf) and OC-associated genes (Ocstamp, Mmp9 and Acp5) in murine gingiva ($P<0.05$). BMMCs isolated from PD mice (Day 28) had a higher capacity for ex vivo RANKL-induced OC-genesis and pit formation compared to BMMCc isolated from control mice. In addition, the expression of OC-related genes, including Ocstamp, Acp5 and Mmp9, was higher in RANKL-primed PD-BMMCs than that of control-BMMCs ($P<0.01$). Moreover, MCSF stimulation alone upregulated Il1b expression, not Tnf, from PD-BMMCs compared to control-BMMCs ($P<0.01$), suggesting the proinflammatory response by BMMC is also augmented in the BM of mice induced of PD.

CONCLUSIONS:

These results demonstrated that PD induced in mice can affect the responsiveness of BMMCs in peripheral bones to RANKL-induced OC-genesis, as well as MCSF-induced expression of proinflammatory Il1b. While the molecular mechanism underlying the discovered phenomenon remains elusive, the finding clearly suggested that PD can affect OCs localized in BM of peripheral bones. Future studies will determine if such PD-dependent dysregulation of pre-OCs in BM can contribute to the pathogenicity of RA.

SUPPORT

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