Title: Mechanical Properties of Azobenzene Nanogel Additives in Adhesive Resins
Kasra Roostan*, Elise Ambrose*, Dixa Gautam, Gannon M. Kehe, and Devatha P. Nair

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Purpose: Composite restorations most commonly fail is due to a weakened bonding interface, leading to recurrent caries and loss of tooth function. More than 50% of all composite restorations are replaced, costing time, money, and additional resources. This study characterizes the mechanical properties of methacrylated azobenzene nanogels (AB-NG) within conventional bonding resins that are designed to enhance the toughness of the bonding interface.

Methods: AB-NG were dispersed in a 60:40 UDMA: HEMA (urethane dimethacrylate: hydroxyethyl methacrylate) bonding formulation and polymerized using a combination of self-cure and photoinitiators: benzoyl peroxide, dimethyl-p-toluidine, 2,2-Dimethoxy-2-phenyl-acetophenone and camphorquinone and ethyl 4-N,N-dimethylaminobenzoate. Bars of 2mm x 2mm x 25 mm (n =5) with two different concentrations (1 wt.% and 2.5wt%) of AB-NG were formulated to test the modulus, ultimate tensile strength, and toughness using three-point bending tests on the Materials Testing Systems. For the microtensile bond strength tests (µTBS), tooth samples were acid-etched (Scotchbond Universal Etchant, 3M ESPE, 20 s) before the bonding resin with/without the AB-NG was placed and polymerized for 20 seconds. Composite build-up using Filtek Z-100 (3M ESPE) was constructed (2 mm in height, 2 layers) on top, and subsequently, teeth were cut into 2 mm by 2 mm sections to determine µTBS.

Results: The 2.5wt.% AB-NG/UDMA/HEMA showed a 5-fold increase in flexural strength in comparison to the control, while the ultimate tensile strength increased by ≥ 3X. The toughness showed a 6-fold increase in comparison to the control. All these values were significantly different with P<0.0001.

Conclusion: The results indicate that low concentrations of AB-NG combined can dramatically enhance the toughness and strength of conventional bonding resins such as UDMA/HEMA. Future work will establish the conditions by which AB-NG can enhance bioadhesion within the hybrid layer via additional crosslinking and stabilize the resin-tooth interface in the oral physiochemical environment.
Title: In vitro evaluation of the apical sealing ability of Endo Seal MTA and BioRoot RC root canal sealers in comparison with resin sealer.
Sirisha Ganguru, Vandana Duggirala, JVN Sravanthi

**Purpose:** The aim of this study was to compare and evaluate the apical sealing ability of AH Plus, Endo seal MTA and Bio Root RCS sealers in root-filled teeth.

**Methods:** Forty-five extracted single-rooted human premolars were biomechanically prepared and randomly divided into three groups according to the root canal sealer. Group I- Endo seal MTA, group II- AH plus, group III- BioRoot RCS sealer. Roots were then immersed in 50% silver nitrate solution for 24 hours and were exposed to fluorescent light for 8 hours; sectioned longitudinally to observe the depth of dye penetration under a stereomicroscope.

**Results:** Statistical analysis was done using one-way Analysis of Variance (ANOVA) and Tukey’s Honest Significant Difference (HSD) tests. The highest microleakage values were observed in Endo Seal MTA group(7.12mm) and the least values were observed in AH plus sealer (3.77) group.

**Conclusion:** Within the limitations of the in-vitro study, the apical sealing ability in decreasing order was AH plus sealer, BioRoot RCS sealer and Endosteal MTA sealer.
Purpose: The recent development of a series of novel tetraurethane di(meth)acrylate monomers produced photocurable resins with the unique potential to combine exceptionally high mechanical strength with extreme resilience and toughness. One resin formulation based on a tetraurethane diacrylate (TUDA) example of these new monomers demonstrated the unexpected ability to achieve unusually high conversion under ambient photocure conditions while also providing a very high modulus polymer. The current study characterizes a composite material prepared with this interesting resin.

Methods: The TUDA resin and a BisGMA/TEGDMA (BT; 7:3 by mass) control resin were combined with silane surface-treated barium aluminosilicate glass filler (0.7 μm; 60 wt%). These composite pastes were photocured (365 nm; 100 mW/cm²) at room temperature with the degree of conversion measured by FT-IR and polymeric flexural strength and modulus obtained in three-point bending of n=7 samples.

Results: The photocured BT composite reached a conversion of 64.6±0.4 % with a flexural modulus of 6.3±0.3 GPa and strength of 145.7±8.7 MPa. Corresponding analyses applied to the photocured TUDA composite provided values of 90.0±2.1 %, 9.9±1.3 GPa and 202.0±23.2 MPa, respectively, which all show highly significant statistical differences. Notably, the TUDA composite displayed higher stress and strain values compared to the BT composite. Further study focused on the markedly increased resilience and toughness of this TUDA composite despite its higher modulus with respect to the BT composite will be reported.

Conclusions: While methacrylate functional analogs of the TUDA resin were found to produce polymers with even higher mechanical properties following a thermal post-cure process, the TUDA resins appear particularly well suited to delivering photopolymers of remarkably high conversion and with impressively robust mechanical properties as a highly filled composite material.

Funding Source: NIH/NIDCR R21DE028444
Title: Impact of COVID-19 Pandemic on Emergency Pediatric Dental Care  
Olivia Hautamaa, Vidisha Sharma, Kaci Pickett, Chaitanya Puranik

**Purpose:** This retrospective study evaluated the impact of the coronavirus pandemic on the dynamics of emergency dental care at a Children’s Hospital in Colorado.

**Methods:** Electronic medical-dental records of children (0-18 years) reporting to the Children’s Hospital Colorado for pediatric dental emergencies between December 2018-December 2020 were randomly selected. The number, type, and factors associated with emergency visits during were assessed for all emergencies reported during the pandemic and a comparable pre-pandemic period from the prior year. Demographic information was reported in percentages or mean±SD. Group differences were tested via t-test or Kruskal-Wallis test for continuous variables and Chi-Squared test or Fisher’s Exact tests for categorical variables. Alpha value was set at 0.05.

**Results:** Two hundred and forty charts were randomly selected for the pre-pandemic and pandemic period. During the pandemic, 52 percent of cases were reported for odontogenic infection. This was a decrease as compared to the year prior (56.4 percent). Similarly, 45 percent cases reported for trauma during pandemic while only 40 percent cases reported for trauma in the pre-pandemic period. There were no differences in race, ethnicity or number of miles traveled for dental care. The selection of advanced behavior management modality by the dental provider seemed to be unaffected by the pandemic.

**Conclusions:** The dynamics of emergency dental care at the children's hospital were unchanged during the pandemic with a comparable number of patients reporting for emergent care. There were no significant changes in dental management modalities due to the pandemic.
Title: Accuracy of Surgical Prediction Following Mandibular Advancement- A comparative study between manual and digital cephalometric tracing
Venkata Naga Sravanthi Jonnalagadda, Sirisha Ganguru, Vandana Duggirala.

Purpose: The aim of this study is to evaluate the accuracy of newer computerized software (Onyx Ceph 3TM) in comparison with the manual method for predicting hard tissue and soft tissue profiles following mandibular advancement.

Materials and Methods: This is a retrospective cephalometric study of fifteen Class II skeletal subjects who had undergone mandibular advancement by bilateral sagittal split osteotomy. The cephalograms were converted into a digital format using a flatbed scanner (Epson V700 Perfection). The prediction for mandibular advancement was done using Onyx Ceph 3TM and compared with manual tracings made on acetate paper. A total of fourteen variables were compared, of which seven were hard tissue, and seven were soft tissue. Both angular and linear measurements were considered.

Results: Onyx Ceph 3TM software overestimated mandibular advancement showing significant differences in OP-SN_M, Sella-Nasion-point B_D, N-Pog_D. The comparisons between the manual and digital error showed statistically significant differences in N-Pog (P = 0.013), Li – L1 (P = 0.043) Sn-Gn’-C (P = 0.052), and G-Sn-Pog’ (P < 0.001). The margin of error was more in soft-tissue prediction performed digitally than manually.

Conclusions: The prediction error was more in soft-tissue prediction performed digitally than manually. Onyx Ceph 3TM algorithms set for soft tissue have not matched the actual postsurgical treatment. Further, this software overestimated the mandibular advancement and has not accounted for the rotational movement associated with mandibular surgery.

Abbreviations:
OP-SN_M: The angle formed between occlusal plane and SN plane in manual method.
Sella-Nasion-point B_D: In Digital method.
N-Pog_D: The distance between pogonion point and perpendicular drawn to Frankfort horizontal plane through Nasion in digital method.
Li – L1: Lower lip thickness – The distance between Li and most prominent point on the labial convexity of lower incisor
Sn-Gn’-C: Lower face – Throat angle. The angle formed between S-Gn’ and C-Gn’
G-Sn-Pog’: Facial convexity angle. The angle formed between G-Sn and Sn-Pog’. 
Title: Medical-Dental Integration Models: A Critical Review of Success and Barriers
Maxim Kondratenko, Jennifer Stobbs-Vergara, Nihmath Nasiha, Tamanna Tiwari

Objective: The relationship between systemic health and oral health is well demonstrated, however, the evidence for Medical-Dental Integration Models (MDIs) has not been extensively reviewed. We are conducting a critical review focused on understanding how integrated care and the MDI model have been delivered for the past ten years. The study will report the successes and failures of current models and highlight future opportunities for medical-dental integration from systems thinking approach.

Methods: We performed a literature search in the PubMed database using a combination of relevant public health and interprofessional subject headings (Mesh) and keywords: (“Delivery of Health Care, Integrated”[MeSH])AND“Oral Health”[MeSH]), (“Delivery of Health Care, Integrated”[MeSH] AND(Dental Health Services)[MeSH]), (medical-dental integration), (safety net clinics AND dental AND primary care). Additional search strategies were used in Google Scholar for pertinent grey literature:(medical-dental integration). We found 350 publications, of which 155 titles were considered relevant. The authors have used a systems-mapping technique and qualitative approach to tease out the themes and focus areas that describe sustainable changes in MDI and barriers to achieving this integration.

Results: After data extraction from the MDI studies and reports, this review emphasizes the recurring themes. The biggest challenges of implementing MDI involved changing provider perspectives and a lack of electronic health record (EHR) interoperability. Additionally, this review found that sustainable change comes from the system-wide policy change, with interprofessional education (IPE) at the forefront of this movement. The results also revealed that most of the pilot MDI programs were funded externally, targeted high-risk populations or children, and don’t measure the effectiveness of their integration projects.

Conclusion: The results from our review can be used to shape medical and dental education reform and inform policymakers of the benefits gained from MDI models.
Background: The goals of this project were to identify School-based health centers (SBHCs) that had either decreased or reduced oral health (OH) services due to the COVID-19 pandemic, understand their OH service goals upon post-pandemic reopening, and provide educational resources for staff, students, and families that increase student OH outcomes upon reopening.

Methods: A survey of Colorado’s 65 SBHC was conducted to understand their capacity to offer OH services and to evaluate readiness and commitment to project goals. Of the five SBHC that were selected, two were rural and one was without any dental services. Individual interviews were conducted to understand which OH services the SBHC wanted to offer upon reopening and determine the specific educational resources needed to ensure services were implemented successfully. After the interviews, a virtual convening with all five SBHC was conducted to discuss the results of the interviews, provide details and answer questions about the project, share the topics of the resources that would be created, and discuss how these resources could be accessed.

Results: The results of the individual SBHC interviews and the convening revealed the need for educational tools; videos and written materials created in English and Spanish designed for a variety of audiences, including medical and dental providers, students, and families. The resources, developed by faculty and students cover an array of OH topics, including how to treat common dental emergencies, children’s oral health, fluoride varnish application, and the importance of healthy food choices.

Conclusions: This project sought out the needs of five SBHC (both rural and urban) that were greatly affected by the pandemic. Resources were developed and are being utilized by all SBHCs.
Title: Antimicrobial Synergy Between Cranberry and Manuka Honey Against *Streptococcus mutans*
Alisha Evangeline Prince, David McDonald, Wichita State University, Kansas.

**Purpose:** Sometimes, when two products are used together, they yield a more powerful antimicrobial effect than the anticipated additive effect. These synergistic combinations are often better treatment options because individual agents may not have sufficient antimicrobial action to be effective when used alone. Cranberries contain phenolic compounds like proanthocyanidins (PAC) that disrupt biofilm formation. Manuka honey has high concentrations of methylglyoxal (MGO), which is cariostatic. Because these agents have varied modes of antimicrobial action, they show potential for possible synergistic effects when paired. This work aims to determine antimicrobial synergy between cranberries and manuka honey against *Streptococcus mutans* and thus explore their potential as an alternative or adjunctive anti-caries therapy.

**Methods:** Five cranberry extracts were tested pairwise with manuka honey (n=20) and MGO (n=20) by agar well-diffusion assays. By comparing zones of inhibition around the wells with individual extracts and the extracts in combination using ANOVA and posthoc Tukey tests, synergistic combinations were determined. Each well diffusion assay was repeated three times. Serial dilutions of extracts were added to 96-well plate checkerboard assays. Synergy was determined by finding the minimum inhibitory concentrations (MIC) and fractional inhibitory concentrations (FIC) of each agent. Each checkerboard assay was repeated three times.

**Results:** Synergy was demonstrated between the resin extracts of cranberry when tested with manuka honey and MGO. In the well diffusion assay, zones of inhibition around the cranberry-manuka honey combination wells and cranberry-MGO combination wells were larger than those around the cranberry and manuka honey wells, respectively. This difference was statistically significant (p < 0.0001) and repeatable. These combinations had mean FICs less than 1 in checkerboard assays, indicating synergy.

**Conclusion:** The synergistic combinations found in this research appear to be good candidates for fighting dental plaque and caries.
Title: Social Deprivation and Dental Caries: How are they related?  
Juan Rodriguez, Tamanna Tiwari

Background: Oral health is influenced by social determinants of health, predisposing individuals, and communities at risk for developing dental caries. Factors related to a higher risk of dental caries include lower socioeconomic groups, systemic diseases, education levels, race/ethnicity, and upstream variables. Identifying relationships between these components could improve our current predictive models and promote a person-centered care approach to treat individuals and design approaches to increase access to care. This study evaluated the association between caries risk in adults and social determinants of health such as zipcodes, systemic diseases, payment methods, and race/ethnicity as an initial step in fulfilling some of these knowledge gaps.

Methods: The BigMouth dental data repository was used to extract all the clinical and social determinants data (n=48,649). The zipcode data was merged with the social deprivation index, which is a composite measure of area-level deprivation based on seven demographic characteristics collected in the American Community Survey.

Results: The results demonstrated that the adjusted odds of being in the high caries risk group compared to low caries were higher for individuals in the age group of 49-64 years (aOR=2.24, CI 2.08,2.40, p= <0.001), males (aOR=1.19, CI 1.13,1.25, p= <0.001), individuals who had comorbidities, (diabetes and cardiovascular disease) and individuals who were in more than 76th percentile of social deprivation index (aOR=2.39, CI 2.21,2.58, p= <0.001). Additionally, in a subgroup analysis, American Indians, Alaska Natives, and Pacific Islanders had higher odds of high caries risk compared to medium risk than other races (aOR=1.28, CI 1.05,1.56, p= <0.014).

Conclusion: This study demonstrates the association of caries risk with higher social deprivation – reinforcing the role of structural and upstream factors in oral health.
Title: Impact of Training Modality on Integrated Electronic Medical and Dental Records Competency.
Amanda Slavik, Chaitanya Puranik, Kaci Pickett,. Aditee Dani,. Zora Generalowich, Lindsay Neveaux, Tracy de Peralta,

Purpose: The American Recovery and Reinvestment Act provided incentives for the adoption of electronic health records. The integrated electronic medical-dental records (iEMDR) can minimize healthcare charting errors and negative outcomes. The use of iEMDR by healthcare students requires training and competence. There are no defined student competencies to assess the effective and responsible use of iEMDR in dentistry. The goal of this study was to propose a student competency model and study the impact of iEMDR training modalities.

Methods: This study retrospectively evaluated the assessment scores (AS) and performance scores (PS) in the student cohorts (stratified as domestic or international students) that received remote or in-person iEMDR training. Independent sample t-test determined the differences in the cohorts and Chi-square tested for the difference in the student-perception regarding preparedness. Statistical significance was set at 0.05.

Results: The sample size (N=240) provided 95% power to detect differences in the cohorts. AS was not impacted due to the training type ($P=0.90$) while PS was higher in international students after remote training ($P<0.001$). A higher proportion of students reported preparedness after remote vs. in-person training ($P<0.001$).

Conclusion: The iEMDR competency model was successful to test effective and responsible use of iEMDR and remote training improved student self-perceived preparedness.
Title: Low Viscosity, High-Performance Urethane Formulations Designed for 3D Inkjet Printing
Kyle Sorensen, Austyn Salazar, Matthew Barros, Rob MacCurdy, Jeff Stansbury

Purpose: 3D Inkjet printing technology allows for spatially distributed variations in compositions, properties, and esthetics through multi-material jetting. Current commercially available inks have limited strength and toughness. Our lab has developed novel urethane monomers & coordinating diluent comonomers as jettable inks with extremely low viscosity and robust mechanical properties.

Methods: A series of novel mono-urethane di(meth)acrylate (MUDMA) monomers were synthesized. Urethane dimethacrylate (UDMA) monomer and polymers were used for comparison. Ambient temperature monomer and formulated ink viscosities were measured with a viscometer. Flexural test specimens (n=8) of mold-formed, photocured homo- and co-polymer materials were prepared by UV irradiation (365 nm at 100 mW/cm²) followed by photo/thermal post-curing. The polymeric degree of conversion & kinetics were assessed by FT near-IR spectroscopy. Polymer samples were submitted to mechanical testing in three-point bending to obtain strength, modulus, and toughness.

Results: MUDMA monomers offered viscosities more than 100-fold lower than UDMA in the range of 28 to 70 mPa·s. When paired with MAA comonomer, the UDMA/MAA composition showed a dramatic decrease in viscosity but the UDMA/MAA resin was still an order of magnitude greater in viscosity than that available with the MUDMA/MAA inks. In nearly all cases, the MUDMA/MAA copolymers exceed mechanical properties of UDMA and were statistically equivalent to the UDMA/MAA polymer in terms of strength and modulus but notably provided substantially enhanced toughness results compared with UDMA-based polymers.
Conclusion: Novel MUDMA/MAA inks offered extremely low viscosities within the jettable range for 3D inkjet printing while also providing exceptional mechanical properties that outperform current commercially available options by Stratasys. These MUDMA/MAA inks demonstrated the potential to advance the applications of 3D inkjet printing by providing high-strength materials that may be used in monolithic printing of functionally graded & biomimetic intraoral appliances.

Category: Dental Students and ISP Students
Poster # DSISP 12

Title: A Study Of Risk Factors and Disparities in Oral Cancer Examination In The United States: NHANES 2015-2016
Shruthi Srinivasan and Dr. William Sappenfield, MD, MPH, CPH, USF College of Public Health

Purpose: Oral Cancers are the sixth most common cancer in the world. Approximately 40-60% of patients present with late-stage disease in the United States and the
screening rates are quite poor. As a result, it is important to identify individuals at risk for not getting an Oral Cancer Screen and address these disparities. This study intends to identify this across several factors—sociodemographic, behavioral, medical, and access to care.

**Methods:** Participants above 30 years, with a response to the ‘Oral Cancer Examination’ question from the NHANES 2015-16 survey were selected. Using SAS

*Figure 1:* A stepwise depiction of the sample size for each Model and the percentage of entries excluded from each analysis.
9.4, Survey procedures for frequency, bivariate and multivariate analysis was performed to identify the association between Oral Cancer Examination and selected risk factors, stratified by gender and last dental visit. Survey-logistic regression estimates were reported as Odds Ratios (ORs) and 95% CI. See Figure 1 for the stepwise depiction of sample size and modeling.

**Results:** Overall, about 28-32% of individuals reported receiving an Oral Cancer Exam. Those who visited a dentist in the past year reported higher odds of receiving an exam [OR=3.2 (2.4, 4.3)]. Racial groups besides Non-Hispanic Whites, the less educated and low-income individuals were significantly less likely to receive an Oral Cancer exam compared to their reference groups.

**Conclusion:** This study helped identify individuals at risk for not being screened and helps inform us about communities, public health practitioners and clinicians need to focus on. Future research needs to focus on understanding factors such as HPV infection amongst men, dental insurance and timeframe of oral cancer screen.