Celebrating Excellence and Achievement in Research

2014–2015 Research Abstracts
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HISTORY OF BATES-ANDREWS DAY

Since the 1930s, this day is held annually to honor George A. Bates, an alumnus of Tufts University School of Dental Medicine, who taught Tufts medical and dental students. He was regarded by his students as an inspiring instructor in histology. Bates Day at TUSDM helps to promote student research and thereby enhance the opportunities for professional growth of our students, alumni, and faculty.

The Robert R. Andrews Society is a student-run organization formed in 1921 in honor of Dr. Andrews, an outstanding researcher and distinguished dental surgeon. The Andrews Society seeks to promote dental research and to honor those who excel in it.

MESSAGE FROM THE DEAN

Welcome to Bates-Andrews Day 2015, a showcase of our predoctoral and postgraduate students’ research activities. This year’s event will be one of the largest, with 72 student poster presentations. We appreciate your attendance and support of our students’ efforts.

We are very pleased to have as our Keynote Speaker, Dr. Ancy Verdier, A96, D03, DG06, who is expected to present “The Complete Clinician: Evidence Based Research in the Dental Office.” Dr. Verdier is a Bates-Andrews Day “veteran,” having presented his student research at the event in 2001.

Bates-Andrews Day gives our students the opportunity to share with the rest of the Tufts community their accomplishments in fields of special interest. I applaud them for their initiative and achievements.

Strengthening and increasing research activity and creating an environment that encourages and supports student participation in research are integral parts of the School’s strategic plan. Student research is also a key accreditation standard for dental education programs.

I appreciate the dedication of the faculty advisors for their mentorship. Special thanks go to the judges and the participation of the commercial exhibitors who help make this event possible. Finally, Eileen Doherty’s guidance as director of predoctoral student research and Dr. Gerard Kugel’s leadership as associate dean for research are highly valued as they greatly enhance our students’ research experiences.

Huw F. Thomas, B.D.S., M.S., Ph.D.
Dean and Professor of Pediatric Dentistry
MESSAGE FROM DR. KUGEL

The research mission of Tufts University School of Dental Medicine promotes integration of innovative studies in basic science, clinical practice, and public health. This book is evidence of the progress we have made and will continue to make at the Dental School.

TUSDM welcomes the valuable partnerships and contributions of corporations, foundations, NIH, and NIDCR to our mission. Working together, we have the means to perform ethical, meaningful research in oral and general healthcare that can be applied for the benefit of the scientific community and the public at large.

Researchers at TUSDM conduct studies in many areas, including bench and clinical studies in dental materials, devices, and pharmaceuticals. We are presently pursuing groundbreaking techniques in tissue engineering, bone remodeling, and Sjögren's syndrome. Tufts also provides a wealth of opportunities for interdisciplinary research with our schools of nutrition, biomedical sciences, veterinary medicine, and engineering.

The combination of disciplines and talent at Tufts University provides the ideal environment for collaborative research and materials testing. Our record of contributions to the sciences and our potential to influence the future of dental medicine are extensive.

As we work to continually promote oral health and improve the quality of life for the general population, we remain aware that strategic partnerships are vital to our efforts. We recognize the power of shared knowledge and are always looking to share resources and ideas. The pages ahead reveal a sample of our achievements thus far.

Gerard Kugel, D.M.D., M.S., Ph.D.
Professor and Associate Dean for Research
ACKNOWLEDGEMENTS

Corporate Partners

The following commercial exhibitors and contributors helped to make this year’s Bates-Andrews Day successful:

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Special thanks to the following Tufts faculty and students

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Bates Student Research Group and Andrews Society Officers

Lindsay Fox, President
Rachel Cohen, Vice President
Jessie Reisig, Secretary
Jonathan Bishop, Treasurer
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Wednesday, March 4, 2015

SCHEDULE OF EVENTS

11:00 AM – 3:00 PM
Predoctoral and Postdoctoral Student Posters on Display
Commercial Exhibitors

3:30 PM – 4:30 PM
Keynote Speech

4:30 PM
Awards Presentation and Reception

KEYNOTE ADDRESS

The Complete Clinician:
Evidence-Based Research in the Dental Office

Ancy Verdier, D.M.D.

Diplomate American Board of Periodontology

Dr. Ancy Verdier is the founder of East End Periodontics and Worcester Periodontics, periodontal dental practices with offices in Worcester, Massachusetts, and East Hampton, New York, where he practices periodontology and implant dentistry. He earned his B.A. in psychology from Tufts University, where he served as student body president and was the winner of the coveted Wendell Phillips Award (sole student speaker at graduation). Following his graduation, Dr. Verdier completed the post baccalaureate program at Harvard University then matriculated at Tufts University School of Dental Medicine. After receiving his Doctor of Dental Medicine, Dr. Verdier completed a prestigious three-year residency program in periodontology at Tufts University School of Dental Medicine after which he was awarded Diplomate status by the American Academy of Periodontology.

Dr. Verdier is a former clinical associate professor at NYU School of Dentistry, is currently an attending at Interfaith Medical Center, and is a frequent speaker at national dental meetings and oral-health seminars. He is the Young Alumni chair for Tufts University School of Dental Medicine, ambassador of American Academy of Periodontology Foundation, and a trustee of Evidence, A Dance Company. He has also been recognized by the trustees of the Southampton Library and Bridgehampton Child Care/Recreational Center for his support of their organizations.
BATES-ANDREWS DAY 2015 AWARDS

**Best Postgraduate Poster Presentation**
Dr. Sage Yoo — “The Influence of Community Service Learning Externship on Pre-doctoral Dental Students’ Future Management of Pediatric Patients”

**Best Scientific Research Presentation by a Senior (Andrews Society Award)**
Elizabeth Bingham — “Dab2-E-cadherin Duo: A New Role in Squamous Cell Carcinoma Development”

**ADA/DENTSPLY Student Clinician Award for Best Overall Predoctoral Table Clinic**
Jason Berglund — “Manipulating Intracellular Pressure in Invading Oral Cancer Cells”

**Second Place Award for Predoctoral Table Clinic**
Maryam Mahdavi — “Oral-Health Status/Outcomes Assessment of Oral-Health Program in Zambia”

**Third Place Award for Predoctoral Table Clinic**
Ronney Tay — “Generation of Three-Dimensional Bioengineered Tissue Constructs of Nasopharyngeal Carcinoma”

**Research Committee Award for Basic Science Research**
Grace Creech — “Regulation of Chondrogenesis and Osteogenesis by miRNA-342-3p Transduction in Mice”

**Massachusetts Dental Society and ASDA Public Health Award**
Justin Maillet — “Assessment of Dental Students’ Knowledge, Attitude, and Perception of HIV/HBV/HCV”

**Omicron Kappa Upsilon (OKU) Hilde Tillman Award**
Haomiao Wang — “Validation of Evidence-Based Dentistry and Critical Thinking Application Assessment Tool”
Bianca Velayo — “Evaluation of the Promotion of Critical Thinking and Integration of Evidence-Based Dentistry in the Pre-doctoral Clinical Courses”

**Dr. Chad Anderson Family Award for Innovative Methodology and Research**
Jessie Reisig — “Direct Pairwise Comparison of Initial Hydrophilicity of Unset Impression Materials”

**Dr. Aikaterini Papathanasiou Award for Promotion of Esthetic Dentistry**
Kunal Dani — “Comparison of Two Different Delivery Techniques for the Placement of Bulk-Fill Composites”

**Scientific Merit Award for First-Time Presenters**
Kathryn Weber — “Optimization of Snai1 siRNA Transfection in Murine Bone Marrow Derived Mesenchymal Stem Cells”

**Oral Health Disparities Award**
Christina Piacquadio — “Speech Pathology and Oral Health of Individuals with Developmental/Acquired Disabilities”

**Bates Student Research Group “Peer-Reviewed” Award**
Mary Sayegh — “Caries Risk Correlates among Adults with Intellectual and Developmental Disabilities”

**ADEA Student Group Educational Research Award**
Ignacio De La Cruz — “Human Papillomavirus and Oropharyngeal Cancer: Dental Students’ Knowledge and Attitudes”
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The Benefit of a Switch: Answer-Changing on Computerized Dental Exams

Anna Bak,* Jennifer Bassett Midle, Steven Eisen, and Gerard Kugel

OBJECTIVES: Based on a notion that your “first instinct” is always right, instructors often advise their students not to change their answers on exams. Yet existing literature overwhelmingly contradicts this belief and supports the benefit that answer-changing has on exam scores. However, many of these studies utilized eraser marks on written exams, small sample sizes, or voluntary low-stakes exams as evidence. The purpose of this study is to confirm the benefits of answer-changing by using detailed, reliable data from high-stakes exams, administered electronically to first-year dental students.

METHODS: This study used computerized data reports from a 24-item multiple-choice exam (MCE) administered to 186 dental students in the first-year biochemistry course. The results will be expanded by ongoing research to include 6 additional first-year MCEs in biochemistry and operative dentistry (N=192, 191, 193, 193, 194, 195), each with respective item numbers (y=45, 40, 45, 33, 33, 33).

RESULTS: Consistent with previous studies in other fields, a majority of answer changes (69.9%) are from wrong to right. An initially correct answer is changed to a wrong answer 10.3% of the time, while 19.9% of answer changes results in no change. Of the latter, 15.2% are wrong-to-wrong changes and 4.6% are right-to-right. While switching more commonly results in the correct answer, only a small proportion (6.8%) of answers are actually reviewed and subsequently changed. In fact, 72.9% of questions are seen only once and never reviewed, while 20.3% of questions are reviewed but an alternative answer is not selected.

CONCLUSIONS: Dental students should be encouraged to review their answers and reconsider alternative choices. They should not be discouraged from changing their answers if upon careful reflection they have reasonable doubt to select a different choice. The benefits of answer-changing should be recognized and adopted as an exam-taking strategy.
Manipulating Intracellular Pressure in Invading Oral Cancer Cells

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Invasive cancer cell migration is associated with transitions between amoeboid and lamellipodial migration mechanisms along the RhoA-Rac1 signaling axis. RhoA controls pressure in primary fibroblasts migrating in 3D matrix, with high and low pressure associated with lobopodia- and lamellipodia-based migration, respectively. It is unclear if intracellular pressure plays a similar function in 3D cancer cell motility. Tropomyosins are actin-binding proteins that modulate actomyosin contractility and cytoskeleton dynamics. Expression of a specific tropomyosin isoform is known to cause lamellipodia-independent movement on a 2D surface. To test the hypothesis that tropomyosin expression regulates intracellular pressure to govern the mechanism of cell movement, two different isoforms of tropomyosin were transfected into primary human fibroblasts and oral cancer cells to determine if they could alter intracellular pressure and cell protrusion. We developed and validated a method to measure the average size of lamellipodia per cell based on distribution of lamellipodial protein marker cortactin and directly measured intracellular pressure in individual cells with a 900A micropressure device. Tropomyosin isoform 3 (Tm3) significantly increased intracellular pressure in primary dermal fibroblasts compared to positive controls, but did not result in a significant change in protrusion type on 2D glass. When Tm3 was transfected into WSU-HN31, a metastatic head and neck squamous cell carcinoma cell line, intracellular pressure was marginally greater than the negative control. Tm3 transfected WSU-HN31 cells showed little cortactin-positive lamellipodia, slightly greater than the negative control. In contrast, controls and transfectants with tropomyosin isoform 5b (Tm5b) exhibited similar intracellular pressures and lamellipodial formation using HFF and WSU-HN31 cell lines. Such variation suggests tropomyosin isoforms exhibit different functions between cell types. While a direct correlation between intracellular pressure and the mode of cellular protrusion formation in response to tropomyosin expression was not evident, associated mechanisms involving the important biophysical property of intracellular pressure warrant further study.

Also presented at the 2015 IADR General Session in Boston. Abstract #1659.
Dab2-E-cadherin Duo: A New Role in Squamous Cell Carcinoma Development

Elizabeth Bingham,*1 Samuel Kamlarz,2 Shawheen Saffari,1 Ronney Tay,1 Jorge Reyes,3 James Baleja,4 and Addy Alt-Holland1
1Tufts University School of Dental Medicine, Boston; 2University of Massachusetts, Amherst; 3Wentworth Institute of Technology, Boston; 4Tufts University Sackler School of Graduate Biomedical Sciences, Boston

OBJECTIVE: Disabled2 (Dab2) is an adaptor protein involved in cellular endocytosis and recycling machinery, and its down-regulation has been associated with progression of epithelial cancers. However, Dab2 involvement in the early stages of squamous cell carcinoma (SCC) has not been elucidated. We previously reported that transient loss of Dab2 is associated with decreased E-cadherin-mediated cell-cell contact, which led to increased SCC cell spread. Here, we investigated whether the effect of a permanent Dab2 depletion on these cells is dependent on their malignant potential.

METHODS: The immortalized HaCaT and ras-transformed HaCaT keratinocytes (II-4) were transfected with lentiviral-mediated sh-Dab2 sequences, which down-regulated Dab2 at the mRNA level. The levels of Dab2, E-cadherin and other proteins were investigated by Western blot and immunofluorescent analyses, and cell morphology was analyzed by bright field microscopy.

RESULTS: A 3-fold and 2-fold decrease of Dab2 expression was achieved in the II-4 SCC cells and HaCaT cells, respectively. E-cadherin, EEA1, and Caveolin-1 proteins were moderately decreased in HaCaT cells. In contrast, these proteins were markedly down-regulated in II-4 cells. Increased cell spread was confirmed in both cell cultures, and immunofluorescent staining of HaCaT cells and, moreover, of II-4 cells, showed the propensity of Dab2 to remain at the perinuclear area instead of being diffused throughout the cells cytoplasm.

CONCLUSIONS: Dab2 depletion in HaCaT and II-4 SCC cells is associated with downregulation and altered cellular localization of E-cadherin and other endocytic proteins. Importantly, the extent to which the characteristics of these cells are changed is dependent on their malignant potential. Our study sheds light on the reciprocal relationship between Dab2 and E-cadherin, as affecting the expression of one influences the level of the other. These data demonstrate that E-cadherin and Dab2 work in concert during SCC development, and further elucidates their role in the progression of epithelial cancer.

Also presented at the 2015 IADR General Session in Boston. Abstract #1118.
In Vitro Adhesive Bond Strength of Three Universal Enamel-Dentin Bonding Agents

Jonathan Bishop,* William Brown, Ronald Perry, Masly Harsono, and Gerard Kugel

OBJECTIVE: Bonding techniques and bonding agents are the main source of retention of a restoration. This study compared the shear bond strength of Optibond™XTR(OP) Kerr™, Scotchbond™Universal(SBU) 3M™, and AdheSE™Universal(AU) Ivoclar™ bonded to dentin and enamel at 15 minutes and 24 hours.

METHODS: One hundred and forty-four human extracted teeth were collected, sectioned, and mounted in acrylic blocks followed by exposing and finishing the enamel or dentin surfaces with 240 and 600 grit silicon carbide papers. Six groups for dentin and enamel were made (N=12). Each group was bonded following manufacturer recommendations, placed on the Ultradent bonding jig (2.38 mm), filled with Herculite® Ultra (Kerr) and polymerized for 20s using a Demi™ Plus curing light. Samples were either stored for 24-hours at 100% humidity and tested or tested 15 minutes after the bonding procedure using an Instron® universal testing machine at 1 mm/min crosshead speed and expressed in MPa’s. The nature of the failure was observed with a 10X stereo microscope (Leica–GZ6). Statistical analysis was done using ANOVA.

RESULTS: See Tables 1 and 2.

Table 1. Bond strength testing RESULTS: Mean (SD) in MPa.

<table>
<thead>
<tr>
<th></th>
<th>Enamel 15 min</th>
<th>Dentin 15 min</th>
<th>Enamel 24 hr</th>
<th>Dentin 24 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optibond XTR</td>
<td>15.3(4.4)</td>
<td>21.8(4.8)</td>
<td>18.8(4.8)</td>
<td>36.5(10.9)</td>
</tr>
<tr>
<td>SB Universal</td>
<td>16.8(3.5)</td>
<td>24.5(4.4)</td>
<td>18.5(4.3)</td>
<td>32.4(10.6)</td>
</tr>
<tr>
<td>Adhese Universal</td>
<td>18.4(2.4)</td>
<td>27.7(6.4)</td>
<td>23.2(7.2)</td>
<td>35.9(10.5)</td>
</tr>
</tbody>
</table>

Table 2. ANOVA testing results

<table>
<thead>
<tr>
<th></th>
<th>Degrees of freedom:</th>
<th>F-Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model, Error</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enamel 15 min</td>
<td>2, 27</td>
<td>1.83</td>
<td>0.179</td>
</tr>
<tr>
<td>Dentin 15 min</td>
<td>2, 27</td>
<td>3.30</td>
<td>0.052</td>
</tr>
<tr>
<td>Enamel 24 hr</td>
<td>2, 27</td>
<td>2.23</td>
<td>0.127</td>
</tr>
<tr>
<td>Dentin 24 hr</td>
<td>2, 27</td>
<td>0.38</td>
<td>0.686</td>
</tr>
</tbody>
</table>

No statistically significant difference was observed between groups in either the enamel-bonded or the dentin-bonded cohort using ANOVA testing [15-min Enamel: F(2, 27)=1.83, p=0.179; 15-min Dentin: F(2, 27)=3.30, p=0.052; 24-hour Enamel: F(2, 27)=2.23, p=0.127; 24-hour Dentin: F(2, 27)=0.38, p=0.686].

CONCLUSIONS: Despite variation in mean bond strengths between AU, OP, and SBU, no statistical difference was observed. Further clinical testing is needed.

Study funded in part by KERR Corp. Also presented at the 2015 IADR General Session in Boston. Abstract #2298.
Ion Releasing Materials, Demineralization, and Shear Strength of Orthodontic Brackets

Charles Bond,* Jacob Donohue,* Pamela Maragliano, Daniella Phillis, Jennifer Bassett Midle, Ronald Perry, Gerard Kugel

OBJECTIVES: This pilot study compared the shear bond strength and demineralization of two ion-releasing materials to a conventional bracket adhesive.

METHODS: Three groups (N=6) of bonded orthodontic brackets were analyzed for shear bond strength (SBS) (MPa) and demineralization (DIAGNOdent™, KaVo (DAG) score). A total of 18 teeth, 6 per group, were assigned to the following groups: composite resin (Transbond XT Light Cure Adhesive™, 3M Unitek) (XT), glass ionomer (Ionoseal™, Voco) (IO), and a bioactive restorative (Activa Bioactive™, Pulpdent) (AB). Teeth were initially screened to determine no demineralization had taken place. Brackets were applied to both the buccal and lingual side of each tooth. Three lingual and three buccal faces in each group were etched using 35% phosphoric acid (Ultra-Etch™, Ultradent) prior to bracket placement. Brackets were applied using the respective material (XT, IO, or AB) and light cured for 30 seconds. Samples were placed in a demineralizing solution (0.05 M acetate buffer pH 5.0) for 30 days and upon removal were tested for demineralization using a DAG and SBS (MPa) using an Instron 5566A™ (Canton, Massachusetts). Comparisons of materials were completed to test the mean demineralization and shear strength between groups (SPSS Version 21).

RESULTS: Lower mean demineralization was noted with AB (61.83±23.37) compared to both the XT and IO groups, however it was not statistically significant (p=0.74 and p=0.90) (Table 1). For both the etched and non-etched groups, AB showed similar SBS (23.51±12.4 and 31.88±20.96) compared to XT and IO (p=0.85 and p=0.99) (Table 2). No significance was noted between groups for both etch and non-etched (Table 3).

CONCLUSIONS: Although demineralization was less with AB, there was no statistical significance between groups (p>0.05). Similarly, there was no significance noted between SBS of the groups (p>0.05). The results warrant further research in this area.

Also presented at the 2015 IADR General Session in Boston. Abstract #3478.
Bond Strengths of Cements to Enamel and Dentin \textit{In Vitro}

William Brown,* Jonathan Bishop, Angel Park, Lindsay Fox, Elisa Giordano, and Ronald Perry

OBJECTIVES: Compare the bond strength of various self-adhesive dental cements to human dentin and enamel using a universal testing machine (UltraTester™, Ultradent).

METHODS: Five self-adhesive cements were used: MaxCem Elite™ (Kerr)MCE, MaxCem Elite™ New (Kerr) MCE2.0, RelyX™ Unicem (3MESPE)UNI, G Cem™ LinkAce (GC America)GC, SmartCem® (DENTSPLY) SC. One hundred-twenty samples were randomly divided into five groups with two bonding groups (enamel and dentin) per product and 12 samples per group. Specimens were prepared and mounted in acrylic blocks followed by exposing and finishing the enamel or dentin surfaces with 240 and 600 grit silicon carbide papers. Each group was bonded following manufacturer recommendations using the Ultradent bonding jig (2.38 mm diameter) and polymerized using a Demi™ Plus curing light. Samples were stored for 24 hours at 100% humidity and tested using a universal testing machine at 1mm/min crosshead speed and expressed in MPa’s.

RESULTS: Cements were analyzed using a one-way ANOVA and showed a statistical difference among tested products and substrates \(p<0.001\). Table 1 shows the results of the Tukey HSD test indicating which products were statistically different. The results indicate that for both enamel and dentin surfaces Maxcem Elite New was statistically higher to the other self-adhesive cements (25.45±2.80 and 25.80±5.14 MPa respectively. Overall SmartCem had the lowest bond strength to enamel and dentin (8.55±3.37 and 11.93±5.88 MPa respectively.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Cement} & \textbf{Mean} & \textbf{SD} & \textbf{P-Value} \\
\hline
\hline
\textbf{Enamel} & & & \textless 0.001 \\
\hline
MCE & 15.05B & 4.38 & \\
MCE New & 25.45A & 2.80 & \\
UNI & 10.96BC & 3.12 & \\
GC & 12.83BC & 4.22 & \\
SC & 8.55C & 3.37 & \\
\hline
\textbf{Dentin} & & & \textless 0.001 \\
\hline
MCE & 13.58B & 3.30 & \\
MCE New & 25.80A & 5.14 & \\
UNI & 15.15B & 4.43 & \\
GC & 14.39B & 2.64 & \\
SC & 11.93B & 5.88 & \\
\hline
\end{tabular}
\end{table}

Note: Groups with same letter are not statistically different. (Tukey HSD test)

CONCLUSIONS: MCENew showed superior adhesive bonding results across all tested surfaces. Further testing is needed.

\textit{Also presented at the 2015 IADR General Session in Boston. Abstract #804.}
Effect of Curing Distances on the Bulk-Fill Composites

Minh Bui,* Alissa Mariano, Sridhar Janyavula, Ronald Perry, Masly Harsono, and Gerard Kugel

OBJECTIVE: To compare and evaluate the effect of curing distances on the polymerization of several bulk-fill composites at clinically relevant distances using two different curing lights.

METHODS: Sample groups (N=16) of composites from Group 1 [experimental flow (DENTSPLY Caulk)], Group 2 [experimental posterior bulk fill (DENTSPLY Caulk)], Group 3 [experimental posterior universal (DENTSPLY Caulk)], Group 4 [SonicFill™ (Kerr)], Group 5 [Surefil SDR® (DENTSPLY Caulk)], Group 6 [Tetric EvoCeram Bulk Fill® (Ivoclar Vivadent)] were placed in custom molds and light cured at distances of 0, 3, and 5 mm with the help of the Marc resin calibrator using the ISO 4049 test method. The remaining hard composite length was measured with a digital micrometer and the value was divided by two per ISO 4049 protocol. Each sub-group (N=8) tested two different curing lights: Light 1 [Demi™ Ultra Plus (Kerr)] and Light 2 [SmartLite Focus (DENTSPLY Caulk)]. Analysis was conducted by one-way ANOVA and Tukey test at 95% confidence interval. Significance was determined with p<0.05.

RESULTS: Among bulk fills with the light at 0 mm distance, groups 1, 2, and 5 had a statistically significant greater mean of average curing depth than groups 4 and 6. Group 5 had the highest average mean curing depth while group 4 showed the lowest mean of the bulk fills (Table 1). The depth of cure had the largest drop when comparing the light source from 0 mm to 5 mm and the smallest decrease when comparing the light source from 3 mm to 5 mm (Table 2).

Table 1. Average composite curing depth (with light distance of 0 mm)

<table>
<thead>
<tr>
<th>Composite (N=16)</th>
<th>Mean of average curing depth</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>4.0200&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.3106</td>
</tr>
<tr>
<td>Group 2</td>
<td>4.2484&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.3033</td>
</tr>
<tr>
<td>Group 3</td>
<td>2.6497&lt;sup&gt;C&lt;/sup&gt;</td>
<td>0.4913</td>
</tr>
<tr>
<td>Group 4</td>
<td>3.2456&lt;sup&gt;B&lt;/sup&gt;</td>
<td>0.1410</td>
</tr>
<tr>
<td>Group 5</td>
<td>4.3425&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.3859</td>
</tr>
<tr>
<td>Group 6</td>
<td>3.4059&lt;sup&gt;B&lt;/sup&gt;</td>
<td>0.1597</td>
</tr>
</tbody>
</table>

Means that do not share a letter are significantly different.

Table 2. Differences in distance of light source on curing depth

<table>
<thead>
<tr>
<th>Differences in distance of light source</th>
<th>Mean of decreased curing depth</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mm vs. 3 mm</td>
<td>−0.1767</td>
<td>0.2621 (p=0.040)</td>
</tr>
<tr>
<td>3 mm vs. 5 mm</td>
<td>−0.0975</td>
<td>0.0593 (p=0.129)</td>
</tr>
<tr>
<td>0 mm vs. 5 mm</td>
<td>−0.2742</td>
<td>0.0823 (p=0.007)</td>
</tr>
</tbody>
</table>

CONCLUSION: Among bulk fills, groups 1, 2, and 5 had higher curability than groups 4 and 6. While group 3, the control group, was statistically different from all other groups, with a lower mean. This was as expected since it is not bulk-fill composite. The depth of cure based on distance showed predictable results; the further away the light source was from the composite, the less the composite was polymerized.

Also presented at the 2015 IADR General Session in Boston. Abstract #2202.
Comparison of Deflection at Break of Four Dental Restorative Materials

William Chao,* Vishavjeet Girn, Masly Harsono, Angel Park, and Gerard Kugel

OBJECTIVE: To evaluate and compare the deflection at break of four commercial tooth-colored restorative materials.

METHOD: Four groups (N=10/group) of restorative materials were tested. Flexural testing samples were prepared using a mold 25 mm in length, 2 mm in height and 2 mm in width (according to ISO Standard 4049). For Filtek™ (3M™ ESPE™) (Group 1), ACTIVA™ BioACTIVE Restorative™ (Pulpdent®) (Group 2), and Ketac™ Nano (3M™ ESPE™) (Group 3), samples were cured with a halogen curing light from top and bottom surfaces for 40 seconds. Fuji IX™ GP (GC America®) (Group 4) was self-polymerized according to manufacturer’s directions. Samples were then stored in distilled water for 24 hours to ensure polymerization of the material. All tests were performed using a universal testing machine (UTM) with 1K load cell (Instron® 5566A, Norwood, Massachusetts). Flexural testing was determined using a three-point bending fixture attached on a UTM machine at a 0.5 mm/min crosshead. The distance between the two supports was set at 20 mm. The radius of each support was 1 mm. Statistical analysis was completed using SAS 9.2. Kruskal-Wallis and Dunn’s tests were performed to determine differences among the groups. Using the Bonferroni correction, a p-value of 0.0083 was considered statistically significant.

RESULTS:

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>25th Percentile</th>
<th>Median</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>0.90</td>
<td>1.00</td>
<td>1.10</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>0.10</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>4</td>
<td>7*</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
</tr>
</tbody>
</table>

*Three samples broke upon polishing

The Kruskal-Wallis test was statistically significant with p<0.001. Additional tests for multiple comparisons using Dunn’s test were completed. Using the Bonferroni correction, groups 2 versus 3 and 2 versus 4 were statistically significant. The other comparisons were not statistically significant.

CONCLUSION: Group 2 showed statistically significant greater deflection at break in comparison to two other commercial tooth-colored restorative materials tested. This result is reflected in flexural strength and the elastic modulus indicating better resistance to fracture and ability to absorb stress when compared to the other materials tested.

Also presented at the 2015 IADR General Session in Boston. Abstract #2375.
Continued Characterization of the Novel Zebrafish Helicase Craniofacial Mutant

Jimmy Chen,* David Cheng, Viktoria Andreeva, and Pamela Yelick

OBJECTIVE: Our goal was to further characterize the developmental defects of previously identified fast track (ftt)ft9 zebrafish mutant and to determine the expression of the ftt helicase gene during embryonic development.

METHODS: Cryosectioning of 5 and 6 days post fertilization (dpf) wild type and mutant zebrafish embryos along with H&E and immunohistochemistry with anti-ftt antibody was utilized to characterize the systemic ftt defects and to highlight the expression pattern of the ftt helicase gene.

RESULTS: H&E staining revealed that the ftt mutant presents with an incompletely absorbed yolk sac, an anteriorly displaced intestine reduced in size and thickness of intestinal linings, a narrowed esophagus also with a loss of lining, a reduced cerebellum and superior/inferior lobe, a narrowed pronephric duct and a narrowed vertical myoseptum. The loss of intestinal linings and incompletely absorbed yolk sac may be indicative of an underlying digestive problem. In humans, the combination of these various gut defects most resembles that of Crohn’s disease. Mental retardation from the reduced cerebellum and superior/inferior lobe along with vertebral malformation from the narrowed vertical myoseptum are also common anomalies seen in cleft palate, which was phenotypically observed previously in the craniofacial region. The immunohistochemical analysis revealed an ftt helicase protein expression pattern consistent with the observed phenotype showing strong staining signals in the esophagus, liver, intestine, pronephric duct, cerebellum, superior/inferior lobes, and the vertical myoseptum. Additional staining signals are also observed in the eye and olfactory pit region, confirming phenotypic expression in the neurocranium observed previously.

CONCLUSION: Apart from the important role the ftt helicase plays in craniofacial development identified previously, our data also suggest an important role of the ftt helicase in the development of the GI tract and the cerebral region. Future functional characterizations of the ftt helicase mutant will be used to further our understanding of human craniofacial development and its association with GI defects and provide new inroads for more effective therapies for the prevention and repair of such defects.

Also presented at the 2015 IADR General Session in Boston. Abstract #3030.
Dental Adhesive Shear Bond Strength: Comparing Human and Bovine Teeth

Elena Ciciolla,* Rachel Cohen, Paul Stark, Gerard Kugel, and Ronald Perry

OBJECTIVES: To evaluate whether substituting bovine coronal dentin and enamel for human hard tissue specimens is appropriate during shear bond strength (SBS) analysis of dental adhesives.

METHODS: Sixty caries-free human third molars and sixty bovine central incisors were polished with pumice and embedded in a cylindrical base. Half of the human and bovine teeth were ground to dentin with a water-cooled grinder using 320-grit silicon carbide paper at 150 RPM. The remaining teeth were ground to a flat enamel surface. Four groups of thirty specimens were made (N=30): bovine enamel, human enamel, bovine dentin, and human dentin. Each group was treated with an adhesive system (N=10): 3M ESPE Adper Scotchbond® (Adhesive 1), Kerr Optibond Solo Plus® (Adhesive 2), and DENTSPLY Caulk Prime and Bond NT® (Adhesive 3), all following recommended manufacturer’s instructions. Diameter buttons of 2.8 mm, using DenMat® Virtuoso universal composite, were bonded to each specimen using an Ultradent Jig®, light cured for 15 seconds with DenMat LED flashlight magna 4.0®, and stored in distilled water for 24 hours at 37°C. The SBS of the specimens were tested using a Universal Testing Machine (Instron5566A®, Norwood, Massachusetts) with a 500N load cell and cross-head speed of 1 mm/min. The data was analyzed using independent sample t-test analysis. A p-value <0.05 was considered statistically significant.

RESULTS:

Table 1: All units for shear bond strength are in (MPa±SD)

<table>
<thead>
<tr>
<th>Dental Adhesive System</th>
<th>Bovine Enamel</th>
<th>Human Enamel</th>
<th>Bovine Dentin</th>
<th>Human Dentin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesive 2</td>
<td>23.41±7.59</td>
<td>16.03±14.54</td>
<td>6.30±5.63</td>
<td>11.60±8.81</td>
</tr>
<tr>
<td>Adhesive 3</td>
<td>25.63±5.03</td>
<td>31.83±10.27</td>
<td>13.88±4.81</td>
<td>14.90±8.89</td>
</tr>
</tbody>
</table>

A statistically significant difference was found between Adhesive 1 for both bovine and human enamel and dentin. When binding to a dentin substrate, a statistically significant difference was found with Adhesive 2. Overall, there is a statistically significant difference between bonding on bovine and human teeth (p<0.002) when using dentin as the substrate.

CONCLUSION: These results suggest that human and bovine teeth are not equivalent when testing SBS on a dentin substrate. This difference should be considered when evaluating the appropriateness of substituting bovine for human specimens.

Also presented at the 2015 IADR General Session in Boston. Abstract #625.
Pilot SEM Analysis of Low pH Whitening Agents
Rachel Cohen,* Elena Ciciolla, Gerard Kugel, and Ronald Perry

OBJECTIVE: The majority of in-office whitening systems are formulated as basic solutions containing 25% hydrogen peroxide (H$_2$O$_2$). Lowering pH has been used as a method to increase the stability of H$_2$O$_2$, but at the risk of etching the enamel surface. LumiSmile White In-office (LS) (DenMat) is an acidic (pH=5.3) whitening agent formulated to increase the stability and penetration of H$_2$O$_2$ while protecting the enamel surface from acid-etching with the addition of calcium phosphate. The objective of this pilot study was to evaluate the effect of various acidic whitening agents such as LS on surface enamel compared to water (H$_2$O) using scanning electron microscope (SEM) analysis.

METHODS: Two bovine teeth were sectioned along their long axes into four pieces. One section of each tooth had one of four treatments applied to its enamel surface: H$_2$O, 37% phosphoric acid (H$_3$PO$_4$), LS containing calcium phosphate (LS+), and LS without calcium phosphate (LS-). Each treatment was applied to the enamel surface for 45 minutes, followed by thorough rinsing and a second 45-minute treatment. Specimens were kept in distilled water for one month and analyzed with SEM (JEOL6340F Field Emission) at various magnifications.

RESULTS: Interpretation of SEM photographs revealed surface similarities between H$_3$PO$_4$ and LS- treatment (Figure 1A, 1B): application of these products appeared to etch the enamel surface. The H$_2$O and LS+ treatments appear not to disrupt the enamel surface (Figure 1C, 1D).

CONCLUSION: A pilot comparison of the effect of acidic whitening agents suggested that LS+ offers greater protection of the enamel surface compared to other acidic agents that lack calcium phosphate. Additional testing and analysis is necessary to validate and investigate the clinical relevance of this finding.

Also presented at the 2015 IADR General Session in Boston. Abstract #367.
A New Side-by-Side Initial Hydrophilicity of Impression Materials Technique

Jessie Reisig, Amanda Merikas, John Constantine,* Gerard Kugel, and Ronald Perry

OBJECTIVES: To test the validity of directly comparing the hydrophilic properties of impression materials in the unset state using newly developed 2-material-side-by-side interface setup and examining how a drop of water placed on this interface behaves.

METHODS: Two polyether impression materials and one experimental medium-bodied VPS impression material (N=5) were tested against themselves. Each test sample was made by: mixing each material using Pentamix™-3 (3M ESPE) with standard mixing times; creating a 2-mm-thick interface of each sample material separately on microscope slides, placing the slides containing samples to be compared side-by-side; placing a 5µl drop of water on the interface by a DropShape Analysis System (DSA-30, Krüss) within 60s after the start of mixing. Bitmap video files of the water drop encountering the interface were recorded and converted to JPEG images at selected time frames. At a drop age of 2 s, the horizontal spreading radius of water in pixels on each material from the center of the water dropper was recorded using JPEG files and measurement tools using Microsoft Paint®, and a standardized ratio was calculated. A conversion between pixels and millimeters is available through DSA-30. One-sample t-tests were conducted to determine the statistical significance using Minitab® version-16. Because compared samples were of the same material, the expected results had a ratio=1.

RESULTS: All ratios of mean horizontal water spread fall within the greatest one standard of deviation found (0.12), ranging 0.89–1.12. In all one-sample t-tests performed, p>0.05, ranging from p=0.37–1.00 (Table 1).

Table 1. Ratio of Horizontal Water Spread Results

<table>
<thead>
<tr>
<th>Lot Number</th>
<th>Ratio of Mean Water Spread (SD)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impregum Penta Soft (3M ESPE)</td>
<td>554904</td>
<td>1.02 (0.04)</td>
</tr>
<tr>
<td>Impregum Penta (3M ESPE)</td>
<td>559759</td>
<td>1.00 (0.12)</td>
</tr>
<tr>
<td>Experimental Medium-bodied-VPS (3M ESPE)</td>
<td>554079</td>
<td>1.02 (0.08)</td>
</tr>
</tbody>
</table>

CONCLUSION: The three impression materials tested failed to reject the expected horizontal water spread ratio of 1 (one-sample t-test, p>0.05). The new technique used was proven to be effective and can be used to compare hydrophilicity of different impression materials at different setting stages in the future. The clinical relevance of hydrophilicity in the unset stage has yet to be tested.

Also presented at the 2015 IADR General Session in Boston. Abstract #2422.
Regulation of Chondrogenesis and Osteogenesis by miRNA-342-3p Transduction in Mice

Grace Creech,* Xiaoying Wang, and Jake Chen

OBJECTIVE: To analyze effects of miRNA-342-3p up-regulation on bone tissue regeneration and formation during wound healing by real-time quantitative PCR and microCT.

METHODS: Critical-sized defects (4 mm diameter) were created using dental bur and slow-speed handpiece on the left and right side of the calvaria of six-week-old mice under anesthesia. Defects on the right-side experimental group (N=11) were repaired with silk scaffold (pore size 500–600 microns, disk-shaped, 4 mm diameter, and 2 mm thick) that had been incubated for 4 hours with a serum-free suspension (2 × 10^7 cells/ml) of miRNA-342-3p transduced C57BL/6J mouse BMSCs. Defects on the left side of the calvaria control group (N=11) were repaired with silk scaffold seeded with a suspension of BMSCs transduced with an empty vector. Six weeks later, calvarial bone from both groups was dissected from euthanized mice and fixed in 10% neutral-buffered formalin solution overnight. Samples were then kept in 70% ethanol. Calvarial bone tissue was scanned with high-resolution micro-computed tomography (CT40; Scanco Medical, Basserdorf, Switzerland) with settings of 1024 x 1024 pixel matrix and slice thickness of 20 μm. Images were segmented using a nominal threshold value of 225. RNA was isolated and purified from samples using Invitrogen TRIzol® reagent, then reverse transcribed with Invitrogen SuperScript® First-Strand Synthesis System according to manufacturer’s instructions. qPCR was carried out using SYBR® Green I Master mix, DNA template, and sequence specific primers for Sox9, ColX, ALP, Aggrecan, OCN, and GAPDH. ΔΔCt method was used for quantifying gene expression relative to the housekeeping gene GAPDH.

RESULTS: MicroCT was used to observe and reconstruct the morphology of the newly formed bone. A substantial amount of newly formed bone was visible in the experimental group, compared to a minimal amount of newly formed bone in the control group. qPCR was used to observe the effects of miRNA342-3p overexpression on mRNA levels of osteogenic and chondrogenic markers. mRNA levels of the osteogenic markers ALP and OCN increased significantly in the experimental group as compared to the control group. mRNA levels of chondrogenic markers Sox9, ColX, and Aggrecan were reduced in the experimental group as compared to the control group.

CONCLUSION: Results suggest miRNA-342-3p increases bone formation and regeneration, possibly mediating the process by up-regulating osteogenic related molecules and down-regulating chondrogenic related molecules.

This project was supported by NIH grant DE21464 to JC.
Comparison of Two Different Delivery Techniques for the Placement of Bulk-Fill Composites

Kunal Dani,* Steven Eisen, and Gerard Kugel

OBJECTIVES: To evaluate the effect of three different delivery techniques of placing bulk-fill composite restorations (pre-warming, sonic vibrations, and conventional method) on the shear bond strength (SBS) of these restorations.

METHODS: Thirty-six extracted caries-free human molars were used for the study. The occlusal surfaces were flattened using diamond wheel (Isomet™, Buehler) and polished using Sic paper until 320 grit (Ecomet™, Buehler) to expose the flat dentin surface. The tooth surfaces were etched (Ultra-Etch®, Ultradent, 37% Phosphoric acid), for 15s, and bonded (Excite® F, Ivoclar Vivadent). With the aid of a jig, Tetric Evoceram® bulk fill (Ivoclar Vivadent) was applied to the prepared surface of the tooth. The restorations were cured following the manufacturer’s protocol. The samples were randomly divided into three groups (N=12). In the first group, the bulk fill was placed using conventional placement of 4 mm. In the second method, it was placed using sonic vibrations using Sonicfill™ handpiece, Kerr Corporation. In the third group it was placed after pre-warming the composite to 54°C using Calset™ composite warmer. The samples obtained were kept in a water bath (37°C/24 hours). SBS was tested using Instron® Machine (0.1 mm per second). Statistical analysis was performed using the Kruskal Wallis test (p=0.05) and Mann-Whitney U test using Bonferroni correction (p=0.0167).

RESULTS: Based on the current bench study performed, the test revealed higher mean values of SBS to dentin using pre-warming of composites (8.25±4.32 MPA) as compared to the sonic vibration method (5.61±4.13MPA) or the conventional method (5.84±2.88MPA). Kruskal Wallis and Mann-Whitney test results were not statistically significant (p-values>0.05).

CONCLUSIONS: No statistically significant difference was found between groups. However, pre-warming of bulk-fill composites did show higher SBS and may serve as a better alternative of placing bulk-fill composite restorations than the conventional method. Further studies comparing SBS, microleakage, and physical parameters are recommended.

Also presented at the 2015 IADR General Session in Boston. Abstract #2091.
Human Papillomavirus and Oropharyngeal Cancer: Dental Students’ Knowledge and Attitudes

Ignacio De La Cruz,* Wanda Wright, Jennifer Bassett Midle, and John Morgan

OBJECTIVES: Dental students as future healthcare professionals have the potential to raise the public's awareness about human papillomavirus (HPV) and oropharyngeal cancer. The aim of this exploratory study was to develop an instrument to assess American dental students’ knowledge of HPV and oropharyngeal cancer, and their attitudes towards addressing HPV and oropharyngeal cancer with their patients.

METHODS: A 26-item questionnaire based on published articles, CDC publications, and consultations with a CDC dental officer was developed to assess dental students’ knowledge and attitudes about HPV and oropharyngeal cancer. Six individuals (two dentists, two physicians, and two researchers) were asked to review the content of each question to assure accuracy (content validity). Each participant rated importance (1=very important, 2=important, 3=moderately important, 4=of little importance, 5=not important) of each question on a five-point Likert scale and whether it should be included (0=no, 1=unsure, 2=yes). Five students completed eight standardized questions to assess the clarity of the questions and ability of the respondent to understand each item (face validity). Tufts Health Sciences IRB granted exempt status.

RESULTS: Face validity respondents indicated that the questions and response categories were relevant and easy to understand. One content validity respondent recommended clarification of abbreviations and more specific wording in the phrasing of four attitude questions in order to improve readability and accuracy.

CONCLUSIONS: A survey document was developed to assess dental students’ knowledge and attitudes about HPV and oropharyngeal cancer. The instrument was revised and finalized based on face and content validation. The final survey will be implemented and results will be available for the March IADR session.

Also presented at the 2015 IADR General Session in Boston. Abstract #0932.
Comparison of Pre-clinical and Clinical Performance in Operative Dentistry and Fixed Prosthodontics of the International Student Program

Risha De Leon,* Tofool Al Ghanem, and Steven Eisen

PURPOSE: There is a significant increase in non-U.S.–trained dentists every year in the United States. In most states, foreign-trained dentists need to complete a two-year program granting a D.D.S./D.M.D., and they must successfully pass the National Board Dental Examination administered by the American Dental Association via the Joint Commission on National Dental Examinations prior to receiving the dental licensure. As of 2006, there were a total of 24 schools offering this program, with varying number of students accepted into the program. Student performance is gauged via competency examinations. Competencies are a basis of proper evaluation of student progression (Albino et al., 2008, and Chambers et al., 1998). Given the importance of competency examinations, it is important to determine whether the students’ pre-clinical exam correlates to their competency examinations in their clinical experience. For pre-doctoral programs, results have shown no correlation between a typodont preparation examination and clinical competency exam involving the preparation of a full crown (Curtis et al., 2007). This study aims to determine whether this trend is apparent in the international student program as well.

METHODS: The international student program at Tufts University School of Dental Medicine (TUSDM) begins in April. Students undergo a rigorous syllabus for four months concentrating on the different aspects of dentistry to prepare them for the clinical curriculum. Two of the concentrations are operative dentistry and fixed prosthodontics. During these pre-clinical courses, students undergo exercises on typodont teeth, written examinations, and pre-clinical competencies to display their skill set for the said concentrations in dentistry. Students receive a final grade out of 100, with 70 as passing and 90 as honors. In the clinical curriculum, the students go through different competencies that average a final grade for operative dentistry and fixed prosthodontics. In the study, the average of pre-clinical practical grades and clinical grades were gathered. The data was then compared between the final grade of the pre-clinical and clinical experience to see any relation between the two results. The data was obtained retrospectively from graduating class of 2010 to 2014, using a convenience sample of 76 students. Grades were acquired from the Office of Registrar at Tufts University School of Dental Medicine from April 1, 2009, to May 30, 2014, with no identifying marks. IRB #11369 approval exempt was attained.

RESULTS: Preliminary data was evaluated with the Class of 2010 with a total of 22 students. Data shows 18% of the class had a decrease in their pre-clinical grade compared to their clinical grade with an average difference of 3 points. Of the class, 82% had an increase in their clinical grade from their pre-clinical grade. The range of difference is from 0.5–14.0 points increase with an average of 5.2. Of the total, 22% students who had a higher clinical grade compared to their pre-clinical grade had a large difference that ranged from 10.5–14.0 points.
Evaluating NaOCl Penetration into Dentinal Tubules Using GentleWave™ System

Lindsay Fox,1* A. Sherman,2 P. Vandrangi,2 M. Kakpour,2 Ronald Perry,1 and Gerard Kugel1
1Tufts University School of Dental Medicine, Boston; 2Sonendo®, Laguna Hills, California

OBJECTIVE: To evaluate dentin disinfection by measuring the penetration depth of sodium hypochlorite (NaOCl) into dentinal tubules using the GentleWave™ system and ultrasonic agitation.

METHODS: Forty extracted human molars were accessed and instrumented to 15/0.04 rotary file, cleaned to remove pulp tissue, immersed in crystal violet dye and incubated (37°C) overnight. Samples were rinsed with water for 30 minutes and randomly divided into four treatment groups (N=10): (1) GentleWave™ system, (2) PiezonMaster™ 700 (EMS) ESI-tip passive, (3) PiezonMaster™ 700 (EMS) ESI-tip active ultrasonic activation with maximum irrigation rate, and (4) positive control (no NaOCl). Following treatments, samples were rinsed with distilled water for one minute. Crowns were removed and roots were split longitudinally. The depth of NaOCl penetration (Dp) into dentinal tubules was imaged and analyzed using Nikon® stereo-microscope and software. Statistical comparisons were done with Welch’s t-test (p<0.05). Pearson correlation coefficients (r) were calculated for degree of dependence between Dp and distance from the apex.

RESULTS:

<table>
<thead>
<tr>
<th>NaOCl Penetration (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
</tr>
<tr>
<td>Distal Canal</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Apical</td>
</tr>
<tr>
<td>Middle</td>
</tr>
<tr>
<td>SD</td>
</tr>
<tr>
<td>Mesial Canal</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Apical</td>
</tr>
<tr>
<td>Middle</td>
</tr>
<tr>
<td>SD</td>
</tr>
</tbody>
</table>

CONCLUSIONS: Group 1 when compared to group 2 and group 3 was significantly different (p<0.05) for the apical region of both mesial and distal canals and middle region of distal canals. No significant difference was observed between group 2 and group 3 (p>0.05). The Dp in the middle region was statistically greater than that in the apical region for group 2 and group 3 (r=0.91 and r=0.94, respectively), whereas group 1 showed no difference in Dp between location and type of canal (r=0.0002). Group 1 demonstrated higher Dp at canal apices than group 2, and no difference was observed in canal.

Study funded in part by Sonendo®. Also presented at the 2015 IADR General Session in Boston. Abstract #3874.
Comparing Two Teaching Methods: Virtual Patient Avatar vs. Traditional Lecture

David Frantz,* Kanchan Ganda, Britta Magnuson, Jennifer Bassett Midle, and Melissa Ing

OBJECTIVE: Dental educators are keen on incorporating new teaching methods to promote learning. This pilot study compared knowledge gained by students using traditional lecture versus a computerized virtual patient avatar. The secondary aim was to compare student attitudes towards traditional classroom lecture versus a computerized avatar.

METHOD: Sixteen second-year pre-doctoral dental students were recruited and given a computerized pre-test prior to a learning module. The pre-test questions pertained to the lecture/avatar material later presented to establish baseline knowledge and allow post-test comparison. Students were randomized into two eight-subject groups, with one group taught via PowerPoint lecture and the other via interactive avatar. A computerized post-test was given following each module with the same questions as the pre-test plus three Likert-scale questions querying each subject’s attitudes towards the teaching method.

RESULTS: Data were analyzed using a Likert scale and Fisher Exact test. Students were asked if their group’s learning module was an effective teaching method, if the module used aided material retention, and if the module would assist their patient care. Pre-test and post-test results were also compared. A positive trend towards significance (<0.20) was seen for avatar effectiveness and information retention, with p-value=0.1580 and 0.1189 respectively. Controlling for pre-test scores, repeated measures analysis evaluated increase in knowledge by learning module type; a p-value of 0.1367 suggested a greater increase in knowledge from pre-to post-test for the avatar, but significance was not reached at alpha of 0.05. A significant difference (<0.05) was found for the avatar assisting in patient care versus traditional lecture, with p-value=0.0438.

CONCLUSIONS: The data trends towards significance in positive student attitude regarding effectiveness of the avatar module, in the avatar for retention of the material taught versus traditional lecture, and in the avatar module resulting in a greater increase in knowledge from pre- to post-test versus standard lecture. A significant difference was found regarding positive avatar impact on student patient care. Overall, the avatar teaching method shows better post-test evaluations, but this pilot study is limited due to small sample size; a larger sample in a future full-size study may show difference in the two p-values trending towards significance (<0.20).

Also presented at the 2015 ADEA Annual Session in Boston.
Effect of Elevated Temperatures on Fluoride Ion Release of Varnish

Katharina Fung,* Myles Clancy,† Steven Eisen, Masly Harsono, Gerard Kugel, John Morgan, Angel Park, and Matthew Finkelman

OBJECTIVE: The aim of this study was to evaluate fluoride ion release of varnish in artificial saliva when stored in elevated temperatures for 72 hours.

METHODS: Sealed fluoride varnishes (Enamel Pro®Varnish) were stored in water baths at temperatures of two groups (N=12): 40°C, 52°C, and control 24°C. Artificial saliva was made in the lab from (mmoles/L): MgCl₂.6H₂O(0.2), KH₂PO₄(4.0), KCl(30.0), NaN₃(0.3) and CaCl₂(0.7). After 72 hours, varnishes were removed and painted onto 2 x 5 mm polyester sheet and immersed in a 4 ml solution of artificial saliva and TISAB II buffering solution (1:1) in a polystyrene vial. Fluoride release was analyzed after 1 and 2 hours with a fluoride ion-specific electrode (Thermo Scientific™, No 0809, Beverly, Massachusetts).

RESULTS: Data results were normal based on Shapiro-Wilk’s test. A one-way ANOVA test was implemented to check for mean differences. At 1 hour (N=12), 24°C mean was 32.98±7.45 ppm, at 40°C mean was 33.40±7.17 ppm, and at 52°C mean of 36.02±6.8 ppm. One-way ANOVA of group yielded no significant differences between each group (p<0.05). At 2 hours, at 24°C the mean was 39.52±10.76 ppm, at 40°C the mean was 39±9.29 ppm, and at 52°C mean was 46.16±10.47 ppm. One-way ANOVA of the group at 2 hours yielded no significant differences between each group (p<0.05).

CONCLUSIONS: Although it was predicted that higher temperatures would cause a decrease in fluoride release of varnish, results were not statistically significant to confirm or reject the hypothesis. Based on observations at the 1 and 2 hour marks, the highest temperature seemed to possess an elevated level of fluoride releasing activity on average. However with inconclusive data, it would be beneficial in future studies to increase sample size as well as control for the variability in the application of varnish to produce more significant results.

Also presented at the 2015 IADR General Session in Boston. Abstract #678.
Demographic Comparison of TUSDM Research Participants vs. Massachusetts Census Data

Yamila Garber,* Shankeertha Sundaralingam, Mabi Singh, Athena Papas, Angel Park, and Britta Magnuson

OBJECTIVES: The aim of this study was to determine if Tufts University School of Dental Medicine (TUSDM) research participants in a clinical screening study were reflective of the population in Massachusetts.

METHODS: Demographic data from 468 participants, age 18–65, in a clinical screening study for caries conducted by the Oral Medicine Department at TUSDM from January 2010 to February 2012 was collected. This was compared to publicly available U.S. Census data for Massachusetts, from a similar time period (2009/2010) and same age group.

RESULTS: The population of Massachusetts in 2010 was 6,547,629. Of that, 51.14% was female. In the clinical study 47.72% were female. The average income in 2010 for Massachusetts residents was $62,072. The majority of the clinical trial participants (50.45%) had an annual income of less than $30,000 at the time of the study. See Table 1 for BMI, smoking, and disease status. See Table 2 for race data.

Table 1. BMI, Smoking, and Disease Status: MA Census Data 2009 vs. Study Data

<table>
<thead>
<tr>
<th></th>
<th>MA Census Data 2009</th>
<th>Clinical Study Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>51.14%</td>
<td>47.72%</td>
</tr>
<tr>
<td>Male</td>
<td>48.85%</td>
<td>52.28%</td>
</tr>
<tr>
<td>BMI&gt;30</td>
<td>19.80%</td>
<td>25.63%</td>
</tr>
<tr>
<td>Tobacco smokers</td>
<td>17.60%</td>
<td>23.33%</td>
</tr>
<tr>
<td>Heart disease</td>
<td>1.67%</td>
<td>1.74%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>16.17%</td>
<td>11.52%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>4.77%</td>
<td>5.87%</td>
</tr>
</tbody>
</table>

Table 2. Race: MA Census Data 2010 vs. Study Data

<table>
<thead>
<tr>
<th>Race</th>
<th>MA Census Data 2010</th>
<th>Clinical Study Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>80.40%</td>
<td>58.96%</td>
</tr>
<tr>
<td>Black or African American</td>
<td>6.60%</td>
<td>25.47%</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>0.30%</td>
<td>0.95%</td>
</tr>
<tr>
<td>Asian</td>
<td>5.30%</td>
<td>6.84%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9.60%</td>
<td>13.74%</td>
</tr>
</tbody>
</table>

CONCLUSIONS: The results suggest that the prevalence of BMI>30, tobacco smoking, heart disease, hypertension, and diabetes was similar between the study group and the Massachusetts population. There was a difference in average income. Additionally, there was a difference in racial diversity. This suggests that the population screened for the clinical study is reflective of the overall Massachusetts population except in regard to annual income and racial diversity.

Also presented at the 2015 IADR General Session in Boston. Abstract #4161.
Select Characteristics of Developmentally Disabled Adults with No Untreated Caries

Hannah Gilman,* Jane Steffensen, Angel Park, and John Morgan

OBJECTIVE: Individuals with intellectual/developmental disabilities (I/DD) are reported to have a high prevalence of dental caries. This study describes characteristics of dentate adults with I/DD who presented to the Tufts Dental Facilities with no untreated dental caries, either with existing restorations or with no restorations.

METHODS: This cross-sectional study analyzed clinical and demographic data from axiUm electronic records of dentate adults with I/DD aged >20 years who received an oral examination from April 1, 2009, to March 31, 2010. Independent variables included disability level (mild, moderate, profound), residence type (community-supported, independent and institutional) and selected comorbidities. Analysis was conducted on the subset of study participants with no untreated caries. Data were analyzed using SPSS. Associations were tested using chi-square analysis.

RESULTS: Of the 4,218 dentate adults in the study, 2,859 had no untreated dental caries, and of those, 82.1% (N=2,346) had restorations (Rest) and 17.9% (N=513) had no restorations (NoRest). The prevalence of profound disability in the Rest group vs. the NoRest group was 39.4% (N=1,518) vs. 63.4% (N=318) respectively, p<0.001; those living in institutions was 12.4% (N=2328) vs. 23.0% (N=511) for Rest vs. NoRest respectively, p<0.001; and of the reported comorbidities, the prevalence of epilepsy, cerebral palsy and gastronomy tubes was 37.9% vs. 44.4%, 17.0% vs. 24.6% and 6.2% vs. 14.8% for Rest vs. NoRest respectively, p<0.001.

CONCLUSIONS: The data from this preliminary analysis showed that the dentate adults with I/DD in the NoRest group were on average of a more profound disability level, more likely to reside in institutional living situations, and had a higher prevalence of epilepsy, cerebral palsy, and gastronomy tubes. Future studies may explore the prevalence of periodontal disease and investigate further reasons why more profound disability level, institutional living, and specific comorbidities would be associated with a lower prevalence of dental caries in this population group.

Also presented at the 2015 IADR General Session in Boston. Abstract #1444.
Are We in the Dark: LED Headlamp Use at TUSDM

Vishavjeet Girn,1* Khoa Tran,1 Courtney Robinson,1 Edsel Ing,2 Angel Park,1 Matthew Finkelman,1 William Chao,1 Jonathan Bishop,1 Gerard Kugel,1 and Melissa Ing1

1Tufts University School of Dental Medicine, Boston; 2University of Toronto, Toronto

OBJECTIVES: Most dental schools offer both magnifying loupes and light emitting diode (LED) headlamps to students as part of their instrument kit. However, blue wavelength 440–880 nm, such as that found in LEDs, has been linked to macular degeneration. Tufts University School of Dental Medicine (TUSDM) students and faculty were surveyed to determine whether they experienced any adverse effects such as blurry vision or headaches that may be linked to LED headlamp use.

METHODS: The sample included faculty and first, second, third, and fourth year pre-doctoral students at TUSDM. The online survey tool Qualtrics was used to administer a 21-question survey regarding use of loupes with or without headlamps, brands used, and frequency of use, and to account for any experience of negative effects.

RESULTS: In the study, 1,361 students and faculty were contacted; a total of 440 completed the survey. Of these, 82.3% reported using LED headlamp with magnifying loupes. Respondents’ average use of an LED headlamp was 3.36 hours per day. Median use was 3 hours per day (IQR: 2.0, 4.0). Of those using an LED headlamp, 13.0% reported turning the LED off during a procedure and 52.4% reported at least one experience of negative effects including blurry vision, headaches, double vision, or other visual disturbance.

CONCLUSIONS: More than half of those surveyed who used LED headlamps experienced some sort of visual disturbance. Blue light hazard from LED usage and subsequent retinal damage are not well understood. Safety education could possibly minimize future visual problems by suggesting the changing of light intensity or limiting time usage.

Also presented at the 2015 IADR General Session in Boston. Abstract #924.
The Prevalence of Global Service Programs in United States Dental Schools


This study evaluated global service programs (GSPs) as an integral part of United States dental school curricula. In 2003, the American Dental Education Association (ADEA) stated some schools are increasing extramural opportunities to introduce students to patients of different needs, cultures, and dental delivery services. According to the American Dental Association (ADA) in 2009, nearly half of the dental schools in the United States offer international volunteer opportunities to their students. This descriptive study determined how many dental schools in the United States incorporated global service learning in their dental curricula. Furthermore, the study describes the unique exchange program experience between Tufts University School of Dental Medicine (TUSDM) and the University Pedro Henriquez Urena (UNPHU) in the Dominican Republic.

OBJECTIVE: The objective of this study was to determine the importance of incorporating global health service into the dental curricula with the goal of preparing dental students to help reduce oral-health disparities and prepare them to work effectively with culturally diverse patients.

METHODS: An evaluation of the 65 dental schools, 41 public and 24 private, was included. Scientific papers and journal articles (N=191) were screened closely using search engines PubMed and Medline from the past ten years, which were systematically filtered to 8 articles.

RESULTS: It was found that 31.3% (less than one third) of all American dental schools incorporate global service learning trips into the dental curriculum, 42.2% do not incorporate these trips into the curriculum, and the remaining 26.5% are unknown. The percentages were almost the same between private and public. For this reason, the p-value was not statistically significant using chi-square test analysis (p>0.05).

RECOMMENDATIONS: Global service programs should be offered to college pre-dental students and first- and second-year graduate students regardless of prior experience in global health. The study suggests that U.S. dental schools should include exchange programs and foster sustainable site partnerships.

CONCLUSION: This study found that less than one third of all dental schools in the United States incorporate global service programs in their curriculum. Many dental students aspire to incorporate global health into their future careers, while others seek international opportunities to better prepare themselves for private practice in United States.
Objectives: The first aim was to determine the efficacy of toothbrushes in removing artificial plaque over a 4-month period using a stationary bristle technique (a modification of the Bass technique) or a scrub technique. The second aim was to determine the amount of wear on a toothbrush when brushing with a stationary bristle technique or a scrub technique, over a 4-month period on a typodont.

Methods: At baseline and at each 2-week interval, each brush was photographed from the top down in three sections under 40X magnification. At the same intervals, artificial plaque was applied to the buccal/lingual surfaces of the “Ramfjord” teeth. The typodonts were photographed buccal/lingually and brushed for two minutes, then photographed again. The scrub (N=2) and stationary bristle (N=2) techniques, with dentifrice and water, were used. Each model was brushed on all surfaces for 2 m per brushing session. This was repeated to simulate brushing twice a day for four months. Technique and temporal indicators were removed from all photographs, and each was assigned a randomized identification number. Two blind evaluators measured the length and width of each toothbrush section to analyze wear and assessed plaque removal using the Sillness and Loe plaque score.

Results: The scrub technique removed significantly (p=0.0004) more supragingival plaque than the stationary bristle technique. Toothbrush length and width measurements increase over time for both techniques; scrub technique deforms width more than stationary bristle technique, but not length.

Conclusions: Although toothbrushes wear down over time using either the scrub or the stationary bristle technique, neither had a definitive effect on removing artificial plaque as time progressed. These results on artificial plaque provide merit for a clinical study looking at plaque removal, as it implies that toothbrushes may not need to be replaced as frequently as recommended.

Also presented at the 2015 IADR General Session in Boston. Abstract #3070.
Fluoride Content in Green Tea

Melissa Ing, David Frantz, Britta Magnuson, Masly Harsono, Jennifer Bassett Midle, Matthew Finkelman, Alexis Irby,* and Gerard Kugel

OBJECTIVES: <i>Camelia sinensis</i>, the tea plant, is a natural bioaccumulator of fluoride, which is uptaken and incorporated into the plant when it is grown in fluoride containing soil. The fluoride is released upon brewing the tea. This study measured the fluoride released from four Asian green teas.

METHODS: Asian sencha variety loose-leaf green teas were obtained from Sri Lanka, South Korea, China, and Japan. Each tea was brewed 20 times, each time using 2.5 grams of loose-leaf tea and 120 cm³ of deionized water. Brewing time was two minutes, and brewed tea was analyzed using a fluoride probe. As control, the above process was done using deionized water without any tea. All reusable articles used in the experiment were cleaned using deionized water between experimental runs.

RESULTS: The normality assumption was checked and violated so nonparametric measures were conducted in this analysis. Medians and interquartile ranges of fluoride concentrations were reported for each tea type; Chinese 6.83 ppm (0.14), Korean 5.36 ppm (0.10), Ceylon 3.58 ppm (0.14), and Japanese 1.88 ppm (0.14). A Kruskal-Wallis test found a significance difference between groups of tea (H=95.06, df=4, p-value<0.0001). Nonparametric post-hoc tests found significant differences between the Chinese tea, with both Ceylon and Japanese tea, and significant differences between Korean tea with Japanese tea. All teas were significantly different from the control group.

CONCLUSIONS: The Chinese tea had the highest amount of fluoride released while the Japanese had the lowest. Chinese tea was not significantly different, though, from the second highest, Korean, but was different than both Ceylon and Japanese tea. This study showed that teas from different countries varied in the amount of fluoride they contained. When considering a person’s daily fluoride intake, tea consumption habits and origin of tea should be evaluated.

*Presented at the 2015 IADR General Session in Boston. Abstract #2546.
Evaluating Dental Students’ Readiness in Managing the Domestic Violence Patient
Mansi Jailwala,* Diana Esshaki, Gülsün Gul, Jennifer Bassett Midle, and Kanchan Ganda

OBJECTIVES: The objectives of this study were to survey and assess dental students’ knowledge and attitudes toward domestic violence (DV) patients; to compare the DV curriculum experience of second-, third-, and fourth-year dental students; to ascertain how the knowledge and opinions of students evolve as they gain training; and to evaluate if the curriculum and clinical experience at Tufts University School of Dental Medicine (TUSDM) enhance students’ knowledge and attitudes.

METHODS: A pre-validated survey tool, PREMIS (Physician Readiness to Manage Intimate Partner Violence Survey), was modified and used to survey second-, third-, and fourth-year dental students. The survey included questions in three sections: background experience, intimate partner violence (IPV) knowledge, and opinions. An online survey tool, Qualtrics, was used to survey students. Statistical analyses were performed with SAS software (version 9.3). Descriptive statistics were computed for each of the three classes. Statistical significance between classes was assessed via ANOVA for the normally distributed continuous measures, with Tukey’s HSD post-hoc tests and Kruskal-Wallis test for not normally distributed continuous measures. Chi-square tests were conducted for categorical measures. P-values<0.05 were considered statistically significant.

RESULTS: The sample population for the survey was 58.4% second years, 24.8% third years and 14.2% fourth years. Analysis showed no significant differences in preparedness, knowledge, and opinions between the three classes. The median level of preparedness that the TUSDM students reported having working with DV patients was 4 on a scale of 1–7. The median score for knowledge was 4–5 on a 1–7 scale with the exception of knowledge on developing a safety plan for DV patients and the relationship between DV and pregnancy was 3. In the opinion section where students were asked to show how much they agree or disagree with a DV-related statement, the answers varied.

CONCLUSIONS: TUSDM’s curriculum is striving to train students to assist DV patients. Most students are at the 50th percentile in knowledge and preparedness indicating that the curriculum has room for improvement in certain areas but it is effectively raising awareness and comfort level of the students.
Oral-Health Related Quality of Life in Sjögren’s Syndrome: A Continuation

Samantha Keck,* Athena Papas, Angel Park, Matthew Finkelman, Britta Magnuson, and Mabi Singh

OBJECTIVES: This study investigated oral-health related quality of life (OHRQoL) in patients with Sjögren’s syndrome (SS).

METHODS: A comprehensive web-based questionnaire (Qualtrics) was created using the OHIP-14 Questionnaire, and questions from the Harrison Interactive Survey on Sjögren’s syndrome previously administered by the Sjögren’s Syndrome Foundation (SSF). After IRB review, the SSF emailed the questionnaire to their members. Members of SSF were asked to forward the questionnaire to a peer of similar age and same gender that had not been diagnosed with SS to serve as a control group. All data were de-identified. For categorical data, the percentages and frequencies were calculated. The mean and median were analyzed for continuous data. Chi-squared tests and ANOVA were run using SAS 9.2.

RESULTS: Preliminary analysis of the data included 1,336 individuals with primary SS (95.94% female), 143 with secondary SS (98.31% female), and 162 for the peer control population (95.27% female). There was no statistical difference between the ages of the three groups (mean=59.1, p=0.327). Participants were asked five questions in regards to the dental work completed (Table 1). Of the five questions, the only statistically significant difference between SS and the comparison population was noted in whether fillings or crowns have been placed in the last 12 months (Table 1). Table 2 lists the continuous data regarding the amount of dental visits as well as the amount spent out of pocket on dental work within the last 12 months for the three populations. The mean amount spent by primary SS patients was $1,595.30 (±$3,234.04), $1,663.18 (±$2,814.33) for secondary SS patients and $488.06 (±$936.49) for the comparison population.

Table 1

<table>
<thead>
<tr>
<th>Have you had any dental implants?</th>
<th>Primary Sjögren's Syndrome (Col Pct)</th>
<th>Secondary Sjögren's Syndrome (Col Pct)</th>
<th>Comparison Population (Col Pct)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you had any root canals?</td>
<td>20.53%</td>
<td>19.49%</td>
<td>17.81%</td>
<td>p=0.989</td>
</tr>
<tr>
<td>Have you had any extractions (not including wisdom teeth)?</td>
<td>69.18%</td>
<td>63.56%</td>
<td>55.48%</td>
<td>p=0.074</td>
</tr>
<tr>
<td>Have you had any fillings in the past 12 months?</td>
<td>50.65%</td>
<td>50.43%</td>
<td>46.94%</td>
<td>p=0.585</td>
</tr>
<tr>
<td>Have you had any crowns placed in the past 12 months?</td>
<td>45.08%</td>
<td>51.69%</td>
<td>22.76%</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Have you had any crowns placed in the past 12 months?</td>
<td>37.64%</td>
<td>42.74%</td>
<td>18.37%</td>
<td>p&lt;0.001</td>
</tr>
</tbody>
</table>
Table 2

<table>
<thead>
<tr>
<th></th>
<th>Primary Sjogren's Syndrome</th>
<th>Secondary Sjogren's Syndrome</th>
<th>Comparison Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many dental visits did you make in the past 12 months?</td>
<td>3.29±2.83</td>
<td>3.15±2.37</td>
<td>1.98±1.00</td>
</tr>
<tr>
<td>How much did you spend out of pocket on dental work in the past 12 months?</td>
<td>$1,595.30 ±$3,234.04</td>
<td>$1,663.18 ±$2,814.33</td>
<td>$488.06 ±$936.49</td>
</tr>
</tbody>
</table>

CONCLUSIONS: Both primary and secondary Sjögren's syndrome reported more fillings and crowns as well as increased amount spent out of pocket on dental work within the last 12 months compared to their peer controls population.

*Also presented at the 2015 IADR General Session in Boston. Abstract #1022.*
Comparison of Microleakage Evaluation Methodology of Beveled Composite Restorations

Julia Kim,* Tofool Alghanem, Gerard Kugel, and Masly Harsono

OBJECTIVE: To observe the microleakage of Class-II restorations using two different microleakage evaluation methodologies.

METHODS: A total of sixty Class-II preparations were prepared on caries-free extracted human molars by a single operator. All preparations were approximately 1.5 mm in depth at the pulpal floor and 2.5 mm at the gingival floor, with 0.5 mm bevel on enamel all around cavosurface margins at 45°. Samples were randomly assigned into four groups (N=15 each, two with phosphoric acid etching (E) and two without (WE)). AdheSE® adhesive system was applied according to the manufacturer's instructions. Then the samples were filled with Filtek Supreme Ultra (3M ESPE) and cured for 20 seconds with an LED light (DEMI, Kerr). Apices of teeth were blocked with wax and tooth surfaces were covered with nail polish except for 2 mm around cavosurface margins. One group each from E and WE was thermocycled for 2,500 cycles in water between 5°C and 50°C with a dwell time of 15 seconds and then immersed in 2% methylene blue solution for 10 hours (H2O). The other two groups were thermocycled in the same manner in buffered 2% methylene blue solution (Blue). Samples were embedded into acrylic and sectioned in the mesio-distal direction (Isomet, Buehler). Microleakage scores towards pulpal floor (P) and axial wall (A) were recorded under a light microscope (Olympus SZX16). Statistical analysis was conducted using an ordinal logistic regression test. Statistical significance was predetermined at p<0.05.

RESULTS: The table shows the number of samples in each scoring group. Groups that used phosphoric acid etching had lower microleakage scores. Groups that were thermocycled methylene blue solution had more microleakage scores of 4 towards axial wall, but the difference between the groups was not statistically significant.

<table>
<thead>
<tr>
<th>Microleakage score towards</th>
<th>Group 1 E+H₂O</th>
<th>Group 2 WE+H₂O</th>
<th>Group 3 E+Blue</th>
<th>Group 4 WE+Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>0=no microleakage</td>
<td>9/6</td>
<td>6/2</td>
<td>10/6</td>
<td>5/2</td>
</tr>
<tr>
<td>1=25% towards (P)/(A)</td>
<td>4/6</td>
<td>3/4</td>
<td>3/1</td>
<td>4/1</td>
</tr>
<tr>
<td>2=50% towards (P)/(A)</td>
<td>1/1</td>
<td>2/2</td>
<td>2/5</td>
<td>2/4</td>
</tr>
<tr>
<td>3=75% towards (P)/(A)</td>
<td>1/1</td>
<td>0/1</td>
<td>0/0</td>
<td>1/1</td>
</tr>
<tr>
<td>4=100% towards (P)/(A)</td>
<td>0/1</td>
<td>4/6</td>
<td>0/3</td>
<td>3/7</td>
</tr>
</tbody>
</table>

CONCLUSIONS: Using phosphoric acid etching significantly reduces microleakage scores (p=0.01). No significant difference in microleakage scores was seen between samples that were thermocycled in methylene blue solution instead of water (p>0.05).

Also presented at the 2015 IADR General Session in Boston. Abstract #647.
Analyzing the Prevalence of Hepatitis B in Asian-American Patients and Non-Asian Americans with a Medical Consult at Tufts University School of Dental Medicine

Yun Ae Kim,* Diana Esshaki, Britta Magnuson, Jennifer Bassett Midle, and Kanchan Ganda

OBJECTIVE: The purpose of this study was to evaluate the prevalence of hepatitis B in all patients getting a medical consult at TUSDM. Both the hepatitis-B–positive patients and the hepatitis-B–negative patients were further subdivided into to Asian-American versus non–Asian-American. The hypothesis was that the prevalence of hepatitis B in Asian-American patients would be much higher in comparison to the non-Asian patients getting a medical consult at TUSDM. The age and gender of the hepatitis B patients were also subject to analysis.

METHOD: A retrospective analysis was conducted of medically complex patients who were treated at TUSDM undergraduate clinic from June 2004 to May 2014. The study population was analyzed for patient demographics and disease status analysis by reviewing Medical Consult and Comprehensive Health History forms on axiUm, respectively.

RESULTS: The prevalence rate of hepatitis B in the Asian population was 4.2%. This rate was comparatively much higher than any other race. When comparing the two racial groups Asians vs. non-Asians, a chi-square <0.0001 indicated the two groups are significantly different in the distribution of proportions among HepB negative and HepB positive. An odds ratio of 0.488 was found, indicating Asians are 48% more likely to be HepB positive than non-Asians. Age and gender were addressed for all patients getting a medical consult in axiUm. Age and gender were also addressed for the hepatitis-B–infected population separately. Although there were more females in the patient population getting a medical consult, there were more males with hepatitis B than females.

CONCLUSION: The original hypothesis of this research was confirmed. It was shown that of the patients getting a medical consult at TUSDM, Asians showed the greatest prevalence rate of hepatitis B. This conclusion confirms and parallels research that has been conducted on Asian Americans elsewhere in the United States.

Also presented at the 2015 ADEA Annual Session in Boston.
Rural Zambia Oral-Health Dental Services: Utilization Outcomes

Alice Ko,* Maryam Mahdavi, Angel Park, and John Morgan

OBJECTIVE: The World Health Organization’s recommendations for the prevention of non-communicable diseases and improved quality of life include prevention-focused oral-health programs. The aim of this study was to investigate various oral-health indicators (pain, required extractions, and treatment urgency (TU)) of patients who participated in a preventive-focused oral-health program in rural Zambia from 2007–2013. First-time members (non-repeaters) in addition to patients returning to the program (repeaters) were assessed for oral-health outcomes.

METHODS: Data was collected each year from screening forms recorded by a calibrated dental team. All records were de-identified, entered in Access, and crude bivariate analyses completed using SAS 9.2. Patients were divided into 2 groups: non-repeaters and repeaters. TU of each patient visit was recorded as 0=no obvious problem; 1=early dental problem; 2=urgent care. Other data include pain (0=no; 1=yes) and extractions (0=no; 1=yes).

RESULTS: From 2007–2013, a total of 3,132 individuals (2,633 non-repeaters and 499 repeaters) were seen. Preliminary analysis indicates that, for non-repeaters vs. repeaters, 47.0% (1,238) vs. 63.5% (317) reported pain and 41.1% (1,082) vs. 54.1% (270) required extractions, respectively. Treatment urgency was evaluated for the first repeated year (2008) and last repeated year (2013) of the program. For non-repeaters vs. repeaters, TU=2 was 30.2% vs. 42.0% in 2008 and 29.7% vs. 31.0% in 2013. TU=0 was 18.2% vs. 25.0% in 2008 and 57.5% vs. 47.3% in 2013, respectively.

CONCLUSION: Preliminary results indicate that a greater percentage of repeaters reported pain and required extractions than non-repeaters. This would be consistent with repeaters better identifying problems and returning for treatment. However, the proportion of TU=2 decreased and TU=0 increased over the study period for both patient pools. This would be consistent with an overall population seeking preventive care. Further assessment of the program, including qualitative methodologies, would assist in project development and strategic planning.

Also presented at the 2015 IADR General Session in Boston. Abstract #3871.
Prevalence of Periodontal Bone Loss as a Function of Age

Zachary Carnow, Yujin Lee,* Paul Kim, Christina Penn, Tannaz Shapurian, Robert Gyurko, Paul Levi Jr.

OBJECTIVE: To study the relationship between periodontal bone loss and age.

METHODS: A retrospective review of 1,000 electronic patient records in the pre-doctoral clinics of TUSDM was performed to observe comprehensive oral examinations and digital radiographs. Patient records from January 1, 2012, to July 8, 2014, were grouped in 10 age cohorts ranging from 15 to 64 years. For each age group, 100 records were randomly selected for inclusion in the study. Data were gathered regarding patient age and periodontal bone loss. Presence of at least one interproximal site with a distance of more than 2.5 mm between the cementoenamel junction and the alveolar bone crest as measured on bitewing radiographs was considered evidence of periodontal bone loss.

RESULTS: Simple logistic regression analysis shows there is a significant relationship between the increase of age and prevalence of periodontal bone loss, p <0.0001 (Graph 1). The minimum prevalence value for bone loss occurs in the age group between 15 and 19, whereas the maximum prevalence value for bone loss occurs in the age group of 55 to 59 (Table 1). Also, we note that there are incremental differences between the age groups, and the biggest incremental difference happens between ages 34 to 39 and also at 54 and 59 (Graph 2). Further statistical analyses are needed to corroborate the trend with calculation.

Graph 1: Percentage of people within each age group pooled into two groups: no bone loss (radiographic bone loss=0) and presence of bone loss (radiographic bone loss=1) vs. age.
Table 1. The prevalence of periodontal bone loss within each age group

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<tr>
<td>Prevalence (%)</td>
<td>1.96</td>
<td>4.76</td>
<td>11.88</td>
<td>23.64</td>
<td>36.89</td>
<td>42.16</td>
<td>44.86</td>
<td>48.04</td>
<td>64.36</td>
<td>64.04</td>
</tr>
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</table>

Graph 2. Prevalence of periodontal bone loss changing with age

CONCLUSION: A significant relationship exists between the prevalence of periodontal bone loss and age. The age groups show different incremental differences. Further statistical analysis is needed to determine specifically at what age the increase is most pronounced. Also for the future we want to look at whether there are differences with gender, tobacco use, BMI, and systemic diseases and compare all of these groups to look for significant differences.

Also presented at the 2015 IADR General Session in Boston. Abstract #2448.
Quantitative Admissions Criteria as Predictor of Academic Failure at TUSDM

Heather Leung,* Jennifer Bassett Midle, and Yun Saksena

OBJECTIVE: Admission to dental school is highly competitive, with admittance rates in the single digits. Each year, the admissions selection committee faces the difficult task of determining which students to admit to their four-year professional program. Admissions information data, such as Dental Admissions Test (DAT) scores, undergraduate grade point average (uGPA), and scientific grade point average (sGPA), have commonly been used to predict academic success in dental school. However, this information can also be utilized to identify students who may be at risk for low academic performance. This study aims to explore the potential of DAT scores, cumulative undergraduate GPA (uGPA), and science GPA (sGPA), as being possible predictors of failure at TUSDM.

METHODS: Following approval from the Tufts University Institutional Review Board, the Tufts University School of Dental Medicine (TUSDM) Office of Admissions and Student Affairs reviewed the academic records of the pre-doctoral students of the 2013, 2014, 2015, 2016, and 2017 classes at TUSDM (N=885). Administrators identified each student as having failed or not failed a first- or second-year course and matched him/her to his/her undergraduate DAT scores (academic average (AA), total science (TS), quantitative reasoning (QR), reading comprehension (RC), and biological sciences (Bio)); cumulative undergraduate GPA (uGPA); science GPA (sGPA); biology, chemistry, physics GPA (BCP GPA); and non-science GPA (nsGPA). Univariate descriptive statistics (counts and percentages, and means and standard deviations for continuous measures like DAT scores, uGPA, and sGPA) were computed for the group of students who failed and the group of students who did not fail a first- or second-year course. All data had been de-identified. Statistical significance between the groups was assessed via bivariate analysis (t-tests) for the continuous measures. All p-values<0.05 were considered statistically significant. All statistical analyses were performed using SPSS Version 21.

RESULTS: Each pre-doctoral class comprised of about 20% of the sample population (N=885), with around 10% (N=91) having failed and 90% (N=794) having not failed a first or second year course. A significant difference between the failure (F) and no failure (NF) groups was determined for the following DAT scores: academic average (mean F=19.242, mean NF=19.743, p=0.004), quantitative reasoning (mean F=17.275, mean NF=18.142, p=0.002), and total science (mean F=19.308, mean NF=19.713, p=0.036). The reading DAT score demonstrated a relationship that was “trending towards significance” (mean F=20.341, mean NF=20.844, p=0.078). No statistical difference was found in the uGPA variables and biology (p=0.254) DAT score for the failure and no failure groups (p>0.05).

CONCLUSION: This study found that DAT scores, not undergraduate GPA, differed across the failure and no failure groups, illustrating the fact that DAT scores are related to failure while uGPA variables are not. This suggests that certain DAT scores are related to failure and may serve as a good indicator of academic failure at the dental school level. However, future analysis will be needed to evaluate whether these relationships are true for all students, when controlling for such factors as gender, race, and age.

Also presented at the 2015 ADEA Annual Session in Boston.
The Effect of Collagen I and Fibronectin on the Inflammatory Potential of THP-1 Macrophages: Baseline Cytokine Measurements

James Leung,* Jason DeFuria, and Jonathan Garlick

OBJECTIVE: Previous studies have suggested that the M1 and M2 macrophage subtypes are involved in systemic scleroderma (SSC), a chronic connective tissue disorder that manifests in persistent fibrosis, due to their ability to produce cytokines that induce fibrosis such as Interleukin 13 (IL-13) and inhibit collagen turnover such as Tumor Necrosis Factor α (TNF-α) and Interleukin 1β (IL-1β). M1 macrophages can be activated via the TLR-4 signaling pathway and secrete IL-1β and TNF-α, which upregulate factors that inhibit collagen, and therefore contribute to pathological collagen accumulation in affected sites in disease. Chronic TLR-4 signaling has been implicated in SSC and fibrosis. The goal of this experiment is to investigate and establish baseline levels of the M1 macrophage IL-1β and TNF-α gene expression in response to collagen and fibronectin.

METHODS: Monocyte-like THP-1 cells were plated on untreated plastic, collagen 1 (Col1), fibronectin and suspension plates, differentiated with 100 nM phorbol myristate acetate for 72 h, and stimulated for 24 h with lipopolysaccharide (LPS) at 10, 100, and 1000 ng/mL concentrations. IL-1β and TNF-α transcripts were analyzed by real time qPCR and data was analyzed with the Pfaffel method.

RESULTS: In response to LPS, changes in THP-1 macrophage IL-1β and TNF-α expression were revealed to be sensitive to substrate composition. Col1 sensitized IL-1β in response to low dose LPS and both Col1 and fibronectin attenuated TNF-α expression while cells on plastic exhibited a non-specific, increased inflammatory response.

CONCLUSION: Using substrates found in vivo is important to understand biologically relevant, substrate specific effects on macrophage function and inflammatory gene expression. TLR-4 and integrin signaling may be viable targets for inhibition of inflammatory cytokines that can promote collagen accumulation. Future studies should evaluate the expression of other pro-/anti-inflammatory targets such as IL-10, IL-13, TGF-β and IL-6, the response of monocytes from SSC patients, and the response in 3D ECM environments.

Also presented at the 2015 IADR General Session in Boston. Abstract #3308.
Oral-Health Status/Outcomes Assessment of Oral-Health Program in Zambia

Maryam Mahdavi,* Angel Park, and John Morgan

OBJECTIVE: Limited literature on outcomes of dental aid organizations (DAOs) exists. The World Health Organization encourages DAOs to collect, analyze, and share data to advance dental public health efforts. This study provided an assessment of a preventative focused oral-health program introduced in rural Zambia in 2007. Prior to annual visits of this program, no local dental services were available.

METHODS: Data were collected from a screening instrument based on the Association of State and Territorial Dental Directors. Oral-health personnel examined 3,392 individuals between 2007 and 2013. For each participant, age, gender, presence of untreated caries (UntxCs), pain, required extractions, and treatment urgency (TU, no obvious problem=0, early dental care=1, urgent care=2) were recorded. Data for 2013 were entered in Access, merged with 2007–2012 data, and analyzed using SAS 9.2.

RESULTS: The study population (age 1–93 years) was 59.7% female with mean (SD) age of 25.3 (17.4). From 2007–2012, the number of participants each year was 193–723 (mean=441) with the most participants (N=736) in 2013. For 2007–2012, the proportion of participants <12 years each year ranged from 19.5% (N=95) in 2010 to 30.1% (N=217) in 2012; in 2013, 38.8% (N=289) were <12. From 2007–2012, the percentages of participants in any given year with the following conditions were: required extractions, 37.5–49.5%; pain, 38.7–63.8%; UntxCs, 56.2–79.9%; and TU=2 score, 32.7–50.5%. In 2013, the reported conditions were proportionally lower in each category: required extractions, 27.5%; pain, 33.8%; UntxCs, 41.5%; TU=2 score, 30.2%.

CONCLUSIONS: These results show an increase in the proportion of younger participants in 2013 as well as improved oral-health indicators for those attending a long-standing oral-health outreach program. Further research including qualitative methodologies would help assess the impact of this program on the community and future directions for program growth.

Also presented at the 2015 IADR General Session in Boston. Abstract #740.
Assessment of Dental Students’ Knowledge, Attitude, and Perception of HIV/HBV/HCV

Justin Maillet,* Wanda Wright, Jennifer Bassett Midle, Helene Bednarsh, and John Morgan

OBJECTIVE: Improvements in medical management have resulted in decreased mortality from HIV, HBV, and HCV and more persons living with these viral conditions. In order to provide optimum care for these patients, practicing dentists must be both knowledgeable and confident in treating these diseases. Our objective is to measure the knowledge, attitudes, and risk perception of students across all four years at TUSDM when treating patients with these diseases in order to have an accurate idea of how prepared Tufts graduates are to treat this growing population. We hypothesize that knowledge, attitudes, and perception will improve over the four years at TUSDM and that those who are more knowledgeable will have more positive attitudes and perceptions.

METHODS: A pre-tested self-administered questionnaire was developed and divided into four sections; knowledge, attitudes, risk perception, and education at TUSDM. The 41-question survey was sent out electronically and was accessible to all four classes at the University for four weeks. All answers were kept anonymous and participants were not required to answer every question.

RESULTS: Although the majority of students were knowledgeable about the methods of transmission of HIV, HBV, and HCV, they were less knowledgeable about treatment options, progression of the diseases, and occupational exposures such as a needle-stick. Of the students, 91.86% believe it is their professional obligation to treat patients with bloodborne diseases, yet 27.38% of those surveyed would prefer not to treat an infected patient. Confidence in treating these patients showed the greatest amount of statistical variation, with 28.74% of students unsure of their ability; however, 83.91% believed their confidence would increase after finishing their education.

CONCLUSION: Students at TUSDM have an adequate baseline understanding of the transmission of bloodborne pathogens that increases over their time at the school; however, it is necessary to provide more education on treatment options and disease progression, especially with the number of infected patients on the rise. Although some students feel they are capable of treating bloodborne infected patients, increased opportunities to provide treatment within the TUSDM clinic would increase confidence and foster better attitudes and perceptions.
Shear Bond Evaluation of Bonding Agents on Enamel and Dentin

Alissa Mariano,* Minh Bui, Ronald Perry, Sridhar Janyavula, and Gerard Kugel

OBJECTIVE: To evaluate the shear bond strength to dentin and enamel on commercially available bonding agents in total-etch and self-etch modes.

METHODS: Four bonding agents Prime & Bond Elect® (PBE) DENTSPLY, Scotchbond™ Universal (SBU) 3M, Adhese® Universal VivaPen (AUVP) Ivoclar Vivadent, and Clearfil™ Universal (CU) Kuraray Dental were used on enamel and dentin according to manufacturers’ specifications. A total of 32 specimens of human enamel (N=8) and 32 specimens of human dentin were prepared by ISO 29022. The teeth were sectioned using an IsoMet™ low-speed saw embedded (Buehler) in acrylic resin and trimmed to expose the desired surface. The surfaces were polished with 400-grit SiC paper and finished with 600-grit SiC paper. The specimens were randomly divided into groups with the universal bonding agent used in both total and self-etch modes on enamel and dentin respectively. Each specimen was bonded using Ultratester™ shear bond strength system (Ultradent) and the corresponding adhesive technique with TPH Spectra™ LV composite A3 (DENTSPLY). The specimens were stored 24 h at 37°C and 100% relative humidity. Shear bond strength was then tested at 1 mm/min using the Ultratester notched cross-head. Analysis was conducted using the Tukey method and run at 95% confidence. Significance was determined with p<0.05.

RESULTS: PBE demonstrated the highest mean shear bond strength for both total etch on enamel and self-etch on dentin (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>Enamel Total-Etch (N=8)</th>
<th>Dentin Self-Etch (N=8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean MPa</td>
<td>Std Dev</td>
</tr>
<tr>
<td>PBE</td>
<td>34.75</td>
<td>7.175</td>
</tr>
<tr>
<td>SBU</td>
<td>33.944</td>
<td>5.25</td>
</tr>
<tr>
<td>AUVP</td>
<td>32.338</td>
<td>8.234</td>
</tr>
<tr>
<td>CU</td>
<td>25.97</td>
<td>5.711</td>
</tr>
</tbody>
</table>

CONCLUSIONS: PBE, SBU, and AUVP bond strengths were all comparable using a total-etch system on enamel. PBE and AUVP had statistically higher bond strengths when compared to SBU and CU when used in the self-etch mode on dentin. This may have clinical relevance in improving the bond strength of composite restorations to enamel and dentin. Further study is required to determine optimal shear bond outputs for the various competing bonding agents.

Also presented at the 2015 IADR General Session in Boston. Abstract #822.
Open Air Aging Effects on Enamel-Dentin Adhesive Systems In Vitro
Matthew Marquis,* Gerard Kugel, Ronald Perry, and Masly Harsono

OBJECTIVES: The aim of this study was to test over time the shear bond strengths (SBS) of three universal adhesive systems on dentin after the systems were exposed to air in order to compare open-bottle composite bonding systems to closed-system adhesives.

METHODS: Ninety caries-free extracted human teeth (all types) were sectioned at their occlusal thirds and flat, exposed dentin surfaces were polished at increasingly fine increments (120-grit, 240-grit, 320-grit) for 30 seconds. Samples were divided into 3 groups (N=10): Ivoclar’s AdheSe® Universal Pen (IP, closed system), Optibond™ XTR (OP, two-bottle open system), and P&Blect® (PB, one-bottle open system). Seven time-points were chosen (0, 2, 4, 6, 8, 10, 12 weeks). The amounts of 2 drops/3 pen clicks were dispensed from each system, which was followed by 15 minutes of air exposure/weekday. At each time point, Filtek™ Supreme Ultra composite buttons were bonded to the dentin surfaces using self-etch manufacturer specifications and samples were left to polymerize (24 hr, deionized water). Samples were then tested via Instron® (Model 5566A) and the change in SBS was analyzed using a paired t-test. The comparison of the 3 groups was done using one-way ANOVA (SAS v9.2). Tested dentin samples were re-polished with the aforementioned polishing protocol for reuse.

RESULTS:

Trends in SBS (mPa) (letter A denotes no statistical significance):

<table>
<thead>
<tr>
<th></th>
<th>IP</th>
<th>OP</th>
<th>PB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg SBS 0 wk</td>
<td>26.6A</td>
<td>22.3A</td>
<td>15.5B</td>
</tr>
<tr>
<td>Avg SBS 12 wk</td>
<td>26.8A</td>
<td>24.7A</td>
<td>8.39B</td>
</tr>
<tr>
<td>Avg ΔSBS</td>
<td>−0.506A</td>
<td>−0.370A</td>
<td>−1.580B</td>
</tr>
<tr>
<td>P-Value</td>
<td>0.397A</td>
<td>0.590A</td>
<td>0.008B</td>
</tr>
</tbody>
</table>

CONCLUSIONS: The results of this investigation indicate that there is no significant decrease in SBS over the twelve-week time period evaluated using IP and OP while there is a significant decrease in SBS for PB.

Sponsored in part by Ivoclar. Also presented at the 2015 IADR General Session in Boston. Abstract #815.
Student Perspectives on Professionalism in Dentistry

Alexa Martin,* Diana Esshaki, and Harish Gulati

A dental student's professional image depends on his/her appearance, style of communication, and behavior both in and out of the dental setting. The evolving world of technology and social media presents unclear rules and blurred lines about what is appropriate behavior and communication for students with regard to their professional image. As these electronic domains increase in popularity, it is important to understand dental students' views on what is appropriate behavior in order to develop a curriculum that prepares them to interact with their patients in a professional manner.

The aim of this study was to describe student views on what is acceptable dress attire, behavior, communication methods with patients, and social media interactions with patients. A multiple-choice survey was created and distributed via LISTSERV to all dental students at Tufts University School of Dental Medicine and analyzed to compare answers among class years.

The majority (90%) of students agreed that the way they dress in clinic plays a significant role in how their patients perceive them as professionals. The majority disagreed that it is okay to be friends with patients on social media (73%), that it is acceptable to post photos of patient care on social media (79%), and that using shorthand/emoji while texting patients is an acceptable way to communicate (65%). Less than half (44%) disagreed that it is acceptable for two dental students to discuss a patient's medical history in an empty operatory during a clinic session. Class years were significantly different (p=0.017) in their responses to the statement about the acceptability of shorthand/emoji in text messages. Students in the class of 2018 were most likely to disagree with the statement (85%); students in the class of 2015 were least likely to disagree (50%). Student responses to other statements did not vary significantly by class year (p>0.05).

Results suggest that students are aware that the way they dress influences how their patients perceive them as professionals. There is a mixed awareness amongst students about acceptable behavior online and while texting. It is essential that we clearly define and educate students about appropriate behavior in the future.
Student Self-Assessment vs. Faculty Evaluation of Operative Dentistry Practical Examinations

Lauren Marzouca,* Bradley Belous,* Jennifer Denike,* Gerard Kugel, Angel Park, and Steven Eisen

OBJECTIVE: Practicing dentists rely on self-assessment in order to provide the highest level of oral healthcare. Accordingly, a comprehensive goal of dental education is to foster a self-critiquing, critically thinking mind in novice dental professionals. While a literature review revealed a great deal of research focusing on the benefits of critical thinking and self-assessment in relation to success and clinical discernment in nursing and medical students, there is a distinct lack of data concerning dental student self-evaluation, especially in the preclinical setting. Therefore, this study aimed to examine first-year dental students’ self-assessment ability, while also comparing it to faculty grading. Additionally, correlations between students’ self-assessment and faculty grading will indicate that Tufts University School of Dental Medicine’s (TUSDM) calibration procedures are reliable and valid tools.

METHODS: Throughout the 2013–14 school year, the D17 students completed six regularly-scheduled operative dentistry practical examinations in simulation clinic. After completing each examination, students self-assessed their work, and then left their self-assessment forms at their seats. Next, two randomized and calibrated faculty members collaboratively scored each students’ practical. Both students and faculty used the same 10-point grading scale, with the lowest passing score being a 7. Student self-assessment and faculty score were coupled using seat number, and the data was not linked to identifiable information.

RESULTS/CONCLUSION: One hundred ninety-two (N=192) D17 students were eligible to participate. The lowest response rate occurred on practical #4 (76%) and the highest response rate occurred on practical #1 (95%). When a student self-assessed his or her work within 0.5 points higher or lower than the faculty grade, the student was deemed to have graded accurately or “the same” as faculty. The “same” scoring ranged from 49% to 59% of students throughout the 6 practical examinations. The remaining students self-assessed themselves greater than 0.5 points away from the faculty score. The majority of students tended to overestimate their work. This most often occurred on practical examinations where students were asked to complete Class I or II preparations. Meanwhile, students underestimated or scored their work “the same” most frequently on practical examinations which were assessing Class I or II amalgam or composite restorations. The highest over-estimation (41% of students) occurred on practical #1, a Class I preparation. This was anticipated because at this early stage of dental education, D17 students were inexperienced at self-assessment and operative dentistry. Additionally, the mean faculty score (8.04, on average) was lower than the mean student score (8.27, on average), not only overall, but also on each individual practical. It was determined that mean student scores were closer to mean faculty scores on practical examinations that were assessing restorations rather than preparations. Overall, it was determined that students improved both on self-assessing and on the practical examinations throughout the eight-month operative dentistry course, but faculty do tend to score students lower than students anticipate.

Also presented at the 2015 ADEA Annual Session in Boston.
Effect of Coatings on Surface Hardness of Glass Ionomer Cements

Amanda Merikas,* Jessie Reisig, Ronald Perry, and Gerard Kugel

OBJECTIVES: Evaluate the effect of coating materials on surface hardness (SH) of several brands of glass ionomer restoratives (GIC).

METHODS: Total of N=300 samples were divided between 9 test groups using 5 different GICs ((3M ESPE Ketac™ Molar Quick Aplicap™ (KMQ), Ketac Molar-New Formulation (KM-NF), GC America Equia™ Fil (EQF), Fuji IX™ (FIX), and VOCO IonoStar® Molar (IM)). There were 7 test groups with coating, with 2 uncoated as controls. In each group, 12 samples were prepared according to manufacturer instructions using 4 x 6 mm aluminum ring jigs, placed in 37°C water bath (5 min), had coating applied, were placed in a distilled water bath (37°C/24 hrs), and either had no grinding or were ground down to 4.0 mm or 3.9 mm with 320-grit sandpaper. SH after coating removal (4.0 mm samples) and the effect on underlying GIC (3.9 mm samples) was evaluated. SH was measured using a universal Zwick/Roell machine loaded for 30 sec/357.9 N with ball point of r=0.5 mm. Statistical analysis was used (one-way ANOVA/Tukey method tests/p<0.05).

RESULTS:

Table 1: 24-Hour Surface Hardness of GIC with and without Coatings

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product</th>
<th>Coating</th>
<th>(µ±SD (MPa)) no grinding N=12</th>
<th>(µ±SD (MPa)) 4.0 mm N=12</th>
<th>(µ±SD (MPa)) 3.9 mm N=12</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M ESPE</td>
<td>KMQ</td>
<td>None</td>
<td>531.6±77.5cde</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3M ESPE</td>
<td>KMQ</td>
<td>SBU</td>
<td>536.9±49.3cd</td>
<td>711.2±116.5a</td>
<td>668.9±86.2ab</td>
</tr>
<tr>
<td>3M ESPE</td>
<td>KMQ</td>
<td>Ketac Glaze</td>
<td>355.8±108.7ghi</td>
<td>581.9±99.4bc</td>
<td>565.4±38.8bcd</td>
</tr>
<tr>
<td>3M ESPE</td>
<td>KM-NF</td>
<td>None</td>
<td>464.2±68.3df</td>
<td></td>
<td>573.4±55.2bc</td>
</tr>
<tr>
<td>3M ESPE</td>
<td>KM-NF</td>
<td>SBU</td>
<td>380.7±81.9ghi</td>
<td>647.8±43.5ab</td>
<td>595.8±49.4bc</td>
</tr>
<tr>
<td>3M ESPE</td>
<td>KM-NF</td>
<td>Ketac Glaze</td>
<td>357.5±120.2ghi</td>
<td>651.3±94.5ab</td>
<td>585.7±83.9bc</td>
</tr>
<tr>
<td>GC</td>
<td>EQF</td>
<td>Equia Coat</td>
<td>391.5±58.8ghi</td>
<td>386.5±59.5ghi</td>
<td>425.6±35.9efg</td>
</tr>
<tr>
<td>GC</td>
<td>FIX</td>
<td>G Coat Plus</td>
<td>363.4±51.8ghi</td>
<td>431.3±54.9efg</td>
<td>396.1±33.9ghi</td>
</tr>
<tr>
<td>VOCO</td>
<td>IM</td>
<td>Easy Glaze</td>
<td>258.5±30.1hij</td>
<td>288.0±21.8ij</td>
<td>297.4±24.3i</td>
</tr>
</tbody>
</table>

(Values with similar superscripts show statistically insignificant differences)

CONCLUSIONS: KMQ plus Scotchbond™ Universal (SBU) and grinding/coating removal has statistically higher SH than all other groups except for KM-NF plus coating. Without a coating, the substructure of KMQ has statistically higher SH than all other brands of GIC. KM-NF with coating removal has statically higher SH than all other groups except KMQ, where it is statistically equivalent. Without coating, KM-NF is statistically equivalent to (FIX and EQF) with coating. FIX, EQF, IM coated and with coating removal display statistically insignificant differences in SH amongst themselves. SH of IM was statistically less than other GICs (p<0.05). The use of a coating on a GIC may have the effect of increasing the SH of the underlying GIC despite the coating itself having a relatively soft surface hardness. Further testing is needed.

Supported in part by 3M ESPE. Also presented at the 2015 IADR General Session in Boston. Abstract #898.
Checklist Intervention to Assess Dental Student Organization and Communication

Kathleen Molgaard* and David Leader

OBJECTIVE: This study was conducted as a modified continuation of a 2012 pilot study performed by Dr. David Leader and Dr. Jill Kollar (a dental student at the time). The study examined the use of checklists in the pre-doctoral clinic at Tufts University School of Dental Medicine in order to assess their effectiveness on student organization, efficiency, and confidence in performing procedures and writing case notes.

METHODS: Third- and fourth-year student participants were randomly split into experimental and control groups. The experimental group received a checklist to use during the course of the study and the control group did not. Working with a statistician, we determined that the experimental and control groups should each contain at least 30 students using a standard effect size calculation. The impact of the checklist was measured using a comparison of surveys distributed to both groups before and after the period of checklist use.

RESULTS: We were unable to achieve a sample size large enough to produce statistically significant results. Although more students expressed interest, when we ultimately ran the study 13 responded to survey one (7 control, 5 experimental) and 8 responded to survey two (5 control and 3 experimental). We also received several comments from the students about their experience using the checklist.

CONCLUSION: Even though the study did not produce sufficient data, we learned from the setbacks and can use this knowledge to guide further experiments. Recruiting participants in the summer, when many students are away or have a lighter patient load, could have contributed to the lack of participation. Since this study was based off of a previous study, we used the original checklist. In future iterations of the experiment, rewriting the checklist with input from multiple PCs as well as students could be beneficial. The physical paper checklist could have been a barrier to use, thus future studies could use a digital version (computer or smart device). We could also narrow the focus to students entering the clinic who may be more eager to participate.
Preparing for Inferior Alveolar Nerve Block Using an Injection Simulation-Model

Sahar Mostafavi,* Yun Saksena, Morton Rosenberg, and Jennifer Bassett Midle

Hands-on preclinical training for local anesthetic injections is limited in most dental school curricula, despite the fact that it is a stressful procedure for both students and patients. A largely accepted aspect of local anesthetic injection education in dental schools is student-to-student injections. Administration of local anesthesia injections can be a source of stress for many students, and surveys have shown that students feel they need more practice in these techniques prior to administering them to patients. Student-to-student injections alone may not be sufficient in training students to confidently and successfully administer local anesthesia injections. In addition, student-to-student injections may present ethical questions and legal ramifications if complications occur, as they are often done without obtaining informed consent from participating students. Therefore, an alternative approach to teaching local anesthetic injections, such as a preclinical model, could be beneficial for students to gain confidence and clinical expertise. This pilot study aimed to evaluate the use of an injection simulation-model as part of the education prior to administering inferior alveolar nerve blocks (IANB) on patients. After approval by Tufts University IRB, sixty students from TUSDM Class of 2016 who had not yet administered an IANB injection on a patient were recruited and split into three groups: two intervention groups who used the simulation-model, and one control group who did not. The model was donated by the DRSK group with anatomical landmarks mimicking those of the mouth and a green signal confirming correct location of needle insertion and successful nerve block. All groups completed pre-intervention, post-intervention, and post-clinic surveys with yes/no and opinion questions based on Likert scale to assess confidence in administering an injection, opinions on the model, and clinical outcome on the first patient injection as measured by number of needle insertions, time until numbness, number of anesthetic cartridges used, and occurrence of adverse events. We postulate that students who used the model to prepare felt more confident in administering their first IANB injection in the clinic and had increased successful clinical outcomes than the control group. Preliminary data based on surveys received thus far indicate students found the simulation-model beneficial.

*Presented at the 2015 ADEA Annual Session in Boston.
How Much Time Do Students Spend Answering Difficult Exam Questions?
Zachary Neitzey,* Jennifer Bassett Midle, and Yun Saksena

It is often said that people spend more time on what they claim to be more difficult exam questions. We now have the technology to investigate this claim. The goal of this research was to determine if there is a relationship between the time exam-takers spend per question and the difficulty of the respective questions. The exam data was recorded using ExamSoft, a program on which the first-year dental students from Tufts University class of 2017 took all their exams. This information was collected from a total of 894 questions that were on 18 exams. The exams were from five different didactic courses that include basic pathology, biochemistry, dental anatomy, operative dentistry, and medicine. We used the difficulty and discrimination indices to quantitatively determine question difficulty. The mean difficulty index was 0.85 with a standard deviation of 0.16. The mean discrimination index was 0.20 with a standard deviation of 0.16. Simple linear regressions were conducted to evaluate the relationship between the difficulty and discrimination indices and average time. The relationship between the indices and time was significant (p<0.01), even when controlling for word count in the exam questions. We looked at each of the five classes separately and found similar results. The results support the hypothesis that students spent more time on questions that are considered more difficult. We also found that students spend significantly more time on questions with a greater word count. Many people claim that they spend more time on questions that they thought were more difficult. These results quantitatively show that this claim may not be far from the truth.

Also presented at the 2015 ADEA Annual Session in Boston.
Diabetic Foot Ulcer Fibroblasts Proliferate and Produce Extracellular Matrix in Response to TGF-β

Joann O'Brien,* Anna Maione, Avi Smith, Behzad Gerami-Naini, and Jonathan Garlick

OBJECTIVES: Many diabetic patients develop diabetic foot ulcers (DFU), which often fail to heal and do not respond to treatment. During proper wound healing, transforming growth factor-beta (TGF-β) stimulates dermal fibroblasts to produce an extracellular matrix (ECM). The objective of this work was to determine if and how fibroblasts derived from DFUs respond to TGF-β to form an ECM.

METHODS: Primary fibroblasts were isolated from skin biopsies obtained from diabetic foot ulcers (DFUFs) and were compared to site matched diabetic patients (DFFs) and non-diabetic control patients (NFFs). To examine how DFU-derived fibroblasts secrete and assemble an ECM, we utilized a 3D, tissue-engineered ECM model. Differences between ECM tissues produced by DFUFs, DFFs and NFFs treated with and without TGF-β were evaluated histologically in terms of: morphology, total cell count, and percent proliferating cells (Ki67 stain).

RESULTS: The ECM morphology was significantly changed with TGF-β stimulation. Tissues that were untreated were long and thin, compared to treated tissues, which were thick and short. We also observed that the total number of cells in each tissue section increased with TGF-β stimulation, suggesting that TGF-β could be stimulating proliferation. Similarly, Ki67 staining demonstrated that TGF-β treatment increased the number of proliferating fibroblasts.

CONCLUSION: The overall goal of the lab is to reprogram these repair deficient DFU-derived fibroblasts from a non-healing to a healing phenotype. This quantitative analysis helped the lab learn more about potential defects in ECM production in diabetic foot ulcers in comparison to non-ulcer fibroblasts. The data show that TGF-β altered ECM production and fibroblast proliferation. The experiment also demonstrated that DFUs are able to respond to TGF-β, suggesting that TGF-β treatment/stimulation could aid in ECM production in non-healing ulcers. In the future, the lab will further investigate differences in the composition of the ECM formed by DFUFs, DFFs, and NFFs.
A Literature Review of the Extraction Decision in Orthodontics

Rumpa Ganguly, Lokesh Suri, and Felisha Patel*

OBJECTIVES: To provide an organized resource for clinicians and patients to use to understand the treatment option and outcomes for orthodontics in terms of extracting permanent teeth or not extracting. Also to compare and determine trends of the effects on soft and hard tissues from these two different treatment plans.

METHODS: Literature published from January 2000 to current was searched in the electronic databases Cochrane Central Register of Controlled Trials and PubMed. Study inclusion criteria included: comparing the extraction technique versus no extraction, average age of participants was 10 years old, and, if relevant, crowding between 4–10 mm. The articles were then grouped according to their method and results. The common variables observed in the studies were cephalometric angles, lower lip thickness, and incisor inclination. The cephalometric measurements include SNA, SNB, ANB, IMPA, interincisal angle, distance from lips to the E plane, and nasolabial angle.

RESULTS: In total, 23 articles have been reviewed, and 10 appear to fit the criteria. Although some studies showed contradicting results, there can be some associations drawn. A trend can be noted of an increase in IMPA, an increase in lower lip thickness, and a proclination of incisors/lower lip after orthodontic treatment with no extractions. In extraction cases, almost the opposite effect occurs as lips are more retruded and incisors are more retracted. These findings along with the other variables provide an insight as to what facial profiles would be best suited for which treatment.

CONCLUSIONS: Patients with more proclined incisors and more protrusive lips may be better with an extraction treatment plan to help compensate these traits. It has been noticed in some of these studies that pretreatment variables can help predict an outcome. To decide the best treatment, each case should be assessed individually as other factors such as crowding, age, and malocclusion can lead to vastly different results.

Also presented at the 2015 IADR General Session in Boston. Abstract #1523.
Screening Instrument for Opioid Risk in General Dentistry: Initial Questionnaire Construction

Charles Pham,* Noshir Mehta, Chao Lu, Britta Magnuson, Shuchi Dhadwal, Matthew Finkelman, and Ronald Kulich

OBJECTIVE: The aim of this study is the development of a screening questionnaire for opioid risk for general dentistry.

MATERIALS AND METHODS: During phase one of our questionnaire design, seven thought leaders were interviewed in the orofacial pain field to gain their insight on what they feel would be important for general dentists to know before prescribing their patients opioids. The second phase was item development using standardized steps from previous research in questionnaire design. Length, grammar, specificity, simplicity, and social desirability of the questions were reviewed. Negatively worded questions, double-barreled questions, and confusing adverbs were eliminated. The questionnaire was presented to individuals not involved in the project. The questionnaire will be determined to have face validity if it appears sufficiently transparent and coherent to individuals who complete it. Content validity requires the use of experts in the subject matter. We will present the questionnaire to orofacial pain clinicians to evaluate whether the questionnaire items assess the defined content adequately. The third phase will involve administration of the draft questionnaire to 20 subjects who currently use opioids or have used them within 12 months. Item analysis and test-retest reliability will be addressed. The questionnaire will be administered to subjects onsite at the TUSDM Craniofacial Pain Center presenting with current opioid use. The questionnaire will be administered at the beginning and end of appointments. This will address the reliability of the instrument.

RESULTS: During the interview with the thought leaders, we were presented with relevant content based on their clinical expertise. Per the thought leaders, important considerations included: alcohol and drug use, arrests for DUI, running out of opioids early, losing prescriptions, mental health issues, concurrent sleeping medications, and other factors. With information from the thought leaders and previously published research, a 19-item questionnaire was completed and submitted to IRB for approval.

CONCLUSION: These are the initial steps toward the development of a questionnaire with sufficient reliability and predictive validity for use within a general dental practice. Upon completion of test-retest reliability, we will move toward completion of final steps in questionnaire development including the predictive validity of the questionnaire.
Silk Fiber Implant Coatings for the Localized Release of Antibiotics

Stephanie Phillis,* Sarah Schuback,* Driss Zoukhri, Gerard Kugel, David Kaplan, and Roberto Elia

OBJECTIVES: The purpose of the present study was to fabricate silk fiber implant coatings for the release of tetracycline and assess the release by measuring inhibition of S. mutans growth.

METHODS: An aqueous solvent-processing method was used to generate the silk biomaterial from B. mori for implant coatings. Tetracycline-loaded silk was then pipetted onto titanium implant studs, and an electric current was run through the material to convert it to an adhesive gel coating. Identical tetracycline-loaded silk was placed on filter paper discs and used as controls. To examine the rate of tetracycline release from the silk coatings, the coated titanium studs were incubated with S. mutans on agar plates and removed after 30 minutes, 60 minutes, or 3 hours (study 1) or up to 3 days (study 2).

RESULTS: Kinetics studies showed that titanium studs effectively released tetracycline as fast as 30 minutes. There were similar zones of inhibition with the studs when compared to their positive paper controls (Table 1). Once it was determined that tetracycline can be released from the studs, the duration of release was investigated. Table 2 shows that on day 1 there is no difference between the studs loaded with 3 or 6 mg/ml tetracycline and their paper counterparts. After two days, the difference between the inhibitions by the stud vs. paper was apparent (Table 2). By the third day there was very little inhibition.

Table 1: Kinetics of tetracycline release

<table>
<thead>
<tr>
<th>Time (Hours)</th>
<th>Stud</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>5.6±1.5</td>
<td>4.0±1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>4.8±1.6</td>
<td>2.4±1.1*</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0±1.0</td>
<td>2.4±1.9</td>
</tr>
</tbody>
</table>

Data are means±SD, N=5. *Denotes a statistically significant difference compared to stud.

Table 2: Effect of dose and time on tetracycline release

<table>
<thead>
<tr>
<th>Time (Days)</th>
<th>3 mg/ml Tetracycline</th>
<th>6 mg/ml Tetracycline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stud</td>
<td>Paper</td>
</tr>
<tr>
<td>1</td>
<td>5.8±1.1</td>
<td>6.0±0.7</td>
</tr>
<tr>
<td>2</td>
<td>0.8±1.1</td>
<td>1.8±1.5</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Data are means±SD, N=5. *Denotes a statistically significant difference compared to stud.

CONCLUSIONS: Our data showed that tetracycline can be loaded in e-gels and released as fast as 30 minutes and maintains release for up to 24 hours. An important implication of this work is that tetracycline-releasing silk implant coatings have the potential to reduce dental implant-related periodontal infections during the first 24 hours after the implant procedure, which is the time period when these infections most commonly arise.

Also presented at the 2015 IADR General Session in Boston. Abstract #111.
Speech Pathology and Oral Health of Individuals with Developmental/ Acquired Disabilities

Christina Piacquadio,* Angel Park, and John Morgan

OBJECTIVE: To explore speech language pathologist (SLP) knowledge of oral health for persons with intellectual/developmental (I/D) and acquired disabilities and the extent to which they implement this knowledge into practice.

METHODS: Upon obtaining exempt status from Tufts University IRB, a 19-item questionnaire was modeled from a questionnaire of occupational therapists’ knowledge of oral health care with regards to individuals with I/D and acquired disabilities. The survey was self-administered using Qualtrics format. Prior to using the questionnaire, a review panel (9 individuals, N=9) of dentists, dental hygienists and speech language pathologists completed the survey and answered six feedback questions to ensure face and content validity. Open-ended questions were asked assessing the clarity and content of questions and ability of respondents to understand each question. Referral recruitment was used by approaching selected SLPs.

RESULTS: Most respondents (77%) believed there was an important role played by the SLP in providing recommendations for oral healthcare, including referrals to dentists, for individuals with I/D disabilities; additionally, 62% agreed that they had the opportunity to recognize dental diseases/issues in their patients. However, over half (62%) did not feel confident in their abilities to recognize dental diseases/ issues in their patients while in their capacity as a SLP, and 65% reportedly did not believe they had developed skills sufficient to address modification recommendations for oral healthcare for individuals with cognitively/physically/behaviorally disabled patients during their post-academic training.

CONCLUSIONS: It was found that the majority of SLP respondents believed there was a role for them in the oral healthcare of individuals with I/D and acquired disabilities, but most of them felt that although they had the opportunity to recognize dental diseases while working as a SLP they were not confident in their abilities to do so.

Also presented at the 2015 IADR General Session in Boston. Abstract #4165.
Direct Pairwise Comparison of Initial Hydrophilicity of Unset Impression Materials

Jessie Reisig,* Amanda Merikas, Gerard Kugel, and Ronald Perry

OBJECTIVES: To directly compare the hydrophilic properties of polyether, vinyl polysiloxane (VPS), and one newly-developed super-hydrophilic-VPS impression materials in the unset state. The comparison was performed in a newly developed two-material-side-by-side interface setup, by examining how a drop of water placed on this interface behaves.

METHODS: Five VPS impression materials (N=5) were tested against two polyether impression materials (Impregum™ Penta™ (3M ESPE) and Impregum™ Penta Soft (3M ESPE)) and one experimental medium-bodied VPS (3M ESPE). The experimental medium-bodied VPS was additionally tested against the two polyether impression materials. Each test sample was made by: mixing each material using Pentamix™-3 (3M ESPE) with standard mixing times; creating a 2 mm thick interface by placing materials side-by-side; placing a 5 µl drop of water on the interface by a DropShape Analysis System (DSA-30, Krüss) within 60 s of the start of mixing. At a drop age of 2 s, the horizontal spreading radius of water in pixels on each material was recorded and a standardized ratio was calculated. A one-way ANOVA and Tukey test were conducted to determine the statistical significance using Minitab® version-16.

RESULTS: The ratios comparing different materials varied in statistical similarity and difference (Table 1).

Table 1. Ratio of Mean Water Spread

<p>| Ratio, (SD), grouping-relation |
| Material Tested (columns): Material Tested (rows) |</p>
<table>
<thead>
<tr>
<th>Impregum Penta Soft (3M ESPE)</th>
<th>Impregum Penta (3M ESPE)</th>
<th>Experimental-Medium-bodied-VPS (3M ESPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VPS Materials</strong> Lot Number</td>
<td>554904</td>
<td>559759</td>
</tr>
<tr>
<td>Aquasil™-Ultra-Monophase (DENTSPLY)</td>
<td>140325</td>
<td>4.72(0.37)A</td>
</tr>
<tr>
<td>EXA'lcence™-370-Medium-Body (GC-America)</td>
<td>1401161</td>
<td>4.08(1.00)A</td>
</tr>
<tr>
<td>Flexitime®-Monophase-Dynamix (Heraeus-Kulzer)</td>
<td>390175</td>
<td>3.92(1.65)A</td>
</tr>
<tr>
<td>Affinis®-Monobody-System-360 (Coltene-Whaledent)</td>
<td>36422</td>
<td>4.72(0.37)A</td>
</tr>
<tr>
<td>Honigum®-Mono (DMG)</td>
<td>715246</td>
<td>4.10(0.24)A</td>
</tr>
<tr>
<td>Experimental-Medium-bodied-VPS (3M ESPE)</td>
<td>554079</td>
<td>2.29(0.44)B</td>
</tr>
</tbody>
</table>

Ratios in the same column with the same letters are not significantly different from each other.
CONCLUSION: Polyether materials tested are more hydrophilic than VPS materials in side-by-side test (ratio>1, p=0.000). The experimental medium-bodied VPS is more hydrophilic than other VPS materials tested (ratio>1, p=0.000). When the experimental medium-bodied VPS is compared with the polyether materials tested at the early stage (60 s after mixing, 2 s after initial water contact), polyether materials behaved equally to each other (t-test, p=0.467) and showed greater hydrophilicity than the experimental medium-bodied VPS (ratio<1, p=0.000). The clinical relevance has yet to be tested.

*Also presented at the 2015 IADR General Session in Boston. Abstract #2421.*
Survey about Use of Checklist for Orthognathic Surgeries among Oral and Maxillofacial Surgeons

Sepideh Sabooee,* Archana Viswanath, Paul Stark, Paula O’Brien, and Maria Papageorge

One of the major procedures done by oral and maxillofacial surgeons is orthognathic surgery. This surgery is performed to restore esthetics and function in patients suffering from severe dentoalveolar discrepancies that are not restorable by other non-surgical means. This is a multidisciplinary and very lengthy procedure that requires precise treatment planning and cooperation of different specialists including an orthodontist and an oral surgeon prior to the procedure.

The purpose of this study was to determine the attitudes among practicing oral surgeons in United States towards using a surgical safety checklist for orthognathic surgery. Another purpose of this study is to determine the prevalence of using a surgical safety checklist for orthognathic surgery among oral surgeons in the United States.

Recruitment for the survey consisted of emailing 1,000 randomly selected oral surgeons with a valid email address published in the American Association of Oral and Maxillofacial Surgeons (AAOMS) directory. Qualtrics (a survey administration tool) was used to facilitate the distribution and completion of surveys. The survey will be open for 60 days (started on January 13, 2015). A reminder email will be sent out on day 30 and 45.

Of the participants, 39 have completed the survey (35 male, 4 females) within the first month. The majority of these people are practice owners (29). Of all these participants, 17 (46%) of them perform 1–10 orthognathic procedures per week. However, out of this group of people, only 13 of them (34%) use a checklist for this procedure. Doctors that had stated that they do not use a checklist were asked if they would use the checklist if provided with one, and 76% of them had answered “yes.”

Although this is an ongoing study, based on the current data, a majority of doctors have found use of checklist useful or they have shown interest in using a checklist if provided with one.

Also presented at the 2015 IADR General Session in Boston. Abstract #1634.
Dab2-Dependent Modulation of the Tumor Microenvironment Can Promote Cancer Development

Shawheen Saffari,* Samuel Kamlarz, Elizabeth Bingham, Ronney Tay, Jorges Reyes, James Baleja, and Addy Alt-Holland

OBJECTIVE: In many epithelial cancers, such as esophageal carcinoma, the adaptor protein Disabled-2 (Dab2), which is crucial for intact cellular endocytosis and recycling, is downregulated. However, Dab2’s role in the development of skin squamous cell carcinoma (SCC) has not been investigated. To elucidate the potential involvement of Dab2 in altering the tumor microenvironment to support SCC progression, we investigated the consequences of Dab2 depletion on the characteristics and growth of human dermal fibroblasts.

METHODS: Human dermal fibroblasts were transfected with a control sh-scrambled sequence or different lentiviral-mediated shDab2 sequences in order to downregulate Dab2 at its mRNA level. The expression of Dab2, Eps15, EEA1 and Caveolin-1 in these cells were analyzed by Western blot and immunofluorescent analyses. Cell counts were performed daily to analyze cell proliferation rate.

RESULTS: Using Western blot analysis, we observed a 5-fold decrease in Dab2 level, as well as downregulation of the associated proteins Eps15, EEA1 and Caveolin-1 in shDab2-fibroblasts when compared to control fibroblasts. Immunofluorescence analysis revealed faint cytoplasmic Dab2 staining in shDab2-fibroblasts that further confirmed the depletion of this protein in these cells, in comparison to strong Dab2 staining in control fibroblasts. Importantly, Dab2 depletion significantly increased fibroblast proliferation.

CONCLUSIONS: The tumor microenvironment is composed of neoplastic epithelial cells that coexist with a variety of stromal cell types and supportive stromal components. Whereas other work from our lab showed that Dab2 depletion in SCC tumor cells can promote SCC progression, the results of this study demonstrate that decreased Dab2 expression in dermal fibroblasts can profoundly affect the behavior and growth of these quiescent cells. These results suggest not only that Dab2 loss in neoplastic keratinocytes can support cancer development, but Dab2 loss in dermal fibroblasts can potentially affect the tumor microenvironment and further support the growth of tumor cells to enhance SCC progression.

“Tufts Collaborates!” grant awarded to Drs. Alt-Holland and Baleja funded this study. Also presented at the 2015 IADR General Session in Boston. Abstract #1119.
Caries Risk Correlates among Adults with Intellectual and Developmental Disabilities

Mary Sayegh,* Jane Steffensen, Angel Park, and John Morgan

OBJECTIVES: The literature shows that individuals with intellectual and developmental disabilities (IDDs) have a higher risk for dental caries. This study aims to identify associated factors in IDD patients having the highest risk for dental caries, as defined as having four or more restorations.

METHODS: This cross-sectional study utilizes demographic and clinical information obtained from the electronic health records of dentate adults ≥20 years of age who received treatment between April 1, 2009, and March 31, 2010, at the Tufts Dental Facilities (TDF). The variable, ≥4 restorations, was calculated from the number of restorations reported in the Axium dental record. The information collected included intellectual disability level (ID), cooperation level (0=least able, 6=most able), type of residence, and untreated caries. The information was analyzed using SPSS software and chi-square tests.

RESULTS: This study included 4,218 dentate adults (422 with ≥4 restorations compared to 3,796 who had <4 restorations). Of those with reported ID levels, 22.9% (N=63) with ≥4 restorations had profound ID compared to 39.5% (N=960) with <4 restorations, p<0.001. Of those with reported cooperation levels, 53.4% (N=218) with ≥4 restorations were more highly cooperative compared to 32.0% (N=1191) with <4 restorations, p<0.001. Nearly one third (32.9%, N=137) of those with ≥4 restorations lived independently compared to 17.8% (N=668) of those with <4 restorations, p<0.001. The majority (83.2%, N=351) of patients with ≥4 restorations had untreated caries compared to 26.6% (N=1,008) of those with <4 restorations, p<0.001.

CONCLUSIONS: The data showed that adults with IDD with ≥4 restorations had less profound disability level, lived more independently, were more cooperative, and had more untreated caries than those with <4 restorations.

Also presented at the 2015 IADR General Session in Boston. Abstract #1443.
Analyzing the Impact and Perceptions of Medical Emergency Training for Faculty and Students at TUSDM

Anjalee Shah,* Diana Esshaki, Jennifer Bassett Midle, and Kanchan Ganda

Nationwide, training in the management of medical emergencies in the dental school setting is limited. Tufts University School of Dental Medicine’s Division of Medicine addressed this gap in education by implementing a novel training program to teach students and faculty how to manage medical emergencies in dental clinics. This program focused on management of common medical emergencies, standard protocols, and how to use emergency equipment.

The Division of Medicine’s training program consisted of two sessions. The first session focused on medical emergency management protocols at TUSDM. That included which code teams to call, tasks of responders, and clinically addressing medical emergencies. The second session showed what medical emergency equipment is available, their contents, and demonstrated how to use them step-by-step. At the completion, both faculty and students participated in an online survey about their prior training in medical emergency management and comfort level with managing medical emergencies post-training.

Of the 195 people who participated and completed the online survey, 23.6% were D15s, 37.9% D16s, 33.8% faculty and 4.6% were unspecified. From this group, 17.4% of people reported that they had previously encountered a medical emergency with a patient in the TUSDM clinic. The most prevalent emergencies experienced were hypoglycemic reaction, vasovagal syncope and needle stick. Prior to this training session 8.7% of the participants felt completely uncomfortable in managing medical emergencies, 48.2% felt uncomfortable, and 36.4% felt comfortable, and 3.6% felt completely comfortable in managing medical emergencies. After completing the training, 87.2% of participants noted they felt the training was helpful or very helpful, 72.9% of the participants noted that they now feel comfortable or very comfortable in managing medical emergencies, and 81.0% of the participants noted that they are likely or very likely to offer their help in a medical emergency.

This study showed that the majority of participants felt they benefited from participating in the medical emergency training program. Suggestions for improvement ranged from requests to receive training in smaller groups, to more hands-on interactive sessions. With this information, TUSDM can continue the evolution of the medical emergency program and share pertinent information with the dental community.
Developing Software to Detect Incipient Caries in Radiographs

Tej Shah,* Cristina Sevilla, and Aruna Ramesh

INTRODUCTION: Bitewing radiographs are the current standard of care for detecting interproximal caries in posterior teeth. However, finding caries that are small or incipient can be time consuming for the dentist. Therefore, a software program was created in order to function as a supplement to visual radiographic diagnosis as it can flag incipient caries in a bitewing radiograph, which will allow a dentist to critically assess these flagged areas. This software, “gdrip” (GNU Dental Radiograph Image Program) is a generic digital radiograph viewer that contains a feature to detect incipient caries. It does this by making a number of assumptions about the layout of the bitewing radiograph and the orientation of the teeth. Afterwards, it looks for decalcified areas of the tooth and “red flags” areas that could be incipient caries.

AIM AND HYPOTHESIS: The aim of the study was to test the accuracy of gdrip in detecting interproximal incipient caries in a bitewing radiograph. The goal of the project was to improve gdrip enough to achieve 80% true positive accuracy. This accuracy rate was determined based on a balance between having a useful tool and clinicians’ ability to ignore incorrect results.

SIGNIFICANCE: If the software is able to accurately detect incipient caries, it would not only save dentists time, but it would also help red-flag areas that may have been missed by the dentist.

MATERIALS AND METHODS: The materials that will be used will be sample radiographs and the program gdrip. TUSDM axiUm records from new patients seen during January 1, 2014, to May 31, 2014, were reviewed. A staff member of the radiology department (who is a co-investigator on this study) who has access to the radiographs will access the records and look for qualifying radiographs. There were 200 records that were reviewed in order to find the 100 qualifying radiographs.

RESULTS: With the 100 radiographs, there were 1,600 total surfaces that could have a carious lesion. Out of those 1,600 surfaces, gdrip correctly identified 1,441 surfaces to have or not have a carious lesion based on the findings by the board certified radiologists. This gives gdrip an overall accuracy of 90.1%. Gdrip does have room for improvement and new algorithms can be applied to increase gdrip’s accuracy even further.
Correlation between Mandibular Third Molar Inclination and Mandibular Divergence

Paul Shamirian,* Moonyoung Lee, Georgios Kanavakis, and Angel Park

OBJECTIVE: To utilize full head CBCT scans to investigate the relationship between third molar inclination and vertical skeletal pattern.

MATERIALS AND METHODS: In the study, 45 full head CBCT scans were obtained from Tufts University School of Dental Medicine and reviewed. An orthogonal lateral cephalometric radiograph was generated and traced using Dolphin Imaging software (Version 11.0.03.40 Premium, Dolphin Imaging, Chatsworth, California, 2010). The inclination of the mandibular third molar was measured in the sagittal and coronal planes using InvivoDental 3D (version 5.3, Anatomage, San Jose, California). Pearson correlations and a canonical correlation analysis were used to determine if there was a relationship between the third molar inclination and the lateral cephalometric measurements.

RESULTS: The canonical correlation between the lateral cephalometric measurements and the third molar inclination was weak (0.334 ≤ r ≤ 0.429, p>0.05). There was a strong correlation between the third molar inclination in the coronal and the sagittal view (r=0.80).

CONCLUSION: The present study showed that there was no relationship between the patient’s mandibular third molar sagittal or coronal inclination and vertical skeletal pattern. A strong relationship was found between the coronal inclination and the sagittal inclination of the mandibular third molar. The correlation could be a useful guide to estimate third molar position when a CBCT scan is not available.
Impact of the “Fourth-Floor Initiative” at TUSDM on Clinical Efficiency

Laura Shim,* Paul Stark, Jennifer Bassett Midle, and Yun Saksena

Tufts University School of Dental Medicine (TUSDM) has introduced a curriculum change entitled the “Fourth-Floor Initiative” to the fourth-floor undergraduate clinics. The purpose of this study was to determine whether the curriculum changes were successful in improving clinical efficiency in the fourth-floor clinics as compared to previous years as well as the third-floor clinics operating under the old curriculum model. This study focuses on two specific changes within the Fourth-Floor Initiative: 1) The addition of scheduling coordinators and 2) the cross-training of core faculty to be able to co-approve certain procedures to completion. The effect of the scheduling coordinators was measured by chair utilization (number of patient visits and empty chairs). The outcomes of cross-training core faculty were analyzed by points generated by the students. The third-floor clinics and historical data were used as a controls. *T-tests for continuous factors and chi-squared tests for categorical factors were used for analysis. The comparison will determine if the Fourth-Floor Initiative increased its clinical efficiency in terms of chair utilization and procedure completions. Surveys were used to assess students’ perceptions of efficiency in their clinics as well. Current data suggests that although chair utilization did not considerably change, the number of points notably increased from that of the control—suggesting that although there wasn’t a huge impact with the scheduling coordinators, there were significant results due to the cross-training of faculty. Surveys revealed that students on both third and fourth floors saw improvements in clinical efficiency as the semester progressed. Overall, the data suggests that the Fourth-Floor Initiative was successful in increasing clinical efficiency within the clinic. However, the continuation of data collection throughout the year, especially once the curriculum change takes effect on other floors, will give more conclusive results to this study.
A Comparison Study: TUSDM Clinical Trial Participants vs. Clinic Patients

Shankeertha Sundaralingam,* Yamila Garber, Mabi Singh, Athena Papas, Angel Park, and Britta Magnuson

OBJECTIVES: The aim of this study was to determine if the population of clinical trial participants seen at Tufts University School of Dental Medicine (TUSDM) are similar in demographics and oral-health status to pre-doctoral dental clinic patients at TUSDM.

METHODS: Demographic information (age, sex, and dental insurance status) and oral-health status, [number of decayed, missing, filled teeth (DT, MT, FT)] data was collected from 468 participants of a clinical trial screening for caries conducted by the Oral Medicine Department at TUSDM between January 2010 and February 2012. This was compared to a random sample of 1,000 patients (roughly 2:1 to study group) seen in the TUSDM pre-doctoral clinic for an initial comprehensive exam during the same time period. Subjects in both groups were between the age of 18 and 65. Chi square and Mann-Whitney U tests were used to see if there were any statistically significant differences between the clinic and trial populations (alpha=0.05).

RESULTS: The mean (SD) age of trial participants was 40.5 years (12.3) compared to 41.6 (13.8) in the clinic group (p=0.23). Trial participants were 47.6% female, clinic patients were 50.5% female (p=0.29). 32.4% of trial participants and 43.2% of clinic patients reported having dental insurance at the time of their visit (p<0.01). See Table 1 for DT, MT, FT data.

Table 1. DT, MT, FT Data Trial vs. Clinic

<table>
<thead>
<tr>
<th></th>
<th>Trial</th>
<th>Clinic</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median 25th, 75th</td>
<td>Median 25th, 75th</td>
<td></td>
</tr>
<tr>
<td>DT</td>
<td>3.0 1.0, 6.0</td>
<td>1.0 0.0, 5.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>MT</td>
<td>4.0 3.0, 6.0</td>
<td>4.0 2.0, 7.0</td>
<td>0.14</td>
</tr>
<tr>
<td>FT</td>
<td>9.0 4.0, 12.0</td>
<td>8.0 3.0, 12.0</td>
<td>0.02</td>
</tr>
</tbody>
</table>

CONCLUSION: There was no significant difference in age and sex between the two groups; however, the clinic patients group had a significantly higher percentage of individuals with dental insurance. Clinical trial participants had a significantly higher number of decayed teeth and filled teeth than the clinic patient group. These results suggest that while demographics of both groups were similar, oral-health status and insurance status were not.

Also presented at the 2015 IADR General Session in Boston. Abstract #4162.
Microleakage Evaluation of Elevated Temperatures in Dental Restoratives
Michelle Ta,* Tian Yuan, Angel Park, Steven Eisen, and Gerard Kugel

OBJECTIVE: To compare marginal microleakage across three different restoratives—glass ionomer, bioactive restorative, and dental composite—after heating materials prior to placement. The delivery and storage of materials exposed to high temperatures prior to placement may compromise its restorative properties.

METHODS: Ninety standard Class II slot preparations were performed on non-carious human molars with approximately 3 mm depth at gingival floor and 4 mm width bucco-lingually. Samples were randomly assigned into 9 groups (N=10). Three dental restoratives were tested: Ketac™ Nano light-curing glass ionomer 3M ESPE (KN), Activa™ bioactive restorative Pulpdent (AB), and Filtek™ Supreme Ultra composite 3M ESPE (FS). Materials were placed in a closed container and heated separately for 120 hours in incubator at either 24°C, 40°C, and 52°C. All materials were applied according to manufacturer’s instructions. Completed restorations were thermocycled for 3,500 cycles between 5°C and 55°C. Samples were immersed in 2% methylene blue dye for 8 hours. Samples were embedded in acrylic resin, sectioned mesio-distally, and evaluated under stereomicroscope (Olympus, SZX16).

A dye-penetration-to-axial-wall (DP) score was used on gingival floor: 0=0% DP, 1=1–25% DP, 2=26–50% DP, 3=50–75% DP, and 4=100% DP. Median and inter-quartile ranges (IQR) were computed, and Kruskal-Wallis tests were completed for significant differences in microleakage mean scores for the products at different temperatures and across temperatures for each product.

RESULTS: Table 1 displays IQR, mean score, and p-value comparison within products. Table 2 displays mean score and p-value comparison across the same temperature. Mean scores are calculated based on mean ranks and total number of observations of only the selected groups.

Table 1: Comparisons within Products at Different Temperatures

<table>
<thead>
<tr>
<th>Product</th>
<th>KN 24°C</th>
<th>KN 40°C</th>
<th>KN 52°C</th>
<th>AB 24°C</th>
<th>AB 40°C</th>
<th>AB 52°C</th>
<th>FS 24°C</th>
<th>FS 40°C</th>
<th>FS 52°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>24°C</td>
<td>40°C</td>
<td>52°C</td>
<td>24°C</td>
<td>40°C</td>
<td>52°C</td>
<td>24°C</td>
<td>40°C</td>
<td>52°C</td>
</tr>
<tr>
<td>25th Percentile</td>
<td>2</td>
<td>3</td>
<td>2.5</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Median</td>
<td>2.5</td>
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<td>4</td>
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<td>2</td>
<td>3</td>
<td>0.5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>75th Percentile</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Mean Score</td>
<td>11.7</td>
<td>15.2</td>
<td>17.3</td>
<td>11.5</td>
<td>14.1</td>
<td>19.1</td>
<td>7.0</td>
<td>17.7</td>
<td>20.6</td>
</tr>
<tr>
<td>P-Value</td>
<td>0.299</td>
<td>0.120</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Mean Scores across Temperatures

<table>
<thead>
<tr>
<th></th>
<th>KN</th>
<th>AB</th>
<th>FS</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>24°C</td>
<td>23.1</td>
<td>13.2</td>
<td>8.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>40°C</td>
<td>21.8</td>
<td>11.3</td>
<td>11.6</td>
<td>0.003</td>
</tr>
<tr>
<td>52°C</td>
<td>19.4</td>
<td>14.1</td>
<td>11.0</td>
<td>0.076</td>
</tr>
</tbody>
</table>
CONCLUSION: The composite-based material (FS) showed statistically greater difference in microleakage with temperature change. However, the glass ionomer-based material (KN) showed statistically greater microleakage overall when compared to AB and FS. Storage of dental materials in prolonged elevated temperatures indicates increased microleakage.

Also presented at the 2015 IADR General Session in Boston. Abstract #3873.
Generation of Three-Dimensional Bioengineered Tissue Constructs of Nasopharyngeal Carcinoma

Ronney Tay,* Shawheen Saffari, Mark Bernardo, Samuel Kamlarz, Pamela Smith, James Baleja, and Addy Alt-Holland

OBJECTIVES: Although nasopharyngeal carcinoma (NPC) is a highly metastatic cancer, the regulatory mechanisms that drive the aggressive behavior of this disease are still elusive. We previously showed that bona fide human NPC tumor spheres isolated from lung mediastinal lymph node metastasis can be propagated in cell cultures and colonize lung tissues in mice. Here, we generated three-dimensional bioengineered tissues that supported the growth and behavior of NPC tumor spheres in vitro.

METHODS: Eight months following injection of human NPC tumor spheres to mice, sphere structures that likely represent NPC metastases were observed in dissected mouse lung tissues. Co-cultures of human stromal cells with tumor spheres that migrated out of these tissues were grown in two-dimensional cell cultures and in three-dimensional bioengineered collagen scaffolds in vitro. Cultures were characterized for their morphology and metabolic profiles by bright-field microscopy and 1H-NMR, respectively.

RESULTS: Tumor spheres grew in their size and number in dissected mouse lung tissues in the presence of human stromal cells. Interestingly, tumor spheres that migrated out of these tissues continued their growth in the culture plate and were successfully expanded in sequential monolayer cell cultures. When embedded together with stromal cells in three-dimensional constructs, rapid sphere growth was observed. Moreover, spheres and stromal cells migrated out of the engineered constructs and expanded in the culture plates. Comparative metabolomics revealed similar patterns of metabolic activity in conditioned media from dissected lung tissues and bioengineered constructs.

CONCLUSIONS: The three-dimensional engineered constructs provided a supportive microenvironment that enabled NPC tumor spheres to maintain their inherent growth and migratory capabilities, similar to those of tumor spheres that developed in genuine lung tissues. These in vivo-like bioengineered tissues will allow us to begin deciphering the mechanisms that underlie the development and progression of NPC, which is central for the development of new NPC therapies.

Also presented at the 2015 IADR General Session in Boston. Abstract #299.
Effect of Elevated Temperature on Adhesive Microtensile Bond Strength

Kanupriya Tewari,* Masly Harsono, Matthew Finkelman, John Morgan, and Gerard Kugel

OBJECTIVES: To investigate how elevated storage temperatures affect the microtensile bond strength (MTBS) of a total-etch adhesive to dentin. This study is part of a larger analysis that aims to establish standardized recommendations for management of materials in settings where cooling systems may not be accessible (i.e., under extreme local climate conditions in resource-limited countries).

METHODS: Forty-two sound extracted human molar teeth were obtained. Excite® F adhesive (Ivoclar, Vivadent) was stored for 72 hours at three temperatures: 24°C (standard room temperature), 40°C and 52°C. Flat dentin surfaces were cut with diamond wheel (Isomet, Buehler) and teeth were randomly divided into the three groups (N=14). The bonding agent was applied on the prepared dentinal surface, thinned using an air-water syringe, and light-cured 10 seconds. Filtek™ Supreme nanohybrid composite (3M ESPE) was applied in two layers of 2.0 mm each. Layers were cured for 20 seconds (per manufacturer’s instructions). Bonded teeth were stored in 0.9% Thymol at 37°C for 24 hours and sectioned in 1 mm increments in two directions to create beams with adhesive areas of 1 mm². Beams were subjected to microTBS testing using a universal testing machine (Bisco Corp, Illinois) and force applied to create fracture was recorded. Statistical significance was assessed using one-way ANOVA, with post-hoc tests conducted via Tukey’s HSD. P-values less than 0.05 were considered statistically significant.

RESULTS: All groups exhibited statistically significant differences, p≤0.001.

CONCLUSIONS: As the temperature at which the bonding agent was stored increased, microtensile bond strength significantly decreased. Further research is suggested to assess the impact of temperatures ≥40°C on restorative materials that may be used under conditions where temperature controlled storage and usage may not be available (shipping conditions/economically developing nations).

Also presented at the 2015 IADR General Session in Boston. Abstract #814.
Complications following Third Molar Extractions at TUSDM: A Case Control Study

Jordan Thomas,* Alireza Ashrafi, Sarah Pagni, Archana Viswanath

BACKGROUND: Surgical extraction of third molars is one of the most common oral surgical procedures. Complications related to third-molar removal range from 4.6% to 30.9%. The four most common postoperative complications of third-molar extraction reported in the literature are localized alveolar osteitis, infection, bleeding, and paresthesia.

OBJECTIVE: Identify risk factors associated with complications following third-molar extractions and evaluate treatment outcomes.

METHODS: This retrospective chart review case-control study was conducted at the Department of Oral and Maxillofacial Surgery, Tufts University School of Dental Medicine. Following Tufts Medical Center IRB approval, digital dental records from patients with documented wisdom teeth removal from the past 5 years were compiled. TUSDM IT team performed a database search of patients with a follow-up visit within three months of extractions that resulted in over 1,500 patients. A total of 250 total patient charts were selected at random, and each patient chart was categorized based on the presence or absence of complications. In order to obtain statistically significant data, it was determined that a 2:1 ratio of controls to cases would be used. Patients were categorized as a “control” if there were no complications after extractions and patients were categorized as a “case” if there was a complication. Of the 250 charts evaluated, 30 patients were categorized as a “case” and 60 random patients were then categorized as a “control.” Dental records were de-identified and analyzed using Stata13. The following variables were identified: demographics (age, sex, social habits), medical and dental history, site of extracted teeth, position of third molar, distal space and depth of inclusion, degree of retention, presence of prior radiolucent lesions, presence of adjacent permanent second molar, concomitant medications, presence of purulence or necrotic tissue at the time of surgery, surgical technique used, post-operative medications, surgeon’s credential.

RESULTS: A total of 250 patient charts were evaluated in order to categorize 60 controls and 30 cases. The 30 cases identified included 16 cases of alveolar osteitis, 4 cases of paresthesia of the chin or side of face, 4 cases of bony spicules, 3 cases of lingual paresthesia, 2 cases of surgical site infection and 1 case of lingual and chin paresthesia. There is significant association (p<0.05) between post-surgical complications and sex (women are associated with higher numbers of post-surgical complications than men), history of allergies, location of extraction, prior radiolucent lesions and antibacterial mouth rinse prescription (cases had fewer mouth rinse prescriptions than controls). There is no significant relationship (p>0.05) between post-surgical complications and marijuana use, alcohol consumption, smoking, degree of impaction, concomitant medications, post-operative medications, and surgeon’s credentials.

CONCLUSION: This is an ongoing study and further analysis is needed to further identify risk factors associated with individual complications following third molar extractions and evaluate treatment outcomes.
A Literature Review of Carotid Plaque Detection in Panoramic Radiographs

Hilde Tillman, Avanthi Tiruvadi,* and Jennifer Barton

OBJECTIVES: To provide an organized resource for clinicians to use to understand the importance of diagnostic panoramic radiographs in detecting carotid artery calcifications for patients at risk for coronary artery disease, given their medical and dental history.

METHODS: Literature published from 2000 to present day was searched in the PubMed electronic database. Study inclusion criteria included: coronary artery disease, age, sex, diagnosed diabetes mellitus, obesity, hypertension, high cholesterol, and chronic renal disease and periodontal disease.

RESULTS: In the study, 14 articles have been reviewed and 14 appear to fit the criteria. Although some studies refute the practical diagnostic use of panoramic for diagnosis of coronary artery disease, there can be some associations drawn from the literature. A trend can be noted in the association between diabetes mellitus, hypertension, age and sex, chronic renal disease, and periodontitis and the visible presence of carotid plaques in panoramic radiographs.

CONCLUSIONS: Patients with the aforementioned diagnosed diseases were at higher risk of developing coronary artery disease and in turn had a positive correlation with detection of carotid artery plaques in panoramic radiographs. Given this correlation, further medical tests are recommended and the radiograph is solely a preliminary screening tool for coronary artery disease.
Evaluation of the Promotion of Critical Thinking and Integration of Evidence-Based Dentistry in the Pre-doctoral Clinical Courses

Bianca Velayo,* Paul Stark, Tofool Alghanem, Jennifer Bassett Midle, Matthew Finkelman, and Haomiao Wang

INTRODUCTION: According to the Dental Education Standards put forth by the Commission of Dental Accreditation, the curriculum should employ methods that support the development of critical thinking and problem solving skills. Additionally the educational program must incorporate the principles of evidence-based dentistry (EBD) during the process of patient care. Recently, Tufts University School of Dental Medicine has started some initiatives to teach the students about EBD, but the promotion of critical thinking and the integration of EBD into the curriculum have been left up to the individual course directors. The aim of this pilot study is to evaluate teaching styles that stimulate critical thinking and the application of EBD in the dental school’s preclinical dental curriculum.

METHODS: Video captured lectures from Tufts University Science Knowledgebase (TUSK) system were extracted and used for this project. The sample size consisted of 216 unique concepts presented in 36 randomly selected recorded lectures from 6 pre-doctoral clinical courses from the 2013–2014 academic year. These courses are second-year endodontics, fixed prosthodontics, radiology, pediatric dentistry, and dentures, and third-year craniofacial function. A validated instrument specifically designed for this study was used to assess each lecture. The lectures were scored for its promotion of critical thinking (from 0 to 7), and each concept within each lecture was scored for its use of evidence (from 0 to 3). For each lecture, the average evidence score per concept was calculated and this was correlated against the critical thinking score of the lecture.

RESULTS: The results show that mean evidence/concept score is 0.451 (SD=0.592), mean number of concepts per lecture is 4.67 (SD=2.07), the mean critical thinking score is 1.44 (SD=1.40), and the mean evidence score per lecture is 2.19 (SD=2.87). There was no statistically significant relationship between critical thinking score and average EBD score/concept as determined by a simple linear regression (r=0.013, p=0.938). The results suggest that lecturers are making an effort to make lectures more interactive in order to stimulate clinical reasoning, self-assessment, and curiosity. Additionally, students are being provided information to independently find and critique the evidence. However, overall there is room for improvement in promoting critical thinking and integrating EBD in pre-clinical courses. The data highlights specific areas that can be targeted for future development.

CONCLUSION: Early and frequent exposure to EBD in the pre-doctoral curriculum can increase the number of dentists who practice and feel comfortable applying EBD. This baseline research is the first step to being able to incorporate EBD as part of the dental curriculum and eventually students’ future dental practices. Future directions include refining the instrument to improve data collection of critical thinking and EBD scores, looking at different modalities of collecting data other than video, and increasing the sample size. We plan to use this data as a benchmark in outcomes assessment evaluating EBD and critical thinking in accordance to CODA Standards.

Also presented at the 2015 ADEA Annual Session in Boston.
Validation of Evidence-Based Dentistry and Critical Thinking Application Assessment Tool

Haomiao Wang,* Bianca Velayo, Tofoo Alghanem, and Paul Stark

INTRODUCTION: Evidence-based dentistry (EBD) is a contemporary approach to patient-treatment that uses the most recent and relevant scientific research to augment a dentist’s professional experience and expertise to form a superior basis for treatment planning and decision-making. EBD and critical thinking (CT) go hand-in-hand; a dentist must possess the critical thinking skills necessary to faithfully apply the appropriate evidence to a given case. Sections 1.1–1.3 of the ADEA Foundation Knowledge and Skills for the New General Dentist directly emphasizes the essentials of CT and its use in integrating research with clinical expertise and a patient’s values for the evidence-based practice of dentistry. Accordingly, an increasing number of dental schools, including the Tufts University School of Dental Medicine (TUSDM), are transitioning towards school-wide implementation of clinical curricula that are supplemented by EBD and aid in the development of critical thinking skills. Currently, however, at TUSDM, the level of incorporation of EBD/CT in a course varies wildly from course to course, with complete dependence on individual course directors. In order to accomplish widespread curriculum change, it is first necessary to devise a tool with appropriate criteria that assesses the level at which each course currently promotes EBD and critical thinking skills. The aim of this study is to formulate and validate such an instrument.

METHODS: Development, face validity, construct validity, and test-retest reliability was performed in order to generate the instrument. Two investigators reviewed appropriate literature to identify the most critical elements of EBD/CT. From this information, they developed the instrument, which was then evaluated for face validity by two additional co-investigators with knowledge of the subject matter, then construct validity by two experts in the subject matter.

RESULTS: Class activities, participation encouragement, assessment of the students’ understanding of the materials taught, and the presence of after-class activities to apply the learned materials were identified as the most important components of teaching with critical thinking. For the EBD part, the use of EBD identifiers, level of evidence used, information about the evidence used, and the limitation of the evidence were identified as most important elements for teaching. These predetermined components were formulated into questions that were assessed for face validity and construct validity. Corrections and changes were made as needed to finalize the tool. The completed tool was finalized (Appendix) and scores were assigned to it as follows:

- The extent to which critical thinking was promoted throughout the lecture (0–7, with 0 points meaning zero promotion of critical thinking and 7 points meaning maximum promotion of critical thinking).
- The extent to which the use of evidence was used to support concepts (0–12, with 0 points meaning zero use of evidence to support concepts and 12 points meaning maximum use of evidence to support concepts).

For the test-retest reliability, Pearson correlation was calculated (work is in progress).

Also presented at the 2015 ADEA Annual Session in Boston.
Optimization of Snai1 siRNA Transfection in Murine Bone Marrow Derived Mesenchymal Stem Cells

Kathryn Weber,* Hema Aluri, Helene Armaos, Suharika Soudam, and Driss Zoukhri

OBJECTIVE: The transcription factor Snai1 is the master regulator of epithelial-mesenchymal transition (EMT) and mesenchymal-epithelial transition (MET). The purpose of this study was to determine the optimal siRNA for silencing Snai1 expression in bone marrow derived mesenchymal stem cells (BD-MSCs) in order to induce MET.

METHODS: BD-MSCs were cultured in six well plates in IMD media until the cells reached 50–60% confluency. Eight different Snai1 siRNA were purchased from OriGene, Dharmacon, and IDT. The transfection reagent Neofectin was mixed with each of the Snai1 siRNA samples (25 nM for Dharmacon and IDT and 30 nM for Origene) and incubated for 15–20 minutes at room temperature. Next the siRNA and Neofectin mixture was added to the six well plates and incubated for 48 hours at 37°C and 5% CO2. The transfected cells were lysed, RNA extracted and RT-PCR for Snai1, and the housekeeping gene GAPDH expression performed. To ensure the efficiency of transfection, cells were grown on 8-well chamber slides and transfected with a fluorescently labelled siRNA. After 48 hours, the number of fluorescently labeled cells was counted.

RESULTS: Transfection efficiency of BD-MSCs using Neofectin was over 80% when using a fluorescently labeled siRNA. Image J analysis of the gel electrophoresis from RT-PCR was used to determine the percent decrease in Snai1 expression when compared to control non-transfected cells. Four IDT siRNAs had on average a percent decrease of 31.7%, 28.5%, 20.1%, and 16.2%, respectively, when compared to control. One OriGene siRNA had an increase of 9.3% while two other ones had a 14.9% and 22.8% decrease in expression when compared to control. The Dharmacon siRNA showed a 1.8% increase in expression.

CONCLUSION: The siRNA sequences and protocols used for transfection in this study did not efficiently downregulate Snai1 in BD-MSCs. Since cell permeability using NeoFectin was found to be over 80%, it is most likely that the siRNA sequences and/or the transient transfection time was not optimal. Future experiments will test lentiviral Snai1 siRNA transfection to assess if this method of transfection is better suited for BD-MSCs.
Impact of an Interprofessional Teamwork and Communication Mini-course for Dental and Dental Hygiene Students

Ellen Patterson,1 Natalie Hagel,1 Kristeen Perry,2 Jennifer Bassett Midle,1 and Fadi White1*

1Tufts University School of Dental Medicine, Boston; 2Massachusetts College of Pharmacy and Health Sciences University, Boston

OBJECTIVES: The objectives of this study are: 1) to demonstrate that an interprofessional education (IPE) intervention for hygiene and dental students will positively impact student attitudes toward teamwork and interprofessional collaboration, and 2) to develop and test a new scale to measure student attitudes toward dental teamwork.

METHODS: Thirty volunteer third- and fourth-year dental students and 16 dental hygiene students participated in five weekly interprofessional learning sessions. Dental and hygiene student were paired weekly in clinic to provide direct patient care, followed by small group-learning sessions focused on teamwork and communication skills. Participants and an unexposed control group completed two measures for pre- and post-test comparison—the validated Readiness for Interprofessional Learning Scale (RIPLS) and a newly developed measure, the Attitudes Toward Dental Teamwork Scale (ATDTS). This 14-item measure was assessed for content validity by a panel of seven experts and was evaluated for face validity with a test-retest reliability analysis. Qualitative data from the participating students was also collected.

RESULTS: All questions on the newly developed measure (ATDTS) were rated very important to important by our expert panel, thus all questions were included. Reliability analysis, however, showed 5 of the 14 questions had poor test-retest reliability scores. Participant vs. control group changes from pre-test to post-test RIPLS scores showed a significant (p<0.05) change on only two of the measure subscales; the total score change p-value was <0.10, indicating a trend toward significance. Comparison of pre- and post-test ATDTS scores showed a significant change (p<0.05) for both groups; however, the control group showed greater change than the participant group. Qualitative data collected from the student pre- and post-intervention indicate that the intervention was an overall positive learning experience.

CONCLUSION: Although our data indicate that participant and control groups did not differ by demographics, participants’ RIPLS scores were significantly higher prior to beginning the intervention (selection bias), likely impacting our ability to measure the effect of this educational intervention. Although we did not measure a statistically significant change in student attitudes, qualitative data indicated that the intervention was highly valued by students. We recommend modification of the ATDTS measure for future use, and a more thorough analysis of the recommended changes will be presented in the final poster.
Effects of Operating Room Efficiency on the Dental Resident Experience

Faryn Bergera* and Jeffrey Graceffo*

Patients with intellectual and developmental disabilities are more likely to have poor oral hygiene, untreated dental decay, and periodontal disease. As a result, comprehensive dental treatment in the operating room is an important service for many of these special needs patients who are unable to receive oral rehabilitation in the traditional dental setting. Many of these individuals receive care from residents training with the guidance of experienced practitioners in the operating room. However, the desire for operating room efficiency and minimization of anesthesia duration are factors that influence available time for dental care, resident training experience, and possibly treatment outcomes. The purpose of this study is to examine potential variables in the operating room setting that can influence both patient outcomes and dental resident experience. Future research methodology will also be proposed in order to better understand the effects of these factors, determine ways of enhancing dental resident training and improving treatment for special needs individuals in the operating room setting.
Effectiveness of an Oral-Health Education Program for Pregnant Women at Tufts Medical Center

Sucheta Budania,* Matthew Finkelman, and Cheen Loo

PURPOSE: The purpose of the study was to assess the knowledge of pregnant women in oral health. An informational seminar session on oral health was used to determine how beneficial such training would be in improving pregnant women’s dental knowledge.

METHODS: A pre/post-test design was used to evaluate the effectiveness of a seminar session given to pregnant women treated at Tufts Medical Center. Knowledge-based and belief-based questions were used to determine the level of knowledge of oral health.

RESULTS: In the study, 66 subjects participated in oral health awareness sessions and completed the questionnaire. The mean age of all participants was 30.6 (SD=4.4). Of the participants, 40% reported receiving information about dental care from their prenatal provider. Preliminary results show that for the knowledge-based questions, the percentage of correct answers from the pre-test was 74.6% while the percentage of correct answers from the post-test was 96.9%. The results suggest that pregnant women could benefit from oral-health education.

CONCLUSION: Pregnancy affords a unique opportunity to educate women on the importance of oral health. Preliminary results showed that there may be potential benefit to an oral-health educational session for pregnant women at Tufts Medical Center. Prenatal education should universally adopt an oral-health component.

Three-Dimensional Bone and Soft Tissue Reconstruction with Implant Placement In Esthetic Areas following Severe Trauma: A Case Report

Irina Dragan,* Hidetada Moroi, and Charles Hawley

Implant placement in maxillary esthetic areas requires respecting certain critical parameters, including the location of the final prosthesis. The three-dimensional reconstruction of maxillary anterior esthetics after trauma is complicated by the vertical and horizontal extent of damage, vestibular depth, biotype, and the amount of remaining keratinized tissue. This case report describes key points to consider in performing successfully horizontal and vertical guided bone regeneration procedures using tenting screws and titanium mesh non-resorbable membranes. Soft-tissue reconstruction and conditioning is essential in delivering acceptable esthetic outcomes. The current report focuses on the sequential planning, timeline, and surgical procedures performed in order to achieve favorable periodontal outcomes in esthetic areas following severe trauma.

Healthcare Providers’ Role in Decreasing Opioid Abuse

Kyle Dunmire,* Ainslee Flavell,* and Kirsten Finn*

The number one symptom that brings even the most reluctant patient into a dental practice is pain. Most general dentists would agree that management of acute pain is an essential skill for maintaining a successful practice. However, the prescribing of opioids has caused an increase in the accessibility of narcotic pain medications and contributes to the growing trends of fatal overdoses. All prescribers have a responsibility to minimize drug misuse while still maintaining legitimate access to opioids for patients in need. Many states have begun implementing Internet-based prescription drug monitoring programs and databases since non-medical use of pain prescriptions are usually more common from dental clinics. Unfortunately, evidence-based medicine does not support opioids as first-line analgesics for dental pain.

Assessment of each patient along with thorough review of records and constant contact with patients’ other healthcare providers may decrease the risk of diversion and non-medical use of opioids.
The Efficacy of CBCT and Extraoral Bitewings in Detection of Interproximal Caries

Osama Felemban,* Aruna Ramesh, Jennifer Bassett Midle, and Cheen Loo

PURPOSE: The purpose of this in vitro study is to evaluate the diagnostic efficacy of cone beam computed tomography (CBCT) and extraoral bitewings in detection of interproximal caries and determining the depth of carious lesions compared to intraoral bitewings.

METHODS: Cadaver heads with 70 posterior teeth were radiographically imaged with i-CAT CBCT, ProMax 3D CBCT, ProMax (extraoral bitewings), and intraoral digital bitewings. The teeth were then extracted and sectioned for histological evaluation under the microscope. Six pediatric dentistry residents evaluated each proximal surface. Inter-observer agreement, sensitivity, and specificity were calculated. ROC curves were analyzed using ANOVA test.

RESULTS: Preliminary results from 40 teeth showed that 51.9% of the proximal surfaces were sound and 48.1% were carious. Statistical analysis will be carried out after the completion of the data collection and resident observation.

CONCLUSION: Statistical analysis will be carried out after the completion of the data collection and resident observation.

Dental Management of Patients with Adrenal Insufficiency, Based on Literature Review

Marina Karnaukh,* Neelam Shah,* and Khoa Tran*

Patients with adrenal insufficiency are treated with long-term steroid use. It has been common practice amongst dentists to increase steroid coverage of such patients before and after routine dental procedures to prevent adrenal crisis. To evaluate the need for supplemental steroids, relevant articles addressing adrenal insufficiency and adrenal crises in dentistry were reviewed. The results of these articles showed the low incidence of adrenal crisis following dental procedures, including major surgeries. Based on these reports, it can be concluded that the dental management of hypoadrenal patients on long-term steroids should be modified. The rarity of adrenal crisis in dentistry strongly suggests that routine dental procedures can safely be completed without any additional steroid coverage.
Dental Management and Complications of Patients with Turner Syndrome

Elaina Kazes* and Amrita Singh*

Turner syndrome is one of the most common chromosomal abnormalities that affects development in approximately 1 in 2,000 female births. It is characterized by anomalies of the X chromosome and encompasses several conditions in patients. It has been shown that dental hygienists and dentists are likely to detect the condition because it manifests clinically in the oral cavity first. Being aware of common dental manifestations and considerations with patients who have the syndrome can aid in the proper treatment and preparation of the patient as well as avoiding potential issues that can ensue.

Biomechanical Evaluation of Different Systems, Locking and Conventional, for Fixing Sagittal Osteotomy in Major Advances with or without Anticlockwise Rotation

Gustavo Batista Grolli Klein,* Gabriel Cury Mendes, Paulo Domingos Ribeiro Jr., Maria Papageorge, and Archana Viswanath

PURPOSE: The overall objective of this in vitro study was to assess the biomechanical stability of 6 different osteosynthesis methods after sagittal split ramus osteotomy by simulating the masticatory forces and using a 3-point biomechanical test method.

MATERIALS AND METHODS: Sixty polyurethane hemi-mandibles with bone-like consistency were randomly assigned to 2 groups, each group containing 6 subdivisions (N=5), and subjected to sagittal split ramus osteotomy. After 10-mm advancement of the distal segment (group 1) and 10-mm advancement of the distal segment combined with 20° counterclockwise rotation (group 2), the bone segments were fixed by different osteosynthesis methods using 2.0-mm mini-plate/screw systems: subdivision A, one 4-hole conventional straight mini-plate; subdivision B, one 4-hole locking straight mini-plate; subdivision C, two 4-hole conventional mini-plate; subdivision D, two 4-hole locking mini-plate; subdivision E, one 6-hole conventional sagittal mini-plate; subdivision F, one 6-hole locking sagittal mini-plate. All models were mounted on a base especially constructed for this purpose. Using a 3-point biomechanical test model, the hemi-mandibles were loaded in compressive strength in an Instron machine (Norwood, Massachusetts) until a 3-mm displacement occurred between segments vertically or horizontally.
RESULTS: In all cases, the fixations show better performance in advancement only, against advancement combined with 20° counterclockwise rotation. The use of 2 straight mini-plates shows more resistant, followed by sagittal mini-plates and one straight mini-plate in both groups. The main forces were respectively: 0.1059 KN, 0.0599 KN, 0.0443 KN in conventional system and 0.1271 KN, 0.0665 KN, 0.0535 KN in locking system, for group 1. About group 2 the forces were respectively: 0.0930 KN, 0.0505 KN, 0.0330 KN in conventional system, and 0.1103 KN, 0.0569 KN, 0.0411 KN in locking system.

CONCLUSION: The use of two mini-plates still remains as a form of fixation, on sagittal split osteotomy, with the less displacement, even in large advancements with or without counterclockwise rotations.

The Influence of Community Service Learning Externship on Pre-doctoral Dental Students’ Future Management of Pediatric Patients

Sage Yoo,* Wanda Wright, Cheen Loo, and Alfred Rich

PURPOSE: The object of this study was to determine if experiences outside of school clinic affects the attitudes of pre-doctoral students toward managing the oral-health problems of pediatric population.

METHOD: A survey will be administered to pre-doctoral class of 2015 (N=179). Students will be surveyed after they have completed their CSLE. The survey consisted of questions about expectation from CSLE, preference of working with adult or pediatric patients prior and post CSLE, primary concern in treating pediatric patients, and what additional training would help more with treating pediatric patients. Hypothesis testing will be conducted using the one-sample t-test. Categorical data will be tested using chi-square test for association.

RESULTS: In the study, 70 responses have been received from the students. Data collection is still in progress. Statistical analysis will be carried out upon completion of the data collection.

CONCLUSION: Data collection is still in progress. Statistical analysis will be carried out upon completion of the data collection.

Research supported by DHHS-HRSA #D84HP19955.
Behavioral, Epidemiologic, and Health Services Research

Risk and Prognostic Factors for Multidrug-Resistant Acinetobacter baumannii Complex Bacteremia: A Retrospective Study in a Tertiary Hospital of West China

Quinquin Liu, Wenzhang Li, Xinmiao Du, Weijing Li, Taiqing Zhong, Yin Tang, Yulin Feng, Chuanmin Tao, and Yi Xie

West China Hospital, Sichuan University, Chengdu, Sichuan, China; First Affiliated Hospital of Chengdu Medical College, Chengdu, Sichuan, China; Tufts University School of Dental Medicine, Boston

BACKGROUND: The increasing prevalence and mortality of multidrug-resistant (MDR) Acinetobacter baumannii complex-associated infections, especially bacteremia, in healthcare settings poses a great threat to public health. We proceeded to investigate the risk and prognostic factors for MDR A. baumannii complex bacteremia in mainland China.

METHODS: This retrospective study was conducted at West China Hospital from January 2009 to December 2013. Using a computer-assisted microbiology laboratory database, patients with MDR A. baumannii complex bacteremia were included as the case group, while those infected with non-MDR A. baumannii complex were selected as the control group. The clinical data were collected and analyzed.

RESULTS: There were 241 non-duplicated A. baumannii complex blood isolates identified in our research, with the overall rate of multidrug resistance reaching 75.52% over the past five years. Using multivariate logistic analysis, being in the intensive care unit (ICU) (adjusted odds ratio [aOR], 5.84; 95% confidence interval [CI], 1.67–20.44), increased Pittsburgh bacteremia score (aOR, 6.55; 95% CI, 1.27–33.70), and use of carbapenem (aOR, 8.90; 95% CI, 1.71–46.30) were independent risk factors for MDR acquisition among patients with A. baumannii complex bacteremia. Older age (aOR, 1.02; 95% CI, 1.00–1.04), being post-transplantation (aOR, 5.21; 95% CI, 1.13–24.04), having a higher Pittsburgh bacteremia score (aOR, 2.19; 95% CI, 1.08–4.47), and having a lower level of albumin (aOR, 0.93; 95% CI, 0.88–0.99) were identified as independent risk factors for 30-day mortality in patients with MDR A. baumannii complex bacteremia.

CONCLUSION: In conclusion, our research revealed the risk factors associated with acquisition of and mortality from MDR A. baumannii complex bacteremia, which may be used to prioritize infection control practices and prognostic evaluations.

Engaging Hygienists in Meth-Mouth Education: Qualitative Pilot (Phase II)

Jennifer Towers,* Susan Gallagher, and Gina Heideman

OBJECTIVES: Design theory-based health communication campaign for dental hygienists to reduce morbidity/mortality of adolescent methamphetamine use. Qualitative pilot test of Idaho adolescent dental patients was designed to determine opinions/preferences about meth-mouth education/meth-use prevention and protocol, delivery, images, and language for dental office meth-use prevention materials.

METHODS: Snowball sample of six female subjects aged 14–15 participated in focus group. Inclusion criteria: aged 10–19, English-speaking, annual dental hygiene appointment, written permission from parent/guardian. Ninety-minute in-person focus group was recorded for content analysis. IRB-approved, Extended Parallel Process Model-informed, Moderator's Guide aided participant feedback on meth mouth/crank bugs pictures/language for teaching aid used by hygienists.

RESULTS: Of the group, 50% understood intent of meth-mouth advertisements; 100% felt graphics were impactful; many but not all felt depictions were realistic. Mild meth-mouth cases elicited a less-dramatic response than advanced cases. Fifty percent felt most extreme cases should be shown to dental patients without qualification; other half felt there should be age considerations. Term “crank bugs” was not familiar to majority; they questioned validity/occurrence of meth-high psychosis. Questions about pain and scientific/medical causes emerged with demand for meth use facts and “myth busting.” Potential thematic use of zombies for teaching aid was deemed interesting but comic book medium was overwhelmingly rejected. Subjects felt meth use information should be widely distributed but mobile messaging not preferred due to lack of smart phone availability/financial hardship. All felt printed posters/pamphlets would be most effective for dental offices and liked billboards, preferring public awareness over a private experience.

CONCLUSIONS: Understanding health outcomes etiology was central to subjects’ acceptance of susceptibility and severity of meth mouth/crank bugs. Access to information and preferred communication channels are affected by perceived/actual socioeconomic status. The Extended Parallel Process Model could be effective with this demographic. There are needs for further audience segmentation and tailored campaign executions.

Presented at the 2015 IADR General Session in Boston. Abstract #2885.
Cancer Biology and Tissue Engineering

Maintenance of Functional Embryoid Bodies in Cryopreservable, Microfluidic Chips: A Platform for Personalized Medicine

Raymond Anchan,1 Sinan Guven,1 Jennifer Lindsey,1 Michael Nickerson,1 Sireesha Chinthala,1 Behzad Gerami-Naini,1,2 Utkan Demirci,1,3
1Brigham and Women’s Hospital, Harvard Medical School, Boston; 2Tufts University School of Dental Medicine, Boston; 3Massachusetts Institute of Technology, Cambridge, Massachusetts

OBJECT: Employ microfluidic cassettes as a novel platform for long-term culture and cryopreservation of functional, differentiated mouse embryoid bodies.

MATERIALS AND METHODS: Embryoid bodies (EBs), grown in suspension from mouse embryonic stem cells (ESCs), were embedded in Matrigel-coated channels with a constant 1 µl/min flow of culture media for 21 days. EB viability, differentiation, and functionality were assayed as measures of the culture system’s efficacy. Viability was assessed with live/dead stains and BrdU proliferation assays. Differentiation was analyzed with immunocytochemistry (ICC) for markers of endoderm, ectoderm, and mesoderm, as well as ovarian tissue. Hormone synthesis served as an indicator of EB differentiation and functionality. Conditioned media collected over 24 hr interval period was assayed by ELISA for estradiol (E2), progesterone (P4), and testosterone (T) synthesis. We also slow-froze sealed microfluidic cassettes in isopropanol, thawed these, and measured viability and functionality of the EBs.

RESULTS: EBs grown in microfluidic cassettes maintain long-term viability and proliferation after 21 days. Differentiation of EBs in the microfluidic system was verified, as shown by ICC of cell markers from all three germ layers and expression of ovarian cell markers (inhibin, Cyp19a1, and AMHR). Functional analyses show increasing synthesis of E2 (15 pg/ml on day 1 to 31 pg/ml on day 20). Cryopreserved EB-laden microfluidic chips recovered upon thawing and continued hormone synthesis.

CONCLUSION: Microfluidic culture of functional EBs is a promising system that can maintain EB viability, differentiation, and functionality even after recovery from cryopreservation and afford an opportunity to develop patient-specific cassettes of differentiated human ESCs that may be stored, used in drug testing, or harvested for hormones.

SUPPORT: NIH 1 R01 EB015776-01A1 (SG, RMA, UD)

Presented at the 2014 Annual Meeting of the American Society for Reproductive Medicine in Honolulu, Hawaii, October, 2014.
**Functional Characterization of Retinoblastoma in Tooth Development**

*Weibo Zhang, Viktoria Andreeva, Betsy Vazquez, Jodie Pietruska, Philip Hinds, and Pamela Yelick*

**OBJECTIVES:** Recently, it has become evident that retinoblastoma 1 (Rb1), a tumor suppressor gene, also plays important roles in cell fate determination and differentiation of multiple tissues. In this study, we evaluated the role of Rb1 in tooth development.

**METHODS:** Transgenic 3.6Col1a1-Cre::Rb conditional knock-out (KO) mice were generated by crossing Rbf19/f19 and 3.6-Col1a1Cre transgenic mice. Evaluation of tooth development in KO, HET and WT mice was performed using histological and immunohistochemical (IHC) analyses of tooth differentiation marker gene expression. Due to the fact that conditional Rb KO mice die at or just before birth, we performed kidney capsule implantation of E14.5 mandibles obtained from KO, HET and WT 3.6Col1a1::Rb mice, grown for 9 days, 23 days, 1, and 2 months. Harvested jaw implants were evaluated using X-ray, SEM, micro-CT, sectioned in situ hybridization (ISH), real-time PCR, histological and IHC analyses. TUNEL assay were used to evaluate cell apoptosis and proliferation, respectively, in jaw implants. Chromatin immunoprecipitation (ChIP) assays were used to determine the role of Rb1 to tooth development.

**RESULTS:** X-ray, SEM, and micro-CT analyses revealed reduced and less organized dentin formation in 3.6Col1a1::Rb KO mouse teeth as compared to aged matched Het and WT animals. Histological analysis confirmed reduced dentin formation, which was accompanied by increased levels of dental pulp cell apoptosis, which was confirmed by TUNEL assay. Reduced odontoblast differentiation marker genes expression was shown using IHC and real-time qRT-PCR. CHIP assays were used to demonstrate that Rb1 and Runx2 cooperative binding to promoter sites within the Dspp and Dmp1 genes.

**CONCLUSIONS:** These studies demonstrate, for the first time, previously unknown roles for Rb1 in odontoblast differentiation and survival.

*Presented at the 2015 IADR General Session in Boston. Abstract #0098.*
Dental Materials

Comparison of Microleakage between Bulk-Fill Flowable and Nanofilled Resin-Based Composites

Eman AlSagob, David Bardwell, Samer Khayat, Paul Stark, and Ala Ali

OBJECTIVES: The objective of this study was to compare the marginal leakage (silver nitrate uptake) of nanohybrid resin-based composite (RBC) and two bulk-fill flowable RBCs with specific clinical protocols.

METHODS: Four experimental groups of RBC were investigated including conventional composite Filtek™ Supreme in 2 mm increment (FS2), Filtek™ Supreme in 4 mm increment (FS4), Filtek™ Supreme Flowable (BFF), and SureFil® SDR® flow (SDR). Class II box preparations (4 x 4 x 3 mm) in extracted intact human molars were prepared and restored using the experimental groups, all according to the manufacturers’ recommendations, except FS4, which was applied in 4 mm increment instead of the 2 mm recommendation of the manufacturer. Samples were aged by thermocycling (2000 cycles). Microleakage was calculated by measuring dye penetration in sectioned teeth using a stereomicroscope. Results were analyzed using one-way analysis of variance (ANOVA), with Bonferroni post hoc test, and Mann-Whitney/Wilcoxon test at α=0.05 significance level.

RESULTS: BFF and FS2 exhibited the least dye penetration and microleakage measurement with no significant difference between the two groups with mean (standard deviation) of 1.90 (4.59) and 1.99 (2.24) respectively, followed by SDR with a mean of 3.91 (6.63). FS4 showed the highest microleakage with significant difference in comparison to BFF and FS2 with a mean of 8.02 (4.01).

CONCLUSIONS: The microleakage of the bulk-fill composites BFF and SDR are comparable to conventional composite FS2; however, it’s more predictable to use FS2 due to its reliable results.

Presented at the 2015 IADR General Session in Boston. Abstract #0648.

Effect of Curing Light and Restoration Location on Energy Delivered

Sapan Bhatt,1 Coralie Ayer,2 Richard Price,2 and Ronald Perry1

1Tufts University School of Dental Medicine, Boston; 2Dalhousie University School of Dentistry, Halifax, Nova Scotia

This study determined how long it would take skilled operators to deliver 16 J/cm² to an anterior or a posterior restoration using different light-curing units (LCUs). Three skilled operators used the following LCUs at two locations in the MARC-patient simulator: Optilux 501 standard mode for 20 s; Sapphire Supreme for 5 s; Elipar™ S10 for 5 s and 20 s; Demi™ Plus standard mode for 5 s; SmartLite® Max boost mode for 5 s and continuous mode for 20 s; Radii Plus for 30 s; Valo (main version) in standard mode for 20 s and Xtra Power mode for 3 s; and Valo Cordless in standard mode for 20 s and Xtra Power mode for 3 s. The three MARCtrained operators made 30 readings with each light over 7 days. The energy (J/cm²) delivered to the anterior Class III and posterior Class I simulated restorations in MARC was recorded using a laboratory-grade spectroradiometer, and the time each light would take to deliver 16 J/cm² calculated. ANOVA and Fisher’s PLSD tests compared differences in the time to deliver 16 J/cm² of energy, α=0.05. Three-way ANOVA showed there was no significant difference between the operators, but there was a difference between the lights and locations. The Valo main and Valo Cordless in the Xtra Power mode delivered 16 J/cm² in the shortest time at both locations. The Radii Plus took the longest to deliver 16 J/cm², taking twice as long in the posterior location.

Published in Compend Contin Educ Dent. 2015 Mar;36(3):208-10, 212, 214.
Change in Bond Strength of Selected Bonding Agents over Time

Sapan Bhatt, Richard Price, Ronald Perry, and Gerard Kugel

OBJECTIVES: To investigate the change in shear bond strength of selected bonding agents over a 3-year period.

METHODS: Two self-etching bonding systems, Clearfil SE™ (CF, Kuraray), Peak SE™ (PS, Ultradent), and two phosphoric acid total-etch bonding systems, Peak LC (PT, Ultradent), Single Bond™ (SB, 3M ESPE), were used according to manufacturer’s instructions to bond Filtek Z100™ (3M ESPE) to human dentin on extracted third molars. Group 1 for each system (N=12) was stored (37°C, 24 hours) and group 2 (N=12) was stored (37°C, 3 years) before de-bonding using Ultradent notched blade. Lowest bond strength value in each group was discarded. Results were compared with two-way ANOVA and Fisher’s PLSD test (α=0.05).

RESULTS: Table 1. Mean shear bond strengths for selected bonding systems and difference in bond strength between 2 groups. Superscript letters A,B,C indicate bonding systems with no significant difference. * = significant difference between bond strength in group 2 versus group 1 (Fisher’s, p<0.05).

<table>
<thead>
<tr>
<th></th>
<th>Mean Bond Strength (mPa)±SD</th>
<th>Difference in Mean Bond Strength (mPa)</th>
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<tbody>
<tr>
<td></td>
<td>Group 1</td>
<td>Group 2</td>
</tr>
<tr>
<td>CF</td>
<td>46.8±3.9A</td>
<td>36.9±13.7C</td>
</tr>
<tr>
<td>PS</td>
<td>44.5±5.9A</td>
<td>42.3±116.6C</td>
</tr>
<tr>
<td>SB</td>
<td>37.3±4.6B</td>
<td>33.9±7.7C</td>
</tr>
<tr>
<td>PT</td>
<td>36.0±10.6B</td>
<td>37.0±12.9C</td>
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CONCLUSIONS: Storage for three years had a significant negative effect on shear bond strength for CF (Table 1). While self-etching bonding systems yielded significantly stronger bonds after 24 hours of storage, there was no significant difference between the systems after three years. These findings suggest further investigation into the change in shear bond strength for self-etch and total etch-bonding systems over time.

Presented at the 2015 IADR General Session in Boston. Abstract #0816.

Effect of Phosphoric Acid on Vitrebond Plus Resin-Modified Glass Ionomer

Jonathan Bishop, William Chao, Melissa Ing, Steven Eisen, Aikaterini Papathanasiou, and Gerard Kugel

OBJECTIVE: This study sought to determine whether phosphoric acid etching of Vitrebond Plus RMGI liner/base material (3M ESPE; St. Paul, MN) affects the shear bond strength between itself and Filtek Supreme Ultra nanocomposite (3M ESPE).

METHODS: In the study, 3 mm x 6 mm cylindrical molds were filled with Vitrebond Plus RMGI liner and light-cured for 20 seconds. Samples were then either treated with 35% phosphoric acid (Group 1; N=27); or not treated with phosphoric acid (Group 2: N=26). All samples were then treated with ExciTE F total-etch bonding agent (Ivoclar Vivadent; Amherst, New York) and light-cured for 10 seconds. Once the bonding agent was cured, Filtek Supreme Ultra nanocomposite was placed over the Vitrebond Plus RMGI liner using 8 mm x 3 mm cylindrical molds and light-cured for 40 seconds using a light-emitting diode curing light (DEMI Plus, Kerr; Orange, California). All samples were treated in accordance to manufacturers’ instructions. After sitting at room temperature for 24 hours, the shear bond strength of each sample was determined using a universal testing machine at a crosshead speed of 1.0 mm/min.
RESULTS: No statistically significant difference was observed between the acid-etched and non-etched groups (p=0.918).

SIGNIFICANCE: Findings suggest that clinicians who currently implement selective-etching may no longer need to use this technique when using Vitrebond Plus RMGI liner and Filtek Supreme Ultra together because there is no detriment as a result of etching Vitrebond Plus RMGI liner. Clinically, this may decrease both application time and indicates that phosphoric acid neither positively nor negatively alters bond strength between the two materials.

Published in the Journal of Cosmetic Dentistry, Fall 2014, Volume 30, Number 3.

Composite Replacement of Amalgam Restorations: An In Vitro Examination
Hetaf Redwan, David Bardwell, Hans-Peter Weber, Ala Ali, Samer Khayat, and Matthew Finkelman

OBJECTIVES: Evaluate microleakage of composite restoration when bonded to tooth structure previously restored with amalgam material compared to that of freshly cut dentin.

METHODS: Thirty extracted intact human molars were mounted in autopolymerizing acrylic resin. Class II box preparations were prepared on the occluso-proximal surfaces of each tooth (4 mm bucco-lingual width and 2 mm mesio-distal depth) with the gingival margin 1 mm above the CEJ. Each cavity was restored using high copper amalgam restoration (Disperalloy®, DENTSPLY), thermocycled for 10000 cycles. Amalgam restorations were removed and replaced with Filtek™ Supreme Ultra Universal (3M ESPE) excluding five of them, which were used for the SEM and EDX composite resin then thermocycled for 5,000 cycles. Twenty samples were randomly selected for dye penetration testing utilizing silver nitrate staining to detect microleakage. Specimens were analyzed with a stereomicroscope at a magnification of 20x. All measurements were done in μm; two readings were taken for each cavity at occlusal and proximal margins.

RESULTS: Corrosion properties were not detected in either group. No statistically significant difference between the microleakage of the two groups was found using a 0 to 3 scale at the occlusal margins (McNemar’s test, p=0.727) or proximal margins (Wilcoxon signed-rank test, p=0.174). No significant difference was found between the two groups using the percentage measurements and Wilcoxon signed-rank test at either the occlusal (p=0.675) or proximal (p=0.513) margins. However, marginal microleakage was statistically significant between the proximal and occlusal margins (p<0.001).

CONCLUSIONS: Within the limitations of this in vitro study, no significant difference was found between the microleakage of non-discolored dentin in teeth that were previously restored with amalgam compared with freshly cut dentin. However, marginal microleakage in the proximal surface was higher than that in the occlusal surface.

Presented at the 2015 IADR General Session in Boston. Abstract #0848.
Diagnostic Sciences

Predictable Technique to Register Retruded Contact Position Using a Disposable Jaw Relation Recording Device

T. Daher,1 William Lobel,2 J. Massad,3 S. Ahuja,3 and Z. Danilov4
1Loma Linda University, School of Dentistry, Loma Linda, California; 2Tufts University School of Dental Medicine, Boston; 3University of Tennessee Health Science Center, Memphis, Tennessee; 4Danilov Dental Laboratory, Carmichael, California

The dental literature presents various definitions and techniques to describe and register centric relation (CR) or centric occlusion (CO). Briefly reviewing the literature in relation to CR, this article proposes the use of the term retruded contact position (RCP), clinically defined as retruded, unstrained, repeatable position and where the mandibular movements start when a Gothic arch tracing is used. With this clinical definition, a technique can be easily selected that meets all the requirements of such a position. The article discusses the use of a jaw recorder that is an intraorally graphic recording device that results in a tracing of mandibular movements in one plane, with the apex of the tracing indicating the retruded, unstrained, and repeatable relationship. The intersection of the arcs produced by the right and left working movement form the apex of the Gothic arch tracing. Several clinical situations using the jaw recorder are described. Clinicians can now quickly and accurately record RCP, balance complete, partial, or implant dentures, and orthopedically reposition the mandible. The technique achieves highly reliable and reproducible results.

Published in Compend Contin Educ Dent. 2015 May;36(5):323-329;quiz330.

CBCT Valuable for Diagnosis of Tooth Fracture

David Leader

DATA SOURCES: PubMed, Embase, Web of Science, ProQuest Dissertations & Theses, CNKI and SIGLE databases.

STUDY SELECTION: Two reviewers independently selected studies. Studies examining the diagnostic accuracy of CBCT for tooth fractures in vivo were considered. Only studies with a minimum of ten participants using a reference test of surgical exploration or extractions to establish the diagnosis of tooth fractures were included.

DATA EXTRACTION AND SYNTHESIS: Data abstraction was carried out independently by two reviewers and study quality assessed using the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool. The main study outcomes were sensitivity, specificity, positive likelihood ratio (LR), negative LR and summary receiver operating characteristic (SROC).

RESULTS: Twelve studies were included in a meta-analysis. The pooled sensitivity was 0.92 (95% CI=0.89–0.94) and pooled specificity 0.85 (95% CI=0.75–0.92). The pooled positive and negative likelihood ratios were 5.68 (95% CI=3.42–9.45) and 0.13 (95% CI=0.09–0.18) respectively. The summary receiver operating characteristic was 0.94 (95% CI=0.90–0.98). The pooled prevalence of tooth fractures in patients with clinically suspected but periapical-radiography-undetected tooth fractures was 91% (95% CI=83%–97%). Positive and negative predictive values were 0.98 and 0.43 (subgroup analysis: 0.98 and 0.28 for endodontically treated teeth; 0.99 and 0.77 for non endodontically treated teeth).
CONCLUSIONS: We suggest that CBCT has a high diagnostic accuracy for tooth fractures and could be used in clinical settings. We can be very confident with positive test results but should be very cautious with negative test results. For patients with negative results, close follow-ups are recommended. The diagnostic accuracy of CBCT is similar among different types of tooth fractures, which should be interpreted with caution due to unavailability of data for subgroup analysis on horizontal and oblique tooth fractures.

*Published in Evid Based Dent. 2015 Mar;16(1):23-4. doi: 10.1038/sj.ebd.6401082.*
Education Research

**Saudi and U.S. Dental Student Attitudes toward Treating Individuals with Developmental Disabilities**

Zuhair Alkahtani, Paul Stark, Cheen Loo, Wanda Wright, and John Morgan

This study was conducted to compare the attitudes of senior dental students at the Faculty of Dentistry at King Abdulaziz University (KAU) in Jeddah, Saudi Arabia, and at Tufts University School of Dental Medicine (TUSDM) in Boston about providing dental care to individuals with developmental disabilities (DD). Two subsequent classes of senior dental students at both universities were surveyed using a pretested, validated, online questionnaire. The students’ demographic and educational data were collected, along with information about their experience, training, and attitudes toward this population. Two hundred and fourteen students responded to the online survey, for a response rate of 35 percent (51 percent for KAU students and 21 percent for TUSDM students). Students at TUSDM had more training, more experience, and more positive attitudes toward individuals with DD compared to KAU students (p<0.05). Students who reported having previous experience with individuals with DD had more positive attitudes than students who reported no experience with these individuals (p<0.05). Students who reported being prepared to treat individuals with DD had more positive attitudes than students who reported not being prepared (p<0.05). These findings suggest an association between predoctoral education in the treatment of individuals with special needs and having positive attitudes toward providing oral health care to individuals with DD.


**A Virtual Patient Avatar: Enhancing Dental Education and Patient Care**

David Frantz, Kanchan Ganda, Britta Magnuson, and Melissa Ing

**PURPOSE:** Integrating comprehensive care in dental school curriculum is critical from the very beginning. Development of virtual patient avatar technology for dental education is important as it allows for the earliest introduction to comprehensive care. This can have a positive impact on dental student learning and patient care. Avatars can promote student critical thinking by allowing for case-based scenarios and simulation of comprehensive care. Additionally, avatars can enhance dental care by allowing students to simulate interactions and treatment with patients prior to clinical experience. Simulations allow for students to practice and learn from their treatment planning options, so mistakes, when made, are still virtual. The purpose of this abstract was to develop a virtual patient avatar to be used in the dental school setting.

**METHODS:** The virtual patient is written in the C# programming language and runs on the state-of-the-art cross-platform Unity three-dimensional engine. The avatar can be quickly reconfigured to provide virtual patients of any desired age, gender, or nationality. The avatar enables a realistic 3D patient for medical and social interaction along with a fully detailed, life-like 3D dentition. In its current version, simple C#, JavaScript, or Boo programming language scripts can be used to quickly reconfigure the system for different scenarios, but a user-friendly graphical configuration system is under development.

**CONCLUSION:** The created virtual patient avatar allows for an interactive experience that dental students can use to learn comprehensive treatment planning. Scenarios cover medically and dentally complex patients, dental material demonstrations, and responsive questions and answers with different outcomes possible depending
on students’ answers. This interactive computerized visualization enhances critical thinking skills and allows students to explore treatment plan options for patients with diverse issues.

Presented at the 2015 ADEA Annual Session and Exhibition Tech Expo in Boston.

Administrative Trends in U.S. Dental Schools

Martin Fu,1 Angel Rodriguez,2 Rebecca Chen,1 Earl Fu,3 Shu-Yi Liao,4 and Nadeem Karimbux5

1Harvard School of Dental Medicine, Boston; 2Boston University School of Dental Medicine, Boston; 3School of Dentistry, National Defense Medical Center and Tri-Service General Hospital, Taipei, Taiwan, ROC; 4University of California, Riverside, California; 5Tufts University School of Dental Medicine, Boston

The aims of this study were to analyze the administrative trends in U.S. dental schools at the beginning and end of a thirteen-year period and to identify the predictive factors for those changes. Administrative trends were measured by the difference in the number of major administrative positions for 1997 and 2010 reported in American Dental Education Association (ADEA) and American Dental Association (ADA) publications. Secondary measures (program length, student enrollment, and tuition) were also gathered. The mean numbers of administrative positions per school significantly increased over the study period, while the mean number of clinical science departments per school significantly decreased. The change in the number of directors was positively correlated with the change in student enrollment, but inversely correlated with the change in number of vice/associate/assistant deans. The change in the number of clinical science departments was positively correlated with changes in student enrollment and out-of-state tuition, but inversely correlated with the change in in-state tuition. The number of all departments per U.S. dental school significantly decreased in this period. The schools that had consolidation of clinical science departments were less likely to have increases in student enrollment and out-of-state tuition, but more likely to have increases in in-state tuition.


Evaluation of Student Research Environment and Intramural Research Database at Tufts

Kelly Leong, Minh Bui, Angel Park, and Yumi Ogata

OBJECTIVES: This study explored student and faculty opinions and about the student research environment at Tufts University School of Dental Medicine (TUSDM). Secondarily, a novel intramural web-based research mentor database was evaluated for usability.

INTRODUCTION: According to the Journal of Dental Education, research experience has become an important component for the vitality and future of dental education. Student research facilitates critical-thinking abilities and scientific advances and fosters a supportive community. In implementing a new resource for young students who are interested in research, thorough evaluation must be made to assess for practicality. Introducing students to research early on in their careers will help strengthen the research community at TUSDM and hopefully lead to increased interest and retention. This project represents one of the first evaluations of TUSDM’s research environment from both student and faculty perspectives.

METHODS: A mixed-methods project with dental student focus groups and faculty key informant interviews was conducted. Inclusion criteria were 2014 Bates Andrews Research Day poster presentation or mentorship. All subjects evaluated research database site (TUSK hosted information).
RESULTS: Time was the biggest barrier for both students and faculty. From a student perspective, time-management was instrumental in successful research project completion. From a faculty perspective, there was too little time to mentor students and have them engage in a full project during time allotted. Most students had found their research mentors through word-of-mouth, and it was overwhelmingly the preferred method of finding a mentor. Faculty reported that their student recruits came either through the Dean's Honors program, word-of-mouth from previous students, or were students who were interested in specializing. They cited the annual student mixer as an important way to meet students. Of the students, 100% responded that they would use the website, and 100% of faculty thought it would be helpful for students. Those with more experience viewed the resource more positively. Students navigated the resource intuitively and commented that “the way it was set up was very clear” and it was “easy to use.” Faculty felt that defining different types of research on the homepage (e.g., basic science vs. clinical) would be helpful for younger students. Both groups hoped for more information such as lab websites, pictures, and space availability in labs. Senior subjects realized difficulty in maintenance.

CONCLUSIONS: This study highlights current attitudes about TUSDM student research. Both faculty and students expressed time and time management as a limiting factor for their pursuits. While faculty felt most of their students were pursuing research due to their interests in specializing, a small sample of students demonstrated that this may not necessarily be true. Both groups commented the TUSDM Research Database would be a useful first resource for young dental students interested in pursuing research opportunities, though improvements can be implemented.

Presented at the 2015 ADEA Annual Session & Exhibition, Boston, #164.

Background, Training Experiences, and Career Plans of U.S. Periodontal Residents: Report of a Web-Based Survey

Hani Mawardi,1,2 Ardavan Fateh,3 Lena Elbadawi,4 and Nadeem Karimbux5
1Brigham and Women’s Hospital, Boston; 2King Abdulaziz University, Jeddah, Saudi Arabia; 3Private practice, Denver, Colorado; 4Boston University, Boston; 5Tufts University School of Dental Medicine, Boston

The purpose of this cross-sectional study was to survey the backgrounds and perspectives of U.S. periodontal residents in 2012. A 64-item web-based survey was distributed to all periodontal residents in the United States (544 residents enrolled in 54 graduate programs) via email in March 2012. Data on the residents’ demographics, experiences during graduate periodontal training, and goals were collected and analyzed, and percentages were calculated. The survey had a 19.1% response rate. Most of the respondents (74%) had graduated from international dental schools, and 81.7% were in combined programs (clinical training combined with a master’s degree, Ph.D., or other doctoral degree). Almost one-fourth of the responding residents (24%) reported a total debt of more than $300,000 after graduation. More than 60% of the respondents planned to practice in a private setting as an associate, partner, or solo practice owner. The responding residents reported having chosen their graduate programs based mainly on the programs’ clinical education and reputation (72% and 48%, respectively). Future studies will determine educational trends and outcomes for periodontal residents in the longer term.

Comfort Levels among Predoctoral Dental and Dental Hygiene Students in Treating Patients at High-Risk for HIV/AIDS
Zuhair Natto, Majdi Aladmawy, and Thomas Rogers

PURPOSE: The purpose of this article is to discuss the impact of the training program for predoctoral dental and hygiene students at Loma Linda University School of Dentistry (LLUSD, Loma Linda, California) with regard to issues related to treating patients with a high risk of having HIV/AIDS.

METHODS: LLUSD offers a training program for fourth-year dental hygiene and predoctoral dental students that addresses the oral healthcare needs of persons with HIV disease. The training occurs in small groups 2 days per week at a community clinic serving HIV-positive individuals. Three academic quarters are required to train all fourth-year students each year. Evaluation of program effectiveness is conducted by means of pre- and post-session surveys. Dental hygiene and dental students completed the pre-survey during the spring quarter of their third year in public health dentistry courses. The same students completed the post-session survey at the end of their weekly training sessions during the fourth year.

RESULTS: The overall change in all areas related to the students’ comfort level in treating patients in the 3 defined categories is in a positive direction (p-value<0.0001). The change was much higher among dental hygiene students compared with predoctoral dental students.

CONCLUSION: A comparison of pre- and post-session surveys reveals a significant improvement in students’ perception of and comfort level with treating patients who are homosexual/bisexual or intravenous drug users or who have a history of blood transfusion in both student groups upon completion of the HIV and the dentist training program at LLUSD.

Published in Journal of Dental Hygiene 2015 June;89(3):162-9.

The Influence of Examiners Type on Dental Students’ OSCE Scores
Sang Park,1 Arthur Kim,1 Joshua Kristiansen,1 and Nadeem Karimbux2
1Harvard School of Dental Medicine, Boston; 2Tufts University School of Dental Medicine, Boston

The purpose of this study was to evaluate the difference in grading of objective structured clinical examinations (OSCEs) at Harvard School of Dental Medicine (HSDM) by full-time faculty examiners, part-time faculty examiners, and postgraduate resident examiners. The OSCE is an evaluation of clinical competence and is used as a multidisciplinary examination at HSDM. Two examiners are selected for each of ten disciplines. Evaluators meet to review the case before the OSCE is given, and faculty examiners are given the opportunity to write exam questions based on the students’ expected level of knowledge and ability. All examiners also meet on the day of the OSCE to review the case and discuss relevant issues. Students are randomly assigned to examiners and meet with one examiner at a time in each discipline during the examination. Analysis of OSCE scores on four exams given to HSDM students between 2012 and 2013 suggests that part-time faculty members tended to score students significantly higher than full-time faculty members or postgraduate residents. This may be a result of reduced contact time between students and the part-time faculty although it may also point to a need for more efforts in calibration of the part-time faculty members who take part in the OSCE.

A Pilot Dental Teamwork Course Focused on Interprofessional Competencies

Ellen Patterson, Natalie Hagel, Kristeen Perry, Jennifer Bassett Midle, and Fadi White

PROBLEM: Interprofessional teamwork skills are essential for all future healthcare professionals. In clinical dental practice, communication and collaboration between dental team members are imperative for safe and effective patient care. The future integration of newly emerging dental team roles, such as advanced practice dental hygienists and dental therapists, will require that all future oral health practitioners have adequate training in interprofessional competencies.

OBJECTIVE: The purpose of this study was to introduce intra-professional clinical collaboration and small group learning sessions to dental and dental hygiene students to evaluate teamwork and communication skills based on interprofessional competencies. The goal was to pilot a replicable curriculum to encourage students of both disciplines to learn clinical skills with and from one another, recognize one another's clinical roles and responsibilities, and practice transferrable skills for effective teamwork and communication.

METHOD: Quantitative and qualitative data was collected utilizing validated pre-test/post-test questionnaires; Readiness for Interprofessional Learning Scale (RIPLS) and Dental Roles and Responsibilities, along with self-assessment evaluation. Third and fourth year dental student participants (N=16) were volunteers; dental hygiene participants (N=7) in their final year were assigned. The control groups (47, N=32 dental, N=15 dental hygiene) were students who did not take the course.

RESULTS: Quantitative data: Participant and control groups were similar; non-significance was found for the following factors using Pearson chi-square test at alpha=0.05 and independent t-test at alpha=0.05: gender, age, education level, prior professional training, future professional plans, and prior exposure to IPE. Study participants' total RIPLS scores at pre-test were higher than controls' (approaching significance at p<0.1). Statistically significant (p<0.05) results for pre-test to post-test changes were found for the total RIPLS and the team collaboration subscale only. Qualitative data: Students self-assessed addressing the value and impact of each session. Overall, both disciplines (84%) valued the interactive, small-group format, clinical collaboration, and teamwork skills training as additions to professional education.

CONCLUSIONS: This study revealed evidence that this pilot course holds promise as an innovative model for teaching dental and dental hygiene students the foundational concepts and skills for collaborative interprofessional practice, both within and beyond the dental team. Additionally, the finding from this study suggests dental and dental hygiene students have divergent opinions about one another's responsibilities. Future studies should explore understanding students' role perceptions as well as research on effective interprofessional teaching methods to assist in developing effective teaching materials and approaches to foster safe and effective teamwork.

Presented at the 2015 ADEA Annual Session & Exhibition in Boston.

An Interdisciplinary, Team-Based Design for an Oral and Maxillofacial Radiology Course for Postdoctoral Dental Students

Aruna Ramesh, Rumpa Ganguly, and Donna Qualters

This article describes the transition of an oral and maxillofacial radiology course from a traditional lecture format to an interactive case-based, team-based, interdisciplinary, and intraprofessional learning model in advanced dental education. Forty-four postdoctoral dental students were enrolled in the course over a twelve-
week period in the fall semester 2012. The class consisted of U.S.- and non-U.S.-trained dentists enrolled in advanced education programs in various dental disciplines. The course faculty preassigned interdisciplinary teams with four or five students in each. The class met once a week for an hour. Ten of the twelve sessions consisted of a team presentation, individual quiz, team quiz, and case discussion. Each member of a team completed peer evaluation of other team members during weeks six and twelve of the course. The final course grade was a composite of individual and team quiz grades, team presentation, and peer evaluation grades. The overall class average was 90.43. Ninety-five percent of the class (42/44) had total team grades equal to or greater than total individual quiz grades. The objective of creating a new case-based, team-based, interdisciplinary, intraprofessional learning model in advanced dental education was achieved, and the initial student perception of the new format was positive.

Published in J Dent Educ. 2014 Sep;78(9):1339-45.
Endodontics Research

Root Fracture Resistance Evaluation Using Different Posts and Ferrule Heights
Ekaterini Antonellou,* Masly Harsono, Gerard Kugel, Matthew Finkelman, and Khadiga Elfallah

OBJECTIVES: To evaluate the difference between fracture resistances of endodontically treated teeth restored with glass, quartz, and metal posts with different ferrule heights.

METHODS: Sixty extracted single rooted teeth (N=10/group) with root length of at least 14 mm were tested. Samples were disinfected, cleaned, and sectioned at 2 mm above CEJ. Endodontic treatment was performed. Three main groups received either metal (A), glass (B) or quartz posts (C). Within those groups, two subgroups had 1-mm or 2-mm ferrule height. Paracore composite build-up was used with paraforms. Preparation with deep chamfer finish line of 0.7 mm was performed. A rubber stop was used in the bur to differentiate the ferrule height for 1 mm and 2 mm. All ceramic crowns of Empress were fabricated using E4D CAD/CAM system. Compression test was done with direction of 135° to the long axis of the teeth. Kruskal-Wallis test was used to compare the post types. Post hoc test analyses were conducted via the Mann-Whitney U test when the Kruskal-Wallis test was statistically significant. The Mann-Whitney U test was used to compare the two ferrule heights.

RESULTS: Difference in root fracture resistance was statistically significant only among the post types (p-value=0.021) with 2 mm ferrule. The metal posts had the highest fracture resistance compared to the quartz and fiber posts and the difference was statistically significant (p-value<0.05). The difference in ferrule heights groups was statistically significant with (p-value=0.019) only within quartz fiber post groups where the 1 mm ferrule group had higher fracture resistance than the 2 mm.

CONCLUSIONS: Within the 2-mm ferrule height group, endodontically treated teeth restored with metal posts had the highest fracture resistance followed by those restored with glass and quartz posts. Within quartz posts groups, teeth with 1-mm ferrule height had a higher fracture resistance compared to those of 2 mm.

Presented at the 2015 IADR General Session in Boston. Abstract #3853.
Geriatric Oral Research

Geriatric Patients’ Oral Quality of Life and Oral Health Status
Jennie Leikin, Matthew Finkelman, and Britta Magnuson

OBJECTIVES: Examine geriatric patients’ oral quality of life (QoL) at Tufts University School of Dental Medicine (TUSDM) (as measured by the General Oral Health Assessment Index (GOHAI)) and oral health status (as measured by periodontal status, number of missing teeth, presence of decay, and presence of restorations).

METHODS: Thirty-five senior citizens (aged ≥65) at TUSDM were consented for participation. GOHAI questionnaire and demographic information was collected. Periodontal status and dental health records were reviewed for dental status. Descriptive statistics were reported. Kruskal-Wallis tests and Spearman correlations were calculated. P-values less than 0.05 were considered significant. STATA13 was used for statistical analyses.

RESULTS: The 35 subjects included 19 females and 16 males; 33 white/Caucasian subjects, 1 black/African American subject, and 1 Asian subject. Scoring of GOHAI was on a scale of 0–60 (lower numbers corresponding to a better oral QoL). The GOHAI median score=18 (range 9–34). Five subjects had clinical periodontal health with a median GOHAI score=18 and IQR=2.00. Thirteen subjects had gingivitis with a median GOHAI score=16 and IQR=9.00. Seventeen subjects had periodontitis with a median GOHAI score=19 and IQR=8.00. Periodontal status compared to GOHAI had p-value=0.163. GOHAI compared to number of previously filled teeth had p-value=0.006. GOHAI compared to previously filled teeth was negatively correlated with subjects with fewer previously restored teeth having lower GOHAI scores. GOHAI compared to number of decayed teeth had p-value=0.302. GOHAI compared to number of missing teeth had p-value=0.546.

CONCLUSIONS: This study showed subjects who had fewer previously filled teeth reported statistically significantly lower GOHAI scores in senior citizen patients presenting at TUSDM. There was insufficient evidence that periodontal status was associated with the GOHAI score. No statistical significant evidence was found to support an association between GOHAI and either number of decayed teeth or number of missing teeth.

Presented at the 2015 IADR General Session in Boston. Abstract #1781.

Factors Contributing to Tooth Loss among the Elderly: A Cross Sectional Study
Zuhair Natto, Majdi Aladmawy, Mohammed Alasqah, and Athena Papas

BACKGROUND: The present study evaluates the influence of several demographic, health, personal, and clinical factors on the number of missing teeth in old-age samples.

METHODS: The number of patients included was 259; they received a full mouth examination and answered a questionnaire provided by one examiner. All the variables related to teeth loss based on the literature were included. These variables focused on age, gender, race, marital status, clinical attachment level, pocket depth, year of smoking, number of cigarettes smoked per day, number of medications, root decay, coronal decay, health status, and year of education. Statistical analysis involved stepwise multivariate linear regression.

RESULTS: Teeth loss was statistically associated with clinical attachment level (CAL) (p-value=0.0001), pocket depth (PD) (0.0007) and education level (0.0048). When smoking was included in the model, age was
significantly associated with teeth loss (0.0037). At least one of these four factors was also related to teeth loss in several specific groups such as diabetes mellitus, male, and White. The multiple linear regressions for all the proposed variables showed that they contributed to teeth loss by about 23%.

CONCLUSIONS: It can be concluded that less education or increased clinical attachment level loss may increase number of missing teeth. Additionally, age may cause teeth loss in the presence of smoking.

Published in Singapore Dental Journal 35:17-22, Dec 2014.

Oral Implications of Polypharmacy in the Elderly

Mabi Singh and Athena Papas

One of the major side effects of medications prescribed to elderly patients is the qualitative and quantitative alteration of saliva (salivary hypofunction). Saliva plays a pivotal role in the homeostasis of the oral cavity because of its protective and functional properties, including facilitating speech, swallowing, enhancing taste, buffering and neutralizing intrinsic and extrinsic acid, remineralizing teeth, maintaining the oral mucosal health, preventing overgrowth of noxious microorganisms, and xerostomia. With salivary hypofunction, a plethora of complications arise, resulting in decreased quality of life. The anticholinergic effects of medications can be overcome, and the oral cavity can be restored to normalcy.

Histomorphometric Results in Ridge Preservation Procedures Comparing Various Graft Materials in Extraction Sockets with Nongrafted Sockets in Humans: A Systematic Review

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INTRODUCTION: The aim of this systematic review was to evaluate, from a histological point of view, the amount of newly formed bone in ridge preservation procedures using various graft materials in comparison with natural healing (NH) and to determine which is the ideal type of graft to be used.

MATERIALS AND METHODS: A search strategy was developed to find articles in a human model published between 1990 and January 2013 in English language using MEDLINE database.

RESULTS: Thirty-four articles were included in this systematic review. When comparing the percentage of newly formed bone using various grafting materials with NH, calcium sulfate, magnesium enriched hydroxyapatite, and porcine-derived bone grafts offered the best outcomes. However, due to the heterogeneity of the included studies, the search was extended to determine which type of graft resulted in the greatest bone formation.

CONCLUSION: When comparing ridge preservation with NH, only three studies encountered a greater amount of newly formed bone in the ridge preservation group, whereas the rest did not find statistically significant differences or even observed a greater percentage of newly formed bone in the control group. Therefore, more studies are needed to determine whether the use of graft materials enhances new bone formation in contrast to NH alone and to determine the most effective bone grafting material.

Published in Implant Dent. 2014 Oct;23(5):539-54.

Assessment of Atmospheric Pressure Plasma Treatment for Implant Osseointegration

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This study assessed the osseointegrative effects of atmospheric pressure plasma (APP) surface treatment for implants in a canine model. Control surfaces were untreated textured titanium (Ti) and calcium phosphate (CaP). Experimental surfaces were their 80-second air-based APP-treated counterparts. Physicochemical characterization was performed to assess topography, surface energy, and chemical composition. One implant from each control and experimental group (four in total) was placed in one radius of each of the seven male beagles for three weeks, and one implant from each group was placed in the contralateral radius for six weeks. After sacrifice, bone-to-implant contact (BIC) and bone area fraction occupancy (BAFO) were assessed. X-ray photoelectron spectroscopy showed decreased surface levels of carbon and increased Ti and oxygen, and
calcium and oxygen, posttreatment for Ti and CaP surfaces, respectively. There was a significant (p<0.001) increase in BIC for APP-treated textured Ti surfaces at six weeks but not at three weeks or for CaP surfaces. There were no significant (p=0.57) differences for BAFO between treated and untreated surfaces for either material at either time point. This suggests that air-based APP surface treatment may improve osseointegration of textured Ti surfaces but not CaP surfaces. Studies optimizing APP parameters and applications are warranted.


Full Mouth Implant Rehabilitation with Staged Approach: Six-Year Clinical Follow-Up

Panos Papaspyridakos

OBJECTIVE: The transition of patients from failing dentition to complete arch implant rehabilitation often requires that the patient is rendered edentulous and has to wear a removable complete denture for varying periods of time. In order to avoid removable provisionalization, the staged treatment approach allows for fixed interim prosthesis throughout the rehabilitation process, patient comfort, and prosthodontic control.

CLINICAL CONSIDERATIONS: The purpose of this clinical report is to describe a combination of staged approach with guided flapless surgery for minimally invasive treatment. The patient had fixed interim prostheses during the entire rehabilitation process. The various implant prosthodontic stages are illustrated for the complete arch prosthetic rehabilitation and the 6-year follow-up outcome is reported. A patient with debilitated dentition was treated with this combined protocol and was followed for 6 years after definitive prosthesis insertion.

CONCLUSION: Implant and prosthesis success rates were 100% with minor biologic and no technical complications encountered up to 6-year recall. Guided surgery has the advantage of prosthetically driven implant placement and minimal postoperative sequelae, whereas the staged approach allows for fixed provisionalization throughout the entire treatment period.

CLINICAL SIGNIFICANCE: As the computer-guided surgery protocols continue to evolve and improve, further clinical studies are necessary to assess accuracy and make this exciting technology even safer for the average clinician. The clinical significance of this case report lies in the treatment sequence combined with cutting edge technology for maximum patient comfort and prosthodontic control. Guided flapless surgery with prosthodontically driven implant placement led to predictable rehabilitation with no major complications after 6 years. A staged approach with fixed interim prostheses was used throughout the entire rehabilitation period, optimizing patient satisfaction and comfort. Natural canine guidance was the occlusal scheme of choice.


Digital vs. Conventional Implant Impressions for Edentulous Patients: Accuracy Outcomes

Panos Papaspyridakos, German Gallucci, Chun-Jung Chen, Stijn Hanssen, Ignace Naert, and Bart Vandenberghe

PURPOSE: To compare the accuracy of digital and conventional impression techniques for completely edentulous patients and to determine the effect of different variables on the accuracy outcomes.

MATERIALS AND METHODS: A stone cast of an edentulous mandible with five implants was fabricated to
serve as master cast (control) for both implant- and abutment-level impressions. Digital impressions (N=10) were taken with an intraoral optical scanner (TRIOS, 3shape, Denmark) after connecting polymer scan bodies. For the conventional polyether impressions of the master cast, a splinted and a non-splinted technique were used for implant-level and abutment-level impressions (4 cast groups, N=10 each). Master casts and conventional impression casts were digitized with an extraoral high-resolution scanner (iScan D103i, Imetric, Courgenay, Switzerland) to obtain digital volumes. Standard tessellation language (STL) datasets from the five groups of digital and conventional impressions were superimposed with the STL dataset from the master cast to assess the 3D (global) deviations. To compare the master cast with digital and conventional impressions at the implant level, analysis of variance (ANOVA) and Scheffe's post hoc test was used, while Wilcoxon's rank-sum test was used for testing the difference between abutment-level conventional impressions.

**RESULTS:** Significant 3D deviations (p<0.001) were found between group II (non-splinted, implant level) and control. No significant differences were found between groups I (splinted, implant level), III (digital, implant level), IV (splinted, abutment level), and V (non-splinted, abutment level) compared with the control. Implant angulation up to 15° did not affect the 3D accuracy of implant impressions (p>0.001).

**CONCLUSION:** Digital implant impressions are as accurate as conventional implant impressions. The splinted, implant-level impression technique is more accurate than the non-splinted one for completely edentulous patients, whereas there was no difference in the accuracy at the abutment level. The implant angulation up to 15° did not affect the accuracy of implant impressions.


**A Retrospective Radiographic Study on the Effect of Natural Tooth/Implant Proximity and an Introduction to the Concept of a Bone-Loading Platform Switch**

*Ranier Urdaneta, Rudolf Seemann, Irina Dragan, William Lubelski, Joseph Leary, and Sung-Kiang Chuang*

**PURPOSE:** To evaluate the effect of tooth/implant proximity using an implant system with a double platform shift that was designed to load bone coronal to the implant abutment interface.

**MATERIAL AND METHODS:** A retrospective cohort study was conducted between January 2008 and December 2009. The sample was composed of patients who had received at least one 5-mm wide HA coated single-tooth Bicon implant that had been placed adjacent to at least one natural tooth. Descriptive statistics and univariate and multivariate linear mixed-effects regression models adjusted for multiple implants in the same patient were utilized. Primary predictor variable was the horizontal distance between implant and adjacent tooth and the primary outcome variable was the change in peri-implant bone levels overtime.

**RESULTS:** In the study, 206 subjects who received 235 plateau root form implants were followed for an average of 42 months. Tooth/implant distance ranged between 0 to 14.6 mm. Out of 235 implants, 43 implants were placed <1 mm to an adjacent natural tooth on mesial and/or distal sides. The proximity of a plateau root form implant was not associated with complications on the adjacent tooth such as bone loss, root resorption, endodontic treatment, pain, or extraction. The proximity of an adjacent tooth was not a risk factor for the failure of a plateau root form implant. After adjusting for other covariates in a multivariate model, the proximity of a natural tooth did not have a statistically significant effect in peri-implant bone levels (p=0.13). The extraction of an adjacent tooth was associated with a significant increase in peri-implant bone loss (p=0.008).
CONCLUSIONS: The placement of a plateau root form implant with a sloping shoulder in close proximity to an adjacent tooth did not cause damage to that tooth or lead to bone loss or the failure of the implant.

Mineralized Tissue

Epigenetically Modified BMSCs in Regenerating Dental and Craniofacial Bone Tissues
Kyle Smith,* Jake Chen, Qisheng Tu, and Qianqian Han

OBJECTIVES: The purpose of this project is to understand PHD Finger Protein 8 (PHF8) regulating bone growth in order to develop applications for use in regenerating bone tissue. In our project, we investigated PHF8 in order to understand how bone marrow stromal cells (BMSCs) are regulated for bone growth. In this study, we hypothesized that PHF8 promotes osteoblastogenesis by epigenetically regulating the expression of SATB2. Ultimately, it is our goal to develop epigenetically modified BMSCs, as they will be useful for in vivo applications in bone regeneration.

METHODS: Our experimental design involved determining if the epigenetic enzyme PHF8 changed during osteogenic differentiation. BMSCs were obtained from mice (4-week-old) and treated with an osteogenic medium for 1, 3, 7, 10, 14 and 21 days. MC3T3-E1 cells (a preosteoblast) were also induced to differentiate with an osteogenic medium. In order to determine if PHF8 could directly affect osteogenic differentiation, we overexpressed and knockdowned PHF8 expression in MC3T3-E1 cells and BMSCs. Once the BMSCs and MC3T3-E1 cells were treated, the expression of PHF8 and other bone markers were detected using real-time PCR and Western blotting.

RESULTS: Our results found that the expression of PHF8 and SATB2 increased in parallel during osteogenic differentiation. Overexpression and knockdowned PHF8 were found to coincide with the expression of a variety of osteogenic markers. Our findings indicated PHF8 overexpression could upregulate all bone marker genes and knockdowned PHF8 using shRNA downregulated the expression of SATB2, OSX, Runx2, BSP and OC in MC3T3-E1 cells and BMSCs.

CONCLUSIONS: Collectively, our results suggest that PHF8 enhances osteogenic differentiation by modulating histone methylation states of SATB2 and converting its chromatin into an active transcriptional conformation. We expect that epigenetic regulation of BMSCs during osteogenic differentiation will promote SATB2-dependent activation and facilitate bone regeneration in tissue engineering.

Presented at the 2015 IADR General Session in Boston. Abstract #3866.

Adiponectin Regulates Bone Marrow Mesenchymal Stem Cell Niche through A Unique Signal Transduction Pathway: An Approach for Treating Bone Disease in Diabetes
Liming Yu, Qisheng Tu, Qianqian Han, Lan Zhang, Lei Sui, Leilei Zheng, Shu Meng, Yin Tang, Dongying Xuan, Jin Zhang, Dana Murray, Q. Shen, Jessica Cheng, Sung-Hoon Kim, Lily Dong, Paloma Valverde, X. Cao, and Jake Chen

Adiponectin (APN) is an adipocyte-secreted adipokine that exerts well-characterized antidiabetic properties. Patients with type 2 diabetes (T2D) are characterized by reduced APN levels in circulation and impaired stem cell and progenitor cell mobilization from the bone marrow for tissue repair and remodeling. In this study, we found that APN regulates the mobilization and recruitment of bone marrow-derived mesenchymal stem cells (BMSCs) to participate in tissue repair and regeneration. APN facilitated BMSCs migrating from the bone marrow into the circulation to regenerate bone by regulating stromal cell-derived factor (SDF)-1 in a mouse
bone defect model. More importantly, we found that systemic APN infusion ameliorated diabetic mobilopathy of BMSCs, lowered glucose concentration, and promoted bone regeneration in diet-induced obesity mice. In vitro studies allowed us to identify Smad1/5/8 as a novel signaling mediator of APN receptor AdipoR1 in BMSCs and osteoblasts. APN stimulation of MC3T3-E1 osteoblastic cells led to Smad1/5/8 phosphorylation and nuclear localization and increased SDF-1 mRNA expression. Although APN-mediated phosphorylation of Smad1/5/8 occurred independently from adaptor protein, phosphotyrosine interaction, pleckstrin homology domain, and leucine zipper containing 1, it correlated with the disassembly of protein kinase casein kinase 2 and AdipoR1 in immunoprecipitation experiments. Taken together, this study identified APN as a regulator of BMSCs migration in response to bone injury. Therefore, our findings suggest APN signaling could be a potential therapeutic target to improve bone regeneration and homeostasis, especially in obese and T2D patients.

Neuroscience/TMJ/Pain

A New Electronic Diary Tool for Mapping and Tracking Spatial and Temporal Head Pain Patterns in Migraine

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AIM: We present an electronic tool for collecting data on the patterns of migraine headache onset and progression.

METHODS: A digitized map consisting of 44 color-coded segments was defined based on previous reports of migraine pain and the distribution of nerves in the face, head, and neck. The map was overlaid on a schematic map of the face, head, and neck nerves. Thirty-six patients (N=36, 28 female/8 male), who met ICDH-II criteria for episodic migraine and had headaches for at least three years identified all regions where pain typically started and how pain spread and subsequently progressed.

RESULTS: Consistent with previous findings, throbbing was the most prevalent quality of migraine pain, always present in 70% of patients surveyed. For the 70% of the patients with throbbing pain, the temple was the onset site of throbbing pain, with no significant difference in the laterality of onset site (58.3% on the right vs. 55.6% on the left hemisphere). The tool was able to capture patterns of pain distribution for throbbing and pressure headache pain and also may be used to assess the change in the pattern of the pain distribution as the disease progresses.

DISCUSSION: The pain map survey may be a useful tool for recording and tracking the temporal pattern of migraine onset both for clinical and research purposes. The tool could be used to create maps of pain locations on a large population scale and thus will be a very useful tool in correlating the temporal nature of headache symptoms with potential mechanisms of disease evolution.

Published in Cephalalgia. 2015 Apr;35(5):417-25.

Safety and Efficacy of LY2951742, a Monoclonal Antibody to Calcitonin Gene-Related Peptide, for the Prevention of Migraine: A Phase 2, Randomized, Double-Blind, Placebo-Controlled Study

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BACKGROUND: Migraine remains poorly treated, with few effective preventive drugs available. We assessed the safety and efficacy of LY2951742, a fully humanized monoclonal antibody to calcitonin gene-related peptide, for migraine prevention.

METHODS: We did a randomized, double-blind, placebo-controlled, phase 2 proof-of-concept study at 35 centers in the United States. Patients aged 18–65 years with 4 to 14 migraine headache days per month were
randomly assigned (1:1) to LY2951742 or placebo by a computerized randomization scheme. LY2951742 (150 mg) or placebo were given as a subcutaneous injection once every 2 weeks for 12 weeks. The primary endpoint was the mean change in number of migraine headache days per 28-day period assessed at 9–12 weeks. Safety was assessed over 24 weeks, including the 12-week treatment period and the subsequent 12 weeks after study drug administration. Patients and treating investigators were masked to treatment allocation. Analyses were by intention to treat. A mixed-effects model of repeated measures was used, including patient baseline value, treatment, visit, and treatment-by-visit interaction as fixed effects, and patients as random effects. Safety measures were analyzed according to the treatment received. This study has been completed and is registered with ClinicalTrials.gov, NCT01625988.

**FINDINGS:** Between July 31, 2012, and September 18, 2013, 218 patients were randomly assigned to LY2951742 (N=108, but one patient withdrew before treatment) or placebo (N=110). The mean change from baseline to week 12 in the number of migraine headache days was −4.2 (SD 3.1; 62.5% decrease) in the LY2951742 group compared with −3.0 (SD 3.0; 42.3% decrease) in the placebo group (least-squares mean difference −1.2, 90% CI −1.9 to −0.6; p=0.0030). Adverse events that occurred more frequently with LY2951742 than with placebo included injection site pain, erythema, or both (21 [20%] of 107 vs. 7 [6%] of 110), upper respiratory tract infections (18 [17%] vs. 10 [9%]), and abdominal pain (6 [6%] vs. 3 [3%]). There were two serious adverse events reported in the treatment arm and four in the placebo arm, none of which were deemed to be related to the study drug.

**INTERPRETATION:** These results provide preliminary evidence that LY2951742 might be beneficial in migraine prevention and provide support for the role of calcitonin gene-related peptide in the pathogenesis of migraine. Further controlled studies are needed to assess the safety and efficacy of monoclonal calcitonin gene-related peptide antibodies for the preventive treatment of migraine.

*Funding: Arteaus Therapeutics. Published in Lancet Neurol. 2014 Sep;13(9):885-92.*

**Sufficiency and Necessity in Migraine: How Do We Figure Out If Triggers Are Absolute or Partial and, If Partial, Additive or Potentiating?**

*Egilis Spierings, Stephen Donoghue, Alec Mian, and Christian Wöber*

Migraine is, to a great extent, a genetically determined disorder. Once it has manifested itself, it generally continues for years if not for decades. While the migraine is active, headaches can seemingly occur spontaneously but are often reportedly precipitated by events or factors, known as migraine triggers, the interplay of which is the topic of this paper. Among migraine triggers, the menstrual cycle is an important one that probably accounts for much of the excess of migraine in women compared with men. Much has also been written about stress as a trigger of migraine, with headache occurring after rather than during stress, when relaxation occurs. Stress is also 1 of the 4 most often acknowledged headache triggers in general, the others being fatigue, not eating on time, and lack of sleep. Singularly, the triggers are generally necessary but not sufficient, i.e., not powerful enough to bring on headache by themselves and, hence, compounding of those triggers is usually required. There is evidence to suggest that the premenstrual phase has a magnifying effect on the stress-headache interaction. The same is true for low-sleep duration with the (predictive) model fitting best when stress and low-sleep duration are considered additive. Menstruation has been identified as possibly the only absolute trigger of headache that is both necessary and sufficient. The scientific study of migraine triggers requires knowledge not just of how often in an individual a trigger is followed by migraine headache but also of how often it is not. Having identified trigger-headache associations, it needs to be determined which triggers
are causative in the individual, either singly or in combination with others. This requires running an experiment with the individual that involves behavioral intervention to change exposure to a given trigger and determine whether that improves migraine. The ubiquitous adoption of the smart phone as a personal-data entry device, along with the possibility of bringing the results of sophisticated statistical analysis into the hands of patients and physicians, may well provide us with an important set of tools that will finally allow the unravelling of the age-old migraine-trigger puzzle.

Nutrition

Effect of Dried California Mission Figs on Mineral Status and Food Replacement

Heba Alshaeri, Zuhair Natto, Serena Tonstad, Ella Haddad, and Karen Jaceldo-Siegl

OBJECTIVE: Figs are a rich source of several different minerals and fibers. We studied the effect of the consumption of dried California Mission figs on mineral and nutrient levels, as well as the effect of the addition of figs to a self-selected habitual diet on dietary patterns.

DESIGN: A crossover randomized controlled trial study design in which participants with a mean of age of approximately 56 years were randomly assigned to eat either their usual diet for 5 weeks or to add dried California Mission figs (120 g/d) to their usual diet for 5 weeks, after which they crossed over to the other group for an additional 5 weeks. Six 24 h dietary recalls and four blood samples were obtained from each participant.

SETTING: Loma Linda University School of Public Health, Loma Linda, California.

SUBJECTS: A follow-up study using data collected from eighty-eight American males and females from September to December 2008.

RESULTS: Diets reported in the 24 h dietary recall during the fig-supplemented diet period were significantly higher in Ca and K in the dietary and total phase (p-value<0.05). Nevertheless, data on mineral levels in the body gathered by means of biochemical analyses from blood samples were nearly the same for both the figs-added and the participants’ standard diet. The estimated displacement suggests that eating figs resulted in the elimination of 4% of desserts, 5% of vegetables, 10% of dairy products, 23% of grain products and 168% of beverages from other sources that participants would otherwise consume.

CONCLUSIONS: Based on 24 h dietary recalls, the daily consumption of figs may increase the intake of several different minerals. However, mineral levels in blood samples were not altered significantly.

**Oral Health Research**

**Seal Away Caries Risk**

*Natalie Hagel and Dorothy Vannah*

Since the first meta-analysis of clinical trials was conducted on the efficacy of sealants in 1993, a significant body of evidence has demonstrated their ability to prevent pit and fissure caries in children, making them one of the most successful preventive measures in dentistry. In the 1950s, Buonocore introduced the acid-etch procedure, which laid the groundwork for the development of sealants as the best preventive agent against pit and fissure caries. Placing a dental sealant on the chewing surfaces of a tooth with deep pits and fissures protects it against food and bacterial plaque. The sealant works by creating a physical barrier separating the tooth surface from the acids produced by plaque, which cause tooth decay. The acid-etch technique also is part of the move toward a minimally invasive approach to restorative dentistry, which is based on preserving healthy tooth structure through prevention, remineralization, and minimal intervention. Placement of dental sealants is recommended depending on patients’ level of caries risk. The American Dental Association (ADA) Council on Scientific Affairs recommends the placement of dental sealants on the primary and permanent teeth of children, adolescents, and adults who are at increased risk of caries. The best predictors of caries risk are prior caries experience, history of fluoride use, fissure anatomy, plaque load, and dietary habits. Sealants are most commonly placed on the molars, which contain many pits and fissures. They also can aid in caries prevention when applied to premolars. Research shows that a sealant must seal over the tooth’s occlusal surface—completely keeping out fermentable food substrates—in order for it to be effective. Sealants can last up to 10 years, but oral health professionals need to periodically check their status and replace them when necessary.

*Published in Dimensions in Dental Hygiene, June 2015.*

**Extended Efficacy of 1.5% Oxalate Strips on Dentinal Hypersensitivity**

*Britta Magnuson, Mabi Singh, Athena Papas, Elizabeth Tzavaras, Joseph Cimmino, Robert Gerlach, and Melanie Miner*

**OBJECTIVES:** Clinical research was conducted to assess the long-term effectiveness of 1.5% oxalate strips on dentinal hypersensitivity.

**METHODS:** A clinical study assessed durability of oxalate treatment of dentinal hypersensitivity with ad lib oral hygiene. The target population was clinical trials subjects who received 1.5% oxalate gel strips (Crest® Sensi-Stop™ Strips, The Procter & Gamble Co.). Test products were dispensed in blinded packaging for professional administration 3x over a week plus regular hygiene for 1 month. Institutional review was obtained to recruit subjects for a single additional post-study evaluation with up to 4 months of uncontrolled oral hygiene. Sensitivity was evaluated clinically using cool air (1 sec) and cool water (single drop) stimuli applied directly to test sites, graded by a clinical examiner using a standard 4-point scale (Schiff), and by each subject using a pain-ranking scale (VAS) on a tablet-based application. Long-term safety was assessed by clinical examination. Responses during uncontrolled monitoring were compared to baseline and post-treatment month 1 to assess overall durability.

**RESULTS:** A total of 41 subjects received 1.5% oxalate strips and provided informed consent for post-study monitoring. Mean (SD) age was 47.2 (13.5), the population was diverse with respect to gender and ethnicity, and the post-treatment evaluations ranged from 68 to 149 days after initial treatment. At the post-treatment
visit, oxalate strip users exhibited 81% and 91% reductions in air and water sensitivity, respectively, differing significantly (p<0.004) from baseline. There was no evidence of a significant (p>0.18) sensitivity relapse with extended ad lib oral hygiene. Generally similar outcomes were observed with subject-assessed pain, with VAS continuing to differ significantly (p<0.002) for air and water after months of uncontrolled hygiene.

CONCLUSIONS: Clinical research demonstrated sensitivity benefits with 1.5% oxalate gel strips that were durable for months after initial use and evident across different methods and stimuli.

Presented at the 2015 IADR General Session in Boston. Abstract #0995.

The Prevalence and Severity of Dental Caries in Chad: A Pilot Study

Zuhair Natto, Floyd Petersen, and Q. Niccola

OBJECTIVE: This study was undertaken to determine the prevalence and severity of dental caries among a cross section of a sample from different locations in Chad as part of a general assessment of their oral health status.

METHODS: A cross-sectional descriptive survey of a nationwide sample included volunteers, 10 years or older, for a total of 1,011 participants. The survey consisted of a brief interview followed by a 1–2 minute oral examination of each subject.

RESULTS: The mean age of the participants was 29.61±12.59 years and the total mean value for decayed/missing/filled teeth (DMFT)=1.96±1.78. Females had a higher mean DMFT (2.72±1.88); decayed (2.82±1.07); missing teeth (1.81±1.14) than males (1.61±1.60): decayed (2.11±1.09); missing (1.45±0.89, respectively; all p<0.001). The older group (>30 years) had higher DMFT (2.79±1.93) than the younger group (<30 years; p<0.001). Urban area showed lower DMFT (1.81±1.68) than rural areas (2.31±1.95).

CONCLUSION: In this study, the prevalence of dental caries is very low, which is similar to the most of the African Saharan and sub-Saharan countries. However, there is need to establish caries control programs to prevent tooth decay in the future and help people maintain lifelong dental health.


The Oral Health Status and the Treatment Needs in Chad: A Pilot Study

Zuhair Natto, Floyd Petersen, and Q. Niccola

AIMS AND OBJECTIVES: This study was designed to evaluate dental conditions, factors contributing to these conditions, and treatment needs among a population from different places in Chad, as part of a general assessment of their oral health.

PATIENTS AND METHODS: A cross-sectional nationwide survey was conducted with 1,011 participants. The survey consisted of a brief health interview (conducted by dental students and public health specialists) followed by a 1–2 minutes oral examination (conducted by dental students and dentists).

RESULTS: Of the subjects, 64.0% had experienced dental pain, 66.7% had decayed teeth, and 56.6% had gum diseases. Dental pain was found to be distributed according to age, gender, and locations (p<0.001). Only 25% of the participants had ever visited a dentist. Males were shown to engage in more tobacco use than females (19.2% vs. 0.3%), while females were more likely to have visited a dentist than males (30.8% vs. 22.8%). Brushing of teeth occurred more often in urban than in rural locations (p<0.001), while date, sugar cane, and cola nut intake
were statistically significant in the older generation compared to the younger subjects (p<0.001).

CONCLUSION: There was a significant need for dental treatment and care in the sample population. In addition, the availability of sugar, combined with poor knowledge and lack of utilization of preventive and restorative oral healthcare services, have contributed to several dental conditions.


Safety and Effectiveness of Two-Step Paste/Gel Sequence with Medication Hyposalivation

Athena Papas,* Mabi Singh, Britta Magnuson, Elizabeth Tzavaras, Joseph Cimmino, Mary Kay Anastasia, and Robert Gerlach

OBJECTIVES: A randomized controlled trial was conducted to evaluate safety and effectiveness of a two-step paste/gel oral hygiene sequence with reduced salivary flow.

METHODS: Institutional review was obtained for the protocol, consent and advertising. The study targeted adults with medication-associated hyposalivation to assess safety in this population. Eligible subjects (medication history and ≤0.2 mL unstimulated saliva) were randomly assigned to one of two oral hygiene groups: 1) two-step 0.454% SnF₂ then 3% H₂O₂ paste and gel sequence (Crest® Pro-Health HD™) or 2) regular 0.76% NaMFP paste control (Colgate® Cavity Protection). Test products were dispensed with a regular manual brush in blinded over-labeled kits for twice daily use with marketed instructions for use. Subjects were evaluated at baseline and after 2 & 6 weeks of test product use. Safety was assessed as adverse events from clinical examination and interview. Digital plaque image analysis of the anterior facial teeth measured fluorescein-disclosed daytime plaque levels, and unstimulated saliva was collected over a 5 minute period in pre-weighed vials.

RESULTS: Of the subjects, 49 ranging from 31 to 80 years of age (53% female) were enrolled, and 45 completed week 6. Relative to baseline, only two-step paste and gel sequence differed significantly (p<0.005) from baseline on daytime plaque coverage, and salivary flow increased significantly (p=0.033) in that group. Between-group comparisons for daytime plaque favored the two-step sequence with 41–46% improvements in plaque control. At week 6, adjusted daytime plaque means (SE) were 5.9 (0.7) and 10.0 (1.1) for the two-step and control groups, respectively (p<0.004). Adverse events were mild in severity, groups differed significantly (p=0.02) on occurrence, and events did not contribute to dropout.

CONCLUSION: In a randomized controlled trial, use of stannous fluoride plus hydrogen peroxide paste and gel improved daily plaque control among individuals with medication-associated hyposalivation.

Presented at the 2015 IADR General Session in Boston. Abstract #3205.

Randomized Controlled Trial Evaluating Use of Oxalates for Dentinal Hypersensitivity

Mabi Singh, Athena Papas, Britta Magnuson, Elizabeth Tzavaras, Joseph Cimmino, Melanie Miner, and Robert Gerlach

OBJECTIVES: A randomized positively-controlled trial was conducted to evaluate the durable effects of 1.5% oxalate strips on dentinal hypersensitivity.

METHODS: Informed consent and baseline measurements were obtained from adults with recession and air-
related dentinal hypersensitivity. Balancing for baseline air sensitivity and age, eligible subjects were randomly assigned to one of two oxalate groups: commercial (the experimental group) or professional (the positive control group). The experimental group received 1.5% oxalate gel strips (Crest® Sensi-Stop™ Strips, The Procter & Gamble Co.), while the control group received a professional oxalate acid potassium salt solution (Super Seal® Dental Desensitizing Liner, Phoenix Dental). Both oxalate products were professionally administered at sensitive test sites following manufacturer’s instructions. Subjects received a blinded anticavity paste and manual brush, 2 additional reapplication visits were scheduled over a 1-week period, and subjects returned 1-month later for evaluation. Sensitivity was evaluated before/after treatment with air (1-sec cool air) and water (single drop of refrigerated water) stimuli. Sensitivity was measured after each stimulus by a clinical examiner using a standard 4-point scale (Schiff), and by each subject using a pain-ranking scale (VAS) on a tablet-based application, while safety was assessed by examination. Clinical evaluations were blind to assignment.

RESULTS: The population (N=80) was diverse with respect to gender, ethnicity, and age (22–82 years). Repeated treatment with both the commercial and professional oxalate treatments resulted in significant (p<0.05) reductions in sensitivity for all stimuli and methods. At the 1-month post-treatment recall, the adjusted mean (SE) Schiff air and water responses were 0.19 (0.05) and 0.07 (0.23) for the experimental group, compared to 0.22 (0.06) and 0.06 (0.20) for the positive control. Groups did not differ significantly (p>0.61) on examiner or self-graded air or water sensitivity.

CONCLUSIONS: In clinical research, a commercial oxalate strip and professional oxalate treatment demonstrated similar reductions in dentinal hypersensitivity.

Presented at the 2015 IADR General Session in Boston. Abstract #0996.

Declining Treatment Clinical Trial to Assess Dentinal Hypersensitivity Relief

Mabi Singh, Athena Papas, Elizabeth Tzavaras, Matthew Barker, and Robert Gerlach

OBJECTIVES: This pilot clinical study used a novel design with declining treatment to assess dentinal hypersensitivity relief with a professionally-administered desensitizing agent.

METHODS: After institutional review, informed consent was obtained from adult volunteers with evidence of dentinal hypersensitivity at recession test sites. Two stimuli were used to provoke sensitivity: 1-sec application of cool air (~21°C, 40–60 psi) followed by a single drop of refrigerated (~2°C) water. Sensitivity was measured after each stimulus by a trained clinical examiner using a standard 4-point scale (Schiff), while subjects used a Visual Analog Scale. Sites with an air response (Schiff>1) received a marketed oxalate acid potassium salt solution (Super Seal® Dental Desensitizing Liner, Phoenix Dental), while sites with an air response of 0 received room temperature water as a negative control. Applications were identically blinded to subjects via professional application of 1 or 2 drops of liquid at test sites with a cotton pellet for 30 sec and then gently air dried. Subjects received a blinded anticavity paste and manual brush, 3 reapplication visits were scheduled over a 2-week period, and subjects returned 1 month later for evaluation.

RESULTS: Of the subjects, 17 (mean age=49.5 years, 65% male) were enrolled and completed the study. At baseline, sensitivity means (SD) were 1.73 (0.65) for air, 1.90 (0.70) for water, and 52.2 (23.9) for VAS. Repeated measures modeling demonstrated significant (p<0.002) reductions in sensitivity at first retreatment (visit 2). By visit 4, sensitivity means (SD) were 0.31 (0.48) for air with 59% of subjects exhibiting no air sensitivity. Response for water and air were generally similar, relief generally persisted at the 1-month recall, and treatment was well-tolerated.
CONCLUSIONS: A novel declining treatment design demonstrated significant initial reductions in hypersensitivity with a professionally applied oxalate solution with effects maintained for 1 month.

Presented at the 2015 IADR General Session in Boston. Abstract #0994.

Oral Medicine Referrals at a Hospital-Based Practice in the United States

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OBJECTIVE: The objective of this study was to characterize the outpatient oral medicine (OM) clinic at Brigham and Women's Hospital (BWH), with particular emphasis on patient demographic characteristics and referral patterns.

MATERIALS AND METHODS: A retrospective case record review of all initial consultations with OM experts at BWH from 2008 to 2010 was conducted. Data included demographic information, type of medical insurance, reason for referral, referring doctor's specialty, and distance between the patient's home and the referring doctor as well as BWH, number of prior doctors seen for the presenting problem (per patient report), tests ordered at the consultation visit, and clinical diagnoses.

RESULTS: There were 1,043 new outpatient consultation visits. Patients lived a median distance of 9.5 miles from the referring doctor and 18.9 miles from BWH and saw a median of one doctor (range 0 to 9) before consultation. Two thirds of patients were referred by physicians. The most common diagnoses included immune-mediated mucosal conditions (27.2%), orofacial pain disorders (25.1%), benign tumors or neoplasms (10.3%), and dysplasia and cancerous conditions (7.6%). Biopsy was the most frequent test performed at consultation.

CONCLUSIONS: Patients with oral conditions often see more than one doctor before being referred to an OM expert and typically travel twice the distance to the expert compared with that between their home and the referring doctor. Equal efforts should be made to increase awareness of the importance of the specialty of OM among dentists, physicians, and the public.

Surgical Safety Checklist Use among Oral Surgeons in AAOMS Database

Andras Balint, Archana Viswanath, Maria Papageorge, Daniel Oreadi, Morton Rosenberg, and William Gilmore

OBJECTIVES: Improving surgical safety has become a high priority in order to ensure patient safety. In 2008, the WHO World Alliance for Patient Safety developed a Surgical Safety Checklist and published data on its efficacy. The overall objective of this study is to determine the attitudes and prevalence of usage of ambulatory oral and maxillofacial Surgery Safety checklist among oral surgeons.

METHODS: Recruitment for the survey consisted of emailing 1,000 oral surgeons with a valid email address published in the American Association of Oral and Maxillofacial Surgeons (AAOMS) directory. There was no bias in subject selection since the email addresses were randomly selected by a person not involved in the study. Qualtrics (survey tool of Tufts University) was used to facilitate the distribution and completion of surveys.

RESULTS: A total of 110 oral surgeons responded to the survey. Of these, 94% were male; 82% were in private practice, and only 37% reported using a checklist in their practice. Of the participants, 60% (N=66) reported that they were not using a surgical safety checklist for ambulatory surgery; 93% reported that if provided they would consider implementing a surgical safety checklist in their practice. Of oral surgeons, 26% reported that they were not using a safety checklist in their practice although they reported that they were performing more than 30 procedures a week.

CONCLUSIONS: Although not statistically significant, the majority of the oral surgeons who had completed OMFS training more than 20 years ago reported not using a checklist in their practice.

Presented at the 2015 IADR General Session in Boston. Abstract #1634.

Essentials of Airway Management, Oxygenation, and Ventilation: Basic Equipment and Devices

Daniel Becker, Morton Rosenberg, and James Phero

Offices and outpatient dental facilities must be properly equipped with devices for airway management, oxygenation, and ventilation. Optimizing patient safety using crisis resource management involves the entire dental office team being familiar with airway rescue equipment. Basic equipment for oxygenation, ventilation, and airway management is mandated in the majority of U.S. dental offices, per state regulations. The immediate availability of this equipment is especially important during the administration of sedation and anesthesia, as well as the treatment of medical urgencies/emergencies. This article reviews basic equipment and devices essential in any dental practice, whether providing local anesthesia alone or in combination with procedural sedation.

Published in J Mass Dent Soc. 2015 Spring; 64(1):22-5.
Post Discharge Nausea and Vomiting following Third-Molar Extractions under Ambulatory Anesthesia

Ray English III, Alireza Ashrafi, Sepideh Sabooree, Mina Boulos, and Archana Viswanath

BACKGROUND AND PURPOSE: One of the most common ambulatory oral surgical procedures done today is removal of third molar teeth. However, as with any other surgeries, there are complications associated with oral surgeries. Post discharge nausea and vomiting (PDNV) is one of the complications commonly seen in ambulatory surgeries. PDNV has a negative impact on patient recovery, and it would be beneficial to identify the risk factors associated with this condition to improve quality of patient care. While the overall incidence of PDNV after general anesthesia is well established to be about 25%, data on the incidence of PDNV after ambulatory surgery patients are limited and conflicting. According to the study done by Apfel, et al., a PDNV prediction model will help clinicians to better identify patients who might benefit from long-acting antiemetics such as transdermal scopolamine, aprepitant, and/or palonosetron. Therefore, finding the incidence of PDNV after third-molar extraction and developing a risk-factor model for this complication would not only allow the oral surgeons to understand how to plan individualized treatment for patients, but it would also allow patients to experience a more pleasant and quick recovery. The overall objective of this study is to report the incidence of PDNV in patients undergoing third-molar extractions under ambulatory anesthesia and identify independent risk factors.

METHODS: This study was conducted in the Department of Oral Surgery at Tufts University School of Dental Medicine. Following IRB approval and written informed consent, a total of 72 subjects were recruited for this prospective study. All subjects between 15 and 60 years who underwent third-molar extractions under general anesthesia were invited to participate in this study. Subjects were provided a questionnaire to be completed for a week following surgery on a daily basis, in regards to development of PDNV and medication use. The following risk factors were included in the analysis: demographics (age, gender, and race), history of motion sickness, smoking status, time for the procedure, surgical extraction score, dose of anesthetic medications (Midazolam, Fentanyl, Propofol, Decadron, Ketamine), and post-operative opioid and antibiotic usage. Fisher’s exact test was performed to identify potential predictors for PDNV, and a p<0.05 was considered significant.

RESULTS: A total of 41 out of 72 subjects completed and returned the questionnaire (demographics: age 23.29±5.3 years, 54.8% female, 45.2% male). Overall incidence of nausea was 51% and vomiting/retching was 12% during the first 48 hours post discharge. None of the predictors listed above were found to be significant risk factors for PDNV (p<0.05) in this population.

CONCLUSIONS: The incidence and severity of PDNV after extraction of third molars under ambulatory anesthesia may be substantially underestimated. Results of this study showed that a total of 51% of patients developed nausea during the first 48 hours post discharge. However due to limited sample size this study failed to identify independent risk factors for development of PDNV.

Accepted for presentation at the Third Annual ACOMS Resident meeting (November 8–9, 2014) at the Jefferson Medical College in Philadelphia.
Efficacy of HemCon Dental Dressing in Reducing Postsurgical Complications following Mandibular Third-Molar Extractions

Ross Fahey, Daniel Oreadi, Ghassan Darwish, and Archana Viswanath

BACKGROUND AND PURPOSE: The surgical removal of impacted mandibular third molars results in tissue trauma, inflammation, and bleeding and is most often accompanied by moderate to severe pain. The HemCon® Bandage is an FDA-cleared chitosan-based flat bandage that controls severe arterial bleeding from traumatic injuries. HemCon dental dressing material (HemCon Medical Technologies, Inc., Portland, Oregon) has an effect to improve the hemostasis and stabilize the clot in anti-coagulated patient. The dressings becomes adherent when in contact with the oral wound environment and provides a protective layer. It provides a physical barrier to protect the wound surface while reducing pain. In addition it has antibacterial property that may aid in reducing the incidence of alveolar osteitis following third-molar extraction. The objective of this study was to evaluate the efficacy of the HemCon Dental Dressing in reducing pain and swelling following third-molar extractions. The hypothesis is that early control of bleeding will help to prevent or reduce the sequel of post-surgical third-molar extraction complications.

METHODS: Following IRB approval and written informed consent, subjects were enrolled in this prospective, randomized, single-blinded, controlled, split mouth design clinical trial. This study was conducted at the Department of Oral Surgery at Tufts University School of Dental Medicine. All subjects between 18 and 30 years for whom a decision had been made to extract symmetric bilateral bone-impacted mandibular third molars (Pell and Gregory classification; class 1 B and class 2 A and B) were invited to participate in the study. The primary end point of this study was post-operative pain and the secondary endpoints were post-operative healing and swelling. The scores were analyzed by nonparametric t-tests (Wilcoxon signed rank test) to determine whether statistically significant differences exist between the experimental and control specimens in regards to both swelling and pain. The Mann-Whitney U test was used to assess differences that exist between experimental groups in regards to wound healing.

RESULTS: A total of 18 patients participated in the study (demographics: age 21±3.6 years, 52% female, 48% male). Although the pain scores and swelling were lower for the HemCon treated sites, these scores were not statistically significantly different than control-treated sites (p<0.05). There was no difference between surgical healing between the HemCon-treated site and control site. There was no negative healing sequela associated with early hemostasis of oral surgical wounds.

CONCLUSION: Previous studies have shown that HemCon is effective in controlling bleeding following teeth extractions in subjects who are on oral anticoagulant therapy. Results from this study showed that there is no significant difference between HemCon-treated side vs. controls in reducing post-operative pain and swelling. We concluded that although HemCon dental dressing is safe to use in the oral cavity, it offers no additional clinical benefit for normal healthy patients undergoing third-molar extractions.

Accepted for presentation at the Third Annual ACOMS Resident meeting (November 8–9, 2014) at the Jefferson Medical College in Philadelphia.
Crestal Bone Resorption in Augmented Bone Using Mineralized Freeze-Dried Bone Allograft or Pristine Bone during Submerged Implant Healing: A Prospective Study in Humans

Hsiang-Yun Huang, Yumi Ogata, James Hanley, Matthew Finkelman, and Yong Hur

BACKGROUND: There is limited evidence on the crestal bone level changes around implants placed in bone augmented by guided bone regeneration (GBR) during submerged healing. The purpose of this study was to prospectively compare radiographic crestal bone changes around implants placed in augmented bone with changes around implants placed in pristine bone.

MATERIALS AND METHODS: Patients receiving dental implants in the augmented or pristine mandibular posterior edentulous ridge were included in the study. The digital standardized radiographs from the implant placement procedure were compared to the radiographs from the second-stage procedure to evaluate the peri-implant marginal bone level changes. The soft tissue thickness (ST), width of keratinized mucosa (wKM), and early cover screw exposure (eIE) were measured at the time of the second-stage procedure.

RESULTS: A total of 29 implants in 26 patients, 11 in augmented bone (test group) and 18 in pristine bone (control group), were analyzed. The mean peri-implant bone loss (ΔBL) was 0.74±0.74 mm (mean±SD) in the test group and 0.25±0.55 mm (mean±SD) in the control group. The differences between the test and control groups in the mesial, distal, and mean peri-implant crestal bone level changes were statistically significant (p=0.009, p=0.004, and p=0.001, respectively). The confounding factors (ST, wKM, and eIE) were adjusted.

CONCLUSIONS: More peri-implant crestal bone loss during the submerged healing period was observed in augmented bone than in pristine bone. Augmented bone may not exhibit the same characteristics as pristine bone during the implant submerged healing period.


A Prospective Randomized Controlled Trial of Two Different Sedation Sequences for Third-Molar Removal in Adults

Ruba Khader, Daniel Oreadi, Matthew Finkelman, Marcin Jarmoc, Sanjeet Chaudhary, Roman Schumann, and Morton Rosenberg

PURPOSE: In oral and maxillofacial outpatient surgery, sedation techniques are an important component in patient management for a wide variety of surgical procedures. Fentanyl and midazolam are commonly used sedatives with different mechanisms of action and specific analgesic or amnestic properties. This study examined whether the order of their administration would affect a patient's pain perception or procedural vital signs.

MATERIALS AND METHODS: After institutional review board approval and written informed consent, a prospective, randomized, parallel-group clinical trial was conducted in patients who planned to undergo removal of at least two third molars under intravenous moderate sedation. Patients were randomly assigned to one of two groups. The fentanyl-first group received fentanyl and then midazolam; the midazolam-first group received midazolam and then fentanyl. Recollection of the intraoperative pain score was assessed 24 hours after surgery using the Wong-Baker FACES pain scale. The Mann-Whitney U test was used to assess for the presence of a statistically significant difference between the two groups. Statistically significant differences in procedural vital sign fluctuations were examined using the t-test. Patients’ satisfaction with the procedure was assessed and intergroup comparisons were made.
RESULTS: Sixty-six patients were enrolled, one of whom did not complete the study. Recollected procedural pain scores at 24 hours after surgery were not statistically different between groups. Median scores on the Wong-Baker FACES pain scale for the two groups were 2.0 (interquartile range, 3.1) for the fentanyl-first group and 1.5 (interquartile range, 2.5) for the midazolam-first group (p=0.333). There was no statistical difference in the change in vital signs from baseline to two surgical end points in the two groups. In addition, patient satisfaction with the procedure did not statistically differ between the two groups.

CONCLUSIONS: In this study, selective sequencing of midazolam or fentanyl during an intravenous moderate-sedation procedure did not result in a measurable difference of recollected procedural pain scores at 24 hours after third-molar extraction. The choice of the sedation agents and the order of their administration should be tailored to the patient’s needs, type of surgical procedure, and surgeon preference.


Biomechanical Evaluation of Different Systems, Locking and Conventional, for Fixing Sagittal Osteotomy in Major Advances with or without Counterclockwise Rotation

Gustavo Batista Grolli Klein, Corey Decoteau, Harshiv Vyas, Paulo Domingos Ribeiro Jr., Maria Papageorge, and Archana Viswanath

PURPOSE: The overall objective of this in vitro study was to assess the biomechanical stability of six different osteosynthesis methods after sagittal split ramus osteotomy by simulating the masticatory forces and using a 3-point biomechanical test method.

METHOD: Sixty polyurethane hemi-mandibles with bone-like consistency were randomly assigned to two groups, each group containing six subdivisions (N=5), and subjected to sagittal split ramus osteotomy. After 10-mm advancement of the distal segment (group 1) and 10-mm advancement of the distal segment combined with 20° counterclockwise rotation (group 2), the bone segments were fixed by different osteosynthesis methods using 2.0-mm mini-plate/screw systems: subdivision A, one 4-hole conventional straight mini-plate; subdivision B, one 4-hole locking straight mini-plate; subdivision C, two 4-hole conventional mini-plate; subdivision D, two 4-hole locking mini-plate; subdivision E, one 6-hole conventional sagittal mini-plate; subdivision F, one 6-hole locking sagittal mini-plate. All models were mounted on a base especially constructed for this purpose. Using a 3-point biomechanical test model, the hemi-mandibles were loaded in compressive strength in an Instron machine (Norwood, Massachusetts) until a 3-mm displacement occurred between segments vertically or horizontally.

RESULTS: In all cases, the fixations show better performance in advancement only, against advancement combined with 20° counterclockwise rotation. The use of two straight mini-plates shows more resistant, followed by sagittal mini-plates and one straight mini-plate in both groups. The main forces were respectively: 0.1059 KN, 0.0599 KN, 0.0443 KN in conventional system and 0.1271 KN, 0.0665 KN, 0.0535 KN in locking system, for group 1. About group 2 the forces were respectively: 0.0930 KN, 0.0505 KN, 0.0330 KN in conventional system, and 0.1103 KN, 0.0569 KN, 0.0411 KN in locking system.

CONCLUSIONS: The use of two mini-plates still remains as a form of fixation, on sagittal split osteotomy, with the less displacement, even in even in large advancements with or without counterclockwise rotations.

Accepted for presentation at the ACOMS 36th Annual Scientific Conference and Exhibition, April 18-20, 2015 at the Ritz-Carlton Fort Lauderdale, Florida.
Airway Assessment for Office Sedation/Anesthesia

Morton Rosenberg and James Phero

Whenever a patient is about to receive sedation or general anesthesia, no matter what the technique, the preoperative assessment of the airway is one of the most important steps in ensuring patient safety and positive outcomes. This article, Part III in the series on airway management, is directed at the ambulatory office practice and focuses on predicting the success of advanced airway rescue techniques.

Published in Anesth Prog. 2015 Summer;62(2):74-80; quiz 80-1.
Orthodontics

An Active, Skeletally Anchored Transpalatal Appliance for Derotation, Distalization, and Vertical Control of Maxillary First Molars

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OBJECTIVE: The objective of this investigation was to evaluate treatment outcomes of the skeletally anchored Frog appliance.

DESIGN: A single-center, retrospective study was performed.

SETTING: Private orthodontic practice.

PARTICIPANTS: Patients who had undergone comprehensive orthodontic treatment with the skeletally anchored Frog appliance.

METHODS: In the study, 43 participants (20 males and 23 females) who had received treatment with the skeletally anchored Frog appliance were included. In order to explore dentoalveolar and skeletal treatment outcomes, pre- (T1) and post- (T2) treatment measurements were performed on patients' plaster models and cephalometric images. Comparisons between T1 and T2 were made by means of a student's t-test. All statistical analyses were conducted at the 0.05 level of statistical significance.

RESULTS: Study model analysis revealed a statistically significant derotation of maxillary molars ($\mu_{\Delta(T2-T1)}=9.5^\circ$, $p<0.001$) as well as an increase in transverse arch dimensions at the end of treatment ($\mu_{\Delta(T2-T1)}=2.2 \text{ mm}$, $p<0.001$). Cephalometric changes included bodily distalization of maxillary molars ($\mu_{\Delta(T2-T1)}=-1.9 \text{ mm}$, $p<0.001$), as well as noticeable angular displacement ($\mu_{\Delta(T2-T1)}=4.1^\circ$, $p=0.004$). No significant anchorage loss was observed, as displayed by the limited change in maxillary incisor position ($\mu_{\Delta(T1-T2)}=0.2 \text{ mm}$, $p=0.45$). In addition, excellent vertical control of the maxillary molars was achieved, with no change in the mandibular plane (ML/NSL) angle ($\mu_{\Delta(T2-T1)}=0.3^\circ$, $p=0.38$).

CONCLUSIONS: The skeletal Frog is effective in derotating and distalizing maxillary molars without anchorage loss and with excellent vertical control.

Published in J Orthod. 2014 Sep;41 Suppl 1:S24-32.

Morphology of Lateral Incisor Adjacent to Palatally Impacted Canines

Georgios Kanavakis, * Moonyoung Lee, and Sreedevi Srinivasan

OBJECTIVES: To explore differences in crown to root angulation between lateral incisors adjacent to palatally impacted canines (PIC) and lateral incisors adjacent to normally erupted canines (NC).

METHODS: Orthodontic records of 100 subjects were reviewed. Crown to root angulations of all lateral incisors were measured manually on the final panoramic radiographs. Also, three experienced orthodontists were asked to visually inspect the morphology of the lateral incisors on the panoramic radiographs. A mixed model was used to test the difference in crown to root angulation of the lateral incisor between the experimental and the control group. The association between the examiners’ observations and the presence of a canine
impaction was assessed by means of a chi-square test. All analyses were performed at the 0.05 level of statistical significance.

RESULTS: A significant (p=0.009) difference of 2.3 degrees in crown to root angulation was found between groups. Also, 66.7% of the lateral incisors that were identified as “abnormal” by the panel of orthodontists were adjacent to a PIC; 65.2% of lateral incisors that were identified as “normal” were located adjacent to NECs.

CONCLUSIONS: The root of lateral incisors adjacent to PICs is angulated more mesially compared to lateral incisors adjacent to NECs. In addition, clinicians are somewhat able to predict if a canine is palatally impacted by visually observing the crown to root angulation of the adjacent lateral incisor. Evaluating the crown to root angulation of a lateral incisor on a panoramic image might facilitate early diagnosis of palatally impacted canines.

Presented at the 2015 IADR General Session in Boston. Abstract #3826.

Clinical Outcomes of Cases with Missing Lateral Incisors Treated with the “T”-Mesialslider

Georgios Kanavakis,1 Björn Ludwig,2 Marco Rosa,3 Björn Zachrisson,4 and Jan Hourfar5

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The objective of this article is to review the fabrication and activation procedures of the “T”-Mesialslider and to present the clinical outcomes in cases where canine substitution is the treatment of choice for missing maxillary lateral incisors. The “T”-Mesialslider allows for effective mesial translation of the canines and the posterior dentition, without significant loss of anterior anchorage and with good vertical control. Possible adverse effects of the appliance and clinical recommendations for their management are also discussed. In canine substitution cases with high anchorage demands, the “T”-Mesialslider provides an effective treatment option.

Published in J Orthod. 2014 Sep;41 Suppl 1:S33-8

Comparison of Shear Bond Strength, Excess Adhesive Flash, and Bonding Time of Two Flash-Free Bonding Techniques

Moonyoung Lee and Georgios Kanavakis

OBJECTIVES: Excess adhesive flash (EAF) around brackets can contribute to the development of white spot lesions and lengthen the bonding process. To minimize EAF, flash-free bonding systems have been developed. In this study, the efficiency of two systems—APC™ Flash-Free Adhesive Coated System and the Manual Flash-Free Bonding System—were compared in terms of (1) the time to bond a bracket, (2) the amount of EAF around the bracket after bonding (mm²), (3) the shear bond strength, and (4) the adhesive residue index (ARI).

METHODS: Extracted human maxillary premolar teeth were used for this in vitro study. The teeth were cleaned with pumice, etched with Transbond Plus Self-Etching Primer (3M Unitek), and divided into three groups (12 teeth per group): group 1—brackets bonded using pre-pasted APC™ Flash-Free Adhesive Coated System and no flash was removed; group 2—brackets bonded using Transbonx XT Light Cure Adhesive Paste in which the adhesive was manually placed on the bracket base and no flash was removed; and group 3—control group—3M APC PLUS pre-pasted brackets bonded and the extruded flash was removed. Bonding time was measured using a stopwatch (seconds). The EAF was measured using an 8X digital microscope. Bond strength was measured
using an Instron that applied a gingivo-occlusal load at a crosshead speed of 1 mm/min. The ARI was evaluated according to the methods of Bishara and Trulove on a scale from 1 to 5. Repeated measures ANOVA and post-hoc Tukey tests were used for statistical analysis.

**RESULTS:** It took significantly \(p<0.001\) less time to bond in the APC Flash-Free group (mean, 30.7±3.3 s) compared to the control group (mean, 41.8±4.0 s) and the manual flash-free group (mean, 39.2±2.8 s). The APC Flash-Free bracket had significantly \(p<0.001\) greater shear bond strength (mean, 13.7±2.2 MPa) compared to the control group (mean, 10.8±2.0 MPa) and the manual flash-free group (mean, 10.4±1.4 MPa). The ARI was significantly \(p<0.001\) greater with the APC Flash-Free bracket compared to that of the other two groups. Because the magnification of the 8X digital microscope was found to be inadequate, the EAF was not measured.

**CONCLUSIONS:** Compared to other methods of bonding, the APC™ Flash-Free Adhesive Coated System can potentially reduce bonding time while increasing shear bond strength.

*Presented at the 2015 IADR General Session in Boston. Abstract #0807.*

**Newly Defined Landmarks for a Three-Dimensionally Based Cephalometric Analysis: A Retrospective Cone-Beam Computed Tomography Scan Review**

Moonyoung Lee, Georgios Kanavakis, and R. Matthew Miner

**OBJECTIVES:** To identify two novel three-dimensional (3D) cephalometric landmarks and create a novel three-dimensionally based anteroposterior skeletal measurement that can be compared with traditional two-dimensional (2D) cephalometric measurements in patients with Class I and Class II skeletal patterns.

**MATERIALS AND METHODS:** Full head cone-beam computed tomography (CBCT) scans of 100 patients with all first molars in occlusion were obtained from a private practice. InvivoDental 3D (version 5.1.6, Anatomage, San Jose, California) was used to analyze the CBCT scans in the sagittal and axial planes to create new landmarks and a linear 3D analysis (M measurement) based on maxillary and mandibular centroids. Independent samples t-test was used to compare the mean M measurement to traditional 2D cephalometric measurements, ANB and APDI. Interexaminer and intraexaminer reliability were evaluated using 2D and 3D scatterplots.

**RESULTS:** The M measurement, ANB, and APDI could statistically differentiate between patients with Class I and Class II skeletal patterns \(p<0.001\). The M measurement exhibited a correlation coefficient \(r\) of −0.79 and 0.88 with APDI and ANB, respectively.

**CONCLUSIONS:** The overall centroid landmarks and the M measurement combine 2D and 3D methods of imaging; the measurement itself can distinguish between patients with Class I and Class II skeletal patterns and can serve as a potential substitute for ANB and APDI. The new three-dimensionally based landmarks and measurements are reliable, and there is great potential for future use of 3D analyses for diagnosis and research.

*Published in Angle Orthod. 2015 Jan;85(1):3-10.*
Interlot Variations of Transition Temperature Range and Force Delivery in Copper-Nickel-Titanium Orthodontic Wires

Renée Pompei-Reynolds and Georgios Kanavakis

INTRODUCTION: The manufacturing process for copper-nickel-titanium archwires is technique sensitive. The primary aim of this investigation was to examine the interlot consistency of the mechanical properties of copper-nickel-titanium wires from two manufacturers.

METHODS: Wires of two sizes (0.016 and 0.016 × 0.022 in) and three advertised austenite finish temperatures (27°C, 35°C, and 40°C) from two manufacturers were tested for transition temperature ranges and force delivery using differential scanning calorimetry and the 3-point bend test, respectively. Variations of these properties were analyzed for statistical significance by calculating the F statistic for equality of variances for transition temperature and force delivery in each group of wires. All statistical analyses were performed at the 0.05 level of significance.

RESULTS: Statistically significant interlot variations in austenite finish were found for the 0.016 in/27°C (p=0.041) and 0.016 × 0.022 in/35°C (p=0.048) wire categories, and in austenite start for the 0.016 × 0.022 in/35°C wire category (p=0.01). In addition, significant variations in force delivery were found between the two manufacturers for the 0.016 in/27°C (p=0.002), 0.016 in/35.0°C (p=0.049), and 0.016 × 0.022 in/35°C (p=0.031) wires.

CONCLUSIONS: Orthodontic wires of the same material, dimension, and manufacturer but from different production lots do not always have similar mechanical properties. Clinicians should be aware that copper-nickel-titanium wires might not always deliver the expected force, even when they come from the same manufacturer, because of interlot variations in the performance of the material.


Surgeon Agreement/Bias When Evaluating Lip Surgery Outcomes in CL/P Patients

Carroll Trotman, Jing Yu, Ceib Phillips, and Gary Kotch

OBJECTIVES: A systematic evaluation approach to quantify circumoral (lip) disability in patients with cleft lip/palate (CL/P) combining (1) a subjective evaluation of still photographs of patients (STILLS) and (2) a dynamic 3D objective/statistical modeling of facial movements (OD3DM) was developed. Previous studies demonstrated that when surgeons used this method, they changed their treatment plans for lip revision surgery. As a follow up, we sought to determine the agreement and bias among surgeons for each component of this approach—STILLS versus OD3DM.

METHODS: The sample consisted of 21 children with repaired CL/P who had lip revision surgery and five surgeons experienced in cleft care. For each patient, each surgeon viewed the pre-surgery and post-surgery STILLS photographs side-by-side, and then repeated the process with the OD3DM animations. Surgeons were asked whether the patient had a change in facial appearance after viewing the STILLS, and then after viewing the OD3DM. “A change” was coded as “E” and “no change” as “N.” Inter-method and inter-observer agreement was measured using Kappa coefficients, ICC, and generalized correlation coefficients. Inter-method and inter-rater bias was examined using Mantel-Haenszel methods and McNemars tests.

RESULTS: There was highly significant inter-observer bias among the surgeons (p<0.004) for both methods. The inter-method bias was small but significant for one surgeon who assigned more “E”s with the OD3DM
versus more “N”s with the STILLS. The agreement between the two methods was moderate (Kappa=0.480, [95% CI, 0.194–0.766]). The inter-observer agreement was poor although slightly better with the STILLS (Kappa=0.224, [95% CI, 0.105–0.455]) than the OD3DMD (Kappa=0.072, [95% CI, 0.162–0.259]).

**CONCLUSIONS:** (1) With both the STILLS and OD3DMD, surgeons exhibited bias in their judgments that had a negative impact on their agreement patterns. (2) The lack of high agreement between the two methods would be expected since they measure different attributes: facial form versus movement.

*Presented at the 2015 IADR General Session in Boston. Abstract #1243.*
Pediatric Dentistry Research

Efficiency and Patient Satisfaction with the Isolite System vs. Rubber Dam for Sealant Placement in Pediatric Patients

Muhanad Alhareky, Danya Mermelstein, Matthew Finkelman, Jehan Alhumaid, and Cheen Loo

PURPOSE: The purpose of this clinical study was to compare the chair time and degree of patient satisfaction after use of the Isolite system (IS) versus rubber dam (RD) during the application of pit and fissure sealants.

METHODS: The patients included in this study ranged from 7 to 16 years old. In each subject, pit and fissure sealants were applied to one permanent molar in each quadrant. IS dental isolation was used on one side; RD isolation was used on the other side. Chair time was assessed using a stopwatch, and patient acceptance was evaluated using a questionnaire.

RESULTS: Forty-two subjects (23 females and 19 males) were enrolled in the study. The average chair time was 19.36 minutes for the application of pit and fissure sealants on the RD side; average chair time was 10 minutes for the IS side (p<0.001). Sixty-nine percent of the subjects were more comfortable using IS, while 31 percent found RD to be more comfortable (p=0.02).

CONCLUSION: Isolite is a viable alternative to the conventional rubber dam. The use of Isolite is associated with reduced chair time and greater patient satisfaction.


Post-traumatic Apexogenesis of an Immature Maxillary Central Incisor: A Case Report

Sonia Arevalo, Cheen Loo, and Mohammad Hassan

The treatment of pulpal injury in an immature apex often presents a challenge for the clinicians. Apexification and apexogenesis are the indispensable treatment choices for teeth with open apices. This case report presents the treatment for an 8-year-old Hispanic male that presented to clinic for treatment of a right central maxillary incisor previously traumatized. This case was managed with apexogenesis as a primary mode before considering apexification. The endodontic therapy consisted of periodical changes of calcium hydroxide dressing and a definitive root canal filling with mineral trioxide aggregate (MTA). Shortly after endodontic treatment had been completed, the tooth suffered repeated trauma. During the emergency dental visit, the tooth was avulsed and immediately replanted. Tooth was splinted for 4 weeks. Post-operative follow up has been done up to 4 months with mild to no root resorption.

Presented at the American Academy of Pediatric Dentistry’s 68th Annual Session, Seattle, May 21–24, 2015

Anterior Crossbite Correction in Mixed Dentition: A Case Report

Ammar Asali and Marjan Askari

Anterior crossbite is one the most common malocclusion forms seen in mixed dentition. Multiple different modalities have been described in the literature. This report describes anterior crossbite in a 9-year-old female and its correction using a fixed functional appliance along with protraction facemask therapy.

Presented at the American Academy of Pediatric Dentistry’s 68th Annual Session, Seattle, May 21–24, 2015
Full Mouth Rehabilitation for a Von Willebrand Disease Patient under General Anesthesia: A Case Report

Ammar Asali and Cheen Loo

This report describes Von Willebrand (VWD) disease and its dental management for a 3-year-old with severe early childhood caries (S-ECC). VWD can cause bleeding complications if not managed. Treatment depends on type and severity of defect. Successful delivery of quality care requires proper knowledge and communication between the physician and treating dentist. Presented is a case of type 2 VWD managed in the operating room following hematologist’s recommendations utilizing multiple medications.


Effect of DentalVibe in Pain Perception during the Administration of Local Anesthetic in Pediatric Dental Patients

Jason Ching, C. Brambila, Cheen Loo, Alfred Rich, and Angel Park

PURPOSE: The purpose of this study is to measure and compare pain reactions in subjects, 4–10 years old, during administration of dental local anesthesia with and without the use of the DentalVibe Injection Comfort System. Hypothesis: Pain reaction of anesthesia with and without DentalVibe will be measured using The Wong Baker Pain Scale. The primary hypothesis is that the pain score from the procedure that had anesthesia administration with DentalVibe will be lower than the pain score from the procedure that only used anesthesia in children aged 4–10. Secondary is that anxiety will have positive correlation with pain scale rating.


The Efficacy of CBCT and Extraoral Bitewings in Detection of Interproximal Caries

Osama Felemban, Jennifer Bassett Midle, Cheen Loo, and Aruna Ramesh

PURPOSE: The purpose of this in vitro study is to evaluate the diagnostic efficacy of cone beam computed tomography (CBCT) and extraoral bitewings in detection of interproximal caries and determining the depth of carious lesions compared to intraoral bitewings.

METHODS: Cadaver heads with 70 posterior teeth were radiographically imaged with i-CAT CBCT, ProMax 3D CBCT, ProMax (extraoral bitewings), and intraoral digital bitewings. The teeth were then extracted and sectioned for histological evaluation under the microscope. Six pediatric dentistry residents evaluated each proximal surface. Inter-observer agreement, sensitivity, and specificity were calculated. ROC curves were analyzed using ANOVA test.

RESULTS: Preliminary results from 40 teeth showed that 51.9% of the proximal surfaces were sound and 48.1% were carious. Statistical analysis will be carried out after the completion of the data collection and resident observation.

CONCLUSION: Statistical analysis will be carried out after the completion of the data collection and resident observation.

Interceptive Orthodontic Treatment with Habit Breaking Appliance: A Case Report

David Juhn, Cheen Loo, and Marjan Askari

Management and treatment of crossbites and oral habits are important in a developing dentition. Management includes recognizing and diagnosing each individual patient independently and providing necessary treatment. AAPD guidelines defines crossbites as any abnormal buccal-lingual relation between opposing incisors, molars, or premolars in the centric relations. Crossbites can be further categorized as dental, skeletal, or a combination of both. Oral habits such as nonnutritive sucking, bruxing, tongue thrust swallow, and abnormal tongue position may change teeth and dentoalveolar structures. These changes may include increased overjet, reduced overbite, posterior crossbite, or long facial height. A case report of thumb sucking habit associated with posterior crossbite is presented and treated using a quad-helix with palatal crib appliance.


Effectiveness of an Oral Health Education Program for Obstetrician/Gynecologist Residents at Tufts Medical Center

Lily Parsi, Matthew Finkelman, Devina Shah, E. Kim, Alfred Rich, and Cheen Loo

PURPOSE: The purpose of the study was to assess obstetrician/gynecologist (OB/GYN) residents’ knowledge and training in oral health and the effectiveness of an educational program for OB/GYN residents at Tufts Medical Center. An informational seminar session on oral health was used to determine how beneficial such training would be in improving OB/GYN residents’ dental knowledge.

METHODS: A pre-post test design with a three-month follow-up was used to evaluate the effectiveness of a seminar session given to OB/GYN residents at Tufts Medical Center. Knowledge-based and belief-based questions were used to determine the level of knowledge of oral health.

RESULTS: Preliminary results of 26 subjects: Subjects participated in oral health awareness sessions and completed the questionnaire. The mean age of participants was 29 years old. Results via the General Estimating Equation Model show that for the knowledge-based questions the subject has 4.33 times the likelihood of getting an additional question correct when comparing the pre- and post-test results (p<0.001). The subject is 3.18 times more likely of getting one additional question correct between the scores on the pre-test and the 3-month follow-up (p<0.001). In regards to the belief-based questions, results displayed trends towards a more favorable attitude overall towards conducting an oral exam during routine obstetric visits and becoming more up-to-date on oral health issues after the seminar.

CONCLUSIONS: Pregnancy affords a unique opportunity to educate women on the importance of oral health. The preliminary results showed that there is a benefit to an oral health educational session for OB/GYN residents at Tufts Medical Center. Thereby, a similar training module can be brought to other OB/GYN residencies and OB/GYNs in an effort to enhance the symbiotic relationship between the medical and dental professions.

Effectiveness of Oral Health Education for Pediatric Nurse Practitioner Students at Northeastern University

John Stark, Matthew Finkelman, Alfred Rich, M. Dolce, L. Malone, and Cheen Loo

PURPOSE: The purpose of this study was to compare the effectiveness of an educational program for pediatric nurse-practitioner students at Northeastern University in oral hygiene, nutritional counseling, disease prevention, and knowledge in dental emergencies.

METHODS: All subjects completed a questionnaire containing pre- and post-seminar questions to analyze effectiveness of the oral health education program. Results were compared with a 3-month follow-up survey that was completed by the same subjects and returned via email.

RESULTS: Of the subjects, 24 participated in three oral health awareness sessions and completed the questionnaire. Preliminary results suggest that for knowledge-based questions, there was an increase in scores between the pre- and post-tests. Statistical analysis will be carried out after the completion of the 3-month follow-up survey and subsequent data collection.

CONCLUSION: Interprofessional education programs provide a unique opportunity to reinforce the importance of oral health and broaden the reach of oral healthcare. The study showed that there is a significant benefit to an oral health educational session for PNPs at Northeastern University. Thereby, a similar training module can be provided to other health professionals for similar benefits.


Dental Externship and Influential Factors on Future Pediatric Care

Sage Yoo, Cheen Loo, Matthew Finkelman, Alfred Rich, and Wanda Wright

PURPOSE: The object of this study was to determine if experiences outside of a school clinic affects the attitudes of pre-doctoral students toward managing the oral health problems of pediatric population.

METHOD: A survey will administer to a pre-doctoral class of 2015 (N=179). Students will be surveyed after they have completed their CSLE. The survey consists of questions about expectation from CSLE, preference of working with adult or pediatric patients prior and post CSLE, primary concern in treating pediatric patients, and what additional training would help more with treating pediatric patients. Hypothesis testing will be conducted using the one-sample t-test. Categorical data will be tested using chi-square test for association.

RESULT: Data collections are still in progress. Statistical analysis will be carried out upon completion of the data collection.

CONCLUSION: Data collections are still in progress. Statistical analysis will be carried out upon completion of the data collection.

Periodontal Research

Impact of Patient Compliance on Tooth Loss during Supportive Periodontal Therapy: A Systematic Review and Meta-analysis

C.T. Lee,1 H.Y. Huang,2 Teresa Sun,3 and Nadeem Karimbux3
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Periodontal treatment consists of active periodontal therapy (APT) and supportive periodontal therapy (SPT). Regular SPT is recommended to prevent and control the occurrence of periodontal disease following APT. A patient’s compliance with SPT is considered one of the most important factors affecting long-term periodontal status. Tooth loss is generally considered the final outcome of periodontitis. This review aimed to analyze the relationship between patient compliance with regular SPT and tooth loss. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline for systematic reviews was used. A search of articles was conducted using MEDLINE (PubMed) and other databases. Quality assessments of selected studies were performed. To assess the effect of compliance on tooth loss during SPT, pooled risk ratio of tooth loss (RRTL) was used as the primary outcome. Pooled risk difference of tooth loss (RDTL) and weighted mean difference of tooth loss rate (WDTLR) were used as secondary outcomes. Subgroup analysis and meta-regression were conducted to evaluate the effects of different variables. In total, 710 articles were screened. Eight studies, which had a regular-compliance (RC) group and an erratic-compliance (EC) group with at least a 5-y follow-up period, qualified for the meta-analysis. The risk of tooth loss in the RC group was significantly lower than that in the EC group (pooled RRTL: 0.56 [confidence interval (CI): 0.38, 0.82]; pooled RDTL: −0.05 [CI: −0.08, −0.01]). The definition of compliance was a variable significantly related to risk ratio of tooth loss. Patients in the RC group had significantly lower tooth loss rate during SPT than did patients in the EC group (WDTLR: −0.12 [CI: −0.19, −0.05]). Teeth have less risk of being lost if patients are more compliant with supportive periodontal therapy. However, unidentified variables causing data heterogeneity and affecting the risk of tooth loss may have been present. More well-controlled prospective studies are needed in the future.


Is There a Relationship between Periodontal Disease and Causes of Death? A Cross Sectional Study

Zuhair Natto, Majdi Aladmawy, Mohammed Alasqah, and Athena Papas

The aim of this study was to evaluate whether there is any correlation between periodontal disease and mortality contributing factors, such as cardiovascular disease and diabetes mellitus in the elderly population. A dental evaluation was performed by a single examiner at Tufts University dental clinics for 284 patients. Periodontal assessments were performed by probing with a manual UNC-15 periodontal probe to measure pocket depth and clinical attachment level (CAL) at six sites. Causes of death was abstracted from death certificate. Statistical analysis involved ANOVA, chi-square and multivariate logistic regression analysis. The demographics of the population sample indicated that most were females (except for diabetes mellitus), white, married, completed 13 years of education, and were 83 years old on average. CAL (continuous or dichotomous) and marital status attained statistical significance (p<0.05) in contingency table analysis (chi-square for independence). Individuals with increased CAL were 2.16 times more likely (OR=2.16, 95% CI=1.47–3.17) to die due to CVD and this effect...
Periodontal Research

persisted even after control for age, marital status, gender, race, years of education (OR=2.03, 95% CI=1.35–3.03). CAL (continuous or dichotomous) was much higher among those who died due to diabetes mellitus or out of state of Massachusetts. However, these results were not statistically significant. The same pattern was observed with pocket depth (continuous or dichotomous), but these results were not statistically significant either. CAL seems to be more sensitive to chronic diseases than pocket depth. Among those conditions, cardiovascular disease has the strongest effect.


Comparison of Different Lasers for the Treatment of Peri-implantitis: A Systematic Review
Zuhair Natto,* Majdi Aladmwaw, Paul Levi, and Hom-Lay Wang

OBJECTIVES: To evaluate the efficacy of various types of lasers (Nd:YAG, CO₂, Diode, Er,Cr:YSGG, and Er:YAG) in the treatment of peri-implantitis and their use in surgical and nonsurgical procedures.

METHODS: Human studies for the treatment of peri-implantitis with laser therapy published between January 2002 and January 2014 were collected utilizing the electronic database of PubMed, Ovid MEDLINE, Cochrane, and Google Scholar. Two reviewers conducted the study selection, data collection, and validity assessment.

RESULTS: Of the studies, 812 were selected initially by a title search; 13 studies were then chosen for this review. No human studies evaluated the effect of Nd:YAG laser (neodymium-doped yttrium aluminum garnet; Nd:Y₃Al₅O₁₂) on peri-implantitis. The CO₂ (carbon dioxide) laser is reported to be safe and to possess an ability to enhance bone regeneration. The diode laser (980 nm) seems to be effective in its bactericidal effect without changing the implant surface pattern. The Er,Cr:YSGG (erbium, chromium-doped yttrium, scandium, gallium, and garnet) laser was able to obtain bone regeneration around a failing implant shown in one case report, while the Er:YAG laser exhibits a high bactericidal effect against periodontopathic bacteria at a low energy level.

CONCLUSIONS: Although lasers showed promising results in reducing clinical signs of peri-implantitis, due to the limited of small sample sizes and short follow-up periods, no firm conclusion can be drawn at this moment. Hence, there is a need for more well-designed, longitudinal, randomized controlled clinical trials.

Presented at the 2015 IADR General Session in Boston. Abstract #4030.

Prevalence of Peri-implant Diseases: A Cross-Sectional Study
Evangelos Papathanasiou, Natalie Jeong, Angel Park, James Hanley, and Andreas Parashis

AIM: This cross-sectional study was designed to evaluate the health status data of implants in patients treated at Tufts University School of Dental Medicine between 2004 and 2010 with implant-supported prostheses of at least 2 years in service.

METHODS: Implant placement data from 49 patients with 116 implants (mean age 59.7 years [29–88 years], 2.4 average number of implants [1–8 implants], 51±25 months median follow-up time after prosthetic placement) was retrieved from electronic records and a detailed history for possible risk indicators was obtained at a follow-up examination. Clinical parameters were recorded by two calibrated examiners and radiographic evaluation was performed by one examiner, blinded to any clinical measurements. Data was analyzed with SAS 9.2.
**RESULTS:** Peri-implant mucositis (M) occurred in 12.1% of the implants and 16.3% of the subjects. Peri-implantitis (PI) was found in 11.2% of the implants and 20.4% of the subjects and occurred more frequently in males and older subjects. Of the implants, 84.6% with PI were in the maxilla and 15.4% in the mandible; 14% and 21.4% of the implants were classified as M and PI respectively when bone augmentation was performed during placement (36.2% of the implants). Of those implants with screw-retained prostheses (56%), 12.3% and 6.2% were classified as M and PI respectively, while the respective percentages for cement-retained prostheses (44%) were 11.8% and 17.6%.

**CONCLUSION:** The preliminary data of this study in patients in the United States support similar prevalence of peri-implantitis, but lower prevalence of peri-implant mucositis at both implant- and patient-level compared to those reported from patients worldwide.

*Presented at the 2015 Europerio 8 Meeting in London, UK.*

**Suppressor of Cytokine Signaling-3 Regulates Macrophage Response to* Porphyromonas gingivalis***

**Evangelos Papathanasiou,** Alpdoğan Kantarcı, Antonios Konstantinidis, Danielle Stephens, Hongwei Gao, and Thomas Van Dyke

**OBJECTIVE:** *Porphyromonas gingivalis* plays a key role in the pathogenesis of periodontitis by triggering the host response. Suppressor of cytokine signaling (SOCS) proteins are negative regulators of inflammatory cells that inhibit cytokine signaling pathways. Our goal was to evaluate the role of SOCS-3 regulation in the inflammatory phenotype of macrophages challenged with lipopolysaccharide (LPS) from *P. gingivalis*.

**METHODS:** Peritoneal macrophages were elicited with 4% thioglycolate broth and isolated from 8-week old myeloid SOCS-3-knockout (KO) and wild-type (WT) C57Bl6-B.129 mice by differential centrifugation. Macrophages were cultured at a concentration of 1.5x10^6 cells/ml in 6-well plates. After 2 hours, non-adherent cells were discarded and the remaining adherent cells were treated with either culture medium alone (control) or with 100 ng/ml *P. gingivalis* A7436 LPS (N=6 per group). Supernatants were collected after 18 hours and cytokine levels were assessed using Luminex multiplex bead immunoassay.

**RESULTS:** *P. gingivalis* LPS stimulation resulted in a significant increase in the secretion of IL-1β, IL-6 and IL-10 in macrophages from myeloid SOCS-3-KO mice compared to macrophages from WT mice (59.5±7.4 vs. 48.6±2.5 pg/ml, 1,303±226 vs. 971±71 pg/ml, 104.5±12.3 pg/ml vs. 73.7±2.9 pg/ml; respectively p< 0.05). Macrophages from myeloid SOCS-3-KO animals produced similar levels of IL-17A, MCP-1 and GRO/KC to WT after stimulation with *P. gingivalis* LPS (50.2±12.8 vs. 33.0±4.4 pg/ml, 331.4±30.1 vs 322.5±17.9 pg/ml, 106.8±19.8 vs. 93.8±5.2 pg/ml; respectively p>0.05).

**CONCLUSIONS:** We have previously reported that myeloid SOCS-3-KO mice exhibit increased susceptibility to periodontal bone loss in a *P. gingivalis*-induced periodontitis model. The results of this study support the conclusion that deletion of the repressor molecule SOCS-3 causes an elevated macrophage-mediated inflammatory response to *P. gingivalis* that increases the inflammatory response to periodontal pathogens and susceptibility to periodontitis.

*Presented at the 2015 IADR General Session in Boston. Abstract #3216.*
Periodontal Treatment for Preventing Adverse Pregnancy Outcomes: A Meta- and Trial Sequential Analysis

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OBJECTIVES: Periodontal treatment might reduce adverse pregnancy outcomes. The efficacy of periodontal treatment to prevent preterm birth, low birth weight, and perinatal mortality was evaluated using meta-analysis and trial sequential analysis.

METHODS: An existing systematic review was updated and meta-analyses performed. Risk of bias, heterogeneity, and publication bias were evaluated, and meta-regression performed. Subgroup analysis was used to compare different studies with low and high risk of bias and different populations, i.e., risk groups. Trial sequential analysis was used to assess risk of random errors.

RESULTS: Thirteen randomized clinical trials evaluating 6,283 pregnant women were meta-analyzed. Four and nine trials had low and high risk of bias, respectively. Overall, periodontal treatment had no significant effect on preterm birth (odds ratio [95% confidence interval] 0.79 [0.57–1.10]) or low birth weight (0.69 [0.43–1.13]). Trial sequential analysis demonstrated that futility was not reached for any of the outcomes. For populations with moderate occurrence (<20%) of preterm birth or low birth weight, periodontal treatment was not efficacious for any of the outcomes, and trial sequential analyses indicated that further trials might be futile. For populations with high occurrence (≥20%) of preterm birth and low birth weight, periodontal treatment seemed to reduce the risk of preterm birth (0.42 [0.24–0.73]) and low birth weight (0.32 [0.15–0.67]), but trial sequential analyses showed that firm evidence was not reached. Periodontal treatment did not significantly affect perinatal mortality, and firm evidence was not reached. Risk of bias but not publication bias or patients’ age modified the effect estimates.

CONCLUSIONS: Providing periodontal treatment to pregnant women could potentially reduce the risks of perinatal outcomes, especially in mothers with high risks. Conclusive evidence could not be reached due to risks of bias, risks of random errors, and unclear effects of confounding. Further randomized clinical trials are required.

Published in PLoS One. 2015 Jun 2;10(6).
**Prosthodontics Research**

**Marginal and Internal Fit of Five- and Three-Axis CAD/CAM Inlays**

_Norah Alajaji,* David Bardwell, Hiroshi Hirayama, Samer Khayat, Matthew Finkelman, and Ala Ali_

**OBJECTIVES:** To evaluate the marginal and internal adaptation of CAD/CAM lithium-disilicate inlay restorations fabricated by two milling systems (five and three-axis), and a heat-press technique.

**METHODS:** Fifteen poly-methyl methacrylate models (premolar tooth #12, Kilgore International Inc., Coldwater, Michigan) with MOD cavity preparation were fabricated. Lithium-disilicate inlay restorations were obtained by three different fabrication techniques and fitted to their single respective die (N=45, N=15/gp) as follows: group 1, E4D three axis milling system; group 2, Tizian™ Cut 5 five axis milling system; group 3, conventional heat-press technique. Gaps were evaluated by X-ray microtomography (mCT) (Nikon Metrology, Inc., Americas). Marginal gap (MG), occlusal-marginal gap (OMG), proximal-marginal gap (PMG), gingival-marginal gap (GMG), absolute marginal discrepancy (AMD), axial-internal gap (AIG) and occlusal-internal gap (OIG) were evaluated at 120 different points per inlay. Data analyzed using repeated measures ANOVA. Pairwise comparisons were conducted for post-hoc tests and the Bonferroni correction was used to adjust for multiple comparisons (α=0.007).

**RESULTS:** The heat-press group demonstrated significantly smaller mean-values amongst all outcomes compared to CAD/CAM groups except for GMG, where there was no statistically-significant difference between groups in the ANOVA (p=0.042). Within the CAD/CAM groups, the five-axis group showed significantly lower OMG mean-value (51.08±12.46 μm) compared to the three-axis group (79.93±19.41 μm; p<0.001), and lower AIG mean-value (104.98±14.05 μm) compared to the three-axis group (143.56±12.44 μm; p<0.001). There was no significant difference between the five-axis and the three-axis groups' AMD, MG, PMG and OIG locations (p>0.007).

**CONCLUSIONS:** Within the limitations of this in vitro study, different fabrication techniques affected the marginal and internal adaptation of ceramic inlay restorations. The heat-press group showed the best marginal and internal adaptation results; however, in every group, all samples were within the clinically acceptable MG limit (100 μm). Among CAD/CAM groups, the five-axis had better AIG and OMG values compared to the three-axis values.

*Presented at the 2015 IADR General Session in Boston. Abstract #2344.*

**Comparison of Candida Albicans Adhesion to Various Denture Base Materials**

_Alaa Makke,* Carol Kumamato, Amit Sachdeo, Matthew Finkelman, and Ali Muftu_

**OBJECTIVES:** Denture stomatitis is a common fungal infection, affecting up to 76% of removable denture patients and is often associated with Candida Albicans (CA) biofilms. A wide range of materials with various processing techniques are used for denture bases. This research examines the adhesion of CA to the surface of various denture base materials and its relation to surface roughness.

**METHODS:** Rectangular samples of (15 x 5 x 2 mm)(N=15) were fabricated for seven different denture base materials: group 1, Avadent® CAD/CAM (A); group 2, Eclipse® DENTSPLY, (E); group 3, SR Ivocap® High Impact, Ivoclar Vivadent (SRI-HI); group 4, Clear Ivocap®, Ivoclar Vivadent (CI); group 5, Lucitone® FRS flexible, DENTSPLY (L-FRS); group 6, Nature-CRYL® Pour, GC America (NCP-GC); group 7, DC acrylic
Luciton® S.P., DENTSPLY (DC-SP). After polishing, surface roughness (Ra) values were measured using a Mitutoyo® profilometer. All samples were incubated with CA suspension (SC5314) for 1 hour at 37°C. Serial dilutions of the original suspension (106 cells/ml) were then plated, along with dilutions of the suspension that was removed from the material, on several YPglucose agar plates and aerobically incubated at 37°C for 48 h. Adherence was calculated by measuring the colony forming units (CFUs) bound to the pieces and the total CFU and determining % binding. Statistical analyses were performed using Kruskal-Wallis tests and Spearman Correlation analysis.

**RESULTS:** Median of CA adhesion values ranged from (0.0) Avadent® to (8.0) Eclipse® (p<0.02). Overall, CI (4.3) and SRI-HI (1.4) showed more adhesion than L-FRS (0.3), DC-SP (0.1), NCP-GC (0.2) and Avadent (0) groups. Ra values also varied: L-FRS (0.7) and NCP-GC (0.12) showed rougher surfaces than CI (0.03), SRIHI (0.03), Eclipse (0.05) and Avadent (0.03) groups (p<0.02). Significant correlations were observed between CA and Ra as well.

**CONCLUSIONS:** Denture base materials differ in surface roughness values and CA adhesion; smoother surfaces had less CA adhesion.

*Presented at the 2015 IADR General Session in Boston. Abstract #2154.*

### Marginal and Internal Adaptation of Ceramic Crown Restorations Fabricated with CAD/CAM Technology and the Heat-Press Technique

*Hisham Mously, Matthew Finkelman, Roya Zandparsa, and Hiroshi Hirayama*

**STATEMENT OF PROBLEM:** The accuracy of chairside computer-aided design and computer-aided manufacturing (CAD/CAM) restorations is questionable, and the effect of the die spacer settings is not well stated in the literature.

**PURPOSE:** The purpose of the study was to evaluate the marginal and internal adaptation of E4D crowns fabricated with different spacer thicknesses and to compare these crowns with those fabricated with the heat-press technique.

**MATERIAL AND METHODS:** The E4D system was used to fabricate 30 crowns for the first three groups, with different spacer thickness settings: 30 μm, 60 μm, and 100 μm. In the fourth group, 10 lithium disilicate crowns were fabricated with the heat-press technique. The occlusal gap, axial gap, vertical marginal gap, and absolute marginal discrepancy were evaluated by X-ray microtomography. Statistical significance was assessed with the Kruskal-Wallis test (α=0.05). For post hoc analyses, the Mann-Whitney U test was used alongside the Bonferroni correction for multiple comparisons (α=0.008).

**RESULTS:** Within the CAD/CAM groups, the 30-μm spacer thickness resulted in the lowest median axial gap (90.04 μm), whereas the 60-μm spacer thickness resulted in the lowest median occlusal gap (152.39 μm). The median marginal gap values of the CAD/CAM-60 group (49.35 μm) and CAD/CAM-100 group (46.65 μm) were lower than those of the CAD/CAM-30 group (55.18 μm). No significant differences among the CAD/CAM groups were observed for absolute marginal discrepancy. The heat-press group had significantly different values than those of the CAD/CAM groups.

**CONCLUSION:** The spacer thickness and fabrication technique affected the adaptation of ceramic crowns. The heat-press group yielded the best marginal and internal crown adaptation results. The 30- or 60-μm spacer settings are recommended for the E4D CAD/CAM system.

*Published in J Prosthet Dent. 2014 Aug;112(2):249-56.*
Comparison of the Accuracy of Digital Impressions and Master Models

Rami Muadab,* Ali Muftu, Gerard Kugel, Matthew Finkelman, and Ala Ali

OBJECTIVES: To compare the accuracy of the digital impressions obtained from Cadent™ iTero and Lava™ C.O.S. and the accuracy of master models obtained from Cadent™ iTero, Lava™ C.O.S., and stone master models from using conventional impressions technique.

METHODS: A reference model was scanned to generate a CAD reference model (CRM). Ten digital impressions were taken using iTero, and another ten digital impressions using Lava™ C.O.S. The scans were sent for fabrication of master models. The digital impressions were compared to the CRM using Qualify software. Ten conventional impressions of the reference model were taken then poured with die stone (Resin Rock). All the master models were scanned and then compared to the CRM using the same software. The root mean square (RMS) values were analyzed. Independent-samples t-tests with Bonferroni correction were used in the first part of the study, and one-way ANOVA tests with Bonferroni correction were used in the second part of the study (α≤0.017).

RESULTS: The results of the first part of the study revealed that the digital impressions obtained from the Lava™ C.O.S. were more accurate compared to iTero (p-value <0.001). The results of the second part of the study demonstrated significant differences between groups (p-value<0.001). Master models obtained from using conventional impression technique were the most accurate, followed by master models obtained from Lava™ C.O.S. and lastly the master models obtained from iTero. There was no statistically significance between Lava™ C.O.S. and iTero in the full coverage design).

CONCLUSIONS: Within the limitations of this study we concluded that digital impressions obtained from using Lava™ C.O.S. are more accurate compared to digital impressions obtained from using Cadent™ iTero. Master models obtained from using conventional impression technique are more accurate than master models obtained from Lava™ C.O.S. and the Cadent™ iTero.

Presented at the 2015 IADR General Session in Boston. Abstract #0572.

Transition from Failing Dentition to Complete-Arch Implant Rehabilitation with a Staged Approach: A Three-Year Clinical Report

Panos Papaspyridakos and Vasilios Chronopoulos

The transition of patients from failing dentition to complete-arch implant rehabilitation often means that the patient is rendered edentulous and has to wear a removable complete denture for a time. Many patients find this objectionable. A staged treatment approach provides a fixed interim prosthesis for use throughout the rehabilitation process, allowing patient comfort and prosthodontic control. This clinical report describes a staged approach protocol with a new type of interim prosthesis. The prosthesis is supported by hopeless teeth and the soft tissues of the maxillary tuberosities and mandibular retromolar pads for the complete-arch implant rehabilitation of a patient with failing dentition. This protocol allows for a fixed interim prosthesis with combined tooth and mucosa or implant support during the entire rehabilitation process, thus avoiding the use of complete dentures. The implants and prostheses were functioning successfully after three years of clinical service.

Published in J Prosthet Dent. 2014 Sep;112(3):423-8.
Life-Changing Diastema Closure: Direct Composite Restorations with Minimal Intervention

Aikaterini Papathanasiou and Charilaos Asikis

In today's esthetics-conscious society, an unesthetic smile can cause many social, emotional, and psychological issues for an individual. Many patients do seek restorative treatment to improve their smile, choosing to maintain a cautious and conservative approach. This article describes the treatment of a patient with large diastema between his discolored maxillary anterior teeth. The treatment consisted of a combination of in-office and take-home tooth whitening, followed by direct composite resin restorations. This case demonstrated exceptional results with the most minimally invasive treatment approach.


Comparison of Marginal Adaptation Accuracy Using Different Impression Systems

Marwa Shembesh, Roya Zandparsa, Ala Ali, and Hans-Peter Weber

OBJECTIVES: The purpose of this in vitro study was to compare the marginal adaptation of 3-unit zirconia fixed dental prosthesis (FDPs) obtained from two different intraoral digital scanners (3M™ True Definition, and Cadent™ iTero), scanning of a silicone impression and the resulting master cast with an extraoral scanner (3Shape™ lab scanner).

METHODS: One reference model was fabricated from intact human mandibular left first premolar and first molar teeth (teeth #19 and #21), which were prepared for a three-unit all ceramic FDP. Impressions were obtained by using four impression systems (N=10); group 1 (Impression scan), group 2 (Stone cast scan), group 3 (Cadent iTero), and group 4 (Lava True Definition). Marginal adaptation of the zirconia FDPs was evaluated with the Deltronic Optical Comparator at four points on each abutment. The mean, standard deviation (SD) was reported for each group. One-way ANOVA was used to assess the statistical significance of the results with post-hoc tests conducted via the Tukey HSD. P-values less than 0.05 were considered statistically significant. All analyses were done with SPSS 22.0.

RESULTS: The mean (SD) marginal gaps from highest to lowest were as follows: group 1, 81.4 μm (6.8); group 3, 62.4 μm (5.0); group 2, 50.2 μm (6.1); and group 4, 26.6 μm (4.7). One-way ANOVA revealed significant differences (p<0.001) among the groups. The Tukey HSD tests demonstrated statistically significant differences between all groups (p<0.001).

CONCLUSIONS: Within the confines of this study, it can be concluded that the marginal gap of all impression techniques was within the acceptable clinical limit. Group 4 showed the lowest average gap among all groups followed by group 2, group 3, and group1; these differences were statistically significant.

Presented at the 2015 IADR General Session in Boston. Abstract #3847.
An In Vitro Comparison of Fracture Load of Zirconia Custom Abutments with Internal Connection and Different Angulations and Thicknesses: Part II

Roya Zandparsa and Abdalah Albosefi

PURPOSE: The purpose of part II of this in vitro study was to compare the fracture load of two-piece zirconia custom abutments with different thicknesses and angulations.

MATERIALS AND METHODS: Forty zirconia custom abutments were divided into four groups as follows: group A1, 0.7 mm thickness and 0° angulations; group A2, 0.7 mm thickness and 15° angulations; group B1, 1 mm thickness and 0° angulations; group B2, 1 mm thickness and 15° angulations. As in part I, in all groups, implant replicas were mounted in self-cure acrylic jigs to support the abutments. The zirconia custom abutments were engaged in the implant replicas using a manual torque wrench. All jigs were secured and mounted in a metallic vice and subjected to shear stress till failure using a universal testing machine with a 0.5 mm/min crosshead speed with the force transferred to the lingual surface of the zirconia custom abutments 2 mm below the incisal edge. The test specimens used in this study did not include a crown. The universal testing machine was controlled via a computer software system, which also completed the stress-strain diagram and recorded the breaking fracture load. The fracture loads were recorded for comparison among the groups and subjected to statistical analysis (two-way ANOVA and Kolmogorov-Smirnov).

RESULTS: The mean fracture load of zirconia custom abutments across the groups (A1 to B2) ranged from 432±97 N to 746±275 N. The angulated zirconia custom abutment exhibited the highest fracture load, which was statistically significant (p=0.045). The thickness of the zirconia custom abutment also had a positive influence on the strength of the specimens (p=0.005).

CONCLUSIONS: In this study, the 15° angulated zirconia custom abutments showed the highest fracture load of those investigated. The 1 mm thick zirconia custom abutments also exhibited significantly higher fracture load compared to 0.7 mm abutments.

CLINICAL IMPLICATIONS: The results of this in vitro study will help dental practitioners with their decision-making process in selecting the type of custom abutment to be used clinically.

Published in J Prosthodont. 2015 Apr 9. doi: 10.1111/jopr.12292. [Epub ahead of print]
Statistics Research

Cognitive Diagnostic Models and Computerized Adaptive Testing: Two New Item-Selection Methods That Incorporate Response Times

Matthew Finkelman, Wonsuk Kim, Alexander Weissman, and Robert Cook

A recent paper proposed an item-selection approach for computerized adaptive testing (CAT) in which the psychometric information per time unit is maximized. The current research extended this methodology to adaptive tests combined with use of a cognitive diagnostic model (CDM). Two new item-selection methods are introduced for the combination of CDMs and CAT: posterior-weighted Kullback-Leibler information per-time-unit, and mutual information per-time-unit. These methods were compared with standard procedures in which the amount of time required to complete an item is not considered. Simulation conditions with and without attribute-balancing constraints indicated that, on average, the new methods required more items but took less time than the standard procedures, while achieving comparable classification accuracy.

Published in Journal of Computerized Adaptive Testing, 2, 59-76.

Stochastic Curtailment in Adaptive Mastery Testing: Improving the Efficiency of Confidence Interval-Based Stopping Rules

Haskell Sie, Matthew Finkelman, Jay Bartroff, and Nathan Thompson

A well-known stopping rule in adaptive mastery testing is to terminate the assessment once the examinee’s ability confidence interval lies entirely above or below the cut-off score. This article proposes new procedures that seek to improve such a variable-length stopping rule by coupling it with curtailment and stochastic curtailment. Under the new procedures, test termination can occur earlier if the probability is high enough that the current classification decision remains the same should the test continue. Computation of this probability utilizes normality of an asymptotically equivalent version of the maximum likelihood ability estimate. In two simulation sets, the new procedures showed a substantial reduction in average test length while maintaining similar classification accuracy to the original method.

Published in Applied Psychological Measurement, 39, 278-292.

Utilizing Response Times in Computerized Classification Testing

Haskell Sie, Matthew Finkelman, Barth Riley, and Niels Smits

A well-known approach in computerized mastery testing is to combine the Sequential Probability Ratio Test (SPRT) stopping rule with item selection to maximize Fisher information at the mastery threshold. This article proposes a new approach in which a time limit is defined for the test and examinees’ response times are considered in both item selection and test termination. Item selection is performed by maximizing Fisher information per time unit, rather than Fisher information itself. The test is terminated once the SPRT makes
a classification decision, the time limit is exceeded, or there is no remaining item that has a high enough probability of being answered before the time limit. In a simulation study, the new procedure showed a substantial reduction in average testing time while slightly improving classification accuracy compared with the original method. In addition, the new procedure reduced the percentage of examinees who exceeded the time limit.

*Published in Applied Psychological Measurement, 39, 389-405.*
Tissue Engineering

Dental Epithelial-Mesenchymal 3D Cell Sheets for Tooth Regeneration

Nelson Monteiro, Elizabeth Smith, and Pamela Yelick

OBJECTIVES: Dental epithelial-mesenchymal (DE-DM) cell interactions provide critical functions in tooth development. Therefore, methods to promote proper DE-DM cell interactions for tooth regeneration have to be established. The objective of this work was to optimize and investigate the DE-DM interactions using 3D cell sheet technology. Parameters tested include: optimized cell seeding density; duration of in vitro culture; and methods to co-culture human DM (hDM) and porcine DE (pDE) cell sheets.

METHODS: pDE and hDM cells were each seeded on temperature-responsive tissue culture plates (UpCell, CellSeed, Tokyo, Japan) at various cell densities (0.02, 0.114, and 0.228 cell 10⁶/cm²) for 7, 14, and 21 days to obtain the cell sheets. pDE/hDM co-culture was established by first seeding hDM cells at density of 0.114 cell 10⁶/cm² and culturing for 4 days, followed by the addition of pDE cells at the same cell density, and continued culture for an additional 10 days. Layered cell sheet constructs were made by stacking the cell sheets. Histological evaluations of cell sheet constructs were performed with hematoxylin-eosin (H&E) staining and immunohistochemistry (IHC).

RESULTS: hDM cell sheets were obtained after 21, 14, and 11 days at cell density of 0.02, 0.114, and 0.228 cell 10⁶/cm², respectively. pDE cell sheets were obtained only using the higher cell seeding density after 14 days in culture. Thus, the optimal cell densities for the formation of the cell sheets was 0.114 cell 10⁶/cm² for hDM cells and 0.228 cell 10⁶/cm² for pDE cells. H&E and IHC showed organized structures of each cell type alone, co-cultured and multi-layered cell sheets.

CONCLUSIONS: This 3D dental cell sheet model can be used to study DE-DM cell interactions and for potential use in tooth regeneration strategies.

Presented at the 2015 IADR General Session in Boston. Abstract #1403.

Silk Fibroin, a Functional Substrate for iPS-derived RPE Cells

Sheldon Rowan, Benjamin Chan, Waseem Khan Raja, Chiara Ghezzi, Avi Smith, Allen Taylor, David Kaplan, Jonathan Garlick, and Behzad Gerami-Naini

OBJECTIVES: Age-related macular degeneration (AMD) is the major cause of human blindness in the United States, whose incidence continues to increase in a burgeoning aging population. AMD occurs when retinal-pigmented epithelial cells (RPE) and its juxtaposed membrane, Bruch's membrane (BrM) on which they reside, are compromised. Induced pluripotent stem cells (iPSCs) cells hold promise for personalized cell replacement therapy, as well as providing an opportunity to study the fundamental disease mechanisms of AMD. We propose to form a functional 3D human retinal tissue in vitro by placing RPE (derived from iPSCs) or ARPE19 human RPE cells on the silk fibroin.

METHODS: We employed silk membrane as a bio-mimetic BrM with different porosities coated with a variety of extracellular matrix (ECM) proteins including 1) collagen IV, 2) laminin, 3) Matrigel and 4) non-coated silk membranes to evaluate the potential of iPS derived-RPE cells and human ARPE-19 cells to attach and proliferate on silk fibroin. We ascertained the state of differentiation and polarity using a series of well-defined antibody markers. Apical and basal polarity was assed via expression of Ezrin and Bestrophin respectively. ZO1
staining was employed to assess tight junction and hexagonal cellular architecture. Differentiation was assessed via degree of pigmentation and RPE65 expression.

RESULTS: ARPE-19 cells were viable and proliferated well on silk fibroin, yet differentiated poorly. IPSC-derived RPE differentiated effectively in 2D-culture. However, markers of differentiation and polarity were improved by culturing the cells on silk fibroin plus ECM.

CONCLUSIONS: Our results suggest that silk fibroin is a suitable BrM biomimetic substrate for RPE cells and can be implemented for therapeutic transplantation in humans.

Presented at the 2015 IADR General Session in Boston. Abstract #1380.

Biomimetic Mineralized Tooth Constructs for Whole Tooth Bioengineering

Elizabeth Smith, Ali Khademhosseini, and Pamela Yelick

OBJECTIVES: Globally, over 158 million people are suffering from tooth loss. Dental implants are currently the most common therapy intended to replace the function of lost teeth. However, complications may occur due to patient response to synthetic dental materials. The ability to engineer biomimetic replacement teeth would be a highly desirable alternative therapy. Here we describe a biomimetic three-dimensional (3D) tooth model as a platform for the development of novel regenerative approaches for tooth replacement in humans. We have previously identified gelatin methacrylate (GelMA) hydrogel scaffold formulas that exhibit similar elastic moduli as natural dental tissues, and elicit optimized porcine dental epithelial (pDE) and porcine dental mesenchymal (pDM) cell morphology, metabolic activity and promote organized endothelial (HUVEC) structures in vitro. When implanted and grown subcutaneously, pDE/pDM/HUVEC constructs expressed dental cell differentiation markers and exhibited tooth and bone specific mineralization and vascularization. Our objective here is to further optimize our biomimetic 3D tooth model by defining cell-seeding densities for optimized pDE and pDM proliferation and differentiation.

METHODS: We will examine three cell-seeding densities (30,000 cells/µl, 60,000 cells/µl and 90,000 cells/µl). Replicate in vitro constructs will be prepared and grown for 1 and 14 days. Replicate samples will then be grown in vivo for 2 and 4 weeks. Histological, immunohistochemical, and radiographic analyses will be used to compare cellular organization, morphology, differentiation and biomineralization of both in vitro and in vivo constructs.

RESULTS: We expect that the higher cell seeding density will improve dental cell interactions and dentin and enamel formation in biomimetic tooth constructs.

CONCLUSIONS: The results from this study will further establish dental cell encapsulated 3D GelMA hydrogel constructs as biomimetic 3D models for functional tooth replacement in humans.

Presented at the 2015 IADR General Session in Boston. Abstract #1369.
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