51st Annual Student Presentations Showcase

March 26, 2021

Dalhousie University
Faculty of Dentistry
Welcome to the Faculty of Dentistry’s annual Research in Oral Health (RIOH) Student Presentations Showcase. This event brings together staff, students, faculty, alumni, and allied oral health professionals. Research is a cornerstone of a university and this showcase allows us to share and celebrate our students’ projects. This process is critical for a health profession in that it allows for the continual evolution of best practices and patient care.

Research improves health. The training required to complete their projects also prepares students for a career that requires continual learning and the ability to assess the literature critically.

The 2021 showcase has been adapted to meet the requirements of life during the pandemic. I’m proud to see that our committee has worked to find the best method of sharing our students’ outstanding projects. This is not how we would traditionally come together, but we are happy to welcome participants and judges who would not otherwise be able to attend.

I am pleased to acknowledge the generous support from our event sponsors. They play a key role the evening’s success. At the same time, our corporate partners gain access to new research and ideas, while providing our students with an excellent opportunity to connect with important members of the professional community.

I offer my congratulations to all the students for their hard work in developing, completing, and presenting their research projects. I am also grateful for the efforts of the faculty who provided our students with mentorship, and all the individuals who have worked behind the scenes to make this event a success.

Enjoy the evening, question the student presenters, and hopefully learn something new!
Sincerely, Dr. Ben Davis
Dean, Faculty of Dentistry
Welcome to Dalhousie Faculty of Dentistry’s Research in Oral Health Student Presentations Showcase! The recent name change reflects two important ways we can interact with research: the first is as a ‘research user’ – using critical analysis of the literature to inform our clinical practice. The second is as a ‘researcher’ who conducts primary research to answer a focused oral health question and disseminate those results to knowledge users and other researchers. The scientific evidence serves as one of the primary pillars of evidence-based practice.

This annual event has become an important tradition for the Faculty of Dentistry and the School of Dental Hygiene. Not only is it a time for students to present their work, but it is an opportunity for alumni to return to support the students and visit (virtually this year!) with friends and faculty from their ‘glory days’ at Dalhousie. It also provides a spotlight under which our students can share their interests with each other and the public. They have worked hard to prepare professional presentations on a variety of interesting topics with the support of faculty who have guided and mentored them through the process.

I want to say how proud we are of all the students. They will now carry forward the tradition and return (maybe next year) in a much more relaxed state to learn, laugh, and visit with friends and colleagues.
2021 marks a special year for the Faculty of Dentistry and School of Dental Hygiene independent student presentations. The Research in Oral Health Student Presentations Showcase comes to you in a new online format. Last year’s event was cancelled because of COVID-19, so we missed the opportunity to host a formal 50-year celebration of this tradition at Dalhousie.

Over the past 50 years, advances in care, diagnostics, and primary research have made oral health care topics ever more complex. At the same time, our ability to systematically review topics and questions through carefully designed review methodologies is enabling us to synthesize and assess increasingly vast quantities of information to determine the best available evidence.

The presentations you visit online showcase individual scholarship requirements for a multi-year Research in Oral Health Project that every dentistry and dental hygiene student has undertaken with the support and guidance of faculty members. The topics are wide-ranging, from dental biomaterials and disease etiology, to antimicrobial therapies and health promotion. We welcome members of the profession and the public to hear our students share new knowledge generated by primary research and the latest in evidence-based dentistry.
Faculty of Dentistry
Research in Oral Health
Student Presentations Showcase

March 26, 2021

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Sponsors
We would like to thank the following sponsors for graciously supporting this event:

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We also want to thank the following for their support:

Bruce N. Fergusson Memorial Prize
Cape Breton Island Dental Society
Dalhousie Dental Hygiene Society
Dalhousie Dental Student Society
Halifax County Dental Society
Dr. James P. Craft
## Dentistry Judges

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<table>
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<tr>
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<tbody>
<tr>
<td>Alia Abdul Majeed</td>
<td>Patty Greencorn</td>
<td>Matthew Nichols</td>
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<tr>
<td>Philip Amys</td>
<td>Sura Hadad</td>
<td>Jason Noel</td>
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<tr>
<td>Maureen Andrea</td>
<td>Nada Haidar</td>
<td>Ahmed Omran</td>
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<tr>
<td>Coralie Ayer</td>
<td>Richard Holden</td>
<td>Tyler Phelan</td>
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<tr>
<td>Safura Baharin</td>
<td>Thora Hunter</td>
<td>Codey Pilgrim</td>
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<tr>
<td>Crawford Bain</td>
<td>Paul Hurley</td>
<td>Adrian Power</td>
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<td>Ed Barrett</td>
<td>Richard Jackson</td>
<td>Richard Price</td>
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<tr>
<td>Abby Barton</td>
<td>Anil Joshi</td>
<td>Gilda Pronych</td>
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<td>Tom Boran</td>
<td>Donald Joyce</td>
<td>Shermin Rahimkhani</td>
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<td>Susan Bourque</td>
<td>Ramneek Khatter</td>
<td>Robyn Ramsay</td>
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<td>Trish Brady</td>
<td>Masoumah Khuraibet</td>
<td>Pat Redmond</td>
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<td>John Brittain</td>
<td>Elizabeth Logan</td>
<td>Sarah Richardson</td>
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<td>Charlotte Brown</td>
<td>Marla MacAulay</td>
<td>Michael Roda</td>
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<td>Barrie Brundige</td>
<td>Gary MacDonald</td>
<td>Samantha Roul</td>
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<td>Bill Brymer</td>
<td>Kevin MacDonald</td>
<td>Kelly Saxby</td>
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<td>Nicola Buckley</td>
<td>Bill Maclnnis</td>
<td>Terrence Shaw</td>
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<td>Joy Carmichael</td>
<td>Ian MacIntyre</td>
<td>Danial Shirvani</td>
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<td>Graham Cobb</td>
<td>Lex MacNeil</td>
<td>Vigneswary Somasekaram</td>
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<td>Helene Cormier</td>
<td>Paula Macsween</td>
<td>Tara Sutherland</td>
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<td>Natasha Cormier</td>
<td>Omer Mallhi</td>
<td>Greg Thistle</td>
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<td>Paul Downing</td>
<td>Alexandra Mann</td>
<td>Peter Walker</td>
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<td>Ian Doyle</td>
<td>Jo-Anne Matheson</td>
<td>Sherrie Wills</td>
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<td>Sachar Dvorkin</td>
<td>Patrick McCarthy</td>
<td>Justin Yeoh</td>
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<tr>
<td>Aisle El-Darahali</td>
<td>Karen McLean</td>
<td>Michelle Zwicker</td>
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<tr>
<td>Corey Felix</td>
<td>Justine Moe</td>
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<tr>
<td>Lyn Fitzpatrick</td>
<td>Michelle Moller</td>
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<tr>
<td>Sarah Foley</td>
<td>Philip Mwimanzi</td>
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</tbody>
</table>
Dental Hygiene Judges

Denise Babin
Heather Chabassol
Katie Daye
Natasha Dillman
Shana Ewart
Sarah Grant
Brooke Greenwood
Cheryl Irving
Sydney Nelson
Stephanie Sampson

Original research judges

Dr. Leigha Rock
Dr. JC Doucet
Dr. Mark Filiaggi
Dr. Pierre-Luc Michaud

The Faculty of Dentistry would like to sincerely thank our judges for their help with the Research in Oral Health Student Presentations Showcase
# Agenda

Please visit the website (here) for links to the virtual sessions.

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation*</th>
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<tbody>
<tr>
<td>4:00</td>
<td>Group 1: Dental Hygiene</td>
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<td>4:00</td>
<td>Group 2: Dental Hygiene</td>
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<td>4:00</td>
<td>Group 3: Practice, profession &amp; training</td>
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<td>4:00</td>
<td>Group 4: Original research - mixed topics</td>
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<tr>
<td>4:00</td>
<td>Group 5: Prosthodontics &amp; implant surgery</td>
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<td>4:00</td>
<td>Group 6: Restorations, local anesthesia &amp; cosmetic dentistry</td>
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<td>4:00</td>
<td>Group 7: Pediatric dentistry, orthodontics, and systemic health</td>
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<tr>
<td>4:00</td>
<td>Group 8: Periodontics, antimicrobial therapies &amp; TMD</td>
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<tr>
<td>4:00</td>
<td>Group 9: DDS4 Qualifying Program students - mixed topics</td>
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<tr>
<td>6:00</td>
<td>Intermission hosted by Dr. Ben Davis and Dr. Leigha Rock</td>
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<tr>
<td>6:30</td>
<td>Group 1: Dental Hygiene</td>
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<tr>
<td>6:30</td>
<td>Group 2: Dental Hygiene</td>
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<td>6:30</td>
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<tr>
<td>6:30</td>
<td>Group 9: DDS4 Qualifying Program students - mixed topics</td>
</tr>
<tr>
<td>9:00</td>
<td>Event conclusion. Winners will be announced on April 2.</td>
</tr>
</tbody>
</table>

* click the presentation title to be taken to the abstract
Dental Hygiene

Presentations

Second-year dental hygiene students select and research topics of their choice with the support of a faculty advisor.
# Dental hygiene presentations

## Group 1

<table>
<thead>
<tr>
<th>Team members</th>
<th>Presentation title</th>
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<tbody>
<tr>
<td>Erin Metzler, Meghan Nazer, Trisha Robicheau,</td>
<td>Beyond the snore: exploring the oral health implications in patients with sleep apnea</td>
</tr>
<tr>
<td>Georgia Stangeland</td>
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<tr>
<td>Advisors: K. Haslam and L. MacDonald</td>
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<tr>
<td>Erin Blackman, Jennifer Johnson, Anna Keating,</td>
<td>Behind the mask: oral manifestations of Covid-19</td>
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<tr>
<td>Cody Moore, Gabriel Ogando De Leon</td>
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<tr>
<td>Advisor: K. Haslam</td>
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<tr>
<td>Sarah Byrne, Cora Orovec, Flora Sandham, Susan</td>
<td>Pre-procedural rinses: rinsing away Covid-19</td>
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<td>Stairs</td>
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<tr>
<td>Advisors: D. Zwicker</td>
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<tr>
<td>Rebecca Bowering, Katelyn Charlton, Jennifer</td>
<td>Large waist, large pockets: the impact of obesity on periodontal disease</td>
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<tr>
<td>Plamondon, Marlow Whittier</td>
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<td>Advisors: H. Doucette</td>
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</tbody>
</table>
### Group 2

<table>
<thead>
<tr>
<th>Team members</th>
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<tr>
<td><strong>Mykayla Commandeur</strong>&lt;br&gt;Alyssa Fraser&lt;br&gt;Breanna Gabriel&lt;br&gt;Lauren Leedham</td>
<td><strong>Fear no more! Reducing dental anxiety in children</strong>&lt;br&gt;Advisor: A. Ward</td>
</tr>
<tr>
<td><strong>Bionca Jbeili</strong>&lt;br&gt;Yasmine Kasey&lt;br&gt;Hanna Rafuse&lt;br&gt;Kholud Saleh</td>
<td><strong>What is the perfect smile worth? Ethical violations of direct-to-consumer aligner therapy</strong>&lt;br&gt;Advisor: S. Hachey</td>
</tr>
<tr>
<td><strong>Caleigh Artur</strong>&lt;br&gt;Daphne Donahue&lt;br&gt;Eunice (Zihui) Liu&lt;br&gt;Emma Perry</td>
<td><strong>The piercing truth: the effects of cosmetic modifications on oral health</strong>&lt;br&gt;Advisor: A. Wade</td>
</tr>
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</table>
## Dentistry student presentations

### Group 3: Practice, profession & training

<table>
<thead>
<tr>
<th>Student</th>
<th>Title</th>
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<tbody>
<tr>
<td>Kimberley Fairman</td>
<td>Knowledge, attitudes, and management practices for individuals with dysphagia: A survey of oral health professionals (<em>original research</em>)</td>
<td>20</td>
</tr>
<tr>
<td>Hannah Gillam</td>
<td>Informing oral health providers about the health implications of Lyme disease in a geographic high-risk region</td>
<td>21</td>
</tr>
<tr>
<td>Alec Grabinski</td>
<td>Defining a safe space: Transitioning the dental profession to a more inclusive space for transgender and non-binary patients</td>
<td>22</td>
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<tr>
<td>Joy Ifesanya</td>
<td>Exploring personnel awareness of interdisciplinary cleft lip and palate management opportunities in a resource limited health facility (<em>original research</em>)</td>
<td>23</td>
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<tr>
<td>Evan Mercer</td>
<td>Intraoral scanners: Use among dentists in Atlantic Canada and integration into dental school curriculums (<em>original research</em>)</td>
<td>24</td>
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<tr>
<td>Cody Muise</td>
<td>Comparison of dental health care professionals' risks, preparedness, and expectations before and after the COVID-19 phased return to work (<em>original research</em>)</td>
<td>25</td>
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<tr>
<td>Victoria Parsons</td>
<td>Oral cancer screening: An updated literature review on breaking the time barrier</td>
<td>26</td>
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<tr>
<td>Warren Robison</td>
<td>Strengthening research in oral health (RIOH): Findings of a survey exploring the table clinic experience of Dalhousie graduates in dentistry and dental hygiene (<em>original research</em>)</td>
<td>27</td>
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</table>
# Group 4: Original research - mixed topics

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<tr>
<th>Student</th>
<th>Title</th>
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<tbody>
<tr>
<td>Susan Cole</td>
<td>An examination of the oral health status and needs of new immigrants and refugees to Nova Scotia <em>(original research)</em></td>
<td>28</td>
</tr>
<tr>
<td>Scott Kennedy</td>
<td>In Atlantic Canada, do dentists practicing in corporately-owned compared to privately-owned clinics experience differences in career satisfaction? <em>(original research)</em></td>
<td>29</td>
</tr>
<tr>
<td>Hannah MacDonald</td>
<td>Exploring the role of pharmacists in supporting oral health in Nova Scotia <em>(original research)</em></td>
<td>30</td>
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<tr>
<td>Kathryn O’Donnell</td>
<td>Exploring social media to better understand parents’ experiences managing teething pain <em>(original research)</em></td>
<td>31</td>
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<tr>
<td>Catherine O’Neill</td>
<td>Novel bioactive glass for use as a caries arresting agent <em>(original research)</em></td>
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<tr>
<td>Erin Steeves</td>
<td>An investigation into the knowledge, training and confidence of emergency physicians in managing dental emergencies in the Atlantic Provinces <em>(original research)</em></td>
<td>33</td>
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<tr>
<td>Andra Sterea</td>
<td>Determining the relationship between hard and soft tissues using multiple imaging modalities <em>(original research)</em></td>
<td>34</td>
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<tr>
<td>Jubal Stewart</td>
<td>Reproducible method for facial volume analysis using 3D photographs <em>(original research)</em></td>
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</tr>
<tr>
<td>Student</td>
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<tr>
<td>Salman Alajmi</td>
<td>Conventional versus digital impressions in single implant crowns</td>
<td>36</td>
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<tr>
<td>James D’Amico</td>
<td>Dental implants and the effect of loading protocol on survival rate: A literature review</td>
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<tr>
<td>Mihir Desai</td>
<td>Symphyseal vs ramus autogenous augmentation of the alveolar ridge</td>
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<tr>
<td>Ryan Kent</td>
<td>Impressions: Digital or conventional? A literature review on the accuracy of digital impressions in the field of prosthodontics when compared to conventional impressions</td>
<td>39</td>
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<tr>
<td>Matthew MacNeil</td>
<td>Effect of virtual cement space on marginal and internal fit of all-ceramic crowns</td>
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<tr>
<td>Negar Mir Sharifi</td>
<td>Cement film thickness, a scoping review</td>
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<tr>
<td>Krupa Shah</td>
<td>Success rates of one-piece implants vs two-piece implants</td>
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<tr>
<td>Stephen Tischler</td>
<td>Materials and methods in bone grafting for dental implants: A systematic review for best treatment options</td>
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## Group 6: Restorations, local anesthesia & cosmetic dentistry

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<tr>
<td>Jarrah Alshammari</td>
<td>Resin infiltration: A literature review on the effects of resin infiltration on white spot lesions</td>
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<tr>
<td>Vinny Andrea</td>
<td>Bulk-fill flowable as an alternative to conventional composite restorations: A review</td>
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<tr>
<td>Kayla MacPherson</td>
<td>Mewing: Can it replace braces?</td>
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<tr>
<td>Todd Myette</td>
<td>Is CCLAD beneficial? Literature review comparing pain from computer-controlled anesthetic delivery to traditional technique</td>
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<tr>
<td>Ian Palmeter</td>
<td>Bleaching sensitivity: Clinical approaches for mitigation</td>
<td>48</td>
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<tr>
<td>Zaid Taher</td>
<td>Literature review of the available intraosseous anesthesia delivery systems</td>
<td>49</td>
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<tr>
<td>Thien Tran</td>
<td>Local anesthesia reversal: OraVerse reduces soft tissue anesthesia after dental procedure</td>
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Group 7: Pediatric dentistry, orthodontics, and systemic health

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<th>Student</th>
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<tbody>
<tr>
<td>Kiran Baljeet Singh</td>
<td>Surgery-first orthognathic surgery</td>
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<tr>
<td>Allanah Conrad</td>
<td>The incidence and characteristics of dental pain in children presenting for new patient examinations in the IWK Dental Department</td>
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<tr>
<td>Rebecca Marr</td>
<td>The importance of early treatment for patients with dentinogenesis imperfecta type II</td>
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<tr>
<td>Cassidy Merrill</td>
<td>Understanding behavioral support techniques for the management of dental anxiety in pediatric dentistry</td>
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<tr>
<td>John Park</td>
<td>Systemic and oral manifestation of e-cigarettes</td>
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<tr>
<td>Gavin Raddall</td>
<td>Safety and efficacy of conscious sedation modalities in the paediatric dental patient</td>
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<tr>
<td>Amy Young</td>
<td>Time delay in treating traumatic permanent tooth injuries in children in Nova Scotia</td>
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<tr>
<td>Claire Boileau</td>
<td>The clinical uses of ozone in periodontal therapy: A literature review</td>
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<tr>
<td>Ricardo Cisneros</td>
<td>Evaluation of antimicrobial effect of garlic extract (allicin, ajoene, vinylsulfide, dialyll sulfide) on s. mutans</td>
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<tr>
<td>Lloyd Hicks</td>
<td>Risk factors contributing to bruxism etiology: A systematic literature review from 2017-2020</td>
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<tr>
<td>Nathan Pirino</td>
<td>Low dose naltrexone: A proposed novel therapy/treatment for oral autoimmune disorders</td>
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<tr>
<td>Ramtin Rezaei</td>
<td>Lactobacillus probiotic therapy in patients with periodontitis</td>
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<tr>
<td>Corey Riemersma</td>
<td>Botox and oral appliances on temporomandibular joint pain: A literature review</td>
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<tr>
<td>Parker Tripp</td>
<td>Defining oral probiotics and current oral probiotic therapies</td>
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## Group 9: DDS4 Qualifying Program students - mixed topics

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<tr>
<td>Wajiha Aziz</td>
<td>Intraosseous Anesthesia Provides More Reliable and Profound Anesthesia as Compared to Inferior Alveolar Nerve Block in Teeth with Irreversible Pulpitis</td>
<td>65</td>
</tr>
<tr>
<td>Maninder Goel</td>
<td>When shall we call a patient's physician? Oral lesions that need immediate attention of dentist and physician.</td>
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<tr>
<td>Harkamal Kaur</td>
<td>Benefits and Challenges of &quot;real time video recording&quot; of clinical oral health procedures</td>
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</tr>
<tr>
<td>Sara Kaur</td>
<td>Enamel Biomimetics; Paradigm shift in caries management</td>
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<tr>
<td>Scott Kennedy</td>
<td>In Atlantic Canada, do dentists practicing in corporately-owned compared to privately-owned clinics experience differences in career satisfaction? <em>(original research)</em></td>
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<tr>
<td>Ravneet Othee</td>
<td>The future of dental amalgam and myths related to it</td>
<td>69</td>
</tr>
<tr>
<td>Siri Putchala</td>
<td>Effect of 2% Chlorhexidine on bond strength of composite resin to dentin</td>
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Dentistry Student

Abstracts
Knowledge, attitudes, and management practices for individuals with dysphagia: A survey of oral health professionals

Kimberley Fairman  Advisors: Drs. Cynthia Andrews and Rebecca Affoo

Dysphagia occurs when a person is no longer able to safely or efficiently transport saliva, food and fluid from the mouth to the stomach while simultaneously protecting the upper respiratory tract from aspiration of the material being swallowed. Dysphagia is not a condition in and of itself, but rather a symptom. There are a multitude of diseases and conditions that cause dysphagia. It can be attributed to developmental disabilities, genetic syndromes, neuromuscular conditions, structural abnormalities, advanced age, cancer and its treatment, neurodegenerative diseases, neurological disorders, respiratory diseases and more.

Dysphagia is a vastly underreported condition not widely understood by the general public, affecting as many as 15 million Americans. It is estimated 1 million Americans are diagnosed, and that 60,000 die annually from complications associated with dysphagia. One in 17 people will develop some form of dysphagia in their lifetime, therefore increasing oral health professionals’ knowledge and management strategies are paramount to mitigating preventable negative sequelae from happening.

Using an anonymous online survey, this pilot research study investigated Nova Scotia dentists’ and dental hygienists’ knowledge, attitudes, and management practices of individuals with dysphagia with the aim of improving care for this population of individuals. Results of the survey will be discussed.
Informing oral health providers about the health implications of Lyme disease in a geographic high risk region

Hannah Gillam

Advisor: Dr. Claire Champoux

Lyme disease (LD) is an infectious disease caused by Borrelia burgdorferi and is spread by ticks. The blacklegged tick is the only species in the southeastern and southcentral regions of Canada that can spread LD. LD manifests early as an erythema migrans rash with flu-like symptoms, but can develop into a multi-organ infection with significant and severe effects. History and clinical manifestations are important indictors if further testing is necessary to diagnose LD. Laboratory testing involves a two-tiered approach with an initial enzyme immunoassay test and a subsequent confirmatory immunoblot test. Treatment for localized LD involves antibiotic therapy with extra guidelines depending on the stage and organ system affected. There is currently no vaccine against LD and the best protection is from tick bites themselves. The entire province of Nova Scotia is considered a risk area for LD. In 2016, Nova Scotia had 12.7 times the national average of LD cases. Because of the growing prevalence of LD in Nova Scotia, along with potential implications for treatment and diagnosis, there is an increased importance for oral care providers in this region to be educated on LD. This presentation will outline key background information regarding LD along with recommendations for care for oral care providers. A review of information on LD and prevalence within Nova Scotia was performed and recommendations for care were created. Considerations for care will include recognizing signs and symptoms, especially in the orofacial region, knowing when to refer, and adaptations to care to accommodate patients suffering from LD.
Defining a safe space: Transitioning the dental profession to a more inclusive space for transgender and non-binary patients

Alec Grabinski  Advisor: Dr. Frances Tompkins

The 2SLGBTQIA+ community has faced discrimination both in society and in healthcare. Providers can fail to meet the healthcare needs of this population due to a lack of proper education and understanding. By focusing on their needs and expectations, an increase in knowledge and visibility of the transgender and non-binary patient population can create a safe and affirming healthcare system that will decrease health disparities, including the risk of poor oral hygiene.

The purpose of this study is to provide introductory information about transgender and non-binary people and to define qualities of a safe space to strengthen the Dalhousie Faculty of Dentistry as an inclusive space for all patients. Using data collected from this literature review will help create future recommendations and resources that enhance dental practices and ultimately create a safe space for this population.

Both web-based grey literature and databases including GoogleScholar, PubMed and PsycINFO were searched to identify disparities seen in healthcare towards the 2SLGBTQIA+ community. Literature regarding barriers to care, gender studies, safe space, and transgender and non-binary care were used to define best practices to meet the healthcare needs of these populations. Appropriate terminology was compiled into a glossary for ease of reference when reviewing this study.

A safe space can be defined as an environment in which a person or group of people can feel confident that they will not be exposed to discrimination, harassment, or physical or emotional harm. Oral health practitioners, organizations, and education systems are needed to achieve this. Making minor modifications to health forms, using proper terminology and pronouns, as well as a change in clinic and web design are some ways to improve patient experience and reduce anxiety towards gender identity to improve the quality of care for transgender and non-binary individuals.
Exploring personnel awareness of interdisciplinary cleft lip and palate management opportunities in a resource limited health facility

Joy Ifesanya  Advisor: Dr. Mary McNally

Introduction and objectives: Holistic cleft care requires a multi-disciplinary/specialty team. Irrespective of the management modalities, local personnel development remains the bedrock of equitable care in low/medium income countries (LMICs). In collaboration with a physician/administrator, this study explored awareness of local resources and personnel set up amongst physicians and dentists and identified gaps in personnel experiences with cleft management in a large teaching hospital in West Africa.

Methods: One-hundred and fifty physicians and dentists were invited by e-mail to complete a self-administered electronic survey (Opinio) to explore their awareness of shared cleft care services and training opportunities. Data was analysed using the Statistical Package for Social Sciences (IBM SPSS version 26). Ethics approval was obtained from the host institutional Ethical Review Committee.

Result: The survey had a response rate of 60%. The level of awareness about the presence of the surgical specialties was high while that for non-surgical cleft specialties were poorer. Irrespective of the level of awareness, there was no significant variation whether the respondents were core cleft caregivers or not (P>0.05). There was little awareness of mechanisms for referrals to services for cleft patients outside the institution. However, 61 (75.3%) respondents were aware that there is a standard operating protocol for cleft management. Only four (4.9%) respondents had ever attended a cleft specific training program and the most important mitigating reason for non-enrollment was lack of awareness of available training programs.

Conclusion: Advocacy, education and enlightenment is needed so that team members fully understand the value of non-surgical cleft management as well as improve clinical experience of trainees with regards to cleft care in this LMIC. A key output of this project is a detailed report which will be shared with the host institution.
Intraoral scanners: Use among dentists in Atlantic Canada and integration into dental school curriculums

Evan Mercer

Advisor: Dr. Thomas Steeves

Background: Intraoral scanners (IOS) are becoming more common in dental practices and are continuously evolving to provide a variety of accurate and reliable functions in nearly every field of dentistry. The purpose of this project is to obtain information on the prevalence and use of IOS among dentists in Atlantic Canada and to explore if there is a place for IOS within the curriculum of dental schools.

Methods: A survey was developed and sent electronically to licensed dentists in Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador by their respective dental associations and societies (n=1126). Additionally, a review of the literature was done using relevant query terms and searching electronic databases including PubMed, Cochrane Library, Google Scholar, Scopus, Web of Science, and Dentistry & Oral Sciences Source of Dalhousie University.

Results: A total of 152 responses were collected. Of the respondents, 52% reported using an IOS, 91% thought that IOS teaching should be integrated into dental school curricula, and 99% thought that, in addition to IOS teaching, dental schools should continue to teach conventional impression techniques.

Conclusions: Based on the data collected in the survey, only half of the dentists in Atlantic Canada use an IOS in their practice, however, almost everyone agrees that students should be learning about them while in dental school. Furthermore, it is imperative that IOS use and instruction be complementary to conventional impressions techniques.
Comparison of dental health care professionals' risks, preparedness, and expectations before and after the COVID-19 phased return to work

Cody Muise

Advisor: Dr. Ferne Kraglund

SARS-CoV-2 (COVID-19) is a global pandemic that began to spread in the human population in December 2019 (Dost et al., 2020). In March 2020, dental clinics across Nova Scotia shut down and moved into a phased return to work, which was developed by the four oral health regulatory bodies. The present study contains two surveys that gauge the oral health care providers’ risks, preparedness, and expectations both before (beginning of phase 2) and after (during phase 3) the COVID-19 phased return to work phases. A five-point Likert scale was used for both surveys (e.g., strongly agree, agree, neither agree or disagree, disagree, or strongly disagree). Results from this study show that the majority of dental health care professionals (dentists, registered dental hygienists, and registered dental assistants) believed that before they returned to work, they would be at an increased risk for COVID-19 (75.37% SA/A) and since returning they are still at an elevated risk (73.16% SA/A). It was also found that a larger percentage of dentists, as compared to dental assistants and dental hygienists, either strongly disagreed or disagreed that they would be at an elevated risk while at their place of work. Overall, the oral health care professionals felt that they were adequately prepared and had thorough knowledge about infection control protocols, site specific opening plans, screening protocols, signs and symptoms of COVID-19, and felt that they had the skills and knowledge needed to effectively treat patients during the COVID-19 pandemic. From the collected data, there is an indication that the communication between the four oral health regulatory bodies allowed for a smooth transition back into the dental work environment, with few discrepancies between the protocols and guidelines put in place by each regulator. This allowed for more unified return to practice across all oral health professions.

Keywords: COVID-19, dentists, registered dental hygienists, registered dental assistants, phase, risk, preparedness
Oral cancer screening: An updated literature review on breaking the time barrier

Victoria Parsons

Advisor: Prof. Kim Haslam

Background: The Canadian Cancer Society in 2020 estimated that 5,500 Canadians were diagnosed, and approximately 1,500 of those individuals will die from oral cancer. In order to reduce the morbidity of oral cancer, early diagnosis is critical. Dental professionals are in the unique position of seeing patients regularly for oral examinations. Unfortunately, research has indicated that time is a major barrier to performing comprehensive oral cancer screenings in practice.

Purpose: 1) Determine if there are abbreviated, but thorough, examinations that can be performed to examine the most common risk areas for oral cancer; 2) Assess the accuracy and efficacy of these abbreviated examinations in identifying oral cancer lesions; 3) To recommend an oral cancer screening that is abbreviated and examines the most common risk areas for oral cancer.

Methods: A literature search was conducted to identify abbreviated oral cancer screening examinations.

Results: The Six-Step Screening was shown to cover the most common risk areas of oral cancer. As it does not include supplementary steps, this exam would require less time to complete.

Conclusions: This research was able to provide insight into the time barrier that has been reported by dental professionals. Dentists may be more inclined to implement a shorter examination, such as the Six-Step Screening, as it accommodates the time pressures, yet focuses on the most common sites for oral cancer. Adoption of an abbreviated oral cancer screening exam could benefit dental practice and potentially save lives. However, more research is required to assess the Six-Step Screening for accuracy and efficacy.

Keywords: Oral cancer screening, extraoral examination, intraoral examination, head and neck neoplasms, dental professional
Strengthening research in oral health (RIOH): Findings of a survey exploring the table clinic experience of Dalhousie graduates in dentistry and dental hygiene

Warren Robison

Advisor: Dr. Mary McNally

For some, doing research can be ominous and uncertain. I have heard from time to time in the halls of the Dentistry Building, in tones of frustration, “Why do we need to do research to become a good clinician!?” Having had the opportunity to attend the Table Clinics event on the day I interviewed for dental school at Dalhousie and since that time I have wondered if research in one area or another influenced the direction, or at least confidence level, of clinicians about the area of research that they did for their Table Clinic project. For example, if someone researched implants, did they have more confidence regarding the use of implants in their practice farther down the road.

The intent, therefore, of my research is to find out whether the “learning about how to do research” through Table Clinics projects and learning about evidence-based dentistry (EBD) has influenced the practice of future clinicians. I did this by sending a focused survey to all Dalhousie Faculty of Dentistry alumni, both DDS and DH, to explore their experiences relating both their understanding of EBD and their Table Clinic topic to later practice.

The results of the survey indicated that, for both DDS and DH, the learning and/or skills they gained by doing a Table Clinic project was beneficial. The in-depth knowledge gained benefitted them both as a student and as a clinician. Learning about the research process specifically did not provide quite as much benefit to them as a clinician, though still providing benefit. Participants overwhelmingly responded that understanding the principles of EBD has provided a benefit in responding to clinical questions, and that the learning of scholarship skills, such as searching and analyzing papers, should be included as part of a dental education.
An examination of the oral health status and needs of new immigrants and refugees to Nova Scotia

Susan Cole  Advisor: Prof. Heather Doucette

Background: There are limited studies on the oral health status and needs of new refugees to Canada despite this vulnerable population facing many barriers to receiving oral care. The purpose of this study was to determine the oral health status of recent refugees to Nova Scotia.

Methods: The study (REB #2018-4444) consisted of a questionnaire and clinical oral examination (n=181). The questionnaire, administered by a trained interpreter in the preferred language of the client, included demographics, oral hygiene self-care practices, self-reported health (oral and general) and professional health care (oral and general) utilization. The clinical examination included validated indices assessing gingival and periodontal health, in addition to decayed, missing and filled teeth. One sample Chi-square test and one sample t-tests were used to compare the clinical data to national data derived from the 2007-2009 Canadian Health Measures Survey. A comparison of clinical indices between subpopulations based on region of origin (Africa, Asia and the Middle East) was performed using the Kruskal-Wallis H and Mann-Whitney U test with the Bonferroni correction.

Results: More than one third (38.1%) of participants reported experiencing a toothache, compared to only 12.2% of Canadians. Probing depths of 4 mm or more were seen in 95.1% of participants compared to 20.1% of Canadians. Debris and inflammation scores were moderate to severe compared to mild for Canadians. Participants had significantly more decayed and missing teeth than Canadians, but fewer filled teeth. Participants from Africa had significantly more decayed teeth than those from the Middle East, while participants from the Middle East had significantly more missing and filled teeth than participants from Africa.

Conclusion: When compared to the average Canadian population, new refugees to Nova Scotia have poorer oral health as indicated by oral clinical indices with significant differences in the clinical indices between regions of origin.
In Atlantic Canada, do dentists practicing in corporately-owned compared to privately-owned clinics experience differences in career satisfaction?

Scott Kennedy  Advisor: Dr. Chris Lee and Dr. Ian MacAskill

Aim: Corporate dentistry is an emerging and vastly expanding concept to dentists throughout the world. The footprint of corporate dentistry within Atlantic Canada is becoming larger as well. This project aimed to investigate if dentists within the Atlantic provinces, whether they be corporately employed/contracted or independent private practitioners, experience a difference in career satisfaction. The goal was to be able to educate newly graduated dentists on this topic so that they can make an informed choice on which pathway they should choose (corporate or private).

Method: A survey was formulated to explore career satisfaction including facets such as autonomy, compensation and time. The survey was sent out to all 4 of the Atlantic provinces’ dental societies (New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland) with the request to distribute the survey to their members. Career satisfaction was scored within a range from 14 (lowest) to 70 (highest).

Results: After leaving the survey open for approximately 1 month 114 responses were collected and scored. The response rate was disappointing and not representative of Atlantic Canada (114 responses were collected in total). Nova Scotia accounted for 79% of responses. A total of 24/114 (21%) were received from New Brunswick, Prince Edward Island and Newfoundland collectively. Only 15.7% of the responses were from dentists within a corporate practice. The career satisfaction scores of responses collected ranged from 27 to 64. Average scores for both corporate dentists (43), and private practice dentists (48) were within 10% of the mid-range score (42) for career satisfaction.

Conclusion: Low response rate and under-representation of corporate dentists prevent reporting of significant findings. More research and greater participation are required to provide both representative and valid results. Taken as a preliminary finding, this project suggests that both corporate and private practice dentists experience similar career-satisfaction.
Exploring the role of pharmacists in supporting oral health in Nova Scotia

Hannah MacDonald  
Advisor: Dr. Ferne Kraglund

The scope of practice for community pharmacists has been evolving from the traditional role of dispensing medications to having a more profound involvement in the public health care system. Pharmacists, arguably being the most accessible health care providers, are in a unique position to provide oral health advice to patients with limited access to regular dental care. There is untapped potential for pharmacists to act as reliable oral health educators to improve the overall health of the community. The purpose of this study was to determine the most common dental problems and dental related questions that present to community pharmacies in Nova Scotia, as well as to assess the attitude, motivation, and perceived knowledge possessed by pharmacists on the provision of oral health advice. The study also evaluated the current level of pharmacist to dentist interaction and gauged pharmacists’ interest in receiving additional training on oral conditions. An anonymous survey using Opinio was distributed electronically via the Pharmacy Association of Nova Scotia (PANS). Of the 40 responses obtained from licensed pharmacists, toothache and dry mouth were the most common chief complaints. Although the majority of pharmacists reported feeling confident counselling patients on these matters, over 50% said they never consult with dentists regarding a patient’s dental concerns. The majority of pharmacists agreed that oral health promotion is an important part of a pharmacist’s role and that there should be more education on oral health implemented in the pharmacy curriculum. Over 90% of pharmacists expressed interest in receiving future education on oral health. The results of this study support the idea that curriculum development and further interprofessional collaboration could be an effective public health strategy aimed at lessening the burden of dental disease, particularly among low socioeconomic groups.
Exploring social media to better understand parents’ experiences managing teething pain

Kathryn O’Donnell

Advisor: Dr. Mary McNally

Background and purpose: Teething is a natural physiologic process that is associated with a variety of signs and symptoms. Many teething pain management methods exist, however, there is a lack of research investigating what methods have been adopted for use by parents, and which of these methods are evidence-based. The aim of the study was to use social media to gain a better understanding of parents’ experiences managing teething pain, and to determine which management techniques are supported by research.

This study involved two approaches: 1. In partnership with a Canadian digital publisher, YummyMummyClub.ca (YMC), a social media campaign, #ItDoesntHavetoHurt, was created as a way to translate scientific knowledge about pain management to parents. As part of the campaign, 9 Facebook polls were shared through the YMC Facebook page, one of which asked, “What do you do when you think your baby has teething pain?”. The poll received 164 responses that were analyzed using a descriptive thematic analysis. Over 20 different teething pain management techniques were identified. The most commonly mentioned methods were: 1) frozen/chilled teething toys and washcloths; 2) over-the-counter oral analgesics; 3) frozen fruits/veggies; 4) oral anesthetic gels; 5) teething necklaces. 2. A literature and web-based search for best evidence was undertaken to determine if the most commonly used pain management techniques are supported by research. The findings suggest a clear lack of research in the area of teething pain management. Several evidence-informed clinical practice guidelines suggest that chilled teething toys, wet washcloths, and over-the-counter oral analgesics are appropriate management methods. There is evidence that oral anesthetic gels and teething necklaces are unsafe and should not be used to manage teething pain.

Conclusion: Teething pain management is an area that requires further research. Science-media partnerships are valuable for translating evidence-based information to parents, healthcare professionals and future researchers.
Silver diamine fluoride is used to treat dental caries by utilizing the antimicrobial properties of silver in addition to the remineralization properties of fluoride on demineralized enamel. The silver payload is released immediately upon use and requires follow-up applications, whereas prolonged release of silver ions over time from bioactive glasses containing <1 mol% silver has been shown. Borate glasses are desirable due to remaining fully degradable at low mol%, which may be beneficial for incorporating higher levels of silver within a glass network. The objective of the study was to establish the feasibility of borate-based glasses containing silver and fluoride ions, and subsequently, quantifying glass degradation rate and concentration of silver and fluoride ions released in an aqueous environment over time. Glasses were fabricated by a melt quenching technique at 1200 oC and ground to <25 mm particles for analysis. Glasses were agitated in HEPES buffer at 37 oC for various times (5min, 30min, 1h, 3h, 12h, 24h, and 48h) then centrifuged to pour off the supernatant. The supernatant was used to determine silver ion concentrations using ICP-OES and fluoride ion concentrations using a fluoride ion-selective electrode. The remaining solid was dried in an oven at 50 oC for two days to gravimetrically determine %mass loss. Borate-based glasses were successfully fabricated and degraded to release silver and fluoride ions over time. The concentration of silver ions released after 5 min was higher than the minimum inhibitory and minimum bactericidal concentrations for Streptococcus mutans, and the concentration of fluoride ions released was found to be much lower than amounts found in conventional toothpastes. Overall, these glasses could be used to arrest carious lesions and remineralize areas of demineralization with the release of silver and fluoride ions over time.
Dental emergencies frequently present to the emergency departments (ED) in hospitals. The over utilization of ED services for dental concerns and the reported lack of confidence and education of ED physicians on the management of dental emergencies in previous studies marks a potential opportunity for education of our Atlantic province medical colleagues. The objectives of this research were to determine the knowledge, education, and confidence of Atlantic province ED physicians in the treatment and management of dental emergencies, and to assess the need for further education surrounding the management of dental trauma. A 21-question survey was developed through Opinio and distributed electronically to contacts from respective provincial medical associations. Most respondents reported that patients present to the ED with dental emergencies on a weekly basis (78%). Most respondents reported that they were somewhat confident (51%) and very confident (7%) in managing dental emergencies. We found a significant positive correlation between years and practice and confidence level in managing dental emergencies. Urban and rural ED physicians reported similar level of access to general dentists (38% and 30% respectively), however urban ED physicians reported greater access to pediatric dental specialists (43%) and oral and maxillofacial surgeons (81%) than rural practising colleagues (4% and 30% respectively). The majority of ED physicians (85%) agreed that it was important to receive training on the management of dental emergencies and reported that education on managing dental emergencies during residency (37%) and access to a dental trauma decision-making pathway (30%) would be of most value. Our study demonstrates the need for further education of ED physicians in the Atlantic provinces on the management of dental trauma and the implementation of dental trauma decision-making pathways in order to enhance patient outcomes. Our results also demonstrate the importance for dentists to provide improved after hour care for dental emergencies.
Determining the relationship between hard and soft tissues using multiple imaging modalities

Andra Sterea

Orthognathic surgery encompasses various techniques used for the treatment of dentofacial deformities, such as malocclusions as well as sleep apnea, TMJ disorders and others. While the primary objective of orthognathic surgery is the improvement of function, enhancement of facial esthetics is often a desirable secondary outcome. However, as is the case with any surgical procedure, tissue manipulation can result in unpredictable and sometimes unfavourable outcomes; thus, it is important to understand the relationship between hard and soft tissues to ensure the accuracy of the surgical plan as well as increasing the predictability of the outcome. In the era of modern technology and personalized medicine, the use of predictive models represents an important aspect of treatment planning as well as patient reassurance and peace of mind when preparing for surgery. The surgeon’s ability to accurately plan and predict the surgical outcome serves as a guide for better care and patient satisfaction and should ultimately become the standard of care. Coupling the use of CBCTs and 3D photographs with digital software analyzing programs has made it possible for surgeons to better predict the surgical outcome. Therefore, the purpose of this study is to determine the correlation between soft and hard tissue movements post-orthognathic surgery using various imaging modalities. Patients enrolled in the study were selected based on inclusion criteria and pre-operative records were used to plan the surgical procedure. The data was then analyzed using the Dolphin Imaging software and several statistical tests were used to determine the significance of the results. By establishing a predictable relationship between the hard and soft tissue movements post-operatively, this study offers another tool that can be used to predict the esthetic and functional outcome of orthognathic surgery patients.
Reproducible method for facial volume analysis using 3D photographs

Jubal Stewart

Advisor: Dr. JC Doucet

Background: Facial volume changes represent important aspects of orthognathic surgery recovery, such as swelling, and are frequently evaluated by a variety of methods. Facial swelling is a significant sequela of orthognathic surgery. Being able to accurately assess the degree of swelling in patients will give us insight into understanding the current state of facial swelling and, almost as importantly, the efficacy of our swelling treatment modalities, including corticosteroids. A variety of methods such as ultrasound, soft tissue references, bony landmarks in the axial plane using CT scans, and magnetic MRI scans have been used to assess facial swelling. CTs and MRIs, although accurate are also cost intensive, have a large radiation burden (CTs) or are time consuming and have a number of relative contraindications (MRIs). Other methods, such as 3D photographs, have come as a popular alternative with no undesirable radiation burden, a rapid acquisition time, and highly reproducible images.

Materials and methods: A double-blinded RCT was carried out and the data were captured and analyzed via the 3dMD system with its associated software analysis was selected for this study. An OMFS resident and a dental student carried out the volume analysis described herein and their results were compared against each other to assess the reproducibility of the method. Each patient had two 3D photos analyzed at two separate timepoints and the difference was determined.

Results: In total, 30 patients were randomly selected for inter- and intrarater reliability testing. For interrater calculations, the mean difference between measurements was 2.05 +/- 6.00 cm3. The ICC for interrater reliability was excellent being 0.93 (95% confidence interval (CI) = 0.86 to 0.97). For intrarater calculations, the mean difference between measurements was 0.81 +/- 6.68 cm3 and the ICC was excellent at 0.95 (95% CI= 0.90 to 0.98).
Conventional versus digital impressions in single implant crowns

Salman Alajmi

Advisor: Dr. Mohamed Gebril

Background: Advanced technology has revolutionized the field of dentistry, especially in the prosthodontics department, to digitize diagnosis and treatment. The most critical step in the process of fabricating an accurate implant crown is the accurate capture of the impression of the dental implant which is known as final impression. The use of intraoral scanners (IOSs) is more common now as they are evolving in their satisfactory features.

Objective: The purpose of this study was to review the available literature regarding the digital impressions used for single implant restorations via intraoral scanners.

Methods and findings: A literature review was conducted via PubMed database that resulted in 9 studies. Studies published after 2010 and in English language were reviewed for the relevance of accuracy while duplicates, irrelevant studies, and literature review were excluded. Thus, 6 studies out of the 9 studies were included and reviewed. Two studies showed that IOSs can be used as an acceptable alternative and used with confidence to obtain consistent and accurate digital impressions for single implant crowns. Regarding the marginal accuracy, one study indicated that the marginal gap values measured for the IOSs is satisfactory. In conclusion, only one study out of 6 studies was in vivo and showed that the use of intraoral laser scanner can be used with confidence to obtain consistent and accurate digital impressions for the fabrication custom restoration and abutments for the dental implant. Also, more long-term in vivo studies are required since there is still so much unknown, and the field is evolving for future accurate findings.
Dental implants and the effect of loading protocol on survival rate: A literature review

James D’Amico

Advisor: Dr. Sachin Seth

Objective: To compare the 1-year clinical survival rate of conventionally placed single tooth dental implants with conventional, early, and immediate loading protocols in partially edentulous patients in the current state of the literature from sources that have been published in the past 5 years

Methods: A electronic search based on a PICO framework to identify studies investigating the outcome of conventionally placed dental implants subjected to conventional, early, and immediate loading protocols with partially edentulous patients. Only studies that involved humans, a minimum follow up of 1 year, titanium screw type implants with rough surfaces, diameters between 3-6 mm, and publication date within the last 5 years were considered. A cumulative survival rate for each of the 3 loading protocols was then weighted by number of implants in each study.

Results: The search resulted in 8 titles that were included for analysis. The cumulative rate of survival was 97.8% for conventionally loaded implants, 98.2% for early loaded implants, and 96.8% for immediate loaded implants.

Conclusion: The current literature, published within the past 5 years and included in this literature review suggests that in appropriately selected cases there were no clinically significant differences between conventional, early, and immediate loading protocols in single implant crowns when specifically comparing their 1-year survival rates.
Symphyseal vs ramus autogenous augmentation of the alveolar ridge

Mihir Desai

Advisor: Dr. JC Doucet

Introduction: In the modern era dental implants are becoming a successful treatment modality for replacing missing teeth which is dependent on the volume/amount of bone present in the edentulous areas but in many instances due to trauma or periodontal disease for many patients this volume is inadequate and implementation of several surgical techniques may be done to reconstruct the ridge which is deficient for implant placement.

Purpose: One of the most common method is to harvest and implant the bone graft in such bone deficient sites and autologous bone grafts are still the gold standard for repair of such ridge defects. Intraoral sites such as Mandibular Ramus as Symphysis are excellent sources with the former purely Cortical and latter Cortico-Cancellous. For preimplant surgery block grafts from these sites are considered due to their quality, surgical access, lower operating and anesthesia time, minimal discomfort and low morbidity.

Methods: The project is a literature review and is basically focused on the presurgical evaluations, acceptance of the graft at the implanted site, morbidity, complications and the type/quality of bone and its significant advantages and disadvantages.

Results: Cortico-cancellous graft provides 65% cortical bone and 36% cancellous bone and has a faster vascularization, quicker integration and reduced potential for resorption while it heals whereas Cortical grafts have a higher concentration of Bone Morphogenic Protein (BMP), can be rigidly fixed has a segment of bone which is dense, good primary graft stability and Bone formation of D1 to D2 at the implantation site. Symphysis Graft offers 50% more volume when compared to Ramus grafts.

Conclusion: Symphyseal grafts has an easy access among all other intraoral sites but has a slightly higher post operative morbidity and more complications when compared to Ramus Grafts.
Impressions: Digital or conventional? A literature review on the accuracy of digital impressions in the field of prosthodontics when compared to conventional impressions

Ryan Kent

Advisor: Dr. Mark Vallee

Dental impressions are a core component of modern dental treatment as a key step in the production of dental prosthesis. Recent technological advances have opened up a new means of taking dental impressions via digital dentistry and digital impressions.

The purpose of this literature review is to assess the current state of affairs of digital impressions with respect to conventional impressions. The accuracy of digital impressions via intra oral scanners compared to conventional impressions via modern impression materials with respect to single unit prosthesis, partial prosthesis, and full arch prosthesis were researched. Other important aspects and applications of dental impressions were also reviewed such as capture of periodontally compromised dentition, time spent, 3D printed casts, mixed dentition impressions, implant coping impressions and surgical guide impressions.

Due to the rapid development of this technology, in order to stay relevant this literature review only reviewed articles published in the calendar year of 2020 and forward. All articles were identified via a PubMed search using the keywords, dental impressions, digital, conventional. 89 articles were identified and sorted and only articles which directly compared digital impressions with conventional impressions were reviewed. 26 articles met the criteria and were reviewed.

100% of articles comparing single unit prosthesis found digital impressions to be more accurate, 100% of articles researching partial prosthesis found digital impressions to be more accurate. 62.5% of articles reviewing full arch prosthesis found digital impressions to be more accurate. Digital impressions were found to be as accurate or more accurate in all applications except that of implant impression copings.
Effect of virtual cement space on marginal and internal fit of all-ceramic crowns

Matthew MacNeil  Advisor: Dr. Mohamed Gebril

Introduction: All-ceramic crowns have become very popular due to aesthetics and same day placement of the final crown using a computer aided design/computer aided manufacturing (CAD/CAM) workflow. This eliminates provisional crowns and much of the production involved in the conventional workflow. To cement them, we must decide on the size of space for the cement to occupy during the design stage. This is the virtual cement space.

Objectives: This literature review seeks to understand the current standards of the marginal and internal fit of these CAD/CAM produced all-ceramic crowns as they pertain to chosen virtual cement space values and if they are clinically acceptable.

Materials and methods: This will be done by conducting a search on the databases PubMed and Medline, and examine studies that have researched the fit of all-ceramic crowns made using various CAD/CAM systems that specifically implement the virtual cement space into the design, and how they compare to the fit of traditional crowns. Search terms included: ceramic crown or full coverage restoration AND digital or virtual AND marginal fit or marginal gap AND cement space or luting space NOT literature review. Only English articles published since 2010 were considered.

Results: PubMed returned 11 studies, one was excluded because the topic was not relevant. Medline returned 2 studies, both of which were included in the PubMed results. In all, 10 papers were used in this review. It was found that CAD/CAM produced all-ceramic crowns generally have clinically acceptable marginal/internal gaps, with the size of the gap depending on the virtual cement space chosen in the design stage.

Discussion and conclusion: The studies found examined the fit of these crowns in many different ways. The most common ways are by measuring the internal gap and the marginal gap. The chosen virtual cement space often depends on the material. The research showed cases where both smaller and larger virtual cement spaces resulted in smaller marginal and/or internal gaps. As such, more research is needed on the topic.
Cement film thickness, a scoping review

Negar Mir Sharifi  Advisors: Drs. Mohamed Gebril and PL Michaud

Objectives: The purpose of this study is to scope the available literature regarding the film thickness of various cements used in dental practices.

Materials and methods: A literature search was conducted on PubMed by 2 investigators using the following terms: (((cement*[Title]) OR (luted [Title])) OR (luting[Title])) AND (((thickness[Title]) OR (layer[Title]))). Only English and French-language peer-reviewed articles were included and the titles and abstracts were assessed to recognize the relevant articles. Studies measuring cement film thickness in veneer, post, inlay, onlay, obturation, and fixed partial prosthesis were excluded.

Results: 305 articles were identified after initial screening and 263 articles were excluded based on inclusion/exclusion criteria. Additional 6 articles were excluded due to the use of experimental cement, disclosing material, and not providing values for the measured cement film thickness. For the included studies (n=36), data on the name of the study, authors’ name, publication date, methods, sample size (n), cement type/brand name, mean (μm)/ median (μm) film thickness, type of prosthesis, temperature (C), force (N) and other relevant paper specific findings were collected and analyzed.

Discussion and conclusion: There is a wide range of cement types used in studies employing glass slabs as their methodology and those cement types do not overlap among studies. Similarly, there is a significant variation in the methodologies for studies measuring cement thickness in crowns in terms of teeth type (plastic vs. natural and premolar vs. molar vs. incisors). The cement film thickness was also measured at different spots on the prepared tooth (at the margin vs. axial vs. occlusal walls) which all impact the measured value. Due to the variation in the methodologies and cement types, there is a need to perform a well-designed experiment to find minimum film thickness for the cements available in the market.
Success rates of one-piece implants vs two-piece implants

Krupa Shah  

Advisor: Dr. James Brady

Background: Dental implants are an efficient treatment option for partially or completely edentulous patients and provide functional and esthetic recovery, especially improved esthetics. Initially, two-piece dental implants were designed to be used with a 2-step surgical procedure. However, this concept has been altered to simplify and increase the effectiveness of treatment and patient comfort.

Purpose: The purpose of this presentation is to give accurate data for comparing the success rate between the two-piece and one-piece dental implant systems.

Method: A literature search was conducted using online databases including PubMed, Google Scholar, Science Direct, Cochrane Library with the following key words “one-piece dental implants” and “two-piece dental implants” and “biologic considerations” and “prosthetic considerations” and “comparative studies”. The search was limited to systematic review, meta-analysis and randomized controlled trials.

Findings: All the statistical data collected points that there is no significant difference between one-piece and two-piece dental implants.

Because of the small number of studies and short follow-up periods, further comparative studies with longer follow-up periods are necessary.
Materials and methods in bone grafting for dental implants: A systematic review for best treatment options

Stephen Tischler  

Advisor: Dr. Pierre-Luc Michaud

Background: Bone loss occurs upon extraction of teeth to be replaced by implants. Often there is not enough bone left to maintain the structural integrity of the implant. This indicates a need for bone augmentation at the sites of bone loss.

Purpose: The primary purpose of this literature review is to evaluate the efficacy of different types of grafting materials. Secondarily, it is meant to be a resource for dentists to begin their initial research on different types of materials to be used in alveolar ridge augmentation prior to placement of dental implants.

Materials and methods: A search was done on PubMed for current and relevant articles. Articles that included studies on the efficacy of one or more types of bone grafting materials were used. Only articles available in English were considered. Preference was given to articles written in the past five years. Studies were used that evaluated materials using either autograft, allograft, xenograft or alloplastic grafting materials.

Results: Socket preservation techniques using Platelet-rich fibrin (PRF) collagen plugs combined with collagen plugs showed to maintain wider bone width than PRF alone and no difference in ridge height, however, results were not statistically significant. Graft sights involving three or more walls of bone loss were more effectively augmented with autogenous bone block grafting. Bone blocks were also more effective in sights requiring initial structural integrity. Ridge height was effectively gained in grafts using Novabone putty guided by titanium mesh.

Discussion: As multiple studies were reviewed, it became apparent that there are many different types of grafts requiring very different clinical outcomes as a result of the graft. The results showed that different materials are optimal for different grafting sites.
A white spot lesion (WSL) is the first clinical change in enamel structure seen clinically as a result of the carious disease process. Non-mutans bacteria are the major bacterial group associated with that enamel change. This project will introduce dentists to resin infiltration as a non-operative conservative treatment for white spot lesions that appear due to orthodontic appliances. Furthermore, resin infiltration will be compared to techniques already used to treat the WSLs, such as bleaching and microabrasion.

A literature review was conducted using systematic reviews, randomized controlled trials, comparative analyses, and *in vitro* studies. Search criteria included English language studies published in the past 20 years. One significant finding included a randomized clinical trial comparing the esthetic improvement of WSLs treated by resin infiltration or microabrasion. After the 12-month follow-up, resin infiltration was more effective for esthetic improvement of the WSLs. In recent years, treatments for dental caries have changed dramatically, from large restorative treatments to a more preventive, non-invasive/minimally invasive treatments.

Systematic reviews have shown that the use of resin infiltration in treating incipient lesions is encouraging. Therefore, it is an additional option for non-operative treatment of carious lesions. Resin infiltration shows promise in being the main restorative option to achieve the best esthetics provided by direct restoration, as well as being in line with contemporary restorative philosophies in regards to minimal preparation and conservation of tooth structure.
Bulk-fill flowable as an alternative to conventional composite restorations: A review

Vinny Andrea  
Advisor: Dr. Sachin Seth

Background: Placement of posterior restorations is time and technique sensitive. Critical factors to consider include marginal integrity, strength, and durability of the restoration. Failure may result in secondary caries, post-op sensitivity, marginal discoloration, and reduction in the longevity of the restoration. Current methodology to overcome these adverse effects is through incremental placement of conventional composite resin (CCR) < 2 mm. This is effective in reducing polymerization shrinkage, however there are disadvantages associated with this technique as well. Incremental placement is a time-consuming technique that incorporates the risk of introducing air bubbles and impurities. Procedure simplification and treatment/chair time reduction arose with the introduction of bulk-fill materials, allowing the clinician to place a single increment up to 4mm. Yet, with bulk-fill flowable (BFF) being so new there are few studies to support its claims and thus a comprehensive review is indicated. 

Purpose: This study will compare CCR to BFF on the premise of three selected restoration parameters: marginal integrity, strength, and durability. The goal is to provide clinicians a detailed understanding of the advantages and limitations of each material based on the selected criteria.

Methods: A literature review was conducted using the PubMed Central and Science Direct databases, as well as NovaNet, and Google Scholar. Keywords include bulk-fill, flowable, composite, marginal integrity, strength, and durability.

Findings: Although BFF is a new material, several studies were retrieved that compared its properties to CCR. In terms of marginal integrity, it was shown that the microleakage associated with BFF was equivalent to that of restorations that used CCR. As for durability, longevity studies demonstrated high clinical effectiveness when compared to CCR. Finally, it was displayed that the use of BFF associated with a CCR as a final capping layer did not jeopardize bond strength to dentin, or marginal integrity of posterior restorations.
Mewing: Can it replace braces?

Kayla MacPherson  

Advisor: Dr. Lee Erickson

A new social media fad called mewing has become prevalent in social media influencers who claim it can eradicate the need for traditional orthodontics, and with the added bonus, accentuate desirable traits that westernized countries have. Mewing is a technique developed by Dr. Johnathan Mew and Mike Mew that is a proposed alternative for orthognathic surgery and orthodontics and is often called facial growth guidance or orthotropics. This technique involves sealing the tongue to the posterior of the palate, keeping their mouths closed and to breathing only through the nose. In turn, the dental arch is supposed to be guided into perfect occlusion. This presentation explores this controversial topic’s origin, treatment modalities, and scientific evidence. The goal is to see if mewing can be objectively verifiable by current scientific evidence and to spread awareness about this treatment. A literature review and search for relevant scientific evidence using the hypothesis and keywords such as orthotropics, mewing, myofunctional therapy, facial growth and orthodontics. The current literature does not support mewing as an alternative for traditional orthodontic/orthognathic surgery and dental practitioners should be aware and have a strong understanding of the current evidence. However, more evidence is needed to make a more informed conclusion as the technique is relatively new.
Is CCLAD beneficial? Literature review comparing pain from computer-controlled anesthetic delivery to traditional technique

Todd Myette  
Advisor: Dr. Thomas Steeves

Background/Purpose: In the field of dentistry, pain caused by local anesthetic injection is a significant factor in patient anxiety and avoidance. It has been noted that, computer-controlled local anesthetic delivery (CCLAD) systems reduce or eliminate pain from even the most painful anesthetic injections when compared to conventional techniques. The purpose of this literature review is to determine whether or not CCLAD consistently and predictably reduces injection pain. If determined so, the author will explore why CCLAD is not the standard of care in dental practices.

Method: A systematic and logical advanced search was made in a database called Novanet. Keywords were used with Boolean operators to find relevant literature. The results of this search revealed 1002 articles. These articles were screened by title, abstract, and body. Twelve highly relevant clinical trials were then selected.

Results: The selected studies included a total of 536 participants with 2 crossover, 6 split mouth, 2 parallel, and 2 split mouth crossover designs. The data extracted from each study included: author, title, design, participants, procedure performed, anesthetic used, intervention, control, significant VAS differences, injection time, and concluding statement.

Conclusion: Following a full review of the literature and organization of the findings, it was concluded that pain caused by local anesthetic injection is significantly reduced by using CCLAD compared to conventional technique. Furthermore, the literature has repeatedly shown increased injection times compared to conventional technique and likely to be the main cause for CCLAD not being the standard of care. Increased cost and complexity certainly play a role when dentists are deciding to incorporate CCLAD into their practice as well. The author recommends that the literature be expanded as to why CCLAD is not being routinely used despite the overwhelming evidence that it reduces injection pain. It is suggested that a survey be distributed to practising dentists in order to obtain data on this topic.
Bleaching sensitivity: Clinical approaches for mitigation

Ian Palmeter  Advisor: Dr. Thomas Steeves

Background and purpose: It is a common side effect for peroxides used in teeth whitening to cause tooth sensitivity. Historically, this has been described by the hydrodynamic theory whereby fluid within dentinal tubules activate nerve endings at the pulp-dentin complex termed dentinal sensitivity (DS). However, this does not explain the pain characteristics unique to bleaching, termed bleaching sensitivity (BS). Peroxides have since been shown histologically to cause pulpal inflammation, involving release of inflammatory mediators known to trigger pain. This had led many researchers to study inflammation as a cause of bleaching sensitivity. Therefore, the purpose of this paper is to investigate the accuracy of this model through evaluation of different pharmalogical anti-inflammatory agents in reducing the risk and severity of bleaching sensitivity. Furthermore, an explanation of the results will be discussed, and the importance of future research will be highlighted.

Method: In order to evaluate the inflammatory model of bleaching sensitivity, various randomized controlled trials will be evaluated where anti-inflammatory agents were given to patients and compared to a placebo for in office bleaching procedures. These anti-inflammatory agents involve a variety of NSAIDs as well as corticosteroids. Two meta-analyses were used to evaluate the strength of these various RCTs and explain the results found.

Results: From this analysis, it was determined there was not a clinically significant effect of anti-inflammatory drugs on bleaching sensitivity. However, more high-quality studies evaluating other pharmalogical agents are required to focus on inhibiting other inflammatory mediators to determine the accuracy of the inflammatory model.
Pain management achieved via local anesthesia is one of the fundamental principles of dentistry. However, the administration of dental anesthesia continues to be a challenge for some dentists and serves as one of the leading causes of patient anxiety. The success rates for conventional local anesthesia techniques are highly variable, especially in the mandible, and can result in significant frustration for the dental practitioner and discomfort for the patient. The failure rates of conventional techniques are further increased with patients who have teeth that have been diagnosed with irreversible pulpitis. Although not considered a new technique, intraosseous anesthesia has shown increasing evidence in its ability to achieve profound pulpal anesthesia when conventional techniques fail. With new advances in the delivery systems available on the market, there is increasing evidence for the intraosseous technique to serve as the primary choice for anesthesia as opposed to being solely an adjunctive option. The aim of this study is to evaluate the safety, efficacy, and efficiency of the currently available devices that can provide intraosseous anesthesia, from both the patient and practitioner’s perspective. The research was carried out through a literature review of published peer-reviewed journal articles found through the PubMed, Cochrane, and Dalhousie University Library’s databases, as well as two other search engines Novanet and Google Scholar. The literature indicates that computer controlled intraosseous anesthesia delivery serves as a viable primary technique of anesthesia in the appropriate situations, and with the aid of advances in dynamic navigation techniques all forms of intraosseous anesthesia delivery devices are decreasingly technique sensitive leading to improved efficiency and efficacy for the practitioner and improved outcomes for the patient.
Local anesthesia reversal: OraVerse reduces soft tissue anesthesia after dental procedure

Thien Tran

Advisor: Dr. Pierre-Luc Michaud

Objective: The residual soft tissue anesthesia after a local anesthetic procedure can be troublesome and inconvenient, negatively affecting patient’s oral functions such as mastication, smile, and speech. In this study, an evidence-based account of a local anesthetic reversal agent, *phentolamine mesylate* (*PM*), is presented. The aim of this research is to provide dental practitioners with relevant information of *PM* so that the undesired effects of local anesthetics can be managed in a patient-centered manner.

Background: *Phentolamine mesylate* (*OraVerse*) is a non-selective α-adrenergic receptor antagonist. It was approved by the FDA in 1952 to be a vasodilator that can used to control the blood pressure of patients with pheochromocytoma. Since a vasodilator can facilitate faster uptake of chemical molecules at an injection site, many studies have investigated the relationship between *PM* and local anesthesia in dentistry.

Methods: The study relied on both primary and secondary sources to evaluate different clinical variables. The eligibility criteria were set to select reliable, ethical, and trusted sources with the strongest evidence and minimal amount of biases. Particularly, the study placed strong emphasis on research papers published on PubMed and Cochrane Library database, up to January 2021. Moreover, the research also used selected information obtained from the Handbook of Local Anesthesia, 5th edition, Dentaltown, and CDA Oasis. The systemic search for relevant data called for the use of various search techniques such as: Boolean and proximity operators as well as filter and limit techniques.

Results: Clinical trials with over 100 subjects showed that the experimental group recovered to normal soft tissue sensations approximately 50-70 minutes faster comparing to the control group. Adverse events between the two groups were insignificant.

Conclusion: There is scientific evidence that *PM* reduces soft tissue anesthesia with minimal undesired effects in a wide range of populations.
Surgery-first orthognathic surgery

Kiran Baljeet Singh  Advisor: Dr. James Brady

The surgical correction of skeletal discrepancies of the mandible, maxilla or both, termed orthognathic surgery, was first done in 1848 without preoperative orthodontic correction. This technique corrected the prognathism but resulted in the patient having an anterior edge-to-edge occlusion. Hence, it was believed that orthognathic surgery alone could not successfully correct skeletal discrepancy nor produce a stable postoperative occlusion, leading to the concept of “orthodontics-first” becoming a widely acknowledged dogma. In 1959, Skaggs raised the issue of surgical timing related to orthodontic treatment and suggested that surgery precede orthodontic correction to achieve an acceptable inter-arch relationship surgically. This is the first documented reference to “surgery-first”.

Orthodontic intervention both presurgical and post-surgically results in a long treatment time of 7 to 47 months, potentially causing gingival recession and hyperplasia, root resorption, dental caries, masticatory and speech issues and further deterioration in the patient’s facial profile. This leads to psychological problems due to the delay in resolution of the patient’s chief complaint.

The purpose of this literature review was to evaluate the stability and efficiency of the SFA technique to determine if it is an acceptable treatment alternative for patients with dentofacial deformities. This study looked at peer-reviewed articles from 2000 to 2020 and will also discuss the advantages and disadvantages of SFA as well as the quality of life of patients post SFA compared to the conventional method.

Although, SFA is an efficient and time saving technique, it has limited indications with patient selection being extremely crucial. A thorough diagnosis and treatment plan together with synergy between the maxillofacial surgeon and orthodontist renders SFA as an appropriate alternative with shorter total treatment time, better patient compliance and immediate improvement in facial esthetics. SFA represents a small revolution in the dental and skeletal malocclusion therapy that needs to be explored further.
The incidence and characteristics of dental pain in children presenting for new patient examinations in the IWK Dental Department

Allanah Conrad

Advisor: Dr. Tracy Doyle

Pain is one of the most common reasons for pediatric patients to seek medical attention and accounts for a large proportion of all emergency visits. Early childhood caries (ECC) is the most prevalent chronic disease of childhood and is often associated with acute and chronic pain. In 5-year-old children, the rate of ECC ranges from 22.5% (India) to 90% (Indonesia) with a median occurrence of 62.7% worldwide. Dental pain in children has been associated with short- and long-term effects that leads to missed days from school and work, hinders growth and development and impacts physical, social, mental and psychological well-being. Pain in the pediatric population is often under-detected, underestimated and undertreated by practitioners and parents and many are unaware that pain control includes non-pharmacological, dietary and pharmacological methods. A study was designed to determine the incidence and characteristics of pain in pediatric patients presenting to the IWK Dental Department. A modified version of the Dental Discomfort Questionnaire (DDQ) was adapted for data collection. The survey will be administered to pediatric patients (10 years of age or younger) and their caregivers presenting for initial consultations with dental disease. Data collection will include demographics, length of wait time, caries diagnosis, sources and characteristics of the child’s pain, current pain management strategies and a determination of degree of current pain using a faces pain scale. Results will determine the incidence of pain for pediatric patients presenting to IWK Dentistry, characteristics of the pain and methods of pain control practiced. Evidence of pediatric pain experience related to dental disease will aid practitioners in counseling caregivers on appropriate pain management. Findings will help enhance access to timely care, advance the education of dental care providers and families about proper pain management and improve outcomes to optimize overall growth and development for children with dental disease.
The importance of early treatment for patients with dentinogenesis imperfecta type II

Rebecca Marr

Adviser: Dr. Heather Dyment

Dentinogenesis Imperfecta Type II (DI II) is hereditary dentin defect characterized by discoloration and early loss of tooth structure. The incidence of DI II is 1 in 6,000-8,000. In the past, patients with DI II were only treated in adulthood. In adulthood, the entire dentition was extracted leaving them edentulous and dentures were fabricated. It is now recognized that these patients should be treated earlier in life and by other preventative and restorative means. The most recent literature suggest that treatment should begin as early as possible and preventative strategies should be used to prevent loss of tooth structure, leading to better prosthetic outcome in adulthood. While a general dentist may only encounter a few cases of DI II in their careers, early diagnosis and early treatment is crucial to helping these patients maintain their dentition.

To promote early diagnosis and treatment of DI II to dentist in Atlantic Canada, a brochure was created to be circulated at the Table Clinic presentations which serves as a guide to diagnosing and treating DI II. This brochure includes characteristics of DI II, differential diagnoses, how to make a diagnosis, when to refer, treatment options, and information about the cleft palate and craniofacial program in Nova Scotia.

In addition, a literature review which analyzed treatment options for DI II in the primary dentition was conducted. It was found that there are various successful restorative treatments to treat DI II. Since DI II presents differently among patients, treatment should be selected on a case-by-case basis. The techniques and materials used to treat DI II should be selected based off of severity of tooth wear, patient age, and patient compliance. Regardless of the treatment provided, early diagnosis and treatment leads to tooth structure conservation and better prognosis of the dentition.
An estimated 10% of youths worldwide are affected by dental anxiety. The American Academy of Pediatric Dentistry (AAPD) recommends an array of non-pharmacological and pharmacological techniques that can be used to alleviate anxiety and nurture a positive dental environment, allowing for the performance of high-quality, safe, and effective oral healthcare. A clinician may hinder the delivery of patient care when they are not appropriately educated on effective behavioral guidance alternatives. For this reason, both parents and dentists require more awareness and education on alternative behavioral management techniques. A combination of techniques presented by the AAPD including positive reinforcement, enhancing control and memory restructuring, is known as Cognitive Behavioral Therapy (CBT). CBT offers a way for practitioners, patients, and parents to manage dental anxiety collaboratively long-term by changing the patient’s mindset while also providing life-long coping mechanisms. The aim of this review is to provide dentists with the knowledge needed to implement behavior guidance therapies, specifically CBT, to manage dental anxiety with the intention of increasing patient compliance. Ideally, this will help limit the need for advanced behavioral guidance techniques and improve patient dental experiences. Systemic reviews and clinical trial studies containing information on CBT and the AAPD reported behavioral guidance recommendations were collected. Databases such as Medline and PubMed were searched to identify the therapies of interest using MeSH terms: behavior management in dentistry, pediatric dental anxiety, CBT; fields: all; limits: within the last 10 years, humans, <16 years old, varying anxiety levels, English. The literature shows that CBT can affect a patient both physically and emotionally, giving them long-term coping mechanisms. There was an increasing body of evidence to support the use of CBT on pediatric patients suffering from anxiety. However, the current evidence for the effectiveness of using these practices in a dental setting is of limited quality.
Systemic and oral manifestation of e-cigarettes

John Park

Electronic cigarettes became popular among general population recently. The manufacturers advertise e-cigarettes as superior alternatives to conventional tobacco cigarette that is healthier. Due to e-cigarettes’ relatively short history, there are no long term researches that studies e-cigarettes and our understanding of how it can affect human system is limited. In the field of dentistry, it is very important for the dental professionals to have a thorough understanding of their patient’s systemic health in order to provide adequate care for patients, and e-cigarettes became a new barrier for proper care. The purpose of this paper is to determine the impact of e-cigarettes on dental healthcare settings. Due to recent emergence of the topic, mainly cross-sectional studies were examined. Case reports of pathologic conditions affecting patients’ cardiovascular system, respiratory system and oral cavity were included in the review. Effects of e-cigarettes on patient’s cardiovascular system, respiratory system and oral cavity were searched in electronic database, then links between the pathologies and clinical dentistry was made as the studies directly linking e-cigarette smoking and dentistry were limited. E-cigarettes caused similar adverse effects as tobacco cigarettes such as platelet impairment, increase in blood pressure, oxidative stress on vasculature, decrease in lung function, and oral impairments. Similar adverse effects were caused by e-cigarettes, but the extent of damage was significantly lower than that of tobacco cigarettes. New studies on E-cigarettes are becoming available but due to its recent emergence and frequent innovation of e-cigarettes, long term effect of E-cigarettes are not fully understood. It is important for dental professionals to be aware of the harm e-cigarettes can cause and to be continuously educated on new discoveries.
Safety and efficacy of conscious sedation modalities in the paediatric dental patient

Gavin Raddall  Advisor: Dr. Chris Lee

Background: Conscious sedation may facilitate comfortable and successful dental treatment in anxious children when non-pharmacological management fails. However, only 13% of Atlantic Canadian dentists offer conscious sedation to children, while 78% refer anxious children to paediatric dentists, contributing to extended waiting times for specialist care and more extensive treatment needs consequentially. To increase the knowledge and awareness of Atlantic Canadian dentists regarding sedation strategies for anxious children, the objective of this study was to review and identify the most safe and effective conscious sedation modalities for paediatric dental patients.

Methods: A systematic review of current dental and medical literature was performed using PubMed®/MEDLINE and Dentistry and Oral Sciences Source (DOSS) by EBSCO databases. The search yielded 91 articles from PubMed®/MEDLINE, and 272 from DOSS. Inclusion criteria were children under age 18 and ASA status of I or II, interventions involving administration of one to two sedatives, primary outcomes of ease of treatment completion and intra- or post-operative adverse events, and randomized controlled crossover trials published since 2000. After removal of duplicate articles and those not meeting specified inclusion criteria, 33 articles were analyzed.

Results: Based on the available literature, there is weak to moderate evidence supporting the safe and effective use of several conscious sedation modalities for paediatric dental patients. The greatest ease of treatment completion and fewest adverse events were found to be with intranasal midazolam and ketamine administered alone or in combination. High success was also achieved with nitrous oxide inhalation, oral midazolam or parenteral ketamine.

Conclusion: These findings suggest that sedation modalities using midazolam, nitrous oxide or ketamine are safe for use and facilitate ease of treatment completion in anxious children, particularly if administered intranasally. However, most studies were completed in hospital settings in the presence of an anaesthesiologist and more research is required in office-based settings.
Time delay in treating traumatic permanent tooth injuries in children in Nova Scotia

Amy Young

Advisor: Dr. Tracy Doyle

Dental trauma is a common occurrence, particularly in the pediatric population. Depending on the injury type and severity, the need for urgent dental care increases. The prognosis of traumatized teeth is dependent on timely and appropriate management. Previous research has demonstrated an average 6.8 hour delay from injury to treatment. Pediatric patients seek care more frequently in hospital clinics. Children treated in a hospital setting experience a notable increase in treatment delay when compared to those treated in private practice. The severity of the injury, lack of pediatric emergency experience and confidence by private practice clinicians, inadequate fee provision and the view that trauma treatment would take up too much chair time have been identified as reasons for referral to the hospital clinic. Potential patient barriers leading to delay were identified in this population as geographic proximity to the facility, lack of a dental home, the patient’s ASA classification, perceived severity of the injury, socioeconomic status, and if/where the patient initially sought care for the injury. Our study was developed to investigate if such treatment delays exists following permanent tooth trauma in Nova Scotia. A survey was designed for data collection in IWK dentistry including: DOB, gender, address, and questions designed to identify the series of events that occurred from the time of initial trauma to patient presentation at the emergency clinic; time from dental injury to contact with a healthcare provider, with dental professional, type of permanent dental trauma, and treatment provided. Initiation of data collection was delayed due to unprecedented limitations of the Covid-19 pandemic. Results will identify if barriers exist in our region regarding access to care for patients who suffered dental trauma and the causes of delayed care. Recommendations will be aimed at reducing any time delays and ultimately improve treatment outcomes for children who sustain injuries to the permanent dentition.
The clinical uses of ozone in periodontal therapy: A literature review

Claire Boileau

Advisor: Dr. Tammy Wright

Background: Periodontitis is a common disease in modern society, causing permanent damage to the supporting tissues of the dentition. Many factors contribute to the development of periodontitis, and particular bacterial species have been well-established in the etiology of the disease. Despite its prevalence, there are currently limited options for the non-surgical treatment of periodontal disease. Most successful treatments, such as scaling and root planing, aim to eliminate the pathogenic bacteria from the oral cavity to halt the progression of periodontal destruction. Due to its antimicrobial and oxidizing effects, the use of ozone gas as treatment for periodontal disease is a promising field of research.

Objectives: The objectives of this study are to 1) thoroughly review the clinical applications of ozone to treat periodontal disease and 2) to summarize the available in vivo literature using ozone therapy in periodontics.

Study selection: Peer-reviewed, English language publications were included. Specifically, in vivo randomized controlled clinical trials were examined. Case reports, editorials, abstracts, and posters were excluded.

Results: The current literature indicates that the in vivo clinical application of ozone in periodontal therapy has not achieved significant levels of efficacy compared to traditional methods of treatment.

Conclusions: Further research is required in this field. Randomized control trials with adequate sample size, length of study, follow-up periods, and standardized measurements must be conducted. It would also be beneficial to compare the efficacies of available ozone treatment modalities.

Keywords: Ozone, perio, periodontal, periodontitis, antimicrobial, therapy, clinical trial, ozonated, antibacterial, ozonized
Evaluation of antimicrobial effect of garlic extract (allicin, ajoene, vinylidithiin, diallyl sulfide) on s. mutans

Ricardo Cisneros

Advisor: Dr. Brendan Leung

Garlic (*Allium sativum*) may be a popular ingredient in many dishes, but its antimicrobial activity is only now becoming well known. Principal extract compounds found in fresh garlic, such as allicin and ajoene, are sulfur-containing molecules that have been found to weaken biofilm formation or eradicate biofilms formed by cariogenic bacteria like *S. mutans* and *A. actinomycetemcomitans*. These compounds interfere with biofilm formation by disrupting their quorum sensing systems. In addition to affecting biofilms, these compounds also inhibit bacterial growth of cariogenic bacteria in the planktonic and biofilm phases. Currently, the gold standard prescription mouthwash for controlling the levels of cariogenic bacteria is chlorhexidine gluconate (CHG). While CHG is an effective antimicrobial agent, it may lead to teeth staining, altered taste perception, promote calculus formation on teeth, trigger anaphylaxis in some, as well as having indiscriminate cytotoxic activity. As an alternative to CHG, the use of garlic extract (GE) may alleviate some of the side effects. In addition, GE use may represent a new strategy against drug-resistant microbes. While empirical data proving its efficacy on controlling cariogenic bacteria concentrations are important, it should be considered that garlic prescriptions may yield high compliance with patients in comparison to other pharmaceutical drugs. In this review, we intend to raise awareness by discussing the benefits and shortcomings of having garlic extract as a remedy to prevent caries and gingivitis.
Risk factors contributing to bruxism etiology: A systematic literature review from 2017-2020

Lloyd Hicks

Advisor: Dr. Yang Gu

Bruxism is a common phenomenon, suspected to affect 8-31% of adults (D. Manfredini, Winocur, Guarda-Nardini, Paesani, & Lobbezoo, 2013; Saczuk, Lapinska, Wilmont, Pawlak, & Lukomska-Szymanska, 2019). Bruxism continues to evolve as further studies investigate the etiology of bruxism as a complex multisystem physiological process with multifactorial etiology rather than solely mechanical or psychological. Thus, the importance for dental practitioners to understand this new phenomenon of bruxism etiology is significant with regard to proper treatment and management of bruxism patients (Klasser et al., 2015).

In 2018 Monika Kuhn and Jens Christoph Türp published Risk Factor for Bruxism, a systematic literature review to identify valid risk factors found in literature published from 2007-2016. Bruxism management is advancing with the recognition of potential risk factors, however, the last systematic literature review identifying risk factors was conducted in 2016, thus the need for another systematic literature review of literature published since 2016 would significantly benefit healthcare providers and promote patient specific treatment approach tailored to each patient’s contributing risk factors rather than a generalized treatment approach. (D. Manfredini et al., 2016). A systematic review of literature published between 2017-2020 regarding the adult population who experience bruxism was conducted to identify if new risk factors have become relevant or if stronger correlation now exists for already identified risk factors in comparison to Kuhn and Türp’s 2007-2016 systematic review. An electronic literature searches was carried out on the following:

2. Novanet searching keywords “bruxism”, “etiology”, “odds ratio”, “adult”.

Of the 132 total hits, approximately 9 relevant articles were reviewed further and similar decisive inclusion criteria to Kuhn and Türp report was used, Odds ratio and 95% confidence intervals were required and used to classify the chance of the risk factor based on Grade of A, B, C, D. Articles that do not contain odds ratios and confidence intervals were not considered.
Low dose naltrexone: A proposed novel therapy/treatment for oral autoimmune disorders

Nathan Pirino

Advisor: Dr. Lisa Johnson

Naltrexone is a competitive opioid receptor antagonist known for its use in the treatment of opioid addiction. Shortly after its approval in 1984, research was conducted on using Naltrexone in lower doses after it was discovered to be improving the immune response of patients living with HIV. At 1/10th the dosage used for opioid addiction, low dose naltrexone (LDN) has proven to be helpful in lowering inflammatory responses in various autoimmune conditions, including lichen planopolaris, benign pemphigus, Crohn’s disease, fibromyalgia and multiple sclerosis. As the oral cavity is also subject to immune based diseases such as erosive oral lichen planus, it is postulated that the use of LDN in the oral cavity could prove beneficial. The goal of this literature review was to gather data that has been found through primary research on therapeutic LDN for various ailments associated with derangements in the immune system and arrange this data in a way that can be easily summarized based on type of trial, the disorder being studied, and the effectiveness of the LDN as a therapy treatment. Articles were found using the National Library of Medicine’s PubMed journal search engine and were then narrowed down to articles relevant and appropriate for this review. The goal was to find research on any LDN trials pertaining to any disorders that could present in the oral cavity or in the very least be conditions with similar pathogenesis to oral diseases. The results of the literature review led to the discovery that currently LDN is not used to treat any oral diseases, but several related conditions such as lichen planopolaris supports the concept that LDN therapy could be effective in the treatment of oral immune conditions. With the low risk of adverse reactions to the LDN and the high potential benefits, further research into the use of LDNs in the oral treatment of oral diseases is warranted.
Periodontal disease is affecting a quarter of adult population in industrialized countries. Periodontitis is a progressed form of periodontal disease with an etiology associated with oral dysbiosis. This oral microbial imbalance can activate a host tissue response that can lead to connective tissue destruction and alveolar bone loss. The conventional non-surgical in-office periodontal therapy aims to establish a healthy microbiota using primarily mechanical debridement with or without antibacterial agents. However, difficulty performing scaling in deeper pockets, the emergent of antibiotic resistance, and yet to be possible use of localized antibiotics that can be utilized only against a targeted pathogenic colony without affecting valuable bacterial strains, are all contributory factors to the frequent recolonization of periodontal pathogens following the conventional therapies, leading to a call for new treatment approaches. Certain probiotics have been proposed as a supplementary module in assisting non-pathogenic bacterial colonies to establish tissue health in microbiota where complex symbiotic relationships and dynamics of nutritional resources is yet to be fully understood. The purpose of this systematic review is to assess clinical effectiveness of *Lactobacillus* probiotics in adult patients with chronic periodontitis. This systematic review utilizes English database search of Cochrane and MEDLINE (via PubMed) up to February 2021 for randomized clinical trials done after year 2000 in patients with chronic periodontitis. This review reveals that there is sufficient evidence to conclude the positive effects of adjunctive *Lactobacillus* probiotics in the treatment of chronic periodontitis.
Botox and oral appliances on temporomandibular joint pain: A literature review

Corey Riemersma

Advisor: Dr. Sachin Seth

Temporomandibular joint disorder refers to a general condition often described as a painful or clicking sensation occurring in the temporomandibular joint region. This can often include the surrounding masticatory musculature with multifactorial causes and origins. These disorders can generally be separated into categories such as extracapsular and intracapsular based on the affected location. Issues arising from the temporomandibular joint have been documented as very complex disease entities with changing schools of thought behind how they should be treated. For decades there have been various types of oral or occlusal appliances utilized to combat pain and damage associated with this condition. These are commonly used in cases with disc displacements and conditions where load force on the condyle is aimed to be reduced. Due to some of the limitations of these appliances, a technique employing the use of intramuscular botulinum toxin injections was introduced only a few decades ago. This is effective through the mechanism of a local muscle paralytic effect due to the inhibition of the release of acetylcholine. Previously, this mechanism was utilized for treating a variety of clinical problems from movement disorders to excessive sweating. The purpose of this paper is to further elucidate and educate on the traditional and recently employed techniques of the proper treatment of temporomandibular disorders. It is my aim to inform the general public and medical professionals about the proper treatment of these disorders. This will be done through a comprehensive literature review strategy from PubMed, Cochrane, and various other professional journals. The major findings from this paper are that traditional oral appliances as well as intramuscular Botox injections can be equally effective in relieving pain stemming from temporomandibular joint disorders. However, more research needs to be conducted into these areas for further understanding of best practice for the use of Botox injections.
Defining oral probiotics and current oral probiotic therapies

Parker Tripp

Advisor: Dr. Brendan Leung

Probiotics have been studied as possible therapies for treatment of periodontal diseases, caries prevention, management of halitosis, and much more. However, therapeutic approaches involving probiotics are not regularly utilized in a dental setting. For many oral healthcare providers, the reservation to recommend oral probiotic therapies may be due to unfamiliarity with probiotic therapies, poor understanding of mechanisms of action, or simply lack of confidence with regulations. The intent of this literature review is to provide a definition of oral probiotics, a summary of regulations, and an overview of current probiotic therapies and applications in dentistry.

Literature was compiled using Dalhousie Library resources such as EBSCOhost Dentistry and Oral Sciences Source, PubMed, Cochrane Library, and Science Direct. The most recent articles were reviewed to ensure accuracy and currency. Key search terms include oral probiotics, gingivitis, periodontitis, caries prevention, halitosis, *Streptococcus*, *Lactobacillus*, *Enterococcus*, and *Bifidobacterium*.

As public and professional interest in probiotics continues to grow, regulatory bodies have explicitly defined probiotics and in doing so have established the framework for regulating therapeutic claims and product marketing. As an emerging therapeutic strategy, there are insufficient longitudinal studies to support the use of probiotics to replace conventional oral treatments. Nonetheless, novel culture platforms and bioinformatic techniques have shed light on the mechanisms of probiotics which leads to the increase in treatment efficacy and reliability. As understanding and regulations are improved and therapies are refined, oral probiotic treatments may become the preferred therapies for treating oral disorders and promoting oral health.
Intraosseous anaesthesia provides more reliable and profound anaesthesia as compared to inferior alveolar nerve block in teeth with irreversible pulpitis

Wajiha Aziz  
*Advisor: Dr. Thomas Steeves*

Profound anesthesia is important for a successful dental procedure. The most common mandibular anaesthetic technique is the inferior alveolar nerve block (IANB). Unfortunately, this technique can have a high failure rate especially for teeth with irreversible pulpitis with its success rate being 80 to 85%.

Intraosseous (IO) anesthesia is an alternative technique which can provide local anesthesia that is painless and profound with no collateral numbness. However, this technique is not commonly used due to reluctance to drill in the bone and lack of training. Although technically challenging and history high failure, IANB is still most commonly used for mandibular pulpal anesthesia. With the advancement in IO anesthetic technique it is a suitable alternative to the IANB. This literature review assesses the benefits of IO anesthesia in comparison to IANB in teeth with irreversible pulpitis.

**Method:** Literature review for this study was done utilizing online database searches such as PubMed, Google Scholar, National Centre of Biotechnology Information (NCBI), Dalhousie University Library (Novanet), relevant journals and Cochrane Library. The studies reviewed were published between 2003 – 2018 and search words included were local anesthesia, inferior alveolar nerve block and irreversible pulpitis in mandibular molars.

**Results:** The literature review performed in this study, identified 4 randomized control trials published since 2012 that demonstrated that IO had a higher success rate as compared the IANB techniques.

**Conclusions:** Based on this study, it can be concluded that IO technique has been shown to be easier to administer, has a higher anesthetic efficiency, shorter sensation period and adds to patient comfort and preference. It may be used as the primary anesthesia in patients with irreversible pulpitis of posterior mandibular teeth.
When shall we call a patient's physician? Oral lesions that need immediate attention of dentist and physician

Maninder Goel

Advisor: Dr. Yang Gu

Background: The basic or fundamental characteristics of familial cancer and paraneoplastic syndrome is malignancy of visceral organs. The presence of an internal and occult malignancy may be forewarned by various external manifestations. Many of those findings are often localized to the head and neck region, more commonly the oral cavity proper. This provides the dental practitioner a unique opportunity to detect these markers of neoplastic involvement.

Purpose: This review aims to provide better understanding to general dentist regarding oral lesions that needs immediate attention from patient’s physician as early diagnosis of associated underlying systemic cause of the oral lesions can be lifesaving diagnosis and can help physician to start treatment in a timely manner.

Method: The articles related to Oral lesions were collected on February 21st, 2020. The search for these articles and journals was conducted using PubMed and VitalSource Bookshelf. The PubMed search contained key words that included “dentist” AND “referrals”, “oral lesions” OR “oral cancer”, “genetic disorders” AND “health”, “multiple endocrine neoplasia” AND “physician”, “oral health” AND “Multiple hamartoma syndrome”, “dentistry”, “acanthosis nigricans” OR “symptoms”, “examinations”, “Peutz-Jeghers syndrome”, “oral mucosa”, “carcinoma” and “history”. Articles and journals that were not available for download on PubMed were obtained from Endnote’s automated full text search, as well as Google Scholar. Information from VitalSource Bookshelf was found using “oral lesions” as a search term.

Findings: All the literature used suggested that Dental professionals are well positioned to recognize these disorders at the very start of potential malignancies. Early identification of patients with these conditions permits timely screening, molecular genetic testing, counseling and lifesaving surgeries. This makes the relationship of dentist and physician more important as identification of these markers by the dentist during a routine exam will help physician to diagnose and treat the malignancies in a timely manner.
Benefits and challenges of "real time video recording" of clinical oral health procedures

Harkamal Kaur

Advisor: Dr. Mary McNally

Oral health professionals have long focussed on new advancements in health care. This presentation focuses on developments in the use of video recording. As video technology is becoming more user friendly and affordable, videos are becoming a common tool of communication with patients, documentation for legal purposes & education for students. In its earlier stages, videos were primarily focused on basic sciences & pre-clinical education, but now, there is a trend to record clinical encounters which can be effectively used for sophisticated training, research, assessment and re-evaluation. In the clinical setting, videos provide clear operator view images, enabling procedures and outcomes to be clearly documented, understood and explained. Clinicians are able to share their work with colleagues, mentors and students.

The objectives of this review are to describe:

- The ethico-legal implications of video recording of dental procedure.
- Applications of camera mounted on loupes for video recording of dental procedure.

A literature review was performed using the following databases: - National Center for Biotechnology Information (NCBI: - Pubmed) and the Dalhousie university library (Novanet: - All Novanet) as well as web-based gray literature.

Findings of the review strongly suggest that the use of videos will increase. Modern dental practices will optimize the use of video recordings for the benefit of patients, education, inter-professional consultations, and accurate documentation. However, as the use of videos expands in health care, it is of paramount importance that guidelines and legislation related to informed consent and privacy keep pace in order to protect patient autonomy, staff and most importantly the dentist-patient relationship.
Dental caries occurs due to an imbalance of the re-mineralization/de-mineralization equilibrium, leading to a net loss of tooth minerals progressing to a cavity. Cavitated carious lesions have been treated by removing and sealing tooth structure. Modern approaches in management of incipient or initial caries involve lesion management without tissue removal. This is keeping in mind the advances in regenerative medicine which focuses on replacing damaged tissues with biologically similar tissues. This provides a minimally invasive technique which can have multiple applications in restorative and pediatric dentistry. One such modality is Guided Enamel Regeneration using Self Assembling Peptides. During odontogenesis, the enamel matrix proteins i.e., amelogenin, ameloblastin and enamelin are produced during the secretory stage of enamel formation and play a role in controlling the enamel formation. These proteins are almost completely degraded during the final stage of maturation when mineralization takes place. Recent studies have demonstrated the potential of a new biomimetic approach with the self-assembling peptide P11-4 to form a 3-dimensional matrix within the subsurface body of the initial carious lesion, which mimics the ability of enamel matrix proteins to template and nucleate hydroxyapatite. Self-assembling peptides are known to promote Biomimetic remineralization and there have been some in vitro and clinical studies recently conducted to determine its uses, mechanisms of action and various applications. The aim of this review is to present the available current scientific evidence related to the use of self-assembling peptides in a modern carious lesion management concept.
The future of dental amalgam and myths related to it

Ravneet Othee

Advisor: Dr. Pierre Luc Michaud

Amalgam is being used as restorative material since 1830 when it was first introduced in America. In recent years popularity of amalgam has decreased because of increasing demand of composite. Myths related to amalgam in general public are playing major role in choosing composite over amalgam. Amalgam restoration plays a minor role in mercury toxicity. There is no evidence of the adverse effects in general public from mercury released from amalgam. Only 0.04-0.2% of the total worldwide environmental mercury pollution is contributed from dental offices. Minamata convention and Geneva meeting held in 2013 and 2009 respectively encouraged on global phasing down of amalgam rather than complete ban until a perfect replacement for it is found. Amalgam has saved millions of teeth so far because of its longevity, cost-effectiveness, material of choice where it is difficult to control moisture and high caries susceptibility. The aim of this review is to investigate whether an amalgam phase down approach is better than complete ban on amalgam. Amalgam is generally a safe, reliable and good material when its waste is disposed following the guidelines. Amalgam phase down approach would have a milder impact on dental health and dental professionals than implementation of complete amalgam ban.
Effect of 2% Chlorhexidine on bond strength of composite resin to dentin

Siri Putchala

Advisor: Dr. Thomas Steeves

The aim of this review is to present the available current scientific evidence related to the effect of 2% chlorhexidine on bond strength of composite resin to dentin. The electronic databases that were searched to identify manuscripts for the proposed objective were Medline via PubMed, Google scholar, Research gate, and Cochrane Database of Systematic reviews. Composite resins are the most frequently used direct tooth-coloured restorative materials. They are able to replace the lost tooth tissue in a conservative way due to the bond between resin and tooth substrate. However, it has been stated that loss of bond strength overtime is related to proteolytic degradation of collagen component of hybrid layer and hydrolysis of adhesive resin component. Hence, preservation of the exposed collagen using matrix metalloproteinases (MMPs) inhibitors may be regarded as an initial restorative step to stabilize the hybrid layer. CHX(Chlorhexidine) is a cationic bis-biguanide, widely known as an antimicrobial agent and is able to inhibit the MMPs’ collagenolytic activity, improving the longevity of the bond between adhesives and dentin. Application of 2% CHX after acid etching and before adhesive application, is the most common protocol used. This review is primarily focussed on determining whether it is clinically feasible to add a CHX pre-treatment step to the resin restoration process to improve bond strength. With chlorhexidine, significantly better preservation of bond strength was observed after 6 months. It also showed significantly less failure in the hybrid layer with chlorhexidine, compared with controls after 6 months. The use of MMP inhibitors did not affect the immediate bond strength overall, while it influenced the aged bond strength.