

1. Patient's and Providers Views on Integrated Prenatal Oral Care

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Objectives: To increase access to oral healthcare, integrated care is recommended for addressing preventive oral health during pregnancy. We sought to explore the views of pregnant women and healthcare providers in British Columbia (BC), Canada, on strategies for achieving integrated prenatal oral care.

Methods: We conducted semi-structured interviews with 23 (12 dental and 11 prenatal) healthcare providers and 14 pregnant women in Vancouver and Surrey, BC. The interviews were transcribed verbatim and analyzed using an inductive thematic approach. Field-notes, member checking, memoing, and external audit ensured study validity.

Results: Four themes were addressed by both pregnant women and health care providers: relevance of integrated prenatal oral health, strategies for achieving integrated prenatal oral health, drivers of the integration process, and barriers to integrating oral health during pregnancy. Health care providers addressed a fifth theme: perception of integrated care. Both groups supported integrated prenatal oral care. Participants suggested including oral health assessments on the provincial antenatal checklist and utilizing screening questions during prenatal visits as achievable integration strategies. Participants recommended that prenatal providers should offer oral health education to all women, and when indicated, referrals to dental providers should be initiated. Clear communication processes to facilitate an effective referral system and interprofessional education were further suggested. Participants, especially healthcare providers, identified various barriers to integrated prenatal oral care. The differential funding and administrative structure of oral health and medical care were the most common barriers cited. Most participants suggested including preventive oral care in the provincial healthcare plan. Some pregnant women suggested providing vouchers for women who cannot afford care. Advocacy for prenatal oral care by dental providers was also proposed.

Conclusions: Pregnant women and healthcare providers supported the integration of oral health in perinatal care and shared similar views on strategies for achieving integrated prenatal oral care.

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2. Selective Laser-Melted Partial Denture Framework Fit Measured Clinically and Digitally

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Objectives: Advances in three-dimensional (3D) printing technology have improved the fit of Partial Removable Dental Prostheses (PRDP) frameworks made by Selective Laser Melting (SLM). Historically, the gaps between master casts and these PRDPs have been evaluated using clinical replicas. More recently, virtual replicas have provided an alternative way to measure these gaps. The aim of this project was to assess the similarities and differences between the two methods when used to evaluate the fit of SLM PRDP frameworks.

Methods: A printed master cast, representing a Kennedy class II mod 2 design with 5 fiducial markers, was made from a dentiform model. Twelve SLM Co-Cr PRDP frameworks were fabricated on this master cast by means of digital design software. Gaps between the frameworks and the cast were assessed by inserting silicone impression material prior to their seating, then measuring the silicon thickness at each marker with a caliper. Digital models of each framework and the master cast were registered with CloudCompare software, which was also employed to measure 3D gaps at the 5 reference markers and 3 occlusal rests. The results were analyzed by one-way ANOVA and post-hoc Bonferroni tests.

Results: The mean gap between the frameworks and master cast for clinical registration was 13.96 ± 7 microns. The mean gap for digital registration was 70.76 ± 24 microns. Statistically significant differences among the fiducial markers were found in both approaches. There were no statistically significant differences among the frameworks. In both cases gap measurements were well below the 300-micron limit considered clinically acceptable.

Conclusions: Both registration methods can help determine whether the fit of an SLM framework is clinically acceptable. Differences in the values they provide are most likely due to unique factors affecting both methods of measurement.

3. Risk Determinants of Periodontitis among Untreated Individuals in Saudi Arabia

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Objectives: To examine the risk determinants of periodontitis in subjects never treated for periodontal conditions in Saudi Arabia.

Methods: Untreated subjects were examined for their periodontal status after collecting information about their sociodemographic characteristics, medical conditions, use of medications, oral behaviours, perceived stress, and perceived social support. The European Federation of Periodontology definitions for periodontitis and generalized advanced periodontitis were used as study outcomes. Periodontitis (outcome 1) was defined as an interproximal clinical attachment loss (CAL) of ≥ 3 mm in ≥ 2 non-adjacent teeth, while generalized advanced periodontitis (outcome 2) was defined as an interproximal CAL of ≥ 5 mm in $\geq 30\%$ of the dentition.

Results: A total of 431 subjects met the inclusion criteria. The mean age of participants was 35.4 ± 13.3 years; 185 (42.5%) were males and 246 (57.5%) were females. Overall, high levels of plaque were observed in the studied subjects. The prevalence of periodontitis (outcome 1) and generalized advanced periodontitis (outcome 2) were 76.3% and 17.4%, respectively. A multivariate logistic regression model for outcome 1 was significant ($p < 0.001$) and 42.5% of the variation of periodontitis was explained by the model's determinants: 35+ years of age (OR=32.1), smoking ≥ 10 cigarette daily (OR=3.3), perceived lack of social support (OR=1.7), and lower monthly income (OR=2.0). A logistic regression model for outcome 2 was significant ($p < 0.001$) and 39.0% of the variation was explained by these risk determinants: male (OR=2.8), above a high school education (OR=0.3), 35+ years of age (OR=10.4), and Diabetes Mellitus (OR=2.9).

Conclusions: A high prevalence of periodontitis in untreated individuals in Saudi Arabia was found. Up to 42.5% of variation in periodontitis was explained by these risk determinants: 35+ years of age, male, low income, low education, perceived lack of social support, smoking ≥ 10 cigarettes daily, and uncontrolled diabetes mellitus.

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4. Does Invisalign® Meet its Tooth Movement Predictions? A Novel Technique

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Objectives: To assess Invisalign® treatment's ability to match its predicted tooth movements in adolescents and adults.

Methods: The study included 25 patients (aged 24.8 ± 8.8 years) who had completed an initial series of Invisalign® treatment. The ClinCheck® prediction and post-treatment digital models were digitally superimposed with CloudCompare® software using the hard palate rugae. CloudCompare® measured differences in displacement and orientation for 150 posterior maxillary teeth, representing all bilateral premolars and first molars. Tooth movements were expressed as mesial-distal, buccal-lingual, and occlusal-gingival translations, and tooth orientations as axial rotations, tips (inclination), and torques (buccal-lingual orientation). Predicted and post-treatment differences considered clinically relevant were defined as those greater than 0.5 mm for tooth displacement and those greater than 2 degrees for tooth rotation.

Results: Anteroposterior and buccolingual translational movements of all posterior teeth appeared to be accurate, with the differences between ClinCheck® predicted and post-treatment digital models insignificant ($P=1.000$). Occlusogingival movements overall were less accurate ($P<0.08$), particularly the extrusion of first molars, which were found to be inaccurate ($P=0.003$). Rotation and torque movements were less accurate, with a statistical significance of $P=0.00126$ and $P=0.00029$, respectively.

Conclusions: The Invisalign® system met some, but not all, of its predicted goals for posterior maxillary tooth movement in non-extraction, mild-to-moderate malocclusions. Achieving predicted vertical tooth movements, axial-rotations, and torques were more challenging for posterior maxillary teeth. Axial rotation for the premolars and torques for all posterior maxillary teeth were less successful. Vertical tooth movement, especially extrusion, was less achievable for second premolars and first molars. Refinements or overcorrection may be necessary to achieve the desired results in these cases.

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5. Antimicrobial Effects of Agitational Irrigation on Biofilms in Dentin Canals

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Objectives: Endodontic treatments aim to prevent or heal apical periodontitis. Some endodontic infections are persistent and are mainly caused by bacterial invasion and colonization in dentinal tubules. These bacteria are capable of forming biofilms. Eradicating biofilms makes endodontic treatment more challenging. Because they render areas that cannot be touched by rotary files, mechanical instrumentation alone cannot eliminate biofilms. Other chemical aids, such as sodium hypochlorite (NaOCl), are necessary to improve bacterial reduction. Studies have shown supplementing NaOCl with different contemporary agitation devices optimize treatment outcomes. Our objective was to compare antibacterial effects of different agitation devices and NaOCl on single- and multispecies biofilms in dentin canals using confocal laser scanning microscopy (CLSM). We hypothesize there are no differences between root canal agitation devices in eliminating single- and multispecies biofilms in dentin canals.

Methods: Dentin blocks were prepared from human root dentin. To form biofilms, *Enterococcus faecalis* and plaque were introduced into dentinal tubules using centrifugation. After 3 weeks, two infected dentin samples were placed at 8 mm and 16 mm in a customized model. Samples were randomly divided into eight groups according to the agitation device used: syringe needle irrigation (SNI), EndoActivator (EA), passive ultrasonic irrigation (PUI), and EDDY, with 2.5% and 6% NaOCl concentrations. Samples were stained and observed using CLSM to quantify the proportions of dead bacteria in dentin canals.

Results: There were no significant differences ($p>0.05$) between single- and multispecies biofilms. NaOCl concentration, location of infected dentin, and agitation device used each played a role in the killing efficacy. There were no significant differences between the killing efficacies of EDDY and PUI.

Conclusions: EDDY was as effective as PUI when used with concentrated NaOCl and demonstrated enhanced antibacterial effects against single- and multispecies biofilms in the dentinal tubules. Apical portions with low antimicrobial efficiency remain a concern.

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6. Validation of Apple iPhone/Bellus3d App for 3D Facial Imaging

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Objectives: This study compared landmark-based linear measurements and whole 3D surface geometry obtained using two three-dimensional facial imaging systems in a sample of adult participants: The Apple iPhone (using the Bellus3D Face Application) and the widely used and extensively tested stationary 3dMDface system. The goal was to determine the concordance between these two systems, one new and one more established.

Methods: Six participants have been included to date (data collection ongoing). Eighteen soft-tissue landmarks were determined on each participant: Nnasion; Prn, pronasale; Sn, Subnasale; Sl, sublabiale; Me, menton; Ftr and Ftl, right and left frontotemporale, respectively; Zyr and Zyl, right and left zygion, respectively; Alr and All, right and left alare, respectively; Cphr and Cphl, right and left crista philtri, respectively; Gor and Gol, right and left gonion, respectively; Tr and Tl, right and left tragon, respectively; and Tr, trichion. 3D facial images were captured using a 3both device. This data was analyzed by Geomagic Control X processing software.

Results: Using error magnitude statistics, linear distances were compared between cameras. In addition, 3D facial surfaces from each system were registered, heat maps generated, and global root mean square (RMS) error calculated. The distances were relatively comparable across the two cameras, with an average technical error of measurement (TEM) value of 1.2 mm (range 0.2-2.5 mm). The average RMS value of the 30 surface-to-surface comparisons was 1.98 mm (range 0.44-3.1 mm). In each case, the vast majority of the facial surface differences were within a 2 mm threshold. Areas exceeding 2 mm were generally limited to facial regions containing hair or subject to facial micro expressions.

Conclusions: These results indicate that 3D facial surface images acquired with the iPhone/Bellus application are sufficiently accurate for most clinical applications.

7. Pilot Study Comparing Two Methods for Evaluation of Facial Asymmetry

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Objectives: Asymmetries in the craniofacial region are typically assessed using annotated landmarks and constructed planes. This method is prone to methodological variability, which is circumvented using Geometric Morphometrics approaches. We aim to compare these two methods in assessing maxillo-mandibular asymmetries.

Methods: We randomly selected 10 cone-beam computed tomographies (CBCTs) of pre-orthodontic patients (ages 7-9 years old) for this pilot study. Fifty-one landmarks were annotated twice with a gap of 7 days, using 3D Slicer software. To assess errors in landmarking, the Euclidean distance between the landmark coordinates of the two attempts was determined. To assess asymmetry, two methods were used: 1) the traditional plane construction (TPC) method, which requires the placement of sagittal, axial, and coronal planes, followed by the assessment of projected distances from each landmark to each plane and 2) geometric morphometric (GM) analysis, which uses the geometric center of the landmarks to superimpose the mirrored landmarks over the original ones with the best fit to determine asymmetry.

Results: Landmarking error was low, ranging from 0.125-0.46 mm. The TPC method revealed statistically significant differences ($P < 0.05$) between the right and left upper molar cusp tip in the axial plane; the supra orbital, frontozygomatic suture, and infraorbital foramen in the sagittal plane; and the zygion landmark in the coronal plane. The GM analysis revealed statistically significant fluctuating and directional asymmetries. The outer orbital margin and zygoma landmarks were further apart (larger) on the left side, while they were closer (smaller) on the right. Additionally, the inner orbit, maxilla and mandibular ramus appeared larger on the right side.

Conclusions: Significant asymmetries were identified using both methods; however, they analyze asymmetries differently. While similarities in outcomes were found around the orbital margins, the results in other regions did not perfectly match.

8. The Platelet Response to Viral Infection: Implications for COVID-19

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Objectives: Infection with the novel severe acute respiratory syndrome-related coronavirus 2 (SARS-CoV-2) confers an increased risk of thrombosis, including thromboembolism and cerebrovascular accident (stroke). Platelets have an undisputed and central role in hemostasis and thrombosis; platelet activation by viruses is also well-documented. However, the molecular mechanisms underlying COVID-19-associated thrombosis are not well understood. The objective of this project was to review the potential virus-platelet signaling pathways that may explain the increased risk of thrombosis due to COVID-19.

Methods: A literature review (PubMed) was conducted to summarize the current state of knowledge regarding virus-platelet interactions, and their relevance in the context of COVID-19. The literature search included published studies focused on the platelet response to SARS-CoV-2.

Results: Considerable evidence supports the concept that platelets have wide-ranging functions in health and disease that extend beyond physiological hemostasis. In the context of COVID-19, patients infected with SARS-CoV-2 are at significantly higher risk for fatal thrombosis. Recently published laboratory investigations indicate that platelets from COVID-19 patients demonstrate hyperactivity and form platelet-monocyte aggregates that are characteristic of pro-thrombotic states. Newly published evidence indicates that platelets express critical proteins that allow viral ingress, notably, ACE2, a host cell receptor for SARS-CoV-2. Platelets also express TMPRSS2, a serine protease that allows “priming” of the SARS-CoV-2 spike protein. Importantly, platelets are activated upon binding of SARS-CoV-2 to ACE2, suggesting that platelets directly mediate thrombosis following COVID-19 infection. Other findings highlight the specific role of MAP kinase (MAPK) signaling in SARS-CoV-2-induced platelet activation.

Conclusions: Additional research is required to determine whether, and how, virus-platelet signaling can be targeted to reduce the risk of thrombotic complications resulting from COVID-19.

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9. SEM Analysis of Biofilms on Dental Implants Explanted for Peri-Implantitis

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Objectives: Dental implants have become a routine part of daily dental practice. About 20% of subjects receiving implants develop peri-implantitis (PI) which is associated with progressive inflammation and bone loss around implants, often leading to implant failure. Little focus has been placed on the biofilms that occupy the implant surface. The purpose of the present study was to investigate the morphotypes of bacteria in the microbial ecosystem that cover the implant threads, to explore whether different implant surface morphologies and chemistries favour different morphotypes, and whether certain morphotypes were associated with more advanced disease.

Methods: The implants (N=20) that were determined by the clinician to have failed were removed and instantly processed for scanning electron microscope analysis. The implants were imaged at different levels (from crest to the apex). Bacterial morphotypes were then divided into cocci, rods, filaments, and spirilla/spirochetes. In addition, bacterial aggregations were classified as corncobs, bristle brushes, and hedgehogs.

Results: Implants removed due to PI demonstrated the presence of variable bacterial morphotypes that did not correlate to disease progression in our preliminary analyses. In general, similar morphotypes were found along the entire implant from the crestal region to the most apically affected areas. In addition, our data suggest that there was no special correlation between bacterial morphotypes and the implant brand. Several implants showed mature biofilms with bacterial aggregates presenting complex structures like corncobs, test-tube brushes, and hedgehogs.

Conclusions: In our data analyses, the profiles of morphotypes present in biofilms in PI were highly variable and were not clearly associated with the implant brand. Interestingly, similar morphotypes were found throughout the entire implant surface. Because of the relatively small number of implants collected thus far due to COVID-19, more implants need to be collected and analyzed to reach the final conclusions of the study.

10. Pan-Canadian Protocols for Reopening Dental Services during the COVID-19 Pandemic

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Objectives: A rise in uncertainty among dental professionals following the release of BC's provincial protocol prompted a review of available provincial and territorial protocols. The aim of this study was to systematically summarize Canadian provincial and territorial protocols and critically analyze their content in contrast with existing evidence.

Methods: Canadian provincial and territorial protocols pertaining to the procedures for the reopening of dental services in light of the COVID-19 pandemic were reviewed between April 15 and July 13, 2020. A search was conducted via Google Scholar, mailing lists from regulatory bodies, websites of organized professions and the government, and personal contacts through academic institutions and dental policy leaders in Canada. Information presented in the protocols assessed eight areas of interest: office management and procedures, patient and staff screening, treatment procedures, office layout, personal protective equipment, transmission risk reduction, supporting information, and length and readability.

Results: Thirteen protocols were identified, and each had substantial variation in the level of details provided. Consistency was found in the areas of patient and staff screening, treatment procedures, and supporting information. Variation was evident in the areas of office management and procedures, office layout, personal protective equipment, transmission risk reduction, and length and readability. While all protocols aimed at restructuring emergency dental services, their recommendations were often lacking evidence.

Conclusions: The information conveyed across all protocols was clear, but the variance highlights the need for a coordinated effort to develop an evidence-based document in order to minimize uncertainty among dental professionals.

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11. Determining Feasibility for Oral Cancer Screening in Rural India

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Objectives: Oral cancer is ranked in the top three of the most common occurring cancers in India, with over 120,000 cases reported annually. Advanced stage diagnosis is common due to poor access to healthcare and low socioeconomic status. Oral cancer screening is a quick, painless, and non-invasive examination to detect suspicious lesions early. The aim of this study was to determine the feasibility of conducting oral cancer screening in a rural area near Hyderabad, Telangana, India, as a collaboration with the Two Worlds Cancer Collaboration Foundation; the University of British Columbia; BC Cancer; MNJ Cancer Hospital, India; a local NGO; and two dental colleges in Hyderabad.

Methods: The feasibility study was held in the Urella village community school. The Canadian team trained Indian clinicians on use of fluorescence visualization (FV) and study methodology. Participants completed a detailed risk habit assessment, then intraoral, extraoral, and FV examinations following informed consent.

Results: A total of 109 participants were screened; 60% males and 40% females. Screening data was complete for 107 participants, of which 14 (13%) had at least one intraoral lesion. Ten lesions in seven participants were clinically diagnosed as oral potentially malignant lesions (OPMLs), while the remaining lesions were attributed to common benign conditions. Biopsy was completed for four lesions, resulting in one carcinoma-in-situ, one submucosal fibrosis, and two hyperkeratosis. FV loss was noted in all lesions indicated for biopsy. Chewing tobacco/betel nut or *pan* was significantly associated with lesion presence ($P=0.010$). FV was a viable adjunctive screening tool in this population; further training and experience is required to improve accuracy.

Conclusions: This feasibility study highlights the challenges of community oral cancer screening and helped prepare for the pilot phase, which screened over 1000 participants in rural areas outside of Hyderabad, using additional adjunct tools to improve risk assessment during screening.

Acknowledgements: This study was supported through fundraising efforts by the Two Worlds Cancer Collaboration Foundation, an NPO based in Kelowna, Canada. Two Worlds aims to provide cancer palliative care in low resource countries.

12. Antibacterial Effect of an Experimental Adhesive Loaded with Nanoparticles

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Objectives: To evaluate the antimicrobial effect of an experimental adhesive loaded with undisclosed bioactive nanoparticles.

Methods: The antimicrobial properties of four bioactive experimental adhesives (BEAs) loaded with bioactive nanoparticles and a control (C) were tested. Experimental and control standardized discs (4 mm/1 mm) were fabricated and autoclaved. *Streptococcus mutans* cells were refreshed, tested for purity, and cultured. Sterile saline solutions were prepared using the microbial suspension with a starting CFU of 1×10^5 /mL. The suspension (1 mL) was dispensed into wells where the fabricated discs were placed. A 3-hour incubation period was set to allow bacterial adhesion to the surfaces of the resin discs. Subsequently, they were washed twice with saline. The discs were placed in 50 μ L of saline solution and sonicated for 5 minutes at 25°C to allow the detachment of bacteria from the discs. From the obtained solution, 10 μ L was removed and added to 90 μ L of saline. Serial dilutions were then performed in a 96-well plate. Subsequently, 10 μ L of each dilution obtained from each group was removed and dispensed onto agar plates. They were incubated for 3 days in 5% CO₂ at 37°C, then bacterial growth was measured. The entire study was done in triplicate. Statistical analysis was performed using the Student's t-test method ($p < 0.05$)

Results: The experimental BEA2 showed a statistically significant antimicrobial effect against *S. mutans* compared with the control (C) and the other experimental adhesives tested. Overall, three experimental adhesives, BEA2, BEA3, and BEA4, showed some antimicrobial effect.

Conclusions: Among the BEA formulations, the most promising undisclosed bioactive nanoparticle was represented by the BEA2 formulation. However, BEA3 and BEA4 also showed a potential for reduction in microbial growth. Further studies will consider adjusting the concentration of the bioactive nanoparticles incorporated into the experimental adhesives.

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13. Evaluating Impact of New Nutrition Curriculum for Dental Hygiene Students

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Objectives: Nutrition education (21 hours) in the second year of UBC's Dental Hygiene Degree Program is being revised to incorporate contemporary educational pedagogy. The purpose of this inquiry was to quantifiably measure students' perspectives of how the old curriculum affected their learning and to survey students' values on interprofessional education and collaborative practice prior to implementation of the new curriculum. The research question asked: How do students' knowledge, skills and perceptions of nutrition education change with implementation of a new blended, interprofessional and peer-to-peer (IP-P2P) educational model?

Methods: A pre/post study design is being deployed to examine changes in students' knowledge, skills, and perceptions of the second-year nutritional sciences curriculum from baseline (2019-20) to post-implementation (2020-21) of the new blended interprofessional peer-to-peer curriculum. This project has been approved by UBC's Behavioural Research Ethics Board (H20-00358).

Results: The baseline survey achieved a 100% response rate. Using a 5-point Likert scale, the "pre" findings indicate a range of responses to 15 variables, including those that pertain to dental hygiene students' working knowledge of nutrition, their attitudes toward peer-to-peer education, and abilities to work on interdisciplinary healthcare teams. The following two variables each received the highest average score of 3.96: *I understand the roles of other professionals within the interdisciplinary team* and *I would recommend peer-to-peer learning to other health professionals*. The variable with the lowest average score (2.48) was in response to: *I had to prepare for class in order to be successful*.

Conclusions: Students' responses support changes to the nutrition education curriculum. Results obtained post-implementation of the new curriculum will determine impact on students' knowledge, skills, and perceptions of the nutritional sciences curriculum.

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14. Oral Cancer Recurrence and Alcohol Use

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Objectives: Recurrent disease (REC) is a serious concern for patients with a history of oral squamous cell carcinoma (OSCC), as up to 30% of patients develop a REC. RECs are second oral cancers that recur at the same site or within three centimetres of the primary tumour. Alcohol use is associated with OSCC risk. This study aimed to determine if the amount and duration of alcohol use are associated with RECs.

Methods: Inclusion criteria included: 1) primary OSCC treated with curative intent and 2) former cancer site was disease-free for 2 months after treatment. Patients were excluded if they developed a REC within 6 months following treatment. Patient demographic, histological, and clinical data were collected at study entry, along with current and past alcohol and tobacco use; an annual follow-up questionnaire provided information on a change in risk habits. The primary study endpoint was a REC at the former cancer site.

Results: Alcohol use data is available for 121 patients: 100 current or past alcohol drinkers and 21 with no history of alcohol use. Although not significant, a smaller proportion of patients with a history of alcohol use (22%) developed a REC as opposed to those with no alcohol use (29%). Notably, the highest proportion of RECs occurred in the group who quit drinking at or after their primary cancer diagnosis (30%), followed by never drinkers (29%), and former drinkers who quit before diagnosis (23%). The duration and amount of alcohol use prior to primary diagnosis were not associated with REC in this cohort.

Conclusions: The amount and duration of alcohol use before and after primary OSCC diagnosis was not associated with an increased risk of REC. The risk of REC may be related to other factors such as treatment and stage at diagnosis rather than alcohol use.

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15. Potential Biomarkers for Managing Oral Premalignant Lesions – a Pilot Study

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Objectives: The effectiveness of various treatment therapies for oral premalignant lesions (OPLs) is difficult to gauge among different patients. Loss of heterozygosity (LOH) at 9p, 3p, and 17p in OPLs are key biomarkers of oral cancer progression and recurrence. Here, we explored if these biomarkers can also predict the outcome of OPLs treated with either topical photodynamic therapy (PDT) or topical cryotherapy.

Methods: This is a retrospective study. Inclusion criteria for patients/lesions included: presence of dysplasia, received topical treatment, and at least 1-year post-treatment follow-up. Formalin-fixed paraffin-embedded (FFPE) and cell brushing samples of the patients' lesions were collected and treated by PDT (N=20) or cryotherapy (N=8). LOH assays using capillary gel electrophoresis and fluorescent-labelled microsatellite probes for 3p, 9p, and 17p were used to analyze FFPE (N= 22) or brushing (if no FFPE, N=6) samples collected at, or prior to, first topical treatment. Patients' demographics and lesion characteristics were also collected. The Chi-square test (or Fisher's exact test when necessary) was used to assess if clinical, pathological, or LOH molecular tests can predict the outcome (persistent vs. resolution) of topical treatment.

Results: Among the 28 patients/lesions that were assessed using the Chi-square test (or Fisher's exact test when necessary) there were no significant differences in the treatment outcome between variables, including age (older (≥ 64) and younger (< 64); median age as cut-off), sex (males and females), smoking habit (ever- and never-smoked), anatomical site (tongue vs. non-tongue site), lesion size [large (≥ 2 cm) and small (< 2 cm)], treatment type (PDT and cryotherapy), and LOH (molecular risk pattern with LOH at 9p and/or 3p).

Conclusions: In this sample set, we did not find any possible biomarkers in the demographics, clinical features, or LOH risk patterns to predict the outcomes. Further investigation using alternative markers, like quantitative cytology, is underway.

16. Vulnerable Populations' Needs and Access to Dental Services During COVID-19

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Objectives: Vulnerable and marginalized populations often have limited access to dental care and have increased risk of poor oral health. In response to the COVID-19 outbreak, all non-essential dental services were ceased across British Columbia between March 16 and May 18, 2020. The aim of this study was to explore the impact of the dental service curtailment on vulnerable populations' access to dental services, describe their coping mechanisms, and identify resources deemed necessary throughout the pandemic.

Methods: Semi-structured, remote interviews were conducted with 13 staff and 17 clients from six community-based organizations. The interviews were audio-recorded, transcribed, and coded for emerging themes using NVivo 12 software. Participants' names and other identifiers were kept confidential, and thematic analysis was performed.

Results: Dental treatment needs generally remained the same during the curtailment of dental services. However, clients had decreased access to dental services, including those with dental emergencies who resorted to seeking primary or urgent care, using medication or substances, or performing self-extractions. Non-COVID-19 related barriers to dental services were numerous, including cost, dental anxiety, and oral health not being a priority. Barriers involving COVID-19 included offices being closed, being considered high risk for COVID-19, COVID-19 anxiety, and specific office requirements. Staff requested a COVID-19 protocol plan, a list of reduced-cost dental clinics, and free hygiene supplies, while clients needed information on dental services during COVID-19 related to the safety of those services. Many believed an oral health resource line may be helpful in providing referrals, assistance with insurance navigation, and answering questions.

Conclusions: The curtailment of dental services further reduced access to dental services for vulnerable populations, leading those with dental emergencies to access primary care, use substances, or perform self-extractions. An oral health resource line may help improve access to dental information and services.

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17. Evaluation of Chinese Medical Plants as Cathepsin K Inhibitor Sources

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Objectives: Cathepsin K (CatK) is the predominant collagen-degrading protease in osteoclasts and a major target for anti-osteoporosis drug development. We hypothesized that medicinal plants used for skeletal-related illnesses in traditional Chinese medicine (TCM) might prevent the collagenase activity of CatK by directly inhibiting its catalytic site or by preventing the protease's complex formation with chondroitin sulfate required for its collagenolytic activity. The aim of this study was to test water and ethanol extracts of 10 medicinal plants for inhibition of CatK.

Methods: Ethanol and water extracts of 10 medicinal plants were prepared, concentrated, and tested for their inhibitory activity against human CatK. The anti-collagenase activity towards CatK was monitored by SDS-PAGE. The active site-directed activity was monitored by the Z-FR-MCA activity assay.

Results: Four ethanol extracts, *Herba Epimedii*, *Rhizoma Drynariae*, *Radix Astragali*, *Cortex Eucommiae*, and *Fructus Psoraleae*, showed inhibition of both the collagenase and active site activity. Four water extracts, *Sclerotium Poriae Cocos*, *Radix Dispacis*, *Radix Astragali*, and *Fructus Psoraleae*, showed inhibition of both collagenase and active site activity. The most interesting result was that the ethanol extract of *Rhizoma Atractylodis* showed no inhibition towards the active site activity of CatK but completely inhibited the collagenase activity, indicating an ectosteric inhibitory mechanism.

Conclusions: Ethanol extract of *Rhizoma Atractylodis* showed the selective inhibition of the collagenase activity of CatK. This indicates an ectosteric inhibitory mechanism where a compound binds to an exosite of CatK instead of its active site. It was previously shown that this type of CatK inhibition is not associated with side effects in animal studies. This demonstrates the possibility of a novel therapeutic approach to decrease abnormal bone degradation with reduced or no side effects as is seen with active site-directed inhibitors. Future studies will focus on the isolation and characterization of the active ingredients of this herb.

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18. Removal of Accidental Materials from Root Canals – *In Vitro* Study

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Objectives: Small pieces of material, typically from dental restorations, may accidentally drop into the apical root canal obstructing treatment. The aim was to i) compare the efficacy of irrigation by different methods in removing materials from the apical root canal and ii) determine if the efficacy is affected by canal orientation and irrigant flow rate.

Methods: A transparent, 3D-printed, micro-CT scan-based resin mandibular molar tooth was selected. Six materials of different density were passively placed into the apical part of the distal root canal: polyethylene, glass, titanium, stainless steel, gold alloy dust, and amalgam dust. Materials were removed using three irrigation methods at manufacturer recommended maximum irrigation times: the GentleWave system (seven minutes), syringe needle irrigation with a 30 gauge open-ended and 30 gauge side-vented needle each at flow rates of 5 and 15 mL/min (2 minutes), and the ProUltra PiezoFlow ultrasonic irrigation system at flow rates of 0 and 15 mL/min (1 minute), resulting in seven experimental irrigation groups. For each material, each irrigation group was repeated 10 times, five in horizontal and five in vertical canal orientations using distilled water. Material removal was assessed using visual evaluation under a stereo microscope. Results were analyzed for completely cleaned canals and percentage of materials removed by each irrigation method.

Results: The GentleWave system was most effective at maximum and 1-minute irrigation times. All other irrigation methods removed the materials significantly less well than GentleWave. Mean percentage removal by GentleWave was 98.6%, with overall values ranging from 67-100%. Canal orientation did not significantly affect the percentage of material removed; however, higher flow rates did show significant results for the open-ended needle and PiezoFlow.

Conclusions: The GentleWave system was the most effective in removing material from the root canal. Removal of material was affected by flow rates, but not by canal orientation.

19. Oral Herpes Simplex Virus Management with Cyanoacrylate Adhesive: Pilot Study

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Objectives: Herpes simplex virus (HSV-1, 2) can present as symptomatic oral lesions or asymptomatic shedding. The risk of viral spreading during dental procedures is a safety concern, which we hypothesized may be reduced by using cyanoacrylate adhesive (CA). The aim of this study was to determine 1) the efficacy of CA in limiting the spreading of symptomatic oral lesions and 2) the proportion of asymptomatic reactivation compared to symptomatic reactivation.

Methods: Thirty-three participants were recruited from UBC's Faculty of Dentistry. Oral mucosal (OS) and lesion swabs (LS) were collected and tested for HSV using the PCR assay. Asymptomatic participants with a possible history of oral HSV lesions (n=17) were followed for 3 months. Symptomatic lesions (n=11) had OS and LS collected, CA applied, and were subjected to soft tissue manipulation (STM). CA's efficacy to alleviate/cause pain was assessed by daily journaling using a visual analogue scale (VAS; 0-10). The examiner was blinded to the symptomatic LS results.

Results: Twelve participants were excluded based on inclusion criteria. Of the 21 participants remaining, 9 participants developed herpes labialis lesions. Two developed recurrent lesions, resulting in 11 lesions in total. Two lesions had detectable HSV through OS. Viral DNA were detected in 36.4% (4/11) of lesions after CA application and 54.5% (6/11) after STM. CA dislodged on average 23.4 h after application (range 2-48 h). CA was well tolerated with an average VAS=1.9. Average time for lesions to reach healing stage is 11.9 days.

Conclusions: CA application limited HSV spreading by forming an occlusive barrier on ulcerated lesions. Average healing time for lesion post CA application matched literature timeframes. VAS scoring identified acceptance and low post-application pain. Due to the irregular frequency of HSV reactivation, results demonstrated difficulty with detecting asymptomatic reactivation, even in subjects with a known positive history of herpetic lesions.

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20. Visualizing the Immune Microenvironment of Oral Potentially Malignant Lesions

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Objectives: Tissue sections of oral potentially malignant lesions (OPML) not only inform clinical diagnosis but provide a snapshot into the interactions between cellular populations, signalling molecules, and structural proteins that impact the clinical course of disease. However, much of this information remains unpacked due to methodological limitations. Traditional immunohistochemistry (IHC) relies on visual scoring of one to three proteins of interest, introducing human error into the analysis, and limiting the number of proteins studied. Newer multiplexed IHC (mIHC) methods involving repeated cycles of staining allow for quantification of a greater number of markers, but adds complexity to result interpretation, and may compromise tissue integrity. There is a need to develop an immunostaining method that overcomes these barriers. We hypothesize mIHC and an in-house Hyperspectral Cell Sociology (HCS) platform will allow for robust investigation of the immune microenvironment of OPML.

Methods: Automated mIHC staining with a seven immune marker panel was completed on annotated formalin-fixed paraffin-embedded OPML tissue. A cocktail of three primary antibodies was applied, then antigens and chromogens stripped using SDS-glycine before second round staining with four antibodies and a hematoxylin counterstain was completed. Slides were digitally imaged, and staining quantified computationally using the HCS platform.

Results: One cycle of staining and de-staining allows for the detection of several markers on one section while minimizing tissue loss. HCS generates a set of images of a single tissue section showing each stain separately, along with a map of the epithelium and underlying connective tissue. True positive cells for each stain are demarcated on this map, allowing for investigation of marker positivity, co-positivity, spatial relationships, and layer-based analysis.

Conclusions: The immune microenvironment contains a wealth of information pertaining to the biology, pathogenesis, and outcome of disease. mIHC and imaging methods to analyze this information is of great clinical utility.

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21. Quantitative Nuclear Phenotype Model Predicts Nodal Disease in OSCC

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Objectives: Oral cancer (OC) patients face a 1-in-4 risk of developing nodal disease (LN+). Prophylactic neck dissections for high-risk patients may save lives. Quantitative nuclear phenotype (QNP) refers to comprehensive extraction of nuclear phenotypes. The study objective was to develop a QNP-based biomarker, a nodal risk score or NRS, in prediction of LN+.

Methods: This study consisted of 35 OC surgical samples (16 LN0, 19 LN+) collected in a Pan-Canadian surgical trial. For each sample, two consecutive 4µm sections were stained with hematoxylin-and-eosin and Feulgen-thionin stains, then scanned and reviewed to define region of interests (ROIs) at cancerous tissue areas. Each ROI was segmented to extract 93 QNP features from individual epithelial squamous cells. Random forests (RF) modelling was performed with input of 93 features from cancer cells and binary outcome LN. The final model gave each cell a score, NRS, with 0 being LN0 and 1 being LN+. The performance of NRS was assessed by accuracy (acc), sensitivity (sen) and specificity (spe). The NRS-predicted group was defined by the cutoff, at which the sum of sensitivity and specificity was highest.

Results: Of the 35 samples, 561 cancer ROIs were defined with 468K (LN0, 120K and LN1, 344K) cells inputted for RF modelling. The LN+ group had significantly higher NRS compared to LN0 (0.67±0.15 vs 0.27±0.16, P<0.0001). At a cutoff of 0.54, the NRS-predicted LN had 91% acc (89% sen, 95% spe). Compared to the <0.54 group, the ≥0.54 NRS had significantly inferior NFS (0.17 vs 0.87, P<0.0001). With tumour grade and DOI, the performance was improved to 97% acc (95% sen, 94% spe).

Conclusions: The NRS based on QNP achieved powerful diagnostic performance in predicting LN+ in OSCC patients. With further validation, it could potentially be translated as a biomarker to help clinicians in the neck management of OC.

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22. Culturally Adapted Caregiver-Centred Preventive Dental Education for Immigrants

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Objectives: Immigrant caregivers bring different levels of knowledge and cultural backgrounds that could be detrimental to the oral health of their children. The aims of the current pilot study were: 1) to assess immigrants' knowledge levels and attitudes toward their children's oral health, 2) to design culturally adapted caregiver-centred preventive dental education for Arabic speaking immigrants, and 3) to compare the short-term effectiveness of two educational strategies utilizing the Lay Health Advisor (LHA) model and employing existing community settings.

Methods: The education was informed by the principles of Adult Learning Theory and Self-Determination Theory. In preparation, the LHA was trained to deliver education and also recruited eligible caregivers. The interactive session was designed to include a short presentation using a workbook activity, brushing practice, and setting personalized goals to improve children's dental behaviours. Passive education included only visual resources. Follow-up calls were conducted 2 weeks after the education, followed by an evaluation questionnaire after 4 weeks. To compare changes within the group pre/post-education either the Chi-Square or Fisher's Exact test was used. The mean of total knowledge scores pre/post-education was compared with a paired sample t-test.

Results: The recruitment rate was 91.6% and 19 mothers attended an interactive education session (74.7% Syrian). The interactive education was feasible and the caregivers were motivated and found it helpful to achieve their goals (84.2%). There was a significant improvement in knowledge post-education ($p < 0.001$). The overall caregivers' diet-related behaviours changed slightly post-education, although, not significantly ($p = 0.290$). While sugary cultural snack options were consumed regularly, the knowledge about their consumption frequency and the parental pattern of permissiveness for children snacking improved significantly post-education ($p < 0.001$).

Conclusions: These findings will help to develop the protocol for a larger study by reaching out to Arab immigrants in order to deliver culturally-adapted and theory-guided preventive interventions.

Acknowledgements: Mount Pleasant Neighbourhood House staff for recruiting participants and hosting this project.

23. Exploring Mental Health and Resilience in Dental Education

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Objectives: Dental and medical education are perceived as sources of psychological and occupational stress for students. While a certain amount of stress is inevitable, equipping students to cope and manage that stress is essential. Psychological resilience is considered a protective factor that has been recently introduced into dental education. The objectives of this study are two-fold: to map the mental health and wellbeing content in the dental curriculum of the Faculty of Dentistry at the University of British Columbia (UBC) and to investigate factors influencing resilience levels among five cohorts of dental students at UBC.

Methods: The curricular database and website of UBC's Faculty of Dentistry were used to gather information on mental health and wellbeing content. The Connor-Davidson 10-Item Resilience Scale was utilized to measure students' resilience levels. Students' de-identified demographic data were also collected.

Results: Two main mental health and wellbeing curricular components were identified: one didactic session on stress management and one interactive workshop on resilience. Students who did not receive any mental health content (2020/21 Year 1 students) had statistically significant higher resilience scores ($p= 0.043$; CI= -6.09 – -0.07) when compared to students who received both the didactic session and the interactive workshop (2019/20 Year 1 students and 2018/19 Year 2 students). The multiple regression analysis highlights North American/ European ethnic origins as a significant predictor that is positively associated with resilience levels ($p = 0.008$).

Conclusions: Addressing wellbeing and mental health issues is important for dental students. The higher resilience levels of 2020/21 freshmen students might indicate that this cohort started dental school in a global pandemic. This group of students may have developed adaptation and coping strategies during the pandemic. Further longitudinal studies are needed to evaluate their resilience after resuming normal learning activities.

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24. Transitioning into an Online Dental Hygiene Degree-Completion Program

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Objectives: The University of British Columbia's (UBC) Dental Hygiene Degree-Completion (DC) program has offered an academic pathway for dental hygienists to earn a degree exclusively through an online delivery format since 2006. The students' experiences transitioning to online learning and related student support needs have not been previously studied. Thus, this study investigated students' experiences as they entered an online dental hygiene DC program.

Methods: An online survey with open and closed-ended questions was distributed to all 53 currently enrolled dental hygiene DC students in September 2019. Survey questions asked for demographic information, academic transitional experiences, social integration and sense of belonging in the Faculty and university, perceived barriers and challenges, and suggestions for future students.

Results: Thirty-two students completed the survey for a 60% response rate. Most student respondents (78%) had no prior experience with online education. Only 59% of respondents were confident in their abilities to navigate a web-based learning environment. Three-quarters (75%) of respondents felt like a valued member of the Faculty of Dentistry community but only 47% felt they belonged to the larger university community. Most (72%) were familiar with the support resources within the Faculty, but fewer than half (41%) were aware of additional resources outside of the Faculty. Students aged 30 years and older felt more comfortable reaching out to faculty and staff members (90% vs. 55%; $p=0.05$). Students with prior online learning experience were more aware of student support resources outside of the Faculty (57% vs. 36%; $p=0.05$).

Conclusions: Lessons learned from this study have informed several recommendations to better support student transition to online learning that can be applicable to this program and in other institutions.

Acknowledgements: The authors thank Ms. Siobhan Ryan, UBC Faculty of Dentistry's Assistant Manager of Student Services, for her assistance with participant recruitment.

25. The Efficacy of Three-Dimensional Tooth Movement with Invisalign Treatment

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Objectives: Invisalign treatment has been widely used to address patient's esthetic demands, yet little research using superimposition has been done to assess its efficacy. We hypothesized that there was no difference between the Invisalign predicted and achieved treatment outcome. The aim of this study was to superimpose both outcomes on the palate to compare the three-dimensional (AP, vertical, transverse) tooth movement in the posterior region of the predicted Invisalign and actual achieved outcome.

Methods: Initial and achieved maxillary casts were superimposed on CloudCompare software using the central palate as a reference. This was repeated for the initial and Invisalign predicted casts. The posterior teeth were then segmented from the four sets of arches. Using CloudCompare, the difference of individual tooth position was calculated between the initial and achieved, and initial and predicted arches. Tipping, torque, and rotation differences were analyzed, as well as movement in the mesial-distal, bucco-lingual, and vertical directions.

Results: The mean accuracy of Invisalign movement for maxillary first premolars, second premolars, and first molars was 41% amongst the different types of movement. There was an overall greater difference between predicted and achieved distance measurements for angular changes compared to linear changes. Rotational movement had the greatest mean accuracy of the six movement types with 55%, while the predicted accuracy of the torque for first premolars was the highest (75%) of all measurements. The accuracy of the mesial-distal movement for the different teeth was 22%, the lowest of both linear and angular changes.

Conclusions: Specific three-dimensional tooth movement types were better predicted by Invisalign than others. There remains error between what Invisalign treatment achieved and what was initially predicted, which can be useful when explaining expected treatment outcomes to patients. The difference should be considered when treatment planning and suggests a need for further study in assessing prediction accuracy.

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26. Obstructive Sleep Apnea, Body Mass Index, and Cellular Adhesion Molecules

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Objectives: To investigate the relationship between obstructive sleep apnea (OSA) severity, body mass index (BMI), and circulating levels of inflammatory adhesion molecules (intercellular adhesion molecule-1, vascular cell adhesion molecule-1, and E-selectin).

Methods: A cross-sectional clinical cohort study was performed and consecutive adults referred to the University of British Columbia (UBC) Sleep Laboratory for a polysomnogram (PSG) for suspected OSA provided a morning blood sample. Fasting blood (15 ml) was collected in the morning after PSG and serum/plasma was stored in a -80°C freezer. Milliplex MAP Human Cardiovascular Disease Panel 1 (HCVD1-67 AK) multiplex Luminex (EMD Millipore, Etobicoke, ON, Canada) was used to determine the levels of ICAM-1, VCAM-1, and E-selectin. All assays followed the manufacturer protocols and were tested in duplicate. The samples were processed in batches.

Results: 488 patients were studied; the majority were male (68%) with a mean age of 50 years, mean AHI of 22.7 events/h, and mean BMI of 32 kg/m². The descriptive statistics suggest a clear relationship between levels of obesity (overweight to obese) and OSA severity, as well as a gradual increase in adhesion molecules levels, especially ICAM-1 and E-selectin. In multivariable linear regression models, all three adhesion molecules were significantly associated with BMI (E-selectin, $p < .0001$; ICAM-1, $p = 0.0007$; VCAM-1, $p = 0.0003$). However, only E-selectin was independently associated with AHI ($p = 0.02$) after adjustment of clinically relevant confounding factors (age, sex, BMI, AHI, Statin usage, ethnicity, diabetes, history of cardiovascular disease, and smoking status). There was no significant interaction between AHI and BMI for E-selectin ($p = .33$).

Conclusions: Although all three adhesion molecules were associated with BMI, only E-selectin was independently associated with OSA severity. E-selectin may represent a useful biomarker in OSA patients in terms of cardiovascular disease prediction. Future studies are needed to determine the clinical significance of the relationship between E-selectin and OSA.

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27. Use of Macromolecular Crowding to Model Human Gingival Fibroblast Matrix

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Objectives: Fibroblast-derived extracellular matrix (ECM) regulates cell phenotype and behaviour relevant to wound healing and pathological conditions. Improved understanding of cell-ECM interactions requires culture models that mimic the extracellular microenvironment found *in vivo*. Unlike *in vivo*, cultured cells reside in aqueous media containing a low concentration of macromolecules. Inclusion of inert macromolecular crowders (MCs) may better mimic *in vivo*-like conditions *in vitro* in a phenomenon known as macromolecular crowding (MMC). We hypothesized that MMC will modulate human gingival fibroblast (GFBL) function and composition/organization of secreted ECM distinct from conventional non-crowded culture conditions (nMMC). Our objective was to compare GFBL function and secreted ECM in nMMC and MMC over time.

Methods: Primary GFBLs were seeded at high density and cultured up to 21 days in three conditions: A) nMMC: DMEM containing 10% FBS and 50 mg/ml of ascorbic acid; B) MMC normal serum: as in A, but supplemented with MCs (Ficoll 70/400); and C) MMC low serum: as in B, but supplemented with 2% FBS. Cell morphology (brightfield microscopy and immunostaining), proliferation (image analysis and total RNA quantification), protein accumulation (Bradford assay) and localization (immunostaining), and gene expression (RT-qPCR) were then assessed. Experiments were repeated a minimum of three times and statistical testing was performed using one-way ANOVA.

Results: MMC resulted in distinct cell morphology, reduced proliferation, and decreased cell and ECM protein abundance over time. MMC altered abundance and/or organization of type I and IV collagen, laminin 1, and LTBP-1 in the ECM and significantly altered expression of 4 out of 29 wound healing-related genes studied.

Conclusions: MMC modulates GFBL function and ECM deposition, suggesting a potential use to generate improved *in vivo*-like three-dimensional fibroblast cultures and matrices. These could be used to study regulation of fibroblast phenotype and function in contexts relevant to human development, wound healing, and diseases.

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28. Technical Faults in Panoramic Radiographs in Mixed Dentition Patients

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Objectives: To determine whether patient age or patient sex affects the number of errors on dental panoramic radiographs (DPR) in the mixed dentition population.

Methods: All DPR taken at the UBC dental student clinic, during the study period, on 6 to 12-year-old patients were examined. The consecutive case series of 178 DPRs were obtained over a 4.5-year period. The primary examiner was calibrated on 30 DPRs. Intra- and inter-examiner reliability was assessed upon completion by examining a random sample of 20 DPRs. A total of 16 errors were examined for each DPR.

Results: A linear regression analysis showed that the number of errors decrease in the DPR as the patient ages, but with a p-value of 0.102 this is not statistically significant so we cannot conclude that age has a significant relationship with the number of errors in a DPR. A p-value of 0.44 was obtained when evaluating the difference in the average number of errors per DPR for males and females. We fail to reject the null hypothesis and cannot conclude that sex has a significant relationship to the number of errors. When errors were grouped, we rejected the null hypothesis up to a 0.011% significance level and conclude that age has a significant relationship to the number of errors in a panoramic radiograph. With an R^2 value of 0.036 only a very small proportion of the variance in errors can be explained by age. Trends for head tilting left and rotating right is likely due to the DPR room design and the door location.

Conclusions: Patient age and sex do not significantly affect the number of errors in a panoramic radiograph in the mixed dentition population. There is a trend for errors to decrease with increasing age. DPR room design may explain the frequency of some errors.

29. Investigating Taurodontism in an Adolescent Population Using Panoramic Radiographs

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Objectives: Until now, taurodontism has been considered to be a relatively uncommon, isolated trait associated primarily with being a marker of oro-facial abnormalities. However, studies have shown that taurodontism is present in normal Chinese and Brazilian populations. Therefore, we hypothesized that taurodontism may be present in an adolescent population as an incidental finding. The significance of this study is that, so far, there has not been a study measuring taurodontism in Canadian populations. The aim of this retrospective study was to examine the molars on panoramic radiographs in adolescents between 15 and 20 years of age to assess the presence of taurodontism and whether it was more prevalent in males or females.

Methods: 130 panoramic radiographs taken of adolescents between 15 and 20 years of age, attending the University of British Columbia's Faculty of Dentistry from January 2004 until April 2019 were examined. Using the Shifman and Chanannel criteria, each unrestored molar with closed apices were measured digitally and a taurodont ratio index was obtained. The molars were then classified according to the index.

Results: Taurodontism was found to be present in an adolescent population with a higher prevalence in females. It was also found to occur more in second permanent molars as compared with first permanent molars.

Conclusions: Our results suggest that taurodontism is present in a general adolescent population. The importance of taurodontism in a normal population is that the root shape impacts the practice of dentistry in a range of specialties, from endodontics to prosthodontics and orthodontics. The ability to identify these teeth and diagnose them early can help inform treatment planning decisions that are beneficial for both the clinician and the patient.

30. COVID-19 Uncertainties from the Perspective of Oral Health Care Workers

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Objectives: The aim of this study was to explore the ways in which the current novel coronavirus outbreak contributed to uncertainties experienced by members of the oral health care workforce in British Columbia, Canada.

Methods: This qualitative inquiry purposefully recruited frontline oral health care workers, including dentists, dental hygienists, certified dental assistants, and administrative staff, via remote semi-structured in-depth interviews between April 20 and May 4, 2020. Interviews were audio recorded and transcribed verbatim for thematic analysis. The anonymized transcripts were independently analyzed between April 20 and May 20, 2020. Coding, categories, and themes were inductively assigned.

Results: A total of 45 interviews, lasting between 39 and 74 minutes each, were conducted. Participants included 18 dentists (nine females), 12 dental hygienists (eleven females), 6 certified dental assistants (all females), and 9 administrators (five females). Fifty-one hours of audio recordings and more than 650 single-spaced pages of transcripts were produced. Five main themes emerged pertaining to uncertainties surrounding COVID-19, patient care, personal lives and infectiousness, concern for the future, and variations among different pandemics. Certitudes were less evident, but surfaced mostly when considering a potential new normal resulting from the pandemic.

Conclusions: Participants indicated that the uncertainties they felt were dependent upon what is both known and still unknown about the pandemic and the provision of oral health care. Future studies are needed to explore the viewpoints of oral health care workers from other provinces, as well as the perceptions of patients who received oral health care during the height of the first wave of the pandemic.

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31. Chinese-Canadian Parents' Attitude Towards General Anesthesia for Pediatric Dental Treatment

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Objectives: According to the Canadian Medical Association, patient and family-centered care with a focus on patient autonomy and shared decision making in acquiring informed consent is essential prior to disease management. However, due to intercultural differences in expected doctor-patient communication approaches, acquiring informed consent sometimes presents unexpected challenges with new Canadians. Statistics Canada's Census data shows that there has been an increased trend of immigration from the People's Republic of China since 1997. This study focused on Chinese parents' understanding of the informed consent process and their acceptance of the use of general anesthesia to complete dental rehabilitation on children who are too young to cooperate during extensive dental treatment in Canada.

Methods: A tested and translated semi-structured, open-ended questionnaire interview guide was utilized to complete 12 interviews, in Mandarin, with parents of young children presenting for dental care. All interviews were transcribed, translated, and coded; thematic analysis was used to determine recurring themes.

Results: Major themes emerging from the data analysis included parents voicing concerns about the safety and possible adverse impacts on neurodevelopment resulting from use of general anesthesia in their children. Other major developing themes included unrealistic parental expectations of young children's ability to cooperate for extensive dental treatment, observed differences in Canadian and Chinese perspectives around the need to protect a young child's developing psyche, and observed differences in expectations of the dentist-family relationship in Canada compared to China when it comes to providing informed consent for dental care.

Conclusions: The results of the study suggest that the informed consent process for full-mouth dental rehabilitation under general anesthesia should include a particular focus on potential adverse outcomes of short anesthesia exposure to the developing brain in preschoolers.

32. Gingival Fibroblast Secretome Modulates Skin Fibroblast Function

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Objectives: Oral mucosal wounds heal faster and generate less scarring than skin wounds. Our preliminary data suggests that when gingival fibroblasts (GFBLs) are placed in scar-forming skin wounds, they modify the skin fibroblast (SFBL) microenvironment and lead to improved healing. We hypothesized that molecules secreted by GFBLs (secretome) contribute to this outcome by modulating SFBL function. The objective of this study was to investigate changes in SFBL gene expression and proliferation when stimulated with GFBL secretome-enriched conditioned media (CM).

Methods: Four primary human GFBLs and SFBLs strains from different donors were cultured in *in vivo*-like three-dimensional cultures over 7 days, then incubated in serum-free DMEM for 3 days. The media were then collected to generate GFBL-CM and SFBL-CM. Next, GFBLs and SFBLs were cultured in GFBL-CM (test-CM), SFBL-CM (control-CM), or DMEM (baseline) for 48 hours before MTT cell proliferation assay, RNA collection, and RT-qPCR. The expression of 18 genes, associated with wound healing, scar formation, and extracellular matrix (ECM) remodelling, was examined. Statistical analyses were performed using ANOVA.

Results: Compared with DMEM, GFBL-CM induced significant upregulation in 7 genes in SFBLs ($p < 0.05$; $n = 4$), including genes associated with ECM remodelling and wound healing (MMPs, TNC). Downregulation was observed in 5 genes including COL1A1 and ACTA2, both associated with scar formation. Compared to SFBLs treated with SFBL-CM, GFBL-CM treatment led to upregulation in 6 genes, including those for TGF- β signaling and MMPs. Both GFBL-CM and SFBL-CM promoted SFBL proliferation significantly at 48 hours, but there was no difference between them.

Conclusions: SFBLs treated with GFBL-CM exhibit gene expression changes consistent with elevated ECM remodelling and diminished scar formation, suggesting the GFBL secretome may favourably modulate skin wound healing. However, no difference in cell proliferation was observed. Further experiments are required to identify signalling molecules within the GFBL secretome associated with these responses.

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33. Transverse and Circummaxillary Sutural Changes in Different Maxillary Expansion Protocols

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Objectives: Alternating Rapid Maxillary Expansion and Constriction (Alt-RMEC) was introduced as a method to disarticulate circummaxillary sutures to enhance maxillary protraction via facemask therapy. Maxillary expansion exhibits a pyramidal pattern: greater amounts of sutural opening both anteriorly and inferiorly than posteriorly and superiorly. No study has compared transverse dentoalveolar and skeletal changes in addition to quantitatively assessing changes in circummaxillary suture patency using cone-beam computed tomography (CBCT). The aims of the study were to use CBCT records to compare the two maxillary expansion protocols (Rapid Maxillary Expansion (RME) vs. Alt-RMEC) with regard to: (1) transverse dentoalveolar and skeletal changes and (2) the amount of circummaxillary sutural opening.

Methods: Single-centre, single-blinded retrospective CBCT records of growing skeletal class III (maxillary deficient) patients (N=34) aged 7-13 years old with 1:1 randomized allocation to RME (N=17) or Alt-RMEC (N=17) were analyzed. Pre-expansion (T0) and post-expansion (T1) CBCT records were analyzed for T0 Cervical Vertebral Maturation Stage (CVMS), T0 Mid-Palatal Suture Density (MPSD), T0 and T1 linear and angular dentoalveolar and skeletal variables, and T0 and T1 circummaxillary sutural patency.

Results: Alt-RMEC resulted in less tipping of the maxillary first molar ($p < 0.05$) by 2.2° , which is clinically significant in addition to significantly more nasal aperture opening than RME ($p < 0.05$). From univariate analyses and linear regression modeling, and a larger nasal aperture width ($P < 0.05$), males had larger treatment changes in posterior and middle palatal basal widths and increasing skeletal maturity, as measured by CVMS, resulting in larger amounts of right nasomaxillary sutural opening.

Conclusions: Generally, there is little difference between the two maxillary expansion protocols in transverse skeletal, dentoalveolar and circummaxillary suture changes except that Alt-RMEC results in significantly less tipping of maxillary first molars and a wider nasal aperture which might due to distraction of a serials of midline sutures.

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