

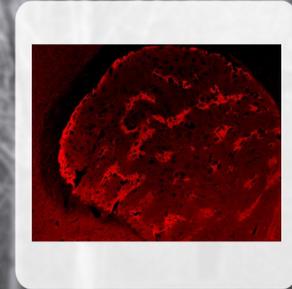
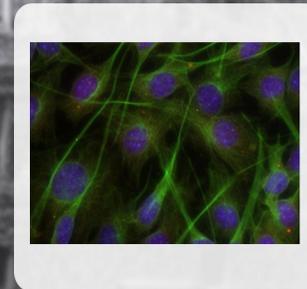
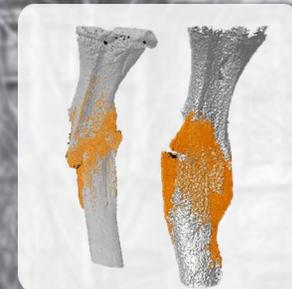
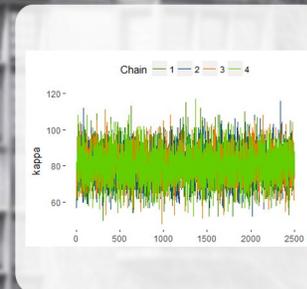


McGill

Faculty of
Dentistry

13th Annual Graduate Dentistry Research Day

Sponsors:



Wednesday, April 4th, 2018
3625 Avenue du Parc, Montreal



P 20. Effects of anticipatory guidance at birth on the oral health of young children

R. CHAMI¹, V. BERTUCCI¹, O. CUKIER¹, B. DABBAGH¹, B. FERRAZ DOS SANTOS¹

1. Division of Dentistry, Montreal Children's Hospital, McGill University Health Centre

Early childhood caries (ECC) is the most prevalent chronic infectious disease in young children, disproportionately affecting vulnerable sectors of the population, despite its preventable nature. Therefore, early interventions dedicated to the provision of anticipatory guidance to parents or caregivers are imperative. The present study aimed to evaluate the effect of anticipatory guidance shortly after birth on promoting parent's knowledge and attitude toward oral health care, as well as young children's future caries experience. All parents or caregivers of newborns (n=122) who were referred to the Division of Dentistry at the Montreal Children's Hospital between August 2015 and July 2016 for an evaluation of the lingual frenum, received anticipatory guidance from the consulting dentist. The total birth cohort was then invited to schedule a complete dental examination between July 2017 to February 2018, and those who participated constituted the prevention group (PG=54). The control group (CG=56) was comprised of healthy children, of similar demographic characteristics, who attended the Division of Dentistry during the same study period. Data was drawn from clinical outcomes in addition to a semi-structured questionnaire completed by the parent or caregiver assessing oral hygiene practices, dietary habits and socioeconomic variables. A total of 110 children (mean age 21.9 ± 4.6 months; 51.8% male) were evaluated. The consumption of sugar-containing beverages (juice) and sugar-containing food (candy/chocolate) were significantly higher among children in the CG. Likewise, poor oral hygiene and gingivitis were more frequently observed in the CG. Most notably, caries prevalence among children in the CG was significantly higher compared to those in the PG (dmft 1.86 ± 2.92 vs. dmft 0.2 ± 1.05 ; $p < 0.0001$). Overall, our findings suggest that anticipatory guidance was an effective approach in encouraging and sustaining sound oral health in young children. Thus, the implementation of postpartum counseling by a dental professional may have the potential to reduce the burden of ECC.

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13th Annual Research Day of McGill's Faculty of Dentistry

Welcome to the 13th Annual Research Day of McGill's Faculty of Dentistry! This year the Research Day will include more than 35 oral and poster presentations from students of our faculty, and these presentations will cover a wide range of exciting research areas. We are also delighted to have Dr. Yoshinori Sumita (Associate Professor, Nagasaki University Graduate School of Biomedical Sciences) as the Keynote Speaker.

This year's Research Day would not have been possible without the outstanding work from Haider Al-Waeli and Entisar Abdulkader, two key members of the Organizing Committee. Haider (Chair) and Entisar (Vice-Chair) have worked extremely hard over the past couple of months in order to find a keynote speaker, design the scientific program, and secure funding to support this event. They have worked closely with Marlene Balena, who has been tremendously helpful throughout the organization process of this Research Day. Marlene's support has been invaluable at all levels and she played a huge role as part of the Organizing Committee. Over the past few months, Haider, Entisar and Marlene have exchanged countless emails and had several meetings to ensure the success of this year's Research Day.

I would also like to thank all session chairs as well as judges who accepted to contribute to the evaluation of oral and poster presentations for the Research Day. The Organizing Committee is highly grateful for your contribution, as these tasks require considerable time, rigor, and energy. I would also like to thank Mr. Sreenath Madathil, who contributed to the preparation of the booklet, and all other individuals providing technical and/or logistical support over the course of the day.

As in previous years, the Organizing Committee received the names of nominees who might serve as the next Vice-Chair/Chair for the 14th (2019) and 15th (2020) editions of the Research Day. All attendees are encouraged to support one of the nominees by voting at the front desk. The outcome of the nomination process will be announced at the end of the day.

In closing, the organizing committee would like to thank the Network for Oral and Bone Health Research (RSBO) for their financial support. The RSBO's financial support is pivotal to the success of the Research Day and allows us to give awards in order to recognize the outstanding work conducted by students from our faculty.

We sincerely thank everyone for attending the 13th Annual Research Day. We hope that you will enjoy your day and the presentations from our students !



Dr. Marc O. Martel (Research Day Advisor)
On behalf of the Organizing Committee

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Awards

- The Best Graduate Student Oral Presentation Awards (3 prizes) are given by the Network for Oral and Bone Health Research.
- The Best Graduate Student Poster Presentation Awards (3 prizes) are given by the Network for Oral and Bone Health Research.
- The Knowledge Translation Prize will be awarded to the student that best demonstrates the potential of their research in a 'Knowledge Translation' and is given by the Faculty of Dentistry.

Dr. Stephane R. Schwartz Award for Excellence in Research will be awarded to the best GPR Poster Presentation and is given by the Division of Dentistry of the Montreal Children's Hospital.

Past Winners:

Year	Orals:	Posters:	Knowledge Translation:
2017	<u>1st</u> Nioushah Noushii	<u>1st</u> Betty Hoac	Qiman Gao
	<u>2nd</u> Yara Oweis	<u>2nd</u> Awatef Enargat	Entisar Abdulkader
	<u>3rd</u> Frances Wang	<u>3rd</u> Muthu Lakshmi Muthu	
2016	<u>1st</u> Akhil Purakkal	<u>1st</u> Ahmed Alsubaie	Lina Abu Nada
	<u>2nd</u> Juliana Murulanda	<u>2nd</u> Seunghwan Lee	Mehrmoosh Alborzi
	<u>3rd</u> André Charbonneau	<u>3rd</u> Kaushar Jahan	

P 19. Influence of individual factors and dental care use on pediatric emergency department visits for caries-related dental problems

J. ALBINO¹, H. ALAMI¹, B. DABBAGH¹, B. FERRAZ DOS SANTOS¹

1. Division of Dentistry, Montreal Children's Hospital, McGill University Health Centre

In North America, caries-related pediatric emergency department (ED) visits have been increasing in recent years. Considering the inefficient method of treatment in the ED it would be of benefit to understand why children still present so frequently. Thus, this study aimed to describe dental care use patterns and sociodemographic characteristics of children attending the ED for caries-related problems. Furthermore, we estimated the extent of association between individual factors and children's dental care utilization and the use of ED for caries-related problems. Data was obtained from children who attended the ED of the Montreal Children's Hospital in 2014–2015 with a caries-related complaint. Measures included patient (age, sex, and ethnicity) and clinical characteristics (nature of complaint, time elapsed since onset of symptoms, day of week and treatment outcome). To assess children's dental care utilization and family socioeconomic characteristics a semi-structured questionnaire was answered by parents/caregivers. Multivariate logistic regression analyses were conducted to examine predictor variables of repetitive use of ED for caries-related problems. A total of 495 children attended the ED for caries-related dental problems. After inclusion criteria were met, data was available for 222 children (response rate of 60%). The majority of the participants were male (55%), under the age of 5 years (49%), recent immigrants (58.4%) and from less privileged families (42.2%). The majority of preschool and school-age children had visited the dentist in the past year; whereas 52.4% of those aged 10 to 17 years did not visit a dentist in the past year. Of those preschool children that had not seen the dentist in the past year, 44.2% had their first encounter with the dentist in the ED. Children from low-income families (OR = 3.07, 95% CI: 1.14– 8.26) and children with non-public dental coverage (OR = 3.59, 95% CI: 1.19 –10.85) were significantly associated with higher odds of using ED repetitively for caries-related dental problems. In conclusion, lack of public dental coverage and sociodemographic factors were associated with the continuous use of the ED for caries-related dental problems. Expansion of Quebec public dental coverage may ensure better oral health outcomes and reduce caries-related ED visits among disadvantaged children.

P 18. Severity of malocclusion among children with cleft lip and palate

E. CHANG¹, J. NGUYEN¹, J. RIZKALLAH¹, G. CHIASSON¹, B. JAMAL¹, B. DABBAGH¹,
B. FERRAZ DOS SANTOS¹

1. Division of Dentistry, Montreal Children's Hospital, McGill University Health Centre

Cleft lip and palate (CLP) is a congenital birth defect caused by the failure of fusion of facial structures during embryonic development. It is acknowledged that children with CLP are more likely to present certain malocclusion traits such as deficient arch length and width, Angle Class III molar relationship tendency and anterior crossbite requiring lengthy orthodontic treatment. However, there has been no study conducted to determine the severity of malocclusion traits associated with CLP. Thus, this study aimed to describe the severity of malocclusion traits associated with CLP and to investigate the association between type of cleft and severity of malocclusion. Children with CLP aged between 7 to 17 years old who attended the Craniofacial & Cleft Clinic of the Montreal Children's Hospital for a complete dental examination between January 2015 and September 2017 were included in this study. A comprehensive review of dental and medical charts was completed to assess participants' demographic data and type of cleft. Dental models were used to determine severity of malocclusion through the discrepancy index (DI). A total of 80 dental models of children with CLP were evaluated in this study. Forty-one children were females and the mean age was 9.9±2.6. The majority of children had unilateral cleft lip and palate (27.5%), followed by unilateral cleft palate (23.8%), unilateral cleft lip (18.8%) and bilateral cleft lip and palate (16.3%). Children with bilateral cleft lip and palate had significantly higher DI scores (mean 31.77; p<0.0001) than children with other cleft type. Decreased overjet, posterior crossbite and congenitally missing teeth were also significantly more prevalent among children with bilateral cleft lip and palate. Overall, this study found that type of cleft affects the severity of malocclusion in children with CLP. The knowledge of malocclusion complexity is of particular importance to improve orthodontic treatment planning for this population.

13TH ANNUAL GRADUATE DENTISTRY RESEARCH DAY**Organizing Committee**

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Dr. Svetlana Tikhonova

Knowledge Translation Award Judges

Dr. Faleh Tamimi (Biomedical Division)

Dr. Mary Ellen McDonalds (Oral Health and Society Division)

Oral Presentation Session Chairs

Letian Li, Ninoska Enriques, Qiman Gao, Amin Najirad,

Ahlan Abdunabi, Melissa Da Silva

Credits

Cover Photo: Cover art images (clockwise from the top left)

1. Sreenath Madathil, Dr. Belinda Nicolau's lab
2. Haider Al-Waeli, Dr. Faleh Tamimi's lab
3. Dr. Laura Stone's lab
4. Dr. Mari Kaartinen's lab

Booklet and cover design: Sreenath Madathil

MCGILL UNIVERSITY
FACULTY OF DENTISTRY
13th GRADUATE DENTISTRY RESEARCH DAY
April 4th, 2018

New Residence Hall
3625 Avenue du Parc, Montreal

Day at a glance

- 07:45 – 08:45** **Poster Set-up**
- 08:45 – 09:00** **Welcome Address:** Dr. Marayam Tabrizian & Haider Al-Waeli
- 09:00 – 10:45** **Mineralized Tissue Biology & Tissue Engineering**
- 10:45 – 13:00** **Poster Session and Lunch** (Lunch beginning at 12:00)
- 13:00 – 14:45** **Oral Health & Society Research**
- 14:45 – 15:00** **Coffee Break**
- 15:00 – 15:45** **Pain & Neurosciences**
- 15:45 – 16:30** **Keynote Address:**
Dr. Yoshinori Sumita
Clinical Research Director and Associate Professor
Basic & Translational Research Center for Hard Tissue Disease
Nagasaki University Graduate School of Biomedical Sciences, Japan
- “Translational Research: Cell-Based Therapy to
Repair Damaged Oral Tissues”**
- 16:45 – 17:30** **Presentation of Awards**

P 17. Ethical inclusion of vulnerable populations in clinical trials

ARNEJA JOYDEEP KAUR

1. Faculty of Dentistry, McGill University, Montréal

Clinical trial is a type of clinical research study that measures the efficacy of health-related intervention on health outcomes. Such health-related interventions may include drugs, medical devices or the use of cells or materials in human body. Depending on the prospective risk or the discomfort involved with the health-related intervention, clinical trials may be categorized as; minimal risk, or more than minimal risk and regardless of the risk, ethically accepted participation of human subjects is required. Research ethics is a vast field and not just limited to the provision of informed consent for research candidate. Modern day research ethics involve the protection of data, privacy, fair distribution of benefits and burdens, assessment of benefits and risk, in clinical research process. The ethics concerning research has been detailed in the national and international research ethics guidelines, however, certain challenges still remain, particularly for those research activities that involve individuals, which possess limited capabilities to protect their own interest in research setting. This may include children, pregnant women, older adults and prisoners. The aim of this literature review is to critically analyze the widely accepted research ethics guidelines for the participation of such vulnerable groups in present day clinical trials. Our report also details the modern challenges such as the use of social media posts, scrolls, unconscious clicks on health fitness surveys and artificial intelligence, that can be used by the researchers for some clinical research studies. Such type of unethical inclusion may involve some members of the vulnerable population, such as children and adolescents, more than the normal population. Therefore, in-depth study regarding the ethically acceptable participation of vulnerable group is important to prevent them from harm or discomfort that may occur due to morally unacceptable recruitment, breach in privacy and lack of data protection strategies in clinical trials.

P 16. Understanding the Influence of Changes to Diet on Individuals Living with TMDs A Qualitative Study Protocol

SAFOUR WAFAA¹, HOVEY RICHARD¹

1. Department of Oral Health and Society, Faculty of Dentistry, McGill University, Montreal

One of the main hurdles facing temporomandibular joint patients is the changing of the quality and quantity of food intake to minimize pain, which is one of the main symptoms characterizing TMDs. TMDs is a group of clinical problems that include the masticatory muscles, the temporomandibular joint (TMJ), and the associated structures. This condition is characterized by chronic pain and dysfunction in the masticatory system. Having a prevalence of between 5% and 12% in a general population, TMDs rank second only to chronic lower back pain in musculoskeletal disorders. As such, patients seek to reduce pain intensity by choosing soft foods that require less chewing. Their focusing on the texture of their food rather than on its nutritional benefits leads to health problems such as loss or gain weight and lose energy. Furthermore, all such patients suffer psychological damage. Unfortunately, health care providers rarely devote time to understanding the suffering these patients experience. In fact, providers mainly focus on identifying the medical needs while ignoring the functional, emotional and social issues that also contribute to suffering. Unquestionably, staff must consider these aspects as a whole.

The purposes of this study are to understand TMDs patients suffering as a result of a change in his or her diet. This study will be to inform medical practitioners the details of these conditions, to create effective communication between patients and medical staff, such that healthcare staff provides patients with guidelines on how to prepare healthy food.

The methodology to achieve this qualitative research is interpretive phenomenology, which is basically a philosophical approach and a method of human science research. The main concept of this method is acquiring a deep understanding of phenomena through patients describing their experiences as they are lived and uncovering the complex realities of nursing work. We will recruit six to ten TMD patients and record the interviews to transcribe them for analysis. The interview is semi-structural, and the questions will let patients explain their experience with TMDs deeply and also allow us to get enough information to understand this phenomenon. Patients will be interviewed about their health, well-being, and barriers preventing them from achieving their optimal nutritional practices. The outcome of this study will be to improve patient health and medical care and increase collaboration among medical staff to relieve patient affliction. Improving communication between doctor and patient will be useful in preventing other medical problems, providing better health care, and eventually establishing high-quality nursing care and lowering treatment costs.





McGill | Faculty of Dentistry

13th Annual Graduate Research Day

Keynote Speaker:

Dr. Yoshinori Sumita, D.D.S., Ph.D.
 Clinical Research Director & Associate Professor
 Basic & Translational Research Center for Hard Tissue Disease
 Nagasaki University Graduate School of Biomedical Sciences, Japan



Translational Research:
Cell-Based Therapy to Repair Damaged Oral Tissues

Currently, treatments using living cells (either non-modified or modified cells) are among the most promising therapies in medicine. In dentistry, cell-based therapies have been investigated in several tissues such as for bone defects and damaged salivary glands. This presentation will focus on our current translational research strategies of cell therapy for oral and salivary tissues.

Wednesday, April 4th, 2018
3625 Avenue du Parc, Montreal

09.00 — 09.15	Application of needle-free device on dental anesthesia	- GAO Q
09.15 — 09.30	CD271 and CD44 are Cancer Stem Cell Markers for Head and Neck Squamous Cell Carcinomas	- ELKASHTY O
09.30 — 09.45	Role of fibrillin-1 in obesity	- MUTHU LAKSHMI M
09.45 — 10.00	The Antidepressant, Sertraline, Hinders Bone Healing and Implant Osseointegration in Rats Tibiae	- ABU NADA L
10.00 — 10.15	The role of SMPD3 in skeletal tissues during fracture healing	- MANICKAM G
10.15 — 10.30	Inner nanostructure of mammalian otoconia	- ATHANASIADOU D
10.30 — 10.45	Biomimetic Composition of Bone Elements Improves Regenerative performance of Dicalcium Phosphate Cements	- MANSOUR A

ORAL HEALTH AND SOCIETY RESEARCH

13.00—13.15	Oral health-related quality of life in children and adolescents with Osteogenesis Imperfecta	- NAJIRAD M
13.15—13.30	Developing a clinical database for Oral Potentially Malignant Disorders (OPMD)	- BASSYONI L
13.30—13.45	Prediction of the Retention of Removable Partial Dentures (RPDs)	- ALAGEEL O
13.45—14.00	Caries Prevalence and Experience in Patients with Osteogenesis Imperfecta	- MA M
14.00—14.15	The Prevalence of clinical and radiographical dentinogenesis imperfect in 159 osteogenesis imperfecta patients	- TAQI D
14.15—14.30	Risk factors associated with the quality of life at 3 months after breast cancer surgery- A prospective cohort study	- AGGARWAL N
14.30—14.45	Orthodontic Treatment Duration Among Race Groups	- ALAMRI A

PAIN AND NEUROSCIENCES

15.00—15.15	Association between fatigue and painful Temporomandibular Disorders (TMD); a case-control study	- ELSARAJ S
15.15—15.30	Progression of pathological disc degeneration, innervation and macrophage infiltration over 12 months following single lumbar disc puncture in mice	- LEE S
15.30—15.45	Association between parafunctional oral habits and painful Temporomandibular Disorders: acute and chronic case-control study	- THAKUR N

16.45—17.30 PRESENTATION OF AWARDS

P 15. Cholinergic function as a linkage between oral health and dementia

ALCHINIR¹, NOGUEIRA T^{1,2}, NICOLAU B¹, BOOIJ L¹, FEINE J¹, MADATHIL S¹, TAMIMI F¹, DE SOUZA R¹.

1. Faculty of Dentistry McGill University, Canada.
2. Faculty of Dentistry, Federal University of Goias, Brazil.

Dementia is a highly prevalent set of disorders that represent a major burden for healthcare systems. It affects over 45 million people worldwide, with this number estimated to double every 20 years. These disorders have been linked to peripheral diseases, such as inflammation of the oral cavity and tooth loss.

Both neurological and oral diseases can be seen as the result of the ageing process, in which injury accumulated during life leads to both types of disease. Interestingly, degeneration of cholinergic neurons affects the mouth (e.g., reduced salivation), as well as several other easily measurable indicators, such as higher intraocular pressure and lower bone density.

We seek to investigate whether aging of the cholinergic system is a pathway through which oral health affects cognition. We will do so by identifying clusters of oral health status and cognitive functioning among middle-aged and elderly individuals. In addition, we will estimate to which extent the indicators of cholinergic activity are cross-sectionally associated with these clusters across different age groups.

We will use baseline data from the Canadian Longitudinal Study on Aging (n=30,000). The study measured cognitive performance and oral health using Rey Auditory Verbal Learning Test and MAT, and self-reported oral health respectively. Cholinergic indicators involved reports of dry mouth, intraocular pressure and bone density. After hierarchical cluster analysis, dendrograms and heat maps will be reported. Next, we will model the joint probability of having cognitive disorders and oral health outcomes through multivariate generalized linear regression models adjusted for potential confounders and stratified by age groups.

Thus, by comparing cholinergic activity estimators across different age cohorts we might understand the effects of ageing on such clusters. This may provide useful information for public health policymakers, consequently improving both oral and neurological health care, as well as the early detection of such health issues.

P 14. Effects of medications on orthodontics tooth movement

ABDULAZIZ ALAMRI¹, FALEH TAMIMI¹

1. McGill University, Faculty of dentistry, Montreal, Canada

Objective: To find the relationship between orthodontics tooth treatment (OTM) and all drugs categories.

Methods: Novel method of systematics review to includes all articles studied any medication in relation to tooth movement.

Results: Search of more than 15,000 articles and 560 drug categories, we found 270 articles related to orthodontics tooth movement after applying inclusion and exclusion criteria.

Conclusion: Local or systemic application of PTH increases the rate of OTM. In a low-calcium diet, when endogenous PTH synthesis is stimulated, the same effect is seen. Administration of thyroxine increases the rate of OTM (like in Hyperthyroidism or medication). Studies in rats with estrogens (female sex hormones) suggest that estrogen supplementation (like in postmenopausal problems) might slow OTM. Vitamin D3 increases the rate of OTM in a dose-dependent manner. Biphosphonate administration decreases the rate of OTM in a dose-dependent manner. Glucocorticoids stimulate OTM, but this depends on the relative anti-inflammatory activity of the corticosteroid and the administration protocol. Paracetamol does not affect the rate of OTM even in high dosages. Studies on effects of NSAIDs during experimental OTM in animals showed decreases in the number of osteoclasts, since prostaglandins are involved either directly or indirectly in osteoclast differentiation or in stimulating their activity. Acetylsalicylic acid significantly decreased the rate of lateral incisor movement in rats when administered twice a day. Indometacin reduce bone turnover, strongly suggested a decrease in OTM rate. Diclofenac stops OTM completely in a rat model. Ibuprofen showed significantly decrease in the rate of OTM after administration of Ibuprofen. Coxibs showed that significantly less OTM occurred in the rats that receive the drug when compared with the controls without medication

Poster Presentations

MINERALIZED TISSUE BIOLOGY AND TISSUE ENGINEERING

- P 01 Progression of Spinal Cord Plasticity over 12 months following Lumbar Intervertebral Disc Injury and Attenuation by Voluntary Running Activity - FOSTER D
- P 02 Reconstruction of the Physiological Environment to Nurture the Growth of Ex-Vivo Human Salivary Organoids - PHAM H
- P 03 Risk factors related to acute and chronic pain after breast cancer surgery: A prospective 3-month cohort study – Preliminary results - ARORA N
- P 04 Labial Stem Cell Extract Rescues the Hypofunction of Salivary Glands - SU X
- P 05 Reconstruction of a 3D printed PEKK based mandible using morphometric measurements - PANDEY N
- P 06 Sulforaphane Increases Drug-mediated Cytotoxicity Toward Head and Neck Squamous Cell Carcinoma - ELKASHTY O
- P 07 A Systematic review and meta-analysis of the positive and negative effects of Drugs on Osseointegration - MAHRI M

ORAL HEALTH AND SOCIETY RESEARCH

- P 08 Tooth Shade Preferences among the General Public - ALMUFLEH B
- P 09 We are what we are: Religious Discrimination and Oral Health of the Muslim Community in Quebec - TANDALE M
- P 10 Single-Implant Overdentures Retained by The Novaloc Attachment System: A Randomized Cross-over Trial - ABDEL JABBAR A
- P 11 The Enculturation of Masculinity and its Effects on Male Chronic Pain Sufferers - WIDJAJA M
- P 12 Barriers in access to oral health care for aboriginals in Canada - PRAJAPATI P
- P 13 Human Salivary Nerve Growth Factor Levels associated with Temporomandibular Disorders and Comorbidities: a Case Control Study - TAROZZO M
- P 14 Effects of medications on orthodontics tooth movement - ALAMRI A
- P 15 Cholinergic function as a linkage between oral health and dementia - ALCHINI R
- P 16 Understanding the Influence of Changes to Diet on Individuals Living with TMDs A Qualitative Study Protocol - SAFOUR W
- P 17 Ethical inclusion of vulnerable populations in clinical trials - ARNEJA JK

GENERAL PRACTICE RESIDENCY

- P 18 Severity of malocclusion among children with cleft lip and palate - CHANG E
- P 19 Influence of individual factors and dental care use on pediatric emergency department visits for caries-related dental problems - ALBINO J
- P 20 Effects of anticipatory guidance at birth on the oral health of young children - CHAMI R

OPI. Application of needle-free device on dental anesthesia

QIMAN GAO¹, AMMAR ALSHEGHRI², ENTISAR ABDULKADER¹, GEOFFROY NOEL³, LUC MONGEAU⁴, ANTONIO BARBERO⁵, KARIM MENASSA⁶, FALEH TAMIMI¹

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5. Higher Polytechnic School and Experimental Science College, Universidad de Almería, Almería, Spain.
6. MIT CANADA Inc, Montreal, Canada.

Many patients experience pain and anxiety from traditional dental anesthesia with needles and thus may avoid necessary dental treatments. These problems could be solved by needle-free device. It delivers drug solutions by creating a micro-thin pressure liquid jet to penetrate the skin and disperse in the soft tissue. The needle-free device can provide better local anesthesia treatment with many advantages like eliminating injection pain, needle phobia and needle disposal, reducing drug volume and increasing drug diffusion which would benefit both the patient and the clinician. However, anesthesia techniques in dentistry were all developed for needle injection, and they are not very effective with the needle-free device. To understand and optimize the dental anesthesia technique with the needle-free device, we study how this device performs in vitro and in anatomical sites for both nerve block and infiltration anesthesia. A new optimal infiltration injection method is proposed, to overcome the existing problems in the literature which are drug rebound and limited anesthesia duration.

In vivo, injection tests were performed on 10% gelatin gel which simulates human soft tissue with plastic which simulates hard tissue. The relation between penetration depth and settings of the device was generated. The result showed that a vertical-to-bone injection could cause drug rebound in infiltration anesthesia. However, the needle-free device could provide sufficient injection depth for nerve blocks.

In anatomical sites, injections were performed on eight cadavers. The mental nerve, infraorbital nerve, and mandibular inferior alveolar nerve could be successfully blocked by the needle-free device. Moreover, cadaver experiments showed that there was less drug rebound using new infiltration method which injections performed parallel to the alveolar bone, instead of the vertical-to-bone injection.

This study sets the basis of how to use needle-free device in the dental clinic in the future to benefit both the patients and the clinicians.

P 13. Human Salivary Nerve Growth Factor Levels associated with Temporomandibular Disorders and Comorbidities: a Case Control Study

TAROZZO MM^{1,2}, SANDER P^{1,2}, GORNITSKY M^{1,2}, FRICTON J³, VELLY AM^{1,2}

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2. Department of Dentistry, Jewish General Hospital, Montreal, Quebec, Canada
3. School of Dentistry, University of Minnesota, Minneapolis, USA

Objective: Inflammatory mediators have been proposed to be related to chronic pain such as temporomandibular disorders (TMDs). The aim of this study was to identify salivary nerve growth factor (NGF) as a marker of TMD-related pain. More specifically: 1) to assess whether there is a significant difference between NGF levels between TMD-related pain cases and controls; and 2) to evaluate whether pain severity is associated with NGF levels.

Methods: Data from 124 individuals with TMD and 9 controls without TMD were obtained from the National Institute of Dental and Craniofacial Research's Temporomandibular Joint Implant Registry and Repository (NIDCR's TIRR). In the NIDCR's TIRR, TMD diagnosis was determined by clinical examination using a Modified Craniomandibular Index (CMI), wherein the CMI examination items were redesigned to conform precisely to those specified for the Research Diagnostic Criteria for TMD (RDC/TMD). Participants completed a few questionnaires to assess pain intensity (Numeric Rating Scale [NRS]: 0-10), pain duration, pain frequency, medical comorbidities (e.g., allergy, cardiovascular disease), oral habits (e.g., clenching, biting the tongue), and demographics (age and gender). Five ml of unstimulated whole saliva were collected from all participants. Saliva samples were assayed for biochemical content using commercially available ELISA kits.

Results: Most of 129 TMD-related pain participants (87.6%) were females (control - 67.3%, $P < 0.0001$) and older than the 102 controls ($P < 0.0001$). The mean worst pain intensity in the last 6 months was 3.67 (NRS: 0-10, standard deviation [SD] = 3.91) and unpleasantness was 4.4 (SD = 3.06). NGF levels were not significantly different between TMD-related pain (TMD mean = 280.98 pg/ml, SD = 279.99) and controls (mean = 290.97 pg/ml, SD = 281.81; $P=0.79$). Also, we did not find a significant difference of NGF levels between disc displacement/osteoarthritis ($P=0.48$) and myofascial pain ($P=0.93$) compared to controls. However, in a multivariate linear regression analysis adjusted by participants' age and gender, NGF levels were positively related to moderate to severe pain intensity ($\beta = 0.001$, $P = 0.05$), among 90 TMD participants who reported pain moderate to severe pain (≥ 4 , 0-10 NRS). Furthermore, participants reporting oral habits comorbidities (mean = 380.80, SD = 315.77) had significant higher levels of NGF than those without those comorbidities (mean = 236.70, SD=245.10, $P = 0.04$) regardless of the levels of pain intensity. Pain frequency ($P = 0.45$), pain duration ($P = 0.36$), as well as painful and non-painful comorbidities were unrelated to levels of NGF ($P>0.24$).

Conclusions: These results may provide a more valid measure of pain severity and oral habits comorbidities. It can also help to elucidate the mechanisms and facilitate the identification of therapeutics target to alleviate pain.

Grant: Supported by NIDCR/N01-DE-22635 and FODQ/RSBO #234656.

P 12. Barriers in access to oral health care for aboriginals in Canada

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Oral health is an essential contributory factor to general well-being and quality of life. The persistent and slow-paced decline of Aboriginal's oral health reflect the historic relationship between aboriginal people and the Canadian health system that fails in providing the contemporary oral health needs of Canada's aboriginal peoples. In this review, we highlight the financial, behavioral, physical as well as ethical barriers to oral care accessibility among aboriginals. These facets include the role of socio-economic factors, the importance of communication in the oral health context, the delivery of culturally sensitive oral care, evidence of under-representation and discrimination of aboriginal groups in clinical-decision making and health outcomes. The presented work is based on the targeted review of the literature determined by defined keywords and articles located using databases - Medline, PubMed and Google Scholar. The best available evidence was obtained and prioritized using the hierarchy of evidence to reduce oral health disparities and promote equitable access with aboriginal peoples. The main barriers to oral care access were related to the determinant of health which included education, language barriers, employment, geographic location, poverty, and the social environment. The increased gaps in health status between aboriginals and non-aboriginal people and reduced patient-provider interactions suggest that Canada's aboriginal residents have insufficient and ineffective oral care. The aboriginal population's perspectives on barriers to oral care were poorly represented and undervalued. If Indigenous oral health is to be ameliorated, access to dental care must be improved, and an integrated holistic approach to oral health needs to be established. Attention is required in the allocation of oral health services, diversifying the oral health care workforce, addressing the discrimination experienced by Aboriginal people and prioritizing the rights of Canada's Aboriginal people to achieve oral health equity.

OP2. CD271 and CD44 are Cancer Stem Cell Markers for Head and Neck Squamous Cell Carcinomas

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Head and neck squamous cell carcinoma (HNSCC) is the seventh most common cancer with over 500,000 new cases diagnosed yearly, which is 4.6% of cancer cases. Despite the improvements in treatment modalities, the five-year survival rate for SCCHN has remained unchanged at ~50% over the past 30 years. One reason for cancer treatment failure is related to the presence of a subpopulation of cells in the tumor called cancer stem cells (CSCs) which are suggested to have tumor initiating potential, combined with the ability of self-renewal and multilineage differentiation. According to many studies, CD44 surface marker can be used to identify CSCs. The purified CD44+ cells from the primary tumors can give rise to tumors faster and by injecting less cell number in xenograft model compared to CD44- cells, and these xenograft tumors subsequently reproduce the original tumor heterogeneity observed in the primary tumor. Recently, CD271 was identified as a marker of CSCs in many tumors, such as human melanoma, esophageal carcinoma, and hypopharyngeal carcinoma. In our study, we investigated if CD271 is a more precise marker for CSCs than the widely used CD44. Our results revealed that CD271+ cells are a subpopulation from the CD44+ cells. The CD44+/CD271+ cells have a faster dividing rate, higher proliferation rate, higher self-renewal ability and chemo/radio-resistance when compared to CD44+/CD271- and the total SCCHN cell population. CD44+/CD271+ cells showed higher expression of stemness genes such as BMI1, SOX2, OCT4 and GLI1 when compared to CD44+/CD271-. Our results suggest that CD271+ is a more accurate marker to purify the CSCs from HNSCC.

OP3. Role of fibrillin-1 in obesity

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Fibrillins are large extracellular glycoproteins ubiquitously expressed in elastic and non-elastic tissues throughout the body. Type I fibrillinopathies are heritable connective tissue disorders caused by mutations in the fibrillin-1 gene. Marfan syndrome (MFS) is the most common type-I fibrillinopathy. Obesity is common in adults with MFS and it increases the risk of cardiovascular complications. Fibrillin-1 expression correlates with obesity and increased adipocyte size. It is unclear how fibrillin-1 deficiency derails fat metabolism in MFS. The aim is to understand the role of fibrillin-1 in adipogenesis and the impact of nutrition using the MFS *mgR* mouse model. *Fbn1^{mgR/mgR}* male mice show significantly higher fat deposition compared to the litter matched wild-type control mice. However, the mutant mice are not significantly different to wild-type controls in the whole-body weight. Gene expression studies of adipogenic markers such as PPARG (adipogenic transcription factor) and adiponectin (protein hormone involved in regulating fatty acid break down) demonstrated that male *Fbn1^{mgR/mgR}* mice are characterized by higher levels of these markers, indicating that fibrillin-1 deficiency in *Fbn1^{mgR/mgR}* mice leads to increased adipogenesis. To study the impact of nutrition on obesity, *Fbn1^{mgR/mgR}* mice were fed with a high fat diet and a matched control diet. The feeding schedule started at 4 weeks and ended at 16 weeks. *Fbn1^{mgR/mgR}* male mice tended to have a higher body weight compared to litter matched wild-type controls. The relative fat mass of the mice was determined by X-ray. Brown and white adipose tissue showed a significant increase in male *Fbn1^{mgR/mgR}* mice, but not in female mice. Therefore, fibrillin-1 deficiency in male mice alters the adiposity and increases the fat mass as observed in obese patients with Marfan syndrome. The impact of nutrition on *Fbn1^{mgR/mgR}* mice clearly demonstrates a link between fibrillin-1 and fat metabolism

P 11. The Enculturation of Masculinity and its Effects on Male Chronic Pain Sufferers

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Introduction: Chronic pain (CP) negatively impacts everyday functioning, resulting in physical and psychosocial distress. Those with CP have been shown to suffer from fatigue and increased susceptibility to disease, not to mention dependence on medication and their caregivers. Some are not able to return to their full-functioning capacity, and as a result succumbed to social isolation; in fact, CP had been associated with the worst quality of life and is indicated as the second major cause of suicide. Currently, one in five Canadians are living with CP. CP is known to have a gender specific impact on men, who because of the enculturation of masculinity, are reluctant or unable to seek help. Little is known of how men cope and the kinds of support preferred. There are currently no specific programs to support men suffering from CP.

Objectives: The primary objective of this project is to bridge the gap between health literacy and personal agency (active engagement in pain management). As such, this project will have two components: the first is a qualitative research project; the second is a partnering strategy. The qualitative research component will focus around the complexities surrounding CP, which includes: a) beliefs and attitudes towards CP, and b) the barriers and enabling factors in accessing care. Research findings will then be used to develop a community-based, patient-centered program that caters to the health needs of male CP sufferers. The second component will revolve around collaborations with local organizations and establishing buy-in ideas for the aforementioned programs.

Methods: Men with CP were recruited with the help of local CP care organizations (YMCA-NDG and the Concordia PERFORM Centre). The interviews adopted Gadamer's philosophical Hermeneutics, allowing us to interpret the deeper meanings that individuals attach to their lived-in experiences. The interviews will be face-to-face, open-ended and semi-structured; wording and sequence of questions are not fixed as to cater towards their personal circumstances. The interviews will be audio recorded and later, transcribed verbatim. Passages of text linked by a common theme will be identified and grouped into categories that are deemed appropriate in framing patients' perspectives around CP.

P 10. Single-Implant Overdentures Retained by The Novaloc Attachment System: A Randomized Cross-over Trial

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The complete absence of teeth (edentulism) negatively impacts the lives of patients, often resulting in physical impairment, psychosocial issues and systemic consequences. Conventional prostheses are unable to rehabilitate many edentulous patients satisfactorily, thus leading to dental implants. Although cost-effective implant-assisted treatments have been used to solve this challenge (e.g., two-implant mandibular overdentures), other methods have been sought to further reduce invasiveness and costs with satisfactory outcomes. Overdentures supported by a single implant in the mandibular midline have emerged as one of those methods. The success rate of single-implant mandibular overdentures (SIMO) depends on the type of the attachment used and its wear pattern. The new Novaloc attachment combines a polyetheretherketone matrix and an amorphous diamond-like carbon-coated cylindrical matrix that is expected to have better wear resistance and, thus, lower maintenance needs. The objective of this study is to compare Novaloc on a SIMO to a traditional attachment (Locator). The primary outcome is ratings of general satisfaction (visual analog scale) following 3 months of each attachment. Secondary outcomes include: oral health-related quality of life, costs, clinician-based outcomes (including adverse events) and choice of attachment.

A randomized, crossover trial will be performed in order to compare the Novaloc attachment to the Locator attachment on SIMO for elderly edentate patients (clinicaltrials.gov, ID: NCT03126942). Participants will receive both attachments in a total interval of 6 months, divided for each type of attachment as two continuous 3-months periods. Quantitative data, outcomes and performance of each attachment will be assessed.

Results from this study will help clinicians and patients determine which attachment system is the most suitable for SIMO. Recommending a specific type of attachment will be based on patient satisfaction/preferences, weighed by costs and clinician-observed performance.

OP4. The Antidepressant, Sertraline, Hinders Bone Healing and Implant Osseointegration in Rats Tibiae

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Background: Selective Serotonin Reuptake Inhibitors (SSRIs) are one of the most common antidepressant drugs. SSRI use is associated with increased risk of bone fracture and titanium implant failure. The aim of this *in vivo* study was to investigate the effect of SSRIs on osseointegration and bone healing.

Methods: On a total of 24 Sprague-Dawley rats, a custom-made titanium implant was placed in the left tibia, while a unicortical defect was created in the right tibia. Rats were assigned randomly into two groups and received a daily dose of either sertraline (5mg/kg) or saline. After two weeks, they were euthanized and bone healing and osseointegration were assessed by micro-CT and histology. Student's *t*-test was used for statistical analysis.

Results: Bone formation in bone defects was significantly lower ($p < 0.05$) in sertraline-treated rats (BV/TV= 20.67 ± 11.98%) compared to the controls (BV/TV = 37.87 ± 9.56%). Furthermore, the percentage of osseointegration was significantly lower ($p < 0.05$) in sertraline-treated rats (34.40 ± 7.17%) compared to the controls (54.37 ± 8.58 %). Histology and histomorphometry of bone defect revealed that osteoclast number was significantly higher ($p < 0.05$) in sertraline-treated group (66.8 ± 23.6 osteoclast /mm²) compared to control group (31.1 ± 5.9 osteoclast/ mm²), and osteoblast number was significantly lower ($p < 0.05$) in sertraline-treated rats (18.36 ± 3.64 osteoblast /mm²) compared to controls (69.3 ± 12.2 osteoblast/ mm²).

Conclusion: Sertraline hinders bone healing and implant osseointegration.

OP5. The role of SMPD3 in skeletal tissues during fracture healing

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Traumatic bone fractures can be a serious and frequent problem for patients suffering from osteoporosis, metastatic bone cancer and congenital bone disorders. The promotion of new bone formation and mineralization during the healing process of fractures can facilitate and shorten the time of healing, as well as yield stronger union of the fractured bones. Sphingomyelin phosphodiesterase 3 (SMPD3), a lipid-metabolizing enzyme, has been identified as a key regulator of skeletal development. SMPD3-deficient *fro/fro* mice show severe congenital skeletal defects hallmarked by poor cartilage and bone mineralization. Using a conditional knock-out mouse model, *Smpd3^{fllox/fllox};Osx-Cre*, where *Smpd3* is deleted in both chondrocytes and osteoblasts, we were able to recapitulate the skeletal phenotype seen in *fro/fro* mice. This suggests that *Smpd3* expression in both chondrocytes and osteoblasts plays a critical role during skeletal development. Building on this finding, since fracture healing involves a recapitulation of the steps seen during bone development, we hypothesized that mice lacking *Smpd3* in chondrocytes and osteoblasts would adversely affect the process of fracture healing.

Methods: Rodded immobilized fracture surgeries were performed in the tibia of 2-month old *Smpd3^{fllox/fllox};Osx-Cre* and control mice. The bones were then analyzed at 2 and 4 weeks post-surgery by micro-CT and histomorphometry.

Results: 1 – Micro-CT analyses did not show any differences at the fracture site between *Smpd3^{fllox/fllox};Osx-Cre* mice and the control mice at both time points. **2** – Histomorphometric analysis showed a significant increase in osteoid volume at the fractured site in *Smpd3^{fllox/fllox};Osx-Cre* mice compared to the control mice at both time points.

Conclusion: Our data provides evidence that SMPD3 plays an active role during fracture healing. The novel insight generated through this study will add to the current understanding of SMPD3 regulation in skeletal tissues and has potential to pave the way for the development of therapeutic approaches to expedite healing of fractured bones

P 9. We are what we are: Religious Discrimination and Oral Health of the Muslim Community in Quebec.

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Background: The Muslim community is the second largest religious group in Canada and represents about 3.2 percent of the total population. Immigrants often face isolation, cultural and language barriers, and lack of appropriate healthcare services. Sometimes, they are also confronted with discrimination and violence based on their religion, as it has happened to the Muslim community in the last year with a terrorist attack on a mosque in Quebec City, and during the recent debate about Muslim women's right to wear the niqab, a religious face cover. Although oral health research in Canada has focused on multiculturalism, scarce research attention has been given to the issue of religious discrimination. In particular, we know very little how the experience of religious discrimination may affect people's oral health and oral health-related behaviors.

Research question and objectives: The objectives of this study are: (a) to better understand how religious discrimination may affect the oral health and the oral health-related behaviors of Muslim people, (b) to identify potential pathways between religious discrimination and people's oral health.

Methodology: We will conduct a qualitative exploratory research in Montreal, Quebec. We will adopt a maximum variation sampling strategy regarding age, sex, education level, marital status, and employment status. We will collect our data through face-to-face, semi-structured interviews with people practicing Muslim religion. One important inclusion criteria will be to have experienced religious discrimination in their daily life in the previous 6 months. We expect to conduct between 10 and 15 interviews with adults being 18 years of age or more. These interviews will be recorded and transcribed verbatim to be analyzed. Data analysis will be carried out by using a thematic analysis approach; it will allow us to provide a detailed description of the phenomena.

Potential Outcome: The knowledge generated by this research will not only enrich the current literature in dentistry, we also hope that it will contribute to improve the oral health-related quality of life of racially discriminated communities. We expect to use our findings in dental education to raise awareness and develop critical consciousness among healthcare professional about discriminated minority groups.

P 8. Tooth Shade Preferences among the General Public

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Objective: to identify laypersons' most preferred tooth shade out of vita 3D Master shade guide and identify influencing factors of people preference including observer and patients factors.

Methods: Two online surveys using computer-designed perioral images were distributed to participants in three cities (Riyadh; Saudi Arabia, Montreal; Canada; San Francisco, USA). The first survey (S1) (n=346) assessed how tooth value, hue and chroma influence tooth shade perception depending on the skin color of the perioral image, and the demographic characteristics of the observer. The image in S1 was modified to get three levels of value (2M1, 3M1, 4M1), hue (3L1.5, 3M1, 3R1.5) and chroma (3M1, 3M2, 3M3). Skin shade of the image was modified to represent six shades. Participants were asked to choose their most preferred image of each category (value, hue, chroma) for each skin shade. Building upon the preferred value, hue and chroma identified in S1, the second survey (S2) (n=100) was performed to pinpoint the most preferred tooth shade. In S2, four teeth shades (1M1, 2M1, 3M1, 4M1) were constructed in the image.

Results: Most of the participants preferred highest value (49%), neutral hue (55%) and lowest chroma (88%), respectively. Moreover, they preferred (77.7%) 1M1 the whitest tooth shade among other shades. Skin colour of image was a significant predictor ($p < .001$), participants were 75% less likely to prefer brighter shades (1M1, 2M1) over darker teeth shades for darker skin shades model compared with lighter skin shades (OR= 0.25, 95% CI: 0.126-0.398). Geographic location and other demographic variables were statistically insignificant ($p > .05$).

Conclusion: Although the whitest shade (1M1 in Vita 3D Master which is equivalent to B1 in Vita Classic shade guide) considered the most attractive shade by most participants, for patients with dark skin shades, teeth shades with darker value and higher chroma can be more attractive.

OP6. Inner nanostructure of mammalian otoconia

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Otoconia in the vestibular apparatus of the mammalian inner ear are calcium carbonate (calcite)-containing structures functioning in maintaining balance and in detecting linear acceleration. Like most biomineralized structures, otoconia contain abundant proteins intercalated with the inorganic mineral phase; some of these are mineral-binding proteins thought to regulate the biomineralization process, which in turn defines nanostructure and functional properties. Of the proteins found in otoconia, osteopontin is a mineral-binding protein that is also present in bones, teeth and avian eggshells. Here we investigate, at the ultrastructural level, mineral structure and osteopontin localization in the interior and at the surface of mouse otoconia. In microtome-cut/fractured otoconia obtained from normal (wild type) C57Bl mice, scanning electron microscopy and atomic force microscopy revealed an internal nanostructure of approximately 50 nm in Feret diameter. Transmission electron microscopy and electron tomography of focused-ion beam-cut sections of otoconia confirmed this nanostructure with similar dimensions. By X-ray diffraction, only calcite was present; and Raman and X-ray absorption spectroscopies, which are chemically sensitive to both crystalline and amorphous forms in the sample, showed no evidence of amorphous calcium carbonate (in these samples from 9-day-old mice). Scanning and transmission electron microscopy combined with colloidal-gold immunolabeling for osteopontin revealed that this protein was concentrated at the surface of the otoconia, where it was associated with surface nanostructure. *In vitro* analyses of calcite grown from solution in the presence of osteopontin revealed concentration-dependent changes (rounding) of the external morphology of the synthetic calcite (this being similar to rounded regions of otoconial morphology), and at high concentration the induction of nanostructure within the interior of the calcite crystals. In conclusion, these findings provide details on the composition and nanostructure of mammalian otoconia, and suggest that while osteopontin may influence surface rounding and surface nanostructure in otoconia, other incorporated proteins (also possibly at higher concentration) likely participate in creating internal nanostructure. *Funded by NSERC and CIHR.*

OP7. Biomimetic Composition of Bone Elements Improves Regenerative performance of Dicalcium Phosphate Cements

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Synthetic dicalcium phosphate bioceramics are attractive alternatives for bone regeneration. Their biological properties can be improved by mimicking bone chemistry through the enrichment with specific chemical elements; however, defining the ideal elemental composition for bone formation remains challenging due to the large number of possible concentrations and combinations of these elements.

We hypothesize that the inorganic phase of bone contains the optimal elemental composition required for bone formation. This phase was obtained by the calcination of natural bovine bone, in form of bone ash material formed of hydroxyapatite that was investigated for its elemental composition and the capability to react with phosphoric acid to produce dicalcium phosphate cements. Scaffolds fabricated using these cements were characterized for their physico-chemical properties including setting time, mechanical properties, crystallography, elemental composition, and microstructure. In addition, the *in vivo* regenerative performance of these scaffolds was examined using micro-computed tomography (μ -CT) and histological examination.

Our results indicated that bone ash scaffolds had a biomimetic elemental composition, and can react with high concentrations of phosphoric acid. By understating this reaction we were able to develop and optimize biomimetic dicalcium phosphate cements derived from natural hydroxyapatite. In addition, these cements could induce a significantly higher rate of bone regeneration than cements fabricated using synthetic apatite ($p < 0.001$). In conclusion, the use of bone ash offers an effective method for developing bioceramics with enhanced functionality that would be beneficial for clinical applications.

Keywords:
Bioceramics, bone regeneration, trace metals

P 7. A Systematic review and meta-analysis of the positive and negative effects of Drugs on Osseointegration.

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Introduction : Dental implants are widely used in dentistry to replace missing teeth. To achieve a good dental implant outcome, we must make sure about bone-implant osseointegration. Some systemic drugs could influence bone metabolism and affect osseointegration.

Objectives: This study was designed to review the impact of all known drugs families on the bone-implant osseointegration.

Methods: In this systemic review, an electronic searching of PubMed database, using the following MESH terms: “bone and bones” [mesh] and” Pharmacological actions” [Mesh] was conducted until January 2018. Clinical and animal studies assessed the systemic effect of medications in implant osseointegration were included. Data extraction and quality assessment were performed following the PRISMA guidelines for systematic reviews.

Results and conclusion: The search strategy of the study yielded 5291 references. Of them, 267 articles were included in the final analysis. The results showed that bone morphogenic proteins (BMP), statins, Thyroid hormone therapy, caffeine and Bupivacaine drugs enhanced implant osseointegration. However, PPI, Calcineurin inhibitors, Metformin, warfarin on the attachment of bone to hydroxyapatite-coated and uncoated porous implants, and combined Alcohol and nicotine drugs showed negative results. Other drugs such as some of NSAID, analgesics, Antiosteoporosis, Asthmatic, Antiallergic drugs, Antihypertensive drug, Antidepressants, Anti-neoplastic, and systemic nicotine drug Combination of Zoledronic acid and dexamethasone, Anti-Neoplastic Drugs revealed either inconsistent results or no role in bone-implant interaction.

P 6. Sulforaphane Increases Drug-mediated Cytotoxicity Toward Head and Neck Squamous Cell Carcinoma

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The efficacy of cisplatin (CIS) and 5-fluorouracil (5-FU) against squamous cell carcinomas of the head and neck (SCCHN) remains restricted due to their severe toxic side-effects on non-cancer (normal) tissues. Recently, the broccoli extract sulforaphane (SF) was successfully tested as a combination therapy targeting cancer cells. However, the effect of lower doses of CIS or 5-FU combined with SF on SCCHN remained unknown. This study tested the chemotherapeutic efficacies of SF combined with much lower doses of CIS or 5-FU against SCCHN cells aiming to reduce cytotoxicity to normal cells.

Titration of SF standalone or in combination with CIS and 5-FU were tested on SCCHN human cell lines (SCC12 and SCC38), and non-cancerous human cells (fibroblasts, gingival, and salivary cells). Concentrations of SF tested were comparable to those found in the plasma following ingestion of fresh broccoli sprouts. The treatment effects on cell viability, proliferation, DNA damage, apoptosis and gene expression were measured.

Our results revealed that SF reduced SCCHN cell viability in a time- and dose-dependent manner. SF-combined treatment increased the cytotoxic activity of CIS by two folds and of 5-FU by ten folds against SCCHN, with no effect on non-cancerous cells. SF-combined treatment inhibited SCCHN cell clonogenicity and post-treatment DNA repair. SF increased SCCHN apoptosis and this mechanism was due to a down-regulation of BCL2 and up-regulation of BAX, leading to an up-regulation of Caspase3.

In conclusion combining SF with low doses of CIS or 5-FU increased cytotoxicity against SCCHN cells, while having minimal effects on healthy cells. The combined treatment may be of therapeutic benefit in clinical settings in reducing the toxic side effects of chemotherapy and increasing its effect. Our data, combined with the works of others, suggest that SF can be used with lower doses of chemotherapy as co-treatments to the benefits of the patients.

OP 8. Oral health-related quality of life in children and adolescents with Osteogenesis Imperfecta

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Background: Osteogenesis imperfecta (OI) affects dental and craniofacial development and may therefore impair Oral Health-Related Quality of Life (OHRQoL). However, little is known about OHRQoL in children and adolescents with OI.

Objectives: To explore the influence of OI severity on oral health-related quality of life in children and adolescents.

Methods: In a multicenter, hospital-based cohort study (Brittle Bone Disease Consortium), a total of 138 patients aged between 8- 14 years were recruited from ten centers across North America. The OHRQoL was evaluated at the baseline (cross-sectional study), employing two versions of Child Perceptions Questionnaires (CPQ) for two age groups (CPQ₈₋₁₀ and CPQ₁₁₋₁₄). Data on socio-demographic factors and medical history were collected using a questionnaire. Oral comprehensive examination was conducted and recorded uniformly at each site by calibrated dentists. Ordinal logistic regression was used to estimate the association of interested variables and CPQ score.

Results: Only adolescents having OI types III (OR: 4.51; 95% CI: 1.21-16.87) & IV (OR: 2.78; 95% CI: 1.07-7.21) were significantly associated with a higher grade of CPQ₁₁₋₁₄-score compared to type I (P<0.05). The difference between OI types was due to the association between OI types and the functional limitations domain. Having posterior crossbite was associated with higher grades of functional limitations (OR: 9.63; 95% CI: 2.04-45.49) and CPQ₁₁₋₁₄-score (OR: 5.75; 95% CI: 1.39- 23.68) (P<0.05).

Conclusion: The severity of OI impacts OHRQoL in adolescents aged 11 to 14 years, but not in children age 8 to 10 years. Posterior crossbite has shown to be a significant determinant of OHRQoL amongst adolescents having OI.

Keywords: Osteogenesis Imperfecta, Oral health-related quality of life, Child Perceptions Questionnaires.

OP 9. Developing a clinical database for Oral Potentially Malignant Disorders (OPMD)

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Oral Potentially Malignant Disorders (OPMD) are a group of lesions carrying an increased potential for cancer transformation comparing to normal oral mucosa. OPMDs are usually seen in middle age and elderly adults. However, they have been diagnosed in people in their early twenties of both sexes. Up to 50% of OPMD could transform into OPC, hence, the importance of this diagnosis and need for prolonged clinical follow up. Indeed, oral cancers progressing from a pre-existing OPMD tend to be smaller in size and have better survival because they are followed up periodically and therefore detected early in their course of development.

Usually premalignant lesions are documented within cancer registries as in the Cancer Registry of Norway or as a part of another database (non-disease specific), such as the nationwide histopathology registry at the Netherlands or U.S. Medicare claims. Otherwise, the literature is scarce on methods of registration and documentation of premalignant lesions in general and oral premalignant lesions specifically. In this presentation, we will share our experience in creating an OPMD clinical database at the OMFS clinic at the Montreal General Hospital (MGH), McGill University Health Centre (MUHC). We created OPMD database uses an HTML based data collection system (REDCap). Information collected includes demographic, treatment, and risk factors for patient treated at MUHC MGH from 2008 to 2015.

Clinical databases are fundamental for tracking clinical finding, linear relationships between exposures and outcomes, early recognition of complications, monitoring disease prevalence, incidence and progression. The aforementioned highly valuable benefits, in addition to the considerable increased risk of malignant transformation in OPMD, and high burden of OPC and other cancers on the Canadian health system; all warrants initiation of a clinical registry for OPMD, and premalignant lesions in general.

P 5. Reconstruction of a 3D printed PEKK based mandible using morphometric measurements

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Mandibular continuity may be lost as a result of trauma, tumor, or inflammation. The objective of mandibular reconstruction should be to restore facial contour and function. Many studies report a high complication rates, up to 70%, after mandibular reconstruction owing to plate and screw fracture, screw loosening, plate exposure, and infection. Contrary to metals and their alloys, PEKK (Polyether Ketone Ketone) material combines high strength with the relatively low elasticity/stiffness (Young's modulus) which is closer to that of human bone than titanium implants. PEKK device minimizes the stress shielding effect by distributing the stress which supports bone formation around the implant and promotes osseointegration. PEKK has been also used for spinal and craniofacial implants.

The aim of this study was to analyze morphometric measurements from the representative models of the patient's facio-anatomical data that was constructed using Bio Sky scan software from CBCT (Cone beam CT) scans. CBCT morphometric measurements were done using the software in which images were assessed using a set of landmarks.

We discovered that the measurements of these landmarks will be then helpful in providing a generalized estimation of the measurements of the mandible. A 3D printed custom-made implant can be fabricated on the basis of the measurements, which can be then implanted and adjusted on the defect site. It is expected that this also reduces time in surgery which lowers the patient mortality and decreases the risks of functional movements of the mandible. This, in turn in expected to decrease the recovery time, improve the quality life of the patient leading to eventual improved cost benefits of the reconstruction.

P 4. Labial Stem Cell Extract Rescues the Hypofunction of Salivary Glands

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Objectives: Nowadays, adult stem cells play an important role in tissue repair and regeneration. However, the effect of stem cell extracts is not well explored. The main objective of this study was to test the therapeutic effect of human labial gland stem cell extract (hLSCE) to restore irradiation (IR)-injured salivary glands (SGs) in a mouse model.

Methods: Human labial gland stem cells were obtained by explant culture from healthy human labial glands. These cells were positive for mesenchymal stem cells markers (CD 44, 73, 90, 105) by flow cytometry analysis and were capable of multiple lineage differentiation (adipo, osteo, chondrogenesis). To prepare the hLSCE, labial stem cells at passage 3 were frozen at -80°C and thawed at 37°C for three cycles, followed by centrifugation. Then the supernatant (hLSCE) or normal saline (as vehicle control) was injected intravenously into C3H mice post- 13Gy IR (n=6).

Results: Results demonstrated that hLSCE restored 55%-60% of saliva secretion, protected acinar cells, blood vessels and parasympathetic nerves, promoted the cell proliferation and up-regulated the expression of tissue repair/regeneration proteins and genes.

Conclusions: In conclusion, hLSCE can mitigate IR damage to SGs. This therapy has clinical potential.

OP 10. Prediction of the Retention of Removable Partial Dentures (RPDs)

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Removable partial dentures (RPDs) provide a cost-effective treatment for millions of partially edentulous patients worldwide. However, they often fail due to loss of retention and subsequent patients' dissatisfaction. One reason for this problem is lack of precise guidelines for designing retentive RPDs. The objective of this study was to determine the forces produced by food and clasps during mastication to develop a model for predicting RPD retention and determining the optimal number of clasps in an RPD. This study aimed to validate the model experimentally and clinically, and investigate the factors determining patient satisfaction. **Material and Methods.** Chewing tension forces (N) exerted on acrylic teeth and the retention forces (N) provided by clasps (wrought-wire, circumferential, and I-bar) engaging teeth were measured during simulated mastication. A model to predict RPD retention was developed according to these measurements. Next, 36 RPDs were fabricated, tested, and compared with their retention prediction from the model. Moreover, 107 RPDs were evaluated clinically using the satisfaction questionnaire, and compared with their retention prediction from the model. Also, patients' satisfaction of the 107 RPD were compared with 7 factors related to the RPD retention design. **Results.** The chewing tension force and retention force varied depending on the type of tooth, occlusion, food, and clasp. The developed model was validated experimentally and clinically. Patients had higher satisfaction score ($P < 0.05$) when RPDs were in maxillary arch, tooth-bounded saddle, or retained by ≥ 3 clasps than when RPDs were in mandibular arch, free-end saddle, or retained by only 2 clasps. **Conclusions.** RPDs predicted by the model to have sufficient retention are more likely to be retained in the arch and provide higher satisfaction rates for their patients.

OP 11. Caries Prevalence and Experience in Patients with Osteogenesis Imperfecta

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Objective: Dentinogenesis Imperfecta (DI) are a group of tooth abnormalities frequently found as an important complication in patients with Osteogenesis Imperfecta (OI), a hereditary bone fragility disease. It is unknown how the OI type and presence of DI affects Caries Prevalence and Experience (CPE) in these individuals. This study was to estimate the caries experience among different OI types and how these estimates change because of DI.

Methods: To determine which clinical characteristics were associated with increased CPE in patients with OI, the adjusted DFT scores were used to account for frequent hypodontia in this population.

Results: A convenience sample of 325 participants were used (median age=18.4years, range=2.8-75.8years) with OI types I (n=150), III (n=68) and IV (n=101). No statistically significant difference for CPE was found between sexes or OI type. Whereas variables such as age and DI, were statistically significant in CPE. Univariate regression of these variables revealed only presence of DI to be positively associated with CPE. The stepwise regression analysis while controlling for all other variables found presence of DI (OR=3.29;CI=1.74-6.20;p<0.000) as the significant independent predictor of CPE in the final model.

Conclusion: This study found no evidence that CPE of patients who suffer from OI is different between the types of OI. Only the presence of DI when controlled for other factors was found as a significant predictor of CPE.

P 3. Risk factors related to acute and chronic pain after breast cancer surgery: A prospective 3-month cohort study – Preliminary results

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Aim: To identify the predictors implicated in the risk of chronic pain after breast cancer surgery (CPBCS).

Methods: In this 3-month cohort study, female participants (≥ 18 years of age) with breast cancer (BC) who underwent BC surgery were recruited from Segal Cancer center, Jewish General Hospital. The putative risk factors for CPBCS were: pre-operative pain, age, painful comorbidities, type and duration of surgery, adjunctive therapy and acute post-operative pain. The study outcomes were: (i) occurrence of acute pain 7 days after surgery, (ii) acute pain intensity, (iii) occurrence of CPBCS 3-months after surgery, and (iv) CPBCS intensity. Pain intensity was assessed by telephone interview using the Brief Pain Inventory scale. Linear and logistic analyses were used to assess these predictors for these outcomes.

Results: 159 patients accepted and completed the 3 months follow-up, from which 62% reported acute pain seven days after surgery and 43% had CPBCS at 3 months after surgery. Multivariable regression analysis showed that participants exposed to preoperative pain (OR=1.04, $P=0.03$), or mastectomy (OR= 2.94, $P=0.04$) had an increased risk of acute pain at rest and during movement 7 days after surgery than those not exposed. Preoperative pain ($\beta=0.51$, $P=0.03$), and mastectomy ($\beta=12.05$, $P=0.01$) are associated with acute pain intensity. A borderline association was found with duration of surgery ($\beta=0.14$, $P=0.06$).

Further, patients who received axillary lymph node dissection were more likely to develop CPBCS (OR=3.82, $P=0.003$) than those who received sentinel lymph node biopsy. A borderline association was found with comorbidities (OR=1.45, $P=0.06$). An association was found between CPBCS intensity and acute pain intensity ($\beta=0.26$, $P=0.01$) and radiotherapy ($\beta=8.47$, $P=0.04$).

Conclusion: Preoperative pain and mastectomy contributed to increased risk of acute pain as well as its intensity. Axillary lymph node and acute pain intensity are CPBCS predictors, while radiotherapy and acute pain intensity increase its intensity.

P.2 Reconstruction of the Physiological Environment to Nurture the Growth of Ex-Vivo Human Salivary Organoids

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Background: There are approximately 500,000 new head and neck cancer radiotherapy cases annually worldwide. These patients typically have their salivary gland irradiated resulting in a condition known as xerostomia which increases their susceptibility to oral infections and disease, and impairs oral functions; to date, treatment options are only palliative.

Objective: This project aims to outline a method for developing salivary organoids and to establish the reliability of these organoids compared to its original tissue. These organoids can then be used for disease diagnosis and drug therapy testing.

Methods: Primary salivary cells will be cultured on a biomaterial scaffold such as a collagen type I gel and an egg white alginate gel. Several treatments will be administered singly or in combination including triiodothyronine, insulin, retinoic acid, uridine-triphosphate, and hydrocortisone. All trials will include the addition of EGF, and the scaffolds will be coated with laminin. The organoids will then be characterized, and the structural and functional features will be compared with the original salivary gland tissue.

Expected Outcomes: It is hypothesized that the mentioned treatments will likely have a positive result with respect to growth, longevity, and organization. Additionally, it is hypothesized that there will be minor differences in morphology and function between the salivary organoid and the original tissue as a result of the self-organization mechanism, native to cells; however, the organoid will exhibit reduced salivary function compared to the cells of the original tissue.

Conclusion: This study will create possibilities for novel studies in the search for a curative treatment for patients suffering with xerostomia. The ability to grow ex-vivo autonomous salivary organoids that have structural and functional resemblance to the original tissue proves these organoids to be reliable for future studies in drug therapy testing, tissue engineering, cancer-detection, and disease-modeling.

OP 12. The Prevalence of clinical and radiographical dentinogenesis imperfect in 159 osteogenesis imperfecta patients

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Background: Osteogenesis imperfecta (OI) is an uncommon inherited skeletal disease characterised by various degrees of bone fragility and fractures in children and adults. The association of OI and Dentinogenesis imperfecta is inconsistent; about one half of all OI patients show no obvious clinical signs of DI (teeth discoloration). X-ray images reveal a unique thin root and wide pulp chamber (Taurodontism) just after eruption, and/or obliteration of the pulp canal.

The purpose of this study is to: investigate the occurrence of clinical and radiographical Dentinogenesis imperfecta in different OI types.

Materials and methods: 159 individuals with a diagnosis of OI were evaluated and classified into 3 groups based on OI type. Intraoral photographs were taken in standardized settings and evaluated for clinical dentinogenesis imperfect for every individual. Panoramic x-ray has been taken for individuals 5 years and older, and used to evaluate pulp obliteration and taurodontism.

Results: Most of the individuals (54%) are under 16 years old. The prevalence of DI in permanent teeth was 8% in OI I, 43% in OI III, and 28 in OI IV. While in the deciduous teeth 17%, 63% and 65% in OI I, III, IV respectively. The presence of DI among our population was in 25% of individuals with OI I, 74% of those with OI III and 33 of individuals with OI IV. 31% of the OI type I patients has deciduous teeth, while for OI III 69% of the patients has deciduous teeth and for OI IV only 35%. The distribution of tooth discoloration varies within each dentition, in which the deciduous teeth are more effected. Pulp obliteration and Taurodontism are less prominent in all OI types within both dentition.

Conclusion: There is a different in the prevalence of the clinical and the radiographical DI among different OI types.

OP 13. Risk factors associated with the quality of life at 3 months after breast cancer surgery- A prospective cohort study

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Aim: To investigate the risk factors associated with the Quality of Life (QoL) among breast cancer patients 3 months after surgery.

Methods: In this 3-month prospective cohort study, 199 patients scheduled to undergo breast cancer surgery were recruited from the Jewish General Hospital (JGH), Montreal, Quebec. Pre-operative data (e.g. age, pain, comorbidities, anxiety and depression) and intra-operative data (e.g. pain, type of surgery, surgery length, axillary status and cancer grade) and post-operative data (e.g. radiotherapy and chemotherapy) were collected at baseline, seven days and three months after surgery, respectively. The study outcomes –QoL and chronic pain – were assessed 3 months after breast cancer surgery. Health-Related quality of life (SF-12) and the Brief Pain Inventory (BPI) questionnaires are used to assess QoL and chronic pain, respectively.

Results: 162 patients completed 3-month follow-up. The parameters assessed in the QoL questionnaire were Physical Component Summary (PCS), Mental Component Summary (MCS) and Quality of Life (QoL). The multivariable analysis showed that depression was negatively associated to PCS ($\beta = -4.38$, $P < 0.05$), MCS ($\beta = -5.60$, $P < 0.05$) and QoL ($\beta = -9.98$, $P < 0.05$) adjusted for other covariates. Axillary status was negatively associated only with PCS ($\beta = -6.16$, $P < 0.05$) and length of the surgery was positively associated with PCS ($\beta = 0.13$, $P < 0.05$) and QoL ($\beta = 0.21$, $P < 0.05$). Radiotherapy was positively associated with PCS ($\beta = 6.12$, $P = 0.0004$), MCS ($\beta = 7.80$, $P < 0.01$) and QoL ($\beta = 13.92$, $P < 0.01$) and chemotherapy was positively associated only with MCS ($\beta = 4.99$, $P = 0.01$), after adjusting for other covariates. Univariate linear regression showed positive association between chronic pain and QoL ($\beta = 11.50$, $P = 0.0007$).

Conclusion: Our preliminary findings suggest that QoL is negatively affected by psychological status, axillary status, whereas cancer treatment seems to improve it.

Keyword: QoL, MCS, PCS, risk factors, breast cancer.

P 1. Progression of Spinal Cord Plasticity over 12 months following Lumbar Intervertebral Disc Injury and Attenuation by Voluntary Running Activity

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Introduction/Aim: Chronic low back pain (LBP) is the most common cause of years lived with disability. However, despite its ubiquity, the mechanisms underlying its pathogenesis are poorly understood. Evidence suggests that intervertebral disc (IVD) degeneration drives chronic LBP in some individuals and that spinal neuroplasticity may contribute to this effect. Increased physical activity is beneficial in chronic LBP. The objectives of this study were to assess spinal cord plasticity following IVD injury for up to 12 months and to test whether exercise may be mediating its therapeutic effect, in part, through attenuation of these neuroplastic changes.

Methods: Female CD1 mice underwent either disc injury (L4/5 IVD puncture with 30G needle) or sham surgery. Two weeks after surgery, a subset of mice were provided with running wheels in their homecages. Animals were then sacrificed at multiple timepoints up to 12-months post-surgery. Spinal cord plasticity was assessed using immunohistochemistry with antibodies directed against neuropeptide CGRP and astrocyte marker GFAP.

Results: Disc-injured animals had increased levels of CGRP- and GFAP-immunoreactivity at middle chronic timepoints, but not earlier ones. Disc-injured animals with access to voluntary running wheels had decreases in these markers in late chronic timepoints compared to sedentary animals.

Discussion/Conclusions: We observed an age-dependent increase in neuroplasticity markers over time in our disc -injury model of chronic LBP, which was attenuated by increased physical activity in mice. These results are consistent with our characterization of disc degeneration over time and suggests that sensory nervous system plasticity may contribute to discogenic LBP.

OP 17. Association between parafunctional oral habits and painful Temporomandibular Disorders: acute and chronic case-control study

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Aim: The aim of this case-control study was to assess if the parafunctional oral habits are more common among chronic than acute painful Temporomandibular Disorders (TMD).

Method: Participants were recruited from three different dental clinics in Montreal, QC and one dental clinic in Ottawa, ON, after receiving a diagnosis of TMD.

Results: Out of 238 participants, 77% and 66% had chronic pain at baseline when the cutoff for chronic pain was duration of at least 3 months and 6 months, respectively. We found no significant difference in mean sum scores for Oral Behavior Checklist between acute (1.07) and chronic cases (1.26, $P=0.13$) defined by pain at 3 months. Chronic cases at 6 months, however, had higher mean sum score than acute cases (1.30 vs. 1.04, $P=0.02$) or when applying the IASP definition for chronic pain (1.28 vs. 1.00, $P=0.01$). Using the screening questionnaire, chronic patients were more likely to report jaw habits than acute cases using pain at 3 months or pain at 6 months ($OR=1.88-2.30$, 95% $CI=1.07-4.18$, $P\leq 0.02$), independent of patients sex and age.

Conclusion: Parafunctional habits are significantly more common among patients with chronic TMD. This result suggested that parafunctional oral habits may contribute to the transition from acute to chronic TMD pain.

OP 14. Orthodontic Treatment Duration Among Race Groups

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Objective: To find the relationship between orthodontics treatment duration among Caucasians and African Americans.

Methods: Consecutively treated patients records (n=254) [130 (51.19%) Caucasians, 124 (48.81%) African Americans, 99 (38.98%) male, and 155 (61.02%) female patients] were selected from orthodontic clinic at Jacksonville University, Florida. Demographic data, age, diagnosis, treatment plans, Pre-and-Post treatment photos, lateral cephalometric radiographs, pano, OrthoCad, and all treatment progress notes were examined.

Results: Treatment duration (month): 28.45 (SD=9.29) Caucasians vs 31.56 (SD=10.86) African Americans. 28.02 Male vs. 31.19 female. Age average: 14.7 and 16.5 for Caucasians and African Americans respectively. Average age of male: 14.33 while females was 17.06 at the start of treatment.

Conclusion: Treatment duration was related to race, age at the start, gender, number of visits, number of missed appointments, and compliance with elastics and headgear.

OP 15. Association between fatigue and painful Temporomandibular Disorders (TMD); a case-control study.

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Introduction/Aim: This case-control study is part of the Acute to Chronic TMD Transition program aimed at identifying risk factors contributing to the transition from acute to chronic painful TMD and its persistence. This project investigates the association between fatigue and TMD pain.

Methods: Painful TMD participants were recruited from three dental clinics in Montreal, QC and one in Ottawa, ON. Recruitment involved a clinical examination according to the Research Diagnostic Criteria/TMD and the completion of questionnaires assessing demographics, TMD symptoms and duration, and comorbidities, such as fatigue. Multivariable logistic analyses were used to assess our primary aim.

Results: Out of 309 TMD cases recruited, 106 reported fatigue; of these, 84% and 75% had chronic pain at baseline when the cutoff for chronic pain was duration of at least 3 months (CP3) and 6 months (CP6) respectively, while 79% were classified as chronic as per IASP. Non-statistically significant difference was noted in the number of chronic cases reporting fatigue compared to acute using the CP3 ($P=0.055$) and IASP ($P=0.096$) definition; both crude analysis (CP3: $OR=1.80$, $95\%CI=0.98-3.31$; IASP: $OR=1.60$, $95\%CI=0.92-2.80$) and that adjusted by age and gender (CP3: $OR=1.76$, $95\%CI=0.96-3.23$; IASP: $OR=1.57$, $95\%CI=0.90-2.80$) also showed borderline association. The number of CP6 chronic cases reporting fatigue was significantly higher than acute ($P=0.015$); fatigue remained associated to chronic TMD compared to acute in both crude ($OR=1.90$, $95\%CI=1.13-3.20$) and adjusted analyses ($OR=1.86$, $95\%CI=1.10-3.13$).

Discussion/Conclusions: Patients with chronic pain at six months were more likely to present fatigue than acute cases.

OP 16. Progression of pathological disc degeneration, innervation and macrophage infiltration over 12 months following single lumbar disc puncture in mice.

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Introduction/Aim: Low back pain (LBP) results in more disability globally than any other condition, yet our understanding of the underlying mechanisms remains unclear. We developed a mouse model of intervertebral disc (IVD) injury-induced LBP that incorporates behavioural signs of axial and radiating pain. In this study, we use this model to investigate whether IVD innervation and macrophage infiltration correlate with the severity of IVD degeneration for 12 months.

Methods: The ventral L4/5 IVD underwent a single puncture injury using a 30G needle in 2-month old CD1 female mice. Animals were euthanized at multiple time-points. Histological methods were used to measure the severity of IVD degeneration, innervation (PGP9.5-, CGRP-, tyrosine hydroxylase (TH)-immunoreactivity(ir)) and macrophage infiltration (F4/80).

Results: Injured L4/5 IVDs were more severely degenerated compared to sham-operated mice and degeneration in IVDs adjacent to injured discs emerged at later time-points. Significant increases in PGP9.5- and CGRP-ir nerve fiber density were observed in injured IVDs at 6 and 12 months post-injury compared to both non-injured IVDs of sham animals and adjacent lumbar IVDs of injured animals. Few TH-ir sympathetic nerve fibers were observed and disc puncture had no effect. Significant numbers of F4/80 labeled macrophages infiltrated the outer layers of injured IVDs.

Discussion/Conclusions: We observed slow, progressive increases in disc degeneration, innervation and macrophage infiltration following a single lumbar IVD puncture over the course of 12 months. Our study suggests the need to understand multiple aspects of IVD pathology and their potential roles in chronic LBP for more targeted and improved therapeutic strategies.