




UNIVERSITY OF OTAGO
FACULTY OF DENTISTRY
**SIR JOHN WALSH
RESEARCH INSTITUTE**
TE POKAPŪ RAKAHAU O TĀ JOHN WALSH

Programme and Abstracts

Thursday 9 July 2015 | Dunedin Public Art Gallery

3M Science.
Applied to Life.



Sir John Walsh
Research Institute
Research Day 2015

Thursday 9 July 2015
Dunedin Public Art Gallery

Programme and Abstracts

Sir John Walsh Research Institute

The Sir John Walsh Research Institute (SJWRI), a Research Centre of the University of Otago, advances research and increases knowledge for the improvement of oral health in New Zealand, and provides a national focus for dental research. The Institute's innovative, future-focused, interconnected research programmes cover the spectrum of oral health research, from the molecular, through biological systems to the health of populations. The SJWRI is integral to New Zealand's only Faculty of Dentistry, ranked in the top ten internationally, and its members have well-established productive collaborations across the University and with other institutions in New Zealand and worldwide. Our mission is to undertake research that underpins our teaching and clinical practice, and that translates discoveries into measurable health improvements for all New Zealanders. The Institute is named after Sir John Walsh, Dean of Dentistry from 1946 to 1971, a strong advocate for research in dentistry and oral health.

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The Sir John Walsh Research Institute Research Day 2015 is made possible by the generous support of 3M ESPE Dental.

Research Day Programme

Auditorium, Dunedin Public Art Gallery, 9 July 2015

8.30am	Registration:	Auditorium, Dunedin Public Art Gallery, Dunedin
9.00am	Mihiwhakatau:	Professor John Broughton
	Introduction:	Professor Paul Brunton, Dean, Faculty of Dentistry
	Opening Address:	Professor Richard Blaikie, Deputy Vice-Chancellor – Research and Enterprise

SESSION 1 9.20 – 10.30am Chair: Professor Richard Cannon

9.20am	Keynote speaker:	Professor Paul Brunton
10.00am	Director's Address:	Professor Richard Cannon Presentation of the SJWRI Awards
10.10am	3M Presentation:	Stephen Langdon, Scientific Affairs Manager
10.30 – 11.00am	Morning Tea in the ODT Gallery with our sponsor 3M's representatives and display SJWRI Research Day Poster Competition	

SESSION 2 11.00am – 1.00pm Chair: Professor Alison Rich

11.00am	Keynote speaker:	Dr Dawn Coates
11.30am		Mohamad Al-Dujaili, DCLinDent candidate
11.45am		Mohammad Alansary, PhD candidate
12.00pm		Olivia Apperley, DCLinDent candidate
12.15pm		Avadhoot Avadhani, PhD candidate
12.30pm		David Ko, DCLinDent candidate
12.45pm		Coreen Loke, DCLinDent candidate
1 – 2pm	Lunch in the ODT Gallery with our sponsor 3M's representatives and display SJWRI Research Day Poster Competition	

SESSION 3 2.00pm – 3.30pm Chair: Professor Warwick Duncan

2.00pm **Keynote speaker:** Professor Mauro Farella

2.30pm Norhasnida Nordin, PhD candidate

2.45pm Janine Tiu, PhD candidate

3.00pm Patrick Wong, PhD candidate

3.15pm Sobia Zafar, DClintDent candidate

3.30 – 4.00pm **Afternoon tea in the ODT Gallery with our sponsor 3M's
representatives and display**

**Closing remarks from Professor Richard Cannon,
SJWRI Director**

**Announcement of Student Presentation and
Poster Competition Winners**

Keynote research presentations

Professor Paul Brunton

BChD (Leeds) MSc PhD (Manchester) FDSRCS(Edin) FDSRCS(Eng) FFGDP(UK)
Professor and Dean, Faculty of Dentistry

Professor Brunton recently joined the University of Otago from the University of Leeds, Leeds, UK. At the University of Leeds School of Dentistry, Professor Brunton was the Director of Student Education. Professor Brunton graduated from University of Leeds, School of Dentistry in 1984 and obtained his MSc in Restorative Dentistry in 1992 and his PhD in 1996 from the University of Manchester. Professor Brunton was granted his fellowship in Dental Surgery from The Royal College of Surgeons of Edinburgh in 1995 and subsequently was awarded Fellowship *ad eundem* of the Faculty of General Dental Practice (UK) of the Royal College of Surgeons of England in 2005 and of the Faculty of Dental Surgery of The Royal College of Surgeons of England in 2009. Professor Brunton's research interests include operative dentistry, specifically tooth preparation and tooth whitening, the early diagnosis and treatment of tooth wear and practice based research. He has been involved in several multi-centre international trials of novel restorative materials and whitening systems. The research into tooth preparation and whitening techniques, particularly the development of experimental methodologies was unique. This has been recognized and reflected in the increasing number of invitations to referee and comment of research in this area for journal editors and publishers. More recently his role has been in the leadership of research and developing junior colleagues. This was evidenced by the award of the National Institute Health Research grant and the In-Practice research fellowship to members of his team in the UK.



Oral Health Research at the Crossroads: Which direction shall we take?

The Faculty of Dentistry has rightly positioned itself as New Zealand's centre for excellence in all aspects of Dental, Oral and Craniofacial research. Research into the oral health problems of today therefore should be a strategic priority both for the Faculty and the nation. As such we have a most important role in shaping the future agenda with respect to Dental, Oral and Craniofacial Research but also in promoting and delivering research in this space. This presentation will explore some concepts around the direction and shape of oral health research going forwards, what the priorities are and how we might address them. The role of challenge-led research in developing research questions and its interface with clinical and laboratory research and how we can translate and or commercialise our research more effectively will also be discussed. To achieve our objectives we need to train the academic workforce of tomorrow and some ideas about how we can support research, training, career development programmes that value and promote science will also be outlined.

Professor Mauro Farella

DDS (Naples), PhD (Reggio Calabria), Specialist in Orthodontics (Naples) Specialist in Medical Statistics (Milan), PD (Zurich)

Professor of Orthodontics, Department of Oral Sciences

Associate Dean, Postgraduate Studies

Director, Craniofacial Biology and Clinical Oral Pathology Research Programme

Mauro Farella is Professor and Director of the Postgraduate Programme in Orthodontics (DClinDent) at the University of Otago, New Zealand. He was previously based at the University of Naples Federico II, Italy, and at the University of Zurich, Switzerland. Mauro Farella graduated as a Doctor in Dental Sciences at the University of Naples, Italy, where he also completed a three-year postgraduate training programme to become a Specialist in Orthodontics. Furthermore, he holds a PhD in Oral Sciences (University of Reggio Calabria), a Specialist Certification in Medical Statistics (University of Milan), and the "Venia Legendi" in Switzerland (University of Zurich). His current research interests include normal and abnormal craniofacial growth, three-dimensional craniofacial imaging, clinical oral physiology, orofacial pain, and craniomandibular function. Additional areas of his expertise include randomized clinical trials in dentistry, the relationship between dentofacial anomalies and psychological wellbeing, and the evaluation of patient-centred clinical interventions. Furthermore, he has introduced, developed, championed and supervised new research streams at the Faculty of Dentistry of the University of Otago, which include craniofacial genetics, translational craniofacial research using animal models, long-term monitoring of intra-oral pH, and use of oral appliances for the management of obstructive sleep apnoea in children. craniofacial growth, craniomandibular function, craniofacial genetics, and biomedical three-dimensional imaging.



Beyond a smile

With modern dentistry, we can effectively restore the smile of patients with craniofacial anomalies and/or a deteriorated dentition, thus improving their wellbeing and quality of life. We are still unable, however, to solve some fundamental, yet unanswered, research questions. Examples of these questions include: what is the relationship between facial anomalies on oral function? What are the leading mechanisms underlying facial growth? Can we reliably predict, prevent and/or modify abnormal facial growth patterns?

New insights in craniofacial biology and oral physiology can considerably improve aspects of diagnosis, prognosis and treatment of abnormal facial growth patterns, but also of their related conditions, such as orofacial pain, jaw dysfunction, and sleep disordered breathing. A better understanding of these aspects will open new windows for personalized oral care and will ultimately allow us to better align dental research to medical research.

Dr Dawn Coates

BSc PhD (Otago)

Research Fellow, Department of Oral Diagnostic and Surgical Sciences

Dr Coates is a molecular and cellular biologist with significant expertise in angiogenesis (blood vessel growth) and stem cell biology. After being awarded her PhD from the Department of Anatomy at the University of Otago in 1993, Dr Coates worked for the Bioactive Discovery Group at AgResearch Invermay, rising to the position of Team Leader, before joining the Department of Oral Sciences within the Faculty of Dentistry in 2007. Since 2009 she has been a Research Fellow. Projects examining angiogenesis have continued with a particular



focus on angiogenic genes and proteins involved in Bisphosphonate-Related Osteonecrosis of the Jaw (BRONJ), and angiogenesis within the pulp of teeth. Stem cell research has examined cells from adipose and their ability to form bone, and stem cells in primary teeth and palatal periosteum. The role of the unfolded protein response and gene expression during tumorigenesis is a new field. In addition Dr Coates has continued to be involved with research investigating motivational interviewing in the context of the Community Oral Health Service and nurses within GP clinics giving oral health advice.

The effects of zoledronic acid on angiogenic genes and implications for Bisphosphonate-Related Osteonecrosis of the Jaw

D E Coates, S Zafar, E J Ohlrich, K McLaughlin, M P Cullinan, T J Milne, B K Drummond, G J Seymour.

The anti-angiogenic effects of zoledronic acid (ZA) may contribute to BRONJ, a side effect of bisphosphonate therapy associated with high morbidity. The mevalonate pathway (MVP) was investigated as a key bisphosphonate target. Primary human gingival fibroblasts, alveolar osteoblasts and monocyte-derived osteoclasts were generated and phenotyped. These cells were treated with ZA and the MVP investigated with add-back assays involving farnesol (FOH) and geranylgeraniol (GGOH). *In vitro* analysis of the fibroblasts and osteoblasts included: proliferation, apoptosis, TEM, gene and protein expression; osteoblast analysis also included migration, bone nodule formation, and VEGFA receptor usage. Human osteoclast angiogenic gene expression was investigated.

Fibroblasts and osteoblasts exposed to ZA reduced proliferation and increased apoptosis in a dose response manner, which was significantly reversed by GGOH but not FOH. TEM confirmed the presence of dilated ER. VEGFA, BMP2 and EREG were up-regulated in fibroblasts and osteoblasts treated with ZA. In osteoblasts the chemo-attractant molecules CCL2 and CXCL12 were down-regulated as were the vessel stabilisation molecules ANGPT1 and PDGFD. Osteoclasts up-regulated CXCL-10. A specific inhibitor of VEGFR1 (ZM306416), but not VEGFR2 (ZM323881) affected osteoblast maturation.

ZA affected human primary cells association with the pathogenesis of BRONJ. The upregulation of VEGFA mRNA and protein suggests that exogenous addition of angiogenic growth factors may not be beneficial. The anti-angiogenic affect may be associated with down-regulation of chemo-attractant and vessel stabilisation molecules and VEGFR1 activation may be involved. This research supports the therapeutic potential of GGOH in reversing the effects of ZA.

3M technical presentation

Stephen Langdon

Scientific Affairs Manager, 3M ESPE Dental ANZ

Stephen has over 30 years experience in the dental industry, initially as a qualified Dental Technician, transitioning into retail sales, and then promoted into manufacturing as an ANZ Area manager with Espe GMBH – Germany. In 1990 he took over responsibility as Business Technical Manager for Espe Australia P/L and in 2000 until present, after the acquisition of ESPE by 3M, holds the position of Scientific Affairs Manager for the 3M ESPE Dental Division specifically responsible for the Indirect, Preventive and Local Anaesthetics categories. Over this time he has developed an extensive Technical expertise across the full range of product / equipment offerings and has presented on numerous occasions in both Australia and New Zealand on various subject matters.



Stephen's role also includes responsibility for the development and presentation of technical and training resources for Government, Academia, distributors and sales teams as well as the resourcing of Key Opinion Leaders and responsibility for local Clinical research and product evaluation programs.

Shining the light on dentistry

A review on the Importance of "Curing" – what you need to know and have we just got lazy in our curing protocols? 3M's recent developments in Posterior composite and its placement procedures – keeping it simple and efficient without compromising performance. 3M Health Care Academy, our commitment to your education and learning.

Student research presentations

Growth Factor Expression in the Rat Condyle

Mohamad Al-Dujaili

DCLinDent candidate, Orthodontics

Supervisors: Prof Mauro Farella, Dr Trudy Milne, Prof Richard Cannon

Background and Aim

The mandible is particularly important in growth and development, in that it contributes to the morphology of the face. From a clinical perspective, mandibular morphologies may be attributed to certain malocclusions. The mandibular condylar cartilage has gained a long-standing interest in orthodontic research, as it is a site of growth and development of the mandible. The initial aim was to extract RNA from the condylar tissue. The main purpose of the experiment was to assess an array of growth factors and to appraise the changes in regulation, over several time points.

Methods

This study was carried out in two parts. A pilot study involving 6 rats was used to validate 1) a surgical method for the harvesting the rat condyle 2) a protocol for the extraction of RNA, following cryogenic grinding of the condyle and 3) using Haematoxylin and Eosinophil and Toluidine Blue stains, different developmentally distinct time points were identified. In the main study, 72 condyles were extracted, and processed through the validated RNA extraction protocol. The remaining eight condyles were assigned for further histological analysis. The level of mRNA obtained and the gene expression for 28 growth factor genes were measured. Quantitative Polymerase Chain Reaction (qPCR) technique was used to compare the relative gene expression at the time points identified.

Results

The condylar tissue harvesting technique, the cryogenic grinding protocol and RNA extraction methods were all successfully carried out. In all the samples, the 28 genes investigated were found to be expressed. Across all time points and relative to the three internal normalisation genes, there was subtle up and down regulation of genes involved in chondrogenesis and osteogenesis. However, the recommended two-fold change was not apparent for any of these growth factor genes.

Conclusions

The present study showed that the cryogenic grinding protocol was a valid technique in extracting RNA from the condyles and that all the growth factors selected were present in the gene analysis. However, in the rat model, the twofold change in the regulation did not occurred for any of the growth factors investigated at any time point selected.

Primary tooth pulp stem cells: from science fiction into science fact

Mohammad Alansary

PhD candidate, Oral Molecular and Immunopathology research programme

Supervisors: Dr Dawn Coates, Prof Greg Seymour, Assoc Prof Mary Cullinan, Dr Lara Friedlander, Prof Bernadette Drummond

Aim

To isolate and phenotypically characterise pluripotent progenitor cells from pulps of primary teeth at different stages of root resorption and to determine their ability to retain their 'stem cell' potential *in vitro*.

Methods

Caries-free primary canine teeth at three stages of physiological root resorption were extracted from healthy participants as part of their orthodontic treatment plans (n=9). Stem cell medium (Essential 8 - Invitrogen) was used with Vitronectin as an attachment matrix for the cell culture. Immunofluorescence was used to detect the embryonic stem cell markers NANOG, SOX2 and Oct 4, the neural crest progenitor cell markers nestin and Dlx2, and the mesenchymal stem cell markers CD90, CD73 and CD105. The differentiation potential of primary pulp cells into ectoderm, mesoderm and endoderm progenitors was assessed and their ability to be induced into cardiomyocytes and neuronal progenitors cells determined. The human embryonic stem cell line GENE002 was used as a positive control.

Results and Conclusions

Cell lines were established from pulps at all three stages of resorption. There was no difference in the expression of embryonic stem cell markers NANOG and SOX2, neural crest progenitor cell markers nestin and Dlx2, and mesenchymal stem cell markers CD90, CD73 and CD105 between the cell lines. Oct 4 was not expressed. All cell lines were able to be differentiated into progenitor cells of the three germ layers, and into neuronal and cardiomyocyte progenitors. Thus verifying their potential for multi-lineage differentiation. There was no difference in protein expression between the cell lines.

This project is funded by New Zealand Dental Association Research Foundation grants 2013 and 2014.

Management of xerostomia following radiotherapy: a cross-over study of a novel emulsion for potential use as a saliva substitute

Olivia Apperley^{1, 2, 4}

DClinDent candidate, Special Needs Dentistry

Supervisors: Professor Alison Rich^{1, 2}, Dr Maggie-Lee Huckabee^{3, 4}, Associate Professor Natalie Medlicott⁵, Dr Eithne MacFadyen¹.

¹Department of Oral Diagnostic and Surgical Sciences

²Sir John Walsh Research Institute

³University of Canterbury

⁴Rose Centre for Stroke Recovery and Research

⁵National School of Pharmacy

Aim

Researchers have recently developed a novel oily formulation for the treatment of dry mouth, for potential use as a saliva substitute. The aim of this randomised, cross-over study is to compare this new formulation to a currently available saliva substitute and a control of water on measures of mastication, subjective feeling of oral dryness and product acceptability.

Methods

Forty participants treated with radiotherapy to the head and neck region and experiencing xerostomia were selected to participate in the trial. Each participant trialled all three products in a randomised order. The effect of each product was measured using the Test of Masticating and Swallowing Solids (TOMASS), the shortened Xerostomia Inventory (SXI) and a questionnaire designed to test the patient acceptability of each product. Outcome data were gathered in a single session after the first administration of each product to evaluate immediate effects, and after 7 days of use to evaluate longer-term effects. Statistical analysis consisted of repeated measures analysis of variance and mixed models.

Results

There was no evidence of a condition or phase effect on any of the TOMASS measures ($p > 0.05$). Application of the novel emulsion resulted in a clinically small but significant improvement in SXI score ($p < 0.01$), however application of methylcellulose ($p = 0.21$) and water ($p = 0.81$) resulted in no significant difference. There was no difference in participant acceptability between the 3 products ($p = 0.32$).

Conclusion

The novel oily emulsion shows no clinically significant benefit over two existing products for relief of xerostomia. Indeed none of the three products demonstrated significant change in patient outcomes.

IL17 induces matrix metalloproteinase expression in oral squamous cell carcinoma and enhances invasion

Avadhoot Avadhani

PhD candidate, Oral Molecular and Immunopathology research programme

Supervisors: Prof Alison Rich, Prof Gregory Seymour, Dr Trudy Milne

Aim

To identify the effect of recombinant human interleukin 17 (RhIL17) on oral cancer cells in relation to their expression of genes associated with metastasis and their ability to invade.

Methods

Oral cancer cell lines, SCC4, SCC15 and SCC25 were cultured using standard methods. RhIL17 was added to the cell lines at varying concentrations (0, 10, 50 and 100 ng/mL). After 48 hrs, tumour metastasis gene expression was assessed by qPCR using a human tumour metastasis gene array and the invasion was assessed using an *in vitro* QCM ECMatrix assay. The data was analyzed using two way ANOVA (GraphPad Prism 6 software).

Results

The expression of matrix metalloproteinase (MMP)2, MMP3, MMP7, MMP10 and MMP13 was upregulated in SCC15 and SCC25 cells whereas all MMPs were downregulated in SCC4 cells. RhIL17 promoted the *in vitro* invasion of SCC15 and SCC25 cells in a dose dependent manner. SCC15 cells exhibited significant invasion compared with control cells when exposed to both 50 and 100 ng/mL RhIL17 ($p < 0.05$), as did the SCC25 cells at 100 ng/mL RhIL17 ($p < 0.05$). In contrast, RhIL17 failed to stimulate invasion in the SCC4 cell line.

Conclusion

This study is the first to demonstrate an association between IL17 and *in vitro* invasion of OSCC. The underlying mechanisms *in vivo* remain to be fully elucidated, but MMPs are likely to play a critical role.

The accuracy of Cone-beam Computerised Tomography (CBCT) to determine healing around bone grafts placed into maxillary sinuses

David (Seung Young) Ko
DClinDent candidate, Periodontology

Supervisors: Prof Warwick Duncan, Dr Don Schwass, Assoc Prof Jonathan Leichter, Prof Patrick Schmidlin (University of Zurich), Andrew McNaughton (Department of Anatomy)

Aim

To assess the effectiveness of CBCT for quantifying tissue development around grafted sinus sites, using an animal model.

Methods

Sinus grafting in eight sheep with bovine xenograft was evaluated after a 16 week healing period. Specimens from each animal were analysed histomorphometrically using three techniques: 3-D computerised tomography (CBCT), high-resolution research radiography (μ CT) and resin-embedded histological sections as a "gold standard". Two-dimensional "virtual" CBCT sections were matched with corresponding 2-D μ CT sections and digitised histological sections. μ CT and CBCT images were calibrated using known-density radiographic phantoms. Using image analysis software (Image J), % new bone, % residual graft and % connective tissue were measured for a matched area of interest for each imaging techniques and compared statistically.

Results

μ CT and histological measurements for % residual graft were similar (presented as % [SD]: 35.8 [7.05] versus 33.74 [5.7], $p < 0.05$), whereas μ CT measurement for % bone was significantly higher than histology (25.85 [8.91] versus 9.54 [6.51], $p < 0.05$). CBCT produced a significantly higher value for both % graft and % bone compared both to μ CT (68.4 [12.38] versus 35.8 [7.05], 65.89 [8.38] versus 25.85 [8.91], respectively, $p < 0.05$) and histology (68.4 [12.38] versus 33.74 [5.7], 65.89 [8.38] versus 9.54 [6.51], respectively, $p < 0.05$).

Conclusion

Histology and μ CT measurements were consistent in their determination of residual graft but μ CT overestimated the quantity of newly-formed bone compared to histology. CBCT markedly overestimated both new bone and residual graft. Cone-beam computerised tomography lacks the resolution to accurately determine osseous healing after maxillary sinus grafting, an important step before definitive implant restoration.

Wireless monitoring of intra-oral pH in real life settings

Coreen Loke

DCLinDent candidate, Orthodontics

Supervisors: Prof Mauro Farella, Prof Jules Kieser, Assoc Prof Sylvia Sander

Aim

To develop a wireless monitoring intra-oral pH device, which could be used to record real-time pH and temperature data; and, to collect preliminary data in a sample of healthy volunteers, as non-invasively as possible, for over 24 hours.

Methods

The wireless device consisted of a miniature pH telemeter, which included a temperature sensor and was capable of transmitting data wirelessly to a smartphone. Monitoring and calibration software application was also developed and aided with participants' data input. *In vitro* tests were conducted to calibrate and validate the measurements and performance of the device. The wireless device was then embedded into an in-mouth appliance and worn by five participants (mean age 28.6 ± 2.5 years) for at least 24 hours, while conducting regular daily activities.

Results

The device was successfully developed and used over a period of 24-hours in all participants. The average intra-oral pH in the study sample was 7.4 ± 0.5 . The intra-oral pH was lower during sleeping hours (7.0 ± 0.5), than waking hours (7.5 ± 0.5). There was a distinct rhythmic pattern of intra-oral pH variation during sleeping hours shown by 4 out of 5 participants. There was inter-individual variation in the intra-oral pH recovery time following acidic stimuli.

Conclusion

Preliminary results suggest that real-time variations in intra-oral pH and temperature can be successfully collected in participants. This wireless device is therefore capable of providing new insights into the variations of intra-oral pH over time, and its relationship with dental wear, white spot lesions and dental caries.

The impact of Early Childhood Caries (ECC) on Oral-health-related Quality of Life (OHRQoL) of the affected children's parents and families: Malaysia and New Zealand experiences

Norhasnida Nordin

PhD candidate, Dental Epidemiology and Public Health research programme

Supervisors: Prof Murray Thomson, Dr Lyndie Foster Page, Dr Kate Morgaine

Aim

To explore the impact of ECC (and its treatment) on OHRQoL of affected children's families.

Methods

Design of the study was a mixed methods using quantitative and qualitative approaches. 310 parents with children aged 2-5 years old either with ECC or caries-free were recruited from hospital-based and community-based dental clinics. They were invited to complete the short-form Family Impact Scale (FIS-8) questionnaire and then underwent a 30-minute interview. The samples were grouped as Hospital ECC, Community ECC and Caries-free. Data and information obtained were analysed using SPSS version 21 for quantitative analysis. Qualitative analysis was carried out using the deductive-inductive content analysis method and assisted by NVivo 10.

Results

The respective mean FIS-8 scores before and after treatment in the Malaysian samples were: 12.9 and 2.4 for the Hospital ECC group; 8.0 and 3.0 for the Community ECC group; and 3.1 and 1.7 for the Caries-free group. The latter group showed a "small" effect size (0.4) while the other two groups showed "large" effect sizes (1.8 and 1.3 respectively). The New Zealand scores were 7.5 and 3.3, 8.1 and 3.8, 5.2 and 0.5 respectively. All groups showed "large" effect sizes (0.7, 0.7 and 1.1). The most severely affected subscale was that of parental/family activity.

Conclusion

ECC has a pervasive impact on affected children's families, especially for the parents.

Prepr™ – A new method for measuring crown preparations

Janine Tiu

PhD candidate, Biomechanics and Oral Implantology

Supervisors and co-supervisors: Dr Basil Al-Amlah, Assoc Prof Neil Waddell, Prof Warwick Duncan

Aim

Current recommended crown preparation parameters, such as the total occlusal convergence angles (TOC) are founded on studies that are not based on clinical evidence due to the complexity in measuring such geometries. The aim is to report on clinical achieved crown preparation geometries prepared by NZ dentists and undergraduate dental students using a custom software (Prepr™) developed and validated at the University of Otago.

Methods

Two separate studies were conducted to report on various crown preparation geometries. The first analysed crown preparations prepared by dentists for all-ceramic crowns by scanning dies collected from dental laboratories around NZ in 2012 (n=236). The second study analyzed digital scans of metal-ceramic crown preparations prepared by dental students in 2013-14 (N=300).

Results

Dentists produced mean TOC angles that were above recommended values and minimum recommended margin width for all-ceramic preparations were not met. Students achieved TOC angles close to the angle recommended for the buccal-lingual cross-section but not the mesio-distal. There was a large range from negative values (undercuts) to the extreme over preparations of > 60°. The majority of preparations meet the recommended marginal widths.

Conclusion

Crown preparations produced by general dentists do not meet values recommended in the literature. However, these recommended values are not based on clinical trials thus it is not possible to predict the effects of observed shortfalls on the clinical longevity of these restorations. We recommend clinical trials routinely report individual crown preparation parameters by implementing similar objective measuring methods.

Energy of adhesion between resin bonding systems and glazed zirconia

Patrick Wong

DClinDent candidate, Prosthodontics

Supervisors: Assoc Prof Neil Waddell, Dr Basil Al-Amleh, Wendy-Ann Jansen van Vuuren, Prof Karl Lyons

Aim

The current recommended protocol for bonding zirconia restorations to teeth involves the use of an adhesive system containing phosphate monomers. This study evaluated the effect of using an etched and silanized glazed porcelain layer on the interfacial fracture toughness between a zirconia ceramic and a resin cement, one a conventional resin cement and the other with a phosphate monomer primer.

Methods

Forty rectangular-shaped zirconia ceramic specimens were planed and squared. The specimens were sintered according to manufacturer instruction and air abraded. 20 Specimens were coated with VITA Akzent Glaze Spray and fired according to manufacturer instruction. The glazed specimens were then etched with hydrofluoric acid and silanized. These were divided into two groups of ten specimens each; one group for each adhesive to be used. The un-glazed discs were divided into similar groups. The specimen groups were bonded with Variolink II and Multilink-Automix on a chevron shaped bond surface created by using a custom-made cut-out sticker made of ± 50 micron non-stick polymeric transparent PVC film. Prior to application of the stickers for the Multilink-Automix groups, the surfaces were treated with Metal/Zirconia Primer according to the manufacturer instructions. Specimens were kept in distilled water at 37 °C for 24 hours prior to interfacial fracture toughness testing on an Instron universal testing machine. The de-bonded specimens were examined under optical microscope to determine the mode of failures. Data were analysed using analysis of variance and Dunnett-T3 post-hoc tests with SPSS with a statistical significance set at 5%.

Results

The use of a glazed zirconia surface significantly improved the mean fracture toughness value in the Variolink II group ($p < 0.05$), however there was no significant change ($p > 0.05$) in the mean fracture toughness value with the Multilink-Automix Metal/Zirconia Primer group. In comparison, the mean fracture toughness value of Multilink-Automix metal/zirconia primer group was significantly higher in the unglazed group ($p < 0.05$).

Conclusion

The interfacial fracture toughness for glazed zirconia bonded to Variolink II resin cement was superior to air-abraded zirconia that had been surface treated with a phosphate monomer primer bonded to Multilink Automix resin cement.

Impact of zoledronic acid on osteoclast angiogenic gene expression

Sobia Zafar

DClinDent candidate (Paediatric Dentistry)

Supervisors: Prof Greg Seymour, Prof Bernadette Drummond, Assoc Prof Mary Cullinan, Dr Dawn Coates¹

The mechanisms underlying Bisphosphonate related osteonecrosis of the jaw (BRONJ) are poorly understood. Previous studies have indicated that the mevalonate pathway (MVP) and an anti-angiogenic effect of bisphosphonates may play a role in the pathogenesis of BRONJ.

Objective

To determine the effects of zoledronic acid (ZA) on angiogenic gene expression in primary human osteoclast (OST) cells, and to investigate replacement of the MVP with geranylgeraniol (GGOH) in the ZA treated OST cells.

Methods

Three OST cell lines were generated from peripheral blood mononuclear cells using ACCUSPIN™ System-HISTOPAQUE (Sigma). The osteoclast phenotype was confirmed by phase contrast microscopy and tartrate-resistant acid phosphatase staining. Gene expression profiling was carried out using the RT² Profiler™ PCR Array System (SABiosciences™). Genes coding for 84 human angiogenic factors were determined. The data were analysed using the SABiosciences Excel template for gene analysis and GraphPad PRISM.

Results

The results showed that the treatment of OST with ZA caused significant ($p \leq 0.05$, Fold regulation $\geq \pm 2$) up-regulation of the chemokine ligand 10 gene. The co-addition of GGOH with ZA resulted in up-regulation of the integrin alpha V gene and down-regulation of seven angiogenic genes including platelet cell adhesion molecule, serpin peptidase inhibitor member 1, chemokine ligand 1, chemokine ligand 9, insulin-like growth factor 1, transforming growth factor beta receptor 1 and endoglin.

Conclusion

Osteoclasts *in vitro* responded to ZA alone and with GGOH by up and down regulating a number of genes, and several families of functional gene groups identified. These genes may play a role in the pathogenesis of BRONJ.

This project was funded by Maurice & Phyllis Paykel Trust, New Zealand Dental Association (NZDA) Continuing Dental Education Trust Research Award and NZDA Central Districts Postgraduate Scholarship.

Poster competition entrants

Students

Name	Authors	Title	Course	Supervisor
Mohamad Al-Dujaili	Azza Al-Ani, Mohamad Al-Dujaili, Joseph Antoun, Florence Bennani, Mauro Farella	Genetic syndromes associated with the long face morphology: A review of the literature	DClinDent	Mauro Farella
Mohammed Alansary	Mohammed Alansary, Dawn Coates, Greg Seymout, Mary Cullinan, Lara Friedlander, Bernadette Drummond	Primary tooth pulp as a source of progenitor cells for permanent pulp tissue regeneration	PhD	Bernadette Drummond
Joanne Choi	Joanne Choi, Neil Waddell, Karl Lyons, Mauro Farella, Jules Kieser	Intraoral pH and temperature during sleep	PhD	Mauro Farella
Tony Lin	Tony Lin, Janine Tiu, Basil Al-Amleh, J Neil Waddell	New Zealand dental students tooth preparations	BDS	Janine Tiu, Basil Al-Amleh

Allauddin Siddiqi	Allauddin Siddiqi, Jules Kieser, Rohana de Silva, Andrew McNaughton, Warwick Duncan	A comparison of trabecular bone micro-architecture in the median palate and maxillary premolar alveolar sites of edentulous elderly cadavers: a radiomorphometric study	PhD/ DClinDent	Warwick Duncan (PhD)
Allauddin Siddiqi	Allauddin Siddiqi, Jules Kieser, Rohana de Silva, Warwick Duncan	Bone implant contact of Zirconia versus Titanium implants	PhD/ DClinDent	Warwick Duncan (PhD)
Janine Tiu	Janine Tiu, Neil Waddell, Basil Al-Amleh, Michael Swain	Capturing and evaluating crown preparation geometry	PhD	Neil Waddell
Joyce Yu	Joyce Yu, Ernxin Chin, Tiffany Hung, Janine Tiu, Don Schwass, Basil Al-Amleh	Effectiveness of dental students' crown preparations using preparation assessment software	BDS	Janine Tiu, Basil Al-Amleh

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Presenter	Authors	Title	Department
Richard Cannon	Nicholas Knight, Karl Lyons, Richard Cannon	Colonisation of acrylic denture surfaces by <i>Candida</i> species	Oral Sciences
Hee Ji Lee	Hee Ji Lee, Erwin Lamping, Richard Cannon	Unravelling the importance of conserved extracellular loop motifs of the archetype fungal multidrug efflux pump <i>Candida</i> <i>albicans</i> Cdr1p	Oral Sciences
Li (Peter) Mei	Li Mei, Joyce Chieng, Connie Wong, Gareth Benic, Mauro Farella	Distribution of dental biofilm in orthodontic patients	Oral Sciences
Colleen Murray	Colleen Murray, Nick Chandler	Eyesight status of students commencing clinical practice: A survey	Oral Rehabilitation

Notes





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