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Research Day 2021

School of Dentistry

Acknowledgements

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Awards

This year for the first time the School of Dentistry is providing awards for best student presentations and publications.

Presentation Awards

Two awards will be made to students in the following categories.

1. Best presentation
2. Most innovative project

Best Publication Awards

A number of awards will be made to recognise the best student publications between 1 June 2020 and 1 June 2021, in the following categories.

1. Tissue Engineering or Regenerative Dentistry
2. Dental Education or Dental Public Health
3. Clinical Research

IADR ANZ/Colgate Student Awards

Two awards, in junior and senior categories, will be made to support students to attend the IADR ANZ annual scientific meeting 2021.

Welcome

Professor Sašo Ivanovski

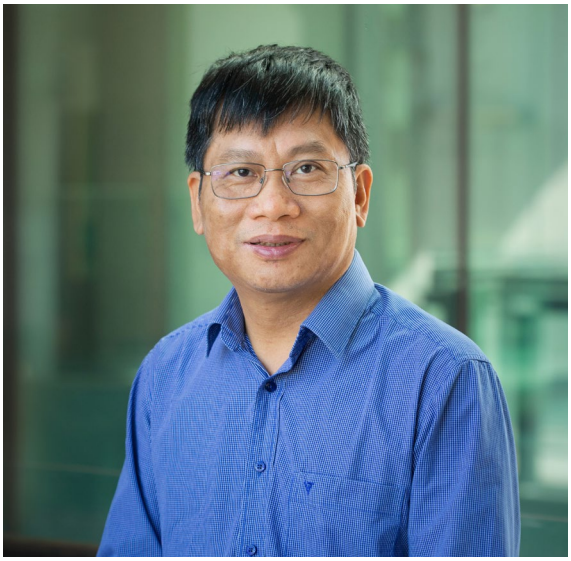
Head of School

It is a pleasure to welcome you to the 2021 School of Dentistry Research Day. The School has a strong research program across our core themes of Dental Public Health, Clinical Research Units and the newly established Centre for Orofacial Regeneration, Reconstruction and Rehabilitation.

Our high quality dental and oral health research contributes to the advancement of scientific knowledge both locally and internationally, and helps to provide effective solutions to contemporary challenges in dentistry. Our research greatly contributes to the school's ranking in the top 100 in the world and top 3 in Australia. I would like to express my warmest congratulations to the students and staff involved in this year's Research Day, and trust that you will enjoy learning about the outstanding research being conducted at the School of Dentistry.

Professor Loc Do

Director of Research



We would like to warmly welcome you to the School of Dentistry Research Day 2021. The theme 'New horizons in dental research' reflects the School's research capability and innovation. The School's research strengths cover well the triad of health and medical research: From bench, to chairside, to population.

We are fortunate to have two world-class keynote speakers at our Research Day, Associate Professor Carlos Salomon and Professor Amanda Ullman. Their speeches will no doubt inspire research ideas and potential collaborations. There will be a wide range of research topics presented by our staff and students and their presentations reflect the quality of research being conducted at the School. There will also be displays of research materials by various research groups at the School.

I would like to thank Dr Karan Gulati, Chair of the Local Organising Committee, and Mr John Bertram, Senior Administration Officer (Research), for their efforts in organising this event. We thank our industry sponsors for supporting this important event.

Dr Karan Gulati

Chair, Research Day Organising Commitee

We welcome you to present, attend and interact at the School of Dentistry Research Day, with a focus on highlighting world leading dental research carried out by our HDR students and research staff. Research Day is an exciting forum for our school to come together and share our research findings with a wider audience, enabling feedback and collaboration.

This time the Research Day will be streamed live via Zoom for our national/international collaborators and a recording will be shared on the school's website. For the first time, we are introducing awards for best presentations and publications by HDR students, to encourage the culture of timely dissemination of research. We hope that this event reaches its maximum potential in showcasing our research strength, facilities and international standing.

Keynote speakers

Associate Professor Carlos Salomon

Associate Professor Carlos Salomon [BSc (Hons I), MPhil, DMedSc, Ph.D] is a National Health and Medical Research Council Investigator Fellow, group leader and Lab Head (Exosome Biology Laboratory) at UQ Centre for Clinical Research (UQCCR).

During his postgraduate studies, he has directed research projects at The University of Barcelona (Barcelona, Spain), The University of Texas Health Science Center at San Antonio (San Antonio, Texas, USA), and The University of Queensland (Brisbane, QLD, Australia), in Regulation of transport systems (2010), Placental function during pregnancy (2011), and Mass Spectrometry (2012), respectively.

A/Professor Salomon held a leadership role in establishing the Centre for Clinical Diagnostics (CCD) at UQCCR, a centre created to develop, evaluate and deliver In Vitro Diagnostics within a National Association of Testing Authorities accredited research and development environment (ISO17025).

A/Professor Salomon's research program has investigated the release of small extracellular vesicles (EVs, commonly knows as exosomes) by the placenta and tumour cells during gestation and cancer progression, respectively, and their utility as a biomarker for a wide range of pregnancy complications and ovarian cancer.

Professor Amanda Ullman

Professor Amanda Ullman is the inaugural Professor and Chair in Paediatric Nursing, conjoint between the University of Queensland and Children's Health Queensland, and a 2021 Fulbright Future Scholar.

Amanda believes that children should be able to receive medical treatment in hospitals, without harm. Her research focusses on improving the most common invasive procedure in paediatrics - the insertion of an intravenous (IV) catheter.

Her program of research on how to select, insert, manage and remove the humble IV catheter is changing paediatric and vascular access practice, reducing infection and pain, and promoting efficient healthcare, for children internationally.

This research program has received considerable investment by the National Health and Medical Research Council (NHMRC) and the Children's Hospital Foundation (>$8M), highly-competitive fellowships and awards, >100 research articles in leading journals, two mHealth apps, and ranking as the top global expert in central venous catheters (ExpertScape, May 2021).

Venue information

Venue

UQ Oral Health Centre Auditorium
Level 4 (ground), 288 Herston Road
Herston QLD 4006

Online

Research Day 2021 will also be streamed live on Zoom.

Time

Friday 9 July, 8am – 1 pm (registration from 7.45am)

Trade and Research Displays

Please take the opportunity to visit the trade display from our sponsor Henry Schein, and displays of the School's research, located in the seminar rooms adjacent to the Lecture Theatre. Morning tea and lunch will also be served in the seminar rooms.

Recordings

For those who are unable to attend, videos of the presentations will be made available on the School of Dentistry website.

Program

7.45-8.00	Registration and COVID19 check in	15 mins
8.00-8.05	Welcome address - Head of School **Professor Sašo Ivanovski**	5 mins
8.05-8.10	Welcome address - Director of Research **Professor Loc Do**	5 mins

Keynote speaker

8.10-8.40	**Associate Professor Carlos Salomon** *From discovery to implementation in clinical practice: Extracellular vesicles in complication of pregnancies and ovarian cancer*	30 mins

Regenerative dentistry

8.40-8.50	**Sepanta Hosseinpour** *Impact of two silica-based miRNA nano-vectors on mesenchymal stem cells*	10 mins
8.50-9.00	**Aya Alali** *The effects of bioinspired titanium nanostructure on human gingival fibroblasts*	10 mins
9.00-9.10	**Tianqi Guo** *Influence of sterilization on topography, chemistry and bioactivity of nano-engineered dental implants*	10 mins
9.10-9.20	**Anjana Jayasree** *Nano-engineered titanium implants for local therapy and improved osseointegration*	10 mins
9.20-9.30	**Divya Chopra** *Fabrication optimization of nano-engineered zirconia dental implants*	10 mins
9.30-9.40	**Kexin Jiao** *Salivary circular RNA In periodontal disease*	10 mins
9.40-10.10	Morning tea and trade display	30 mins

Program

Keynote speaker		
10.10-10.40	**Professor Amanda Ullman** *Thinking big: building research programs with impact*	30 mins

Dental Education and Public Health		
10.40-10.50	**Yvonne Lai** *Enablers and barriers in dental attendance in Rett syndrome: an international observational study*	10 mins
10.50-11.00	**Radin Manofi-Khosroshahi** *Facial anthropometrics: epidemiology and concordance in Australian children and their parents*	10 mins
11.00-11.10	**Harmeet Kaur** *The evaluation of undergraduate dental students' experiences in paediatric dentistry*	10 mins
11.10-11.20	**Sandra March, Clare Mangoyana** *Audit of educational, social and economic benefits of rural Indigenous community dental student clinical outplacement*	10 mins
11.20-11.30	**Nicole Stormon** *A structured approach modelling child-level predictors of children's dental caries*	10 mins
11.30-11.40	**Christopher Sexton** *SMS reminders to improve public outpatient attendance: a retrospective study*	10 mins
11.40-11.50	**Leigh Harrison-Barry** *The Queensland birth cohort study for early childhood caries (ECC): Results at 7 years*	10 mins
11.50-12.00	**Janice Chuang** *Oral care provision for older adults with disabilities: Singapore dentists' perspectives*	10 mins
12.00-12.45	Lunch and trade display	45 mins
12.45-13.00	Awards	15 mins

Abstracts

Impact of two silica-based miRNA nano-vectors on mesenchymal stem cells

Researchers

Sepanta Hosseinpour[1], Maria Natividad Gomez-Cerezo[1], Yuxue Cao[2], Chun Xu[1] Laurence J. Walsh[1]

1. School of Dentistry, The University of Queensland
2. The Pharmacy Australia Centre of Excellence (PACE), The University of Queensland

Objectives

RNA mediated transfection is a novel method for driving regeneration. Despite high efficiency, plain microRNAs are not functional, and they require a vector to pass the cellular membrane and regulate post-transcriptional cascades. Although several delivery systems have been introduced, there remains a need for a safe, affordable and efficient transfection method. The present study explored and compared two silica-based nanovectors carrying microRNA as cargo, in terms of transfection efficiency and the osteogenic effects on rat bone marrow mesenchymal stem cells (rBMSCs).

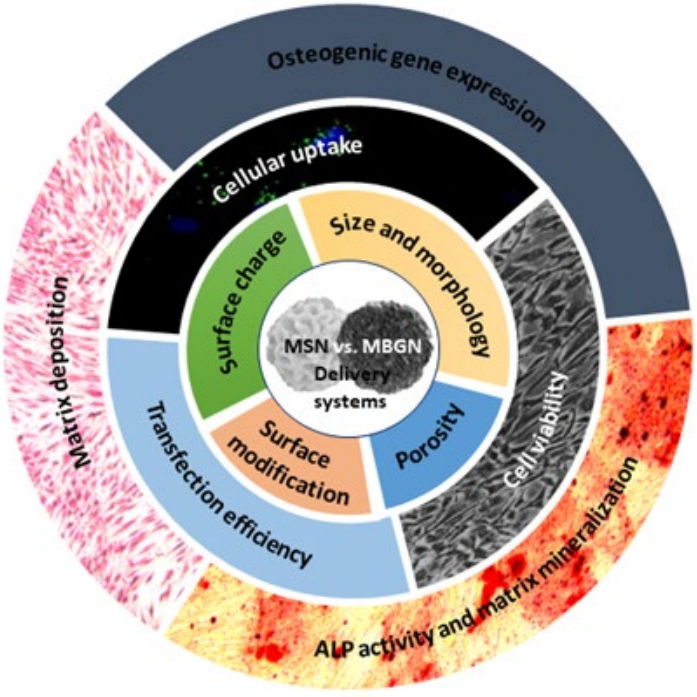
Methods

Two novel microRNA delivery systems were compared: mesoporous silica nanoparticles (MSN) and mesoporous bioactive glass nanoparticles (MBGN) (200 nm particle size). MSNs and MBGNs were fabricated by the modified Stöber process and oil/water emulsion technique respectively. Nanoparticles were coated by polyethyleneimine (10 KDa) to increase their zeta potential, and characterized by SEM and TEM. Nanoparticles were loaded with fluorescent tagged microRNAs, and their transfection efficiency for rBMSCs was evaluated by confocal laser scanning microscopy and flow cytometry analysis. Cell viability was assessed after 1, 3, and 7 days by the MTT assay. Following transfection with negative control microRNA, the expression of osteogenic genes (Runx-2, OCN, collagen 1, and BMP-2) was assessed at 7 days using the real-time quantitative polymerase chain reaction. In addition, osteogenic differentiation was assessed at 14 days by alkaline phosphate activity and alizarin red S staining.

Results and Conclusions

Polyethyleneimine-coated MSN and MBGN effectively transfected rBMSCs. A low concentration of MGBN + negative control microRNA significantly intensified the expression of osteogenic genes compared to controls ($p < 0.05$), as well as matrix mineralization and ALP activity.

These findings support the concept that both MSN and MBGN can effectively transfect mesenchymal stem cells. MBGN as a gene-vector also can exert a significant osteogenic effect on stem cells.



Schematic progress and comparison of mesoporous silica nanoparticle (MSN) and mesoporous bioactive glass nanoparticle (MBGN) miRNA delivery systems for promoting osteogenesis. After fabricating and coating the nanoparticles, they were characterized. Then, biocompatibility, cellular uptake, and transfection efficiency have been assessed. Finally, the osteogenic impact of miRNA-26a which was delivered by MSN/MBGN to mesenchymal stem cells has been investigated.

The Effects of Bioinspired Titanium Nanostructure on Human Gingival Fibroblasts

Researchers

Aya Q. Alali[1], Benjamin Fournier[1,2], Abdallah Ali[1], Karan Gulati[1], Saso Ivanovski[1], Ryan Lee[1].

1. School of Dentistry, The University of Queensland
2. Laboratory of Molecular Oral Physiopathology, INSERM UMRS 1138, Cordeliers Research Center, Paris-Descartes, Pierre and Marie Curie, and Paris-Diderot Universities, UFR Odontology, 75006 Paris, France

Objective

To evaluate the effects of Lithium doped (Li-Ti) and Alkaline treated (NaOH-Ti) titanium surface on attachment and extracellular matrix deposition of human gingival fibroblasts (HGF) in vitro.

Materials and Methods

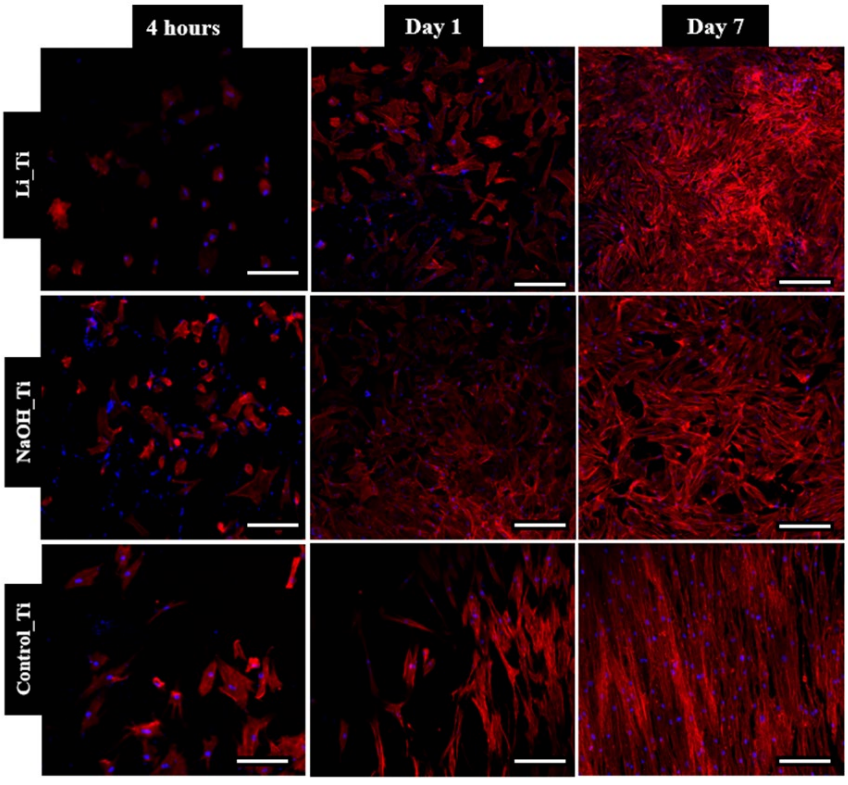
HGF (5000 cells/cm2) were cultured on three groups of square-shaped Titanium plates (10mm2, 0.2mm thickness); Li_Ti, NaOH_Ti and micro-grooved flat titanium (Control_Ti) for multiple time points (4 hours,1,3,7 days). Cell viability, growth, and metabolic activity were assessed using confocal microscopy, scanning electron microscopy (SEM), and spectrophotometry. Moreover, multiplex ELISA was performed to quantify various (MMP1, MMP8, FGF2, and VEGF) cytokines from 3 and 7 days culture media.

Results

The Lithium incorporated Ti surface group showed good biocompatibility with regard to the cell viability, metabolic activity, and proliferation of HGFs. The secretome profile demonstrated that MMP1, MMP8, FGF2, TIMP, and VEGF expression were increased at 7 days compared to 3 days, however, no significant differences were found among the titanium groups. Confocal microscopy images revealed an increased cell number in the Li-Ti group at 24 hours and 7 days compared to the other groups, indicating an increased cellular proliferation in the Li-Ti group. Moreover, it showed denser, randomly distributed actin filaments on the Li-Ti surface. Statistical analysis of cell length revealed that the cells in the control group were the longest, followed by Li-Ti then NaOH-Ti at 1 and 7 days. Furthermore, cells in the NaOH-Ti group were not only shorter but also narrower than Li-Ti group, as indicated by their higher Aspect Ratio.

Conclusions

The effect of bioinspired lithium-containing nanostructure showed promising results on the proliferation HGFs without causing any cytotoxicity. Furthermore, HGFs morphology and subsequent connective tissue arrangement were influenced by the Li-Ti group compared to the alkaline treated and control groups, contributing to the formation of denser connective tissue network on the implant surface.



Attachment of Human gingival fibroblast.

Confocal images of sample sections showing Nuclei (Blue) and Actin filaments (Red). At 4 hours, 1 and 7 days post-seeding in Lithium incorporated alkaline treated Titanium (Li_Ti), Alkaline treated Titanium (NaOH_Ti), and micro-grooved smooth titanium (Control_Ti). The scale bar is 100µm

Influence of Sterilization on Topography, Chemistry and Bioactivity of Nano-Engineered Dental Implants

Researchers

Tianqi Guo, Karan Gulati, Pingping Han, Sašo Ivanovski

School of Dentistry, The University of Queensland

Objectives

Nano-engineering of titanium implant augments bioactivity towards enhanced osseo- and soft-tissue integration. Interestingly, appropriate sterilization of such nano-engineered system and its influence of bioactivity performance remains underexplored. The current study aims to systematically evaluate the influence of sterilizations on nano-engineered Ti surfaces with nanostructures, which bring us one-step closer to their clinical application.

Methods

To address this research gap, we performed in-depth investigation of the influence of various sterilization techniques on topography, chemistry and bioactivity of anodized titanium implants with TiO2 nanopores. Briefly, TiO2 nanopores (TNPs) are fabricated on micro-rough titanium via electrochemical anodization, followed by sterilization using UV irradiation, gamma irradiation, ethanol immersion and autoclaving. Next, we categorically assessed their influence on nanopore topography, chemistry and mechanical stability to select the most appropriate surface sterilization technique. Further, gingival fibroblast functions, including proliferation and time-dependent adhesion and alignment, was studied on varied sterilized nanopores.

Results

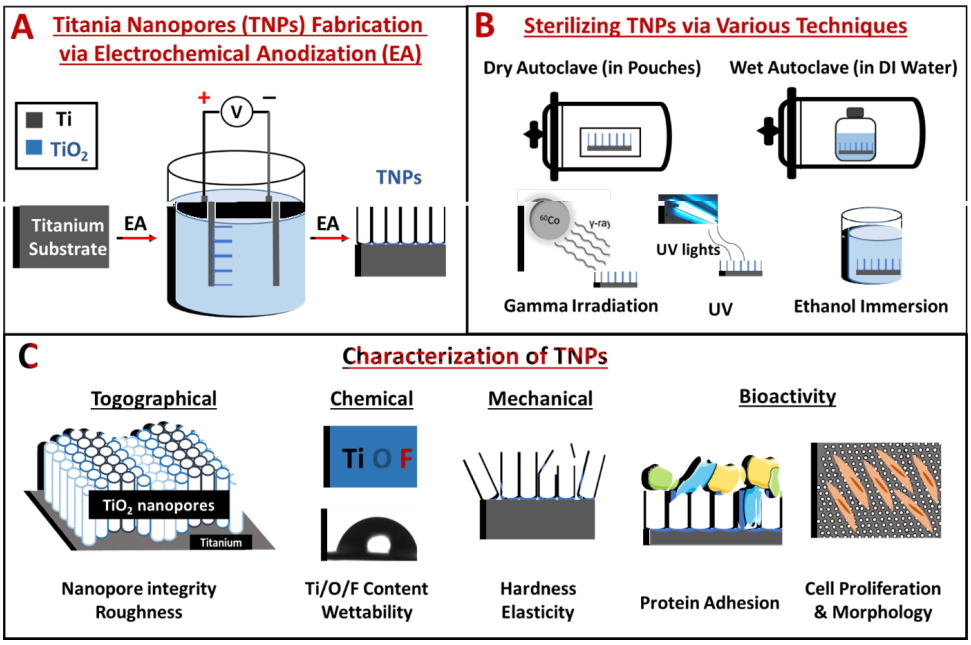
Ethanol immersion, gamma irradiation and UV irradiation conserved the nanotopography on titanium, but autoclave compromised the features. The influence of varied time of UV-sterilization indicated no significant changes on the surface topography and chemistry of fabricated TNPs. Further, our findings indicate that UV irradiation is the most appropriate technique to sterilize nano-engineered titanium implants, which significantly enhanced wettability, protein adhesion capacity and proliferation of human gingival fibroblasts (hGFs).

Conclusions

This study redefines the influence of sterilization on anodized nano-engineered titanium implants towards achieving reproducible outcomes (in terms of topography, chemistry and bioactivity) and holds great promise to be applied across different nano-engineered metal surfaces.

References

1. Guo, T.; Oztug, N. A. K.; Han, P.; Ivanovski, S.; Gulati, K., Old Is Gold: Electrolyte Aging Influences the Topography, Chemistry, and Bioactivity of Anodized Tio2 Nanopores. ACS Appl Mater Interfaces 2021, 13 (7), 7897-7912.
2. Gulati, K.; Moon, H.-J.; Li, T.; Sudheesh Kumar, P. T.; Ivanovski, S., Titania Nanopores with Dual Micro-/Nano-Topography for Selective Cellular Bioactivity. Mater Sci Eng C 2018, 91, 624-630.
3. Chopra, D.; Gulati, K.; Ivanovski, S., Understanding and Optimizing the Antibacterial Functions of Anodized Nano-Engineered Titanium Implants. Acta Biomater 2021.



Sterilization of nano-engineered titanium implants. Schematic representation of (A) fabrication of nanopores on Ti via anodization; (B) use of various sterilization techniques; and (C) studying the influence of sterilization on implant's topography, chemistry, stability and bioactivity.

Nano-Engineered Titanium Implants for Local Therapy and Improved Osseointegration

Researchers

Anjana Jayasree, Sašo Ivanovski, Karan Gulati

School of Dentistry, The University of Queensland

Introduction

Poor osseointegration and bacterial infection are the two major causes of implant failure in both orthopaedic and dental settings. Micro-scale and nano-scale modifications have shown great potential to regulate cellular interactions and thereby promote osseointegration. Utilising these surface modifications as local drug eluting systems can help deliver drugs like antibiotics locally. In this project, we aim to develop an advanced nano-engineered titanium implant system capable of achieving superior osteogenic and antibacterial functions. Specifically, the project aims to:

1. Fabricate titania nanopores (TNPs) on Ti implants by electrochemical anodization.
2. Optimize the antibiotic loading and local release from TNPs in vitro.
3. Evaluate the interaction of osteoblasts with TNPs in a 3D cell culture model in vitro.

Methods

TNPs of varying diameter were fabricated on Ti wire (model for dental implant) by using a recently optimized electrochemical anodization (EA) process and its surface topography was analysed using scanning electron microscopy (SEM) [1-3]. Loading and local release of antibiotics from TNPs was evaluated in PBS in vitro. Further, a 3D osteoblast culture system was established using collagen gel. Next, drug-loaded implants were inserted into the 3D gel. The cell proliferation of osteoblasts on TNPs will be evaluated by Picogreen assay and cell attachment by Actin-DAPI staining (imaged by confocal microscopy). Further, the osteogenic potential of the TNPs will be evaluated by alkaline phosphatase (ALP) assay.

Results

he analysis of surface morphology of the fabricated TNPs confirmed that by altering the voltage and time of EA, TNPs of varying diameters can be fabricated. To evaluate the cellular interactions with cylindrical wire implants, 2D cell culture is unsuitable, thus a 3D cell culture model was optimized using collagen gel (ongoing experiment). Live-dead staining of the 3D cell culture system confirmed that osteoblasts were viable for 14 days in the culture and with TNP implant inserted.

Conclusions

The current study demonstrates that the nano-engineered implants have great potential to improve osseointegration and enable tailored local therapy.

Acknowledgments

AJ is supported by a UQ Graduate School Scholarship (UQGSS) funded by the University of Queensland. KG is supported by the National Health and Medical Research Council (NHMRC) Early Career Fellowship (APP1140699).

References

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2. Gulati K, Li T, Ivanovski S. Consume or Conserve: Micro-Roughness of Titanium Implants towards Fabrication of Dual Micro-Nano Topography. ACS Biomater Sci Eng. 2018, 4, 3125–3131.
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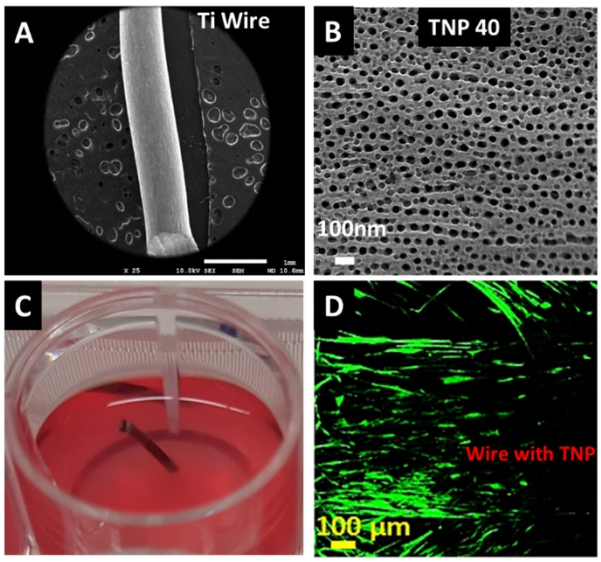


A) SEM image of Ti wire, B) SEM image of titania nanopores (TNPs) fabricated at 40V. C) Photograph of 3D cell culture system with osteoblast with TNPs/Ti wire; and D) live dead stain of TNPs inside 3D cell culture at day 14.

Fabrication Optimization of Nano-Engineered Zirconia Dental Implants

Researchers

Divya Chopra, Karan Gulati, Sašo Ivanovski

School of Dentistry, The University of Queensland

Background

Anodization enables fabrication of controlled nanotopographies on Ti implants to offer tailorable bioactivity and local therapy. However, anodization of Zr implants to fabricate ZrO2 nanostructures remains underexplored and is limited to the modification of easy-to-manage polished Zr foils, which do not represent the shape of clinically used implants. In this pioneering study, we report extensive optimization of various nanostructures on implant-relevant micro-rough Zr curved surfaces, bringing this technology closer to clinical translation.

Objectives

1. Fabrication of various nanotopographies on Zr wire substrates (as a model for dental implants) via electrochemical anodization (EA).
2. Characterization of surface topography, chemistry and bioactivity towards dental implant applications

Methods

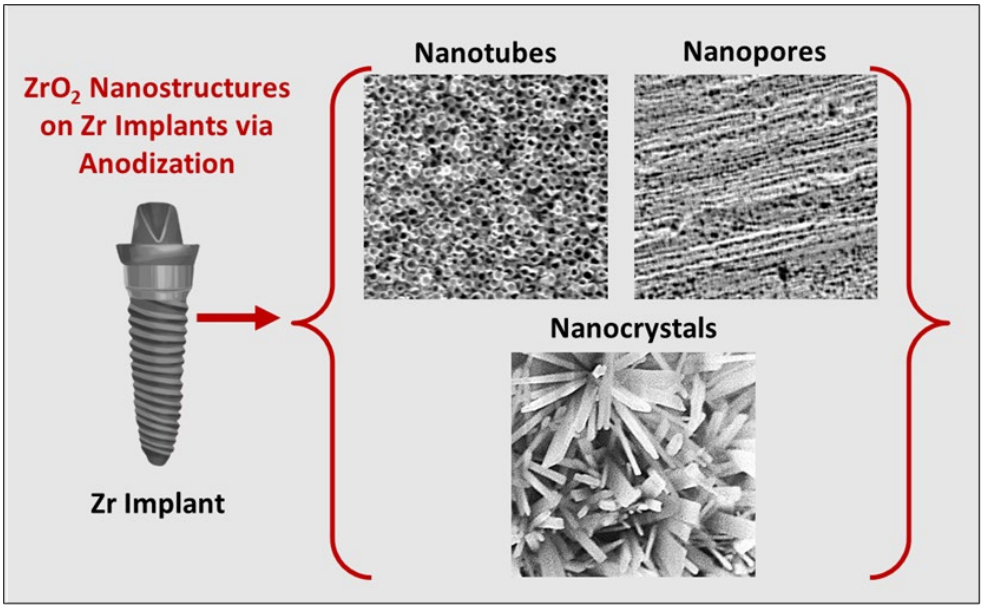
Zr nanostructures were fabricated on as-received curved Zr wire using EA at various voltages/times. To remove the anodic oxide layer, anodized samples were sonicated in methanol for various time intervals to reveal the underlying features. Characterization was performed using SEM, AFM and water contact angle. Further, functions of osteoblasts (proliferation and adhesion) were also evaluated on nano-engineered Zr implants.

Results

In this pioneering attempt, stable ZrO2 nanopores, nanotubes and nanograss, and Zr nanotemplate were successfully fabricated on rough Zr curved surfaces. The surface nano-engineering preserved the 'gold standard' micro-roughness to fabricate dual micro–nanostructures. Further, nano-engineered Zr, in comparison with rough and micro-rough Zr, enhanced protein adhesion and osteoblast functions.

Conclusions

This study showcases the fabrication of various controlled nanotopographies on Zr wire substrates (as a model for dental implants) via EA. By tuning EA voltage and time, EA of micro-machined Zr enabled the fabrication of nanopores, nanotubes, and nanograss/nanocrystals. Preserving the underlying micro-roughness and superimposition of controlled ZrO2 nanostructures holds great promise towards improving the bioactivity and therapeutic potential of conventional Zr-based dental implants.



Schematic representation of various nanostructures fabricated on zirconium dental implants.

Salivary Circular RNA In Periodontal Disease

Researchers

Kexin Jiao, Sašo Ivanovski, Pingping Han

School of Dentistry, The University of Queensland

Objectives

This project aims to investigate the salivary circular RNA expression profiles in healthy, gingivitis and periodontitis patients. Periodontitis is a complex inflammatory disease that is related to the host immune response to oral biofilm dysbiosis, eventually loss of tooth-supporting tissues [1, 2].

Methods

A total of 57 participants were recruited (23 healthy, 14 gingivitis and 21 stages III/IV periodontitis), and total RNA samples were extracted from participants' whole unstimulated saliva. Following with RNase R treatment to degrade linear RNAs and enrich circRNAs, the 10 circRNAs gene expression profile was evaluated by real-time quantitative PCR (RT-qPCR). Receiver operating characteristic (ROC) curves and the area under the curve (AUC) were performed to analyse the diagnostic ability of circRNAs in periodontal disease.

Results

The current study showed that salivary hsa_circ_0001162, hsa_circ_0064947, hsa_circ_0107474 hsa_circ_0137250 and has_circ_0003563 were significantly upregulated in periodontitis compared to that from the healthy and non-periodontitis groups. Specifically, has_circ_0003563 is a potential biomarker that illustrated a diagnostic capability (AUC=1) to discriminate among periodontitis and non-periodontitis patients. Furthermore, among the periodontitis patients, hsa_circ_0001161 was increased in grade C patients compared to grade B patients, with an AUC value of 0.82.

Conclusions

This research shows that salivary circRNAs are potential biomarkers for periodontal status.

References

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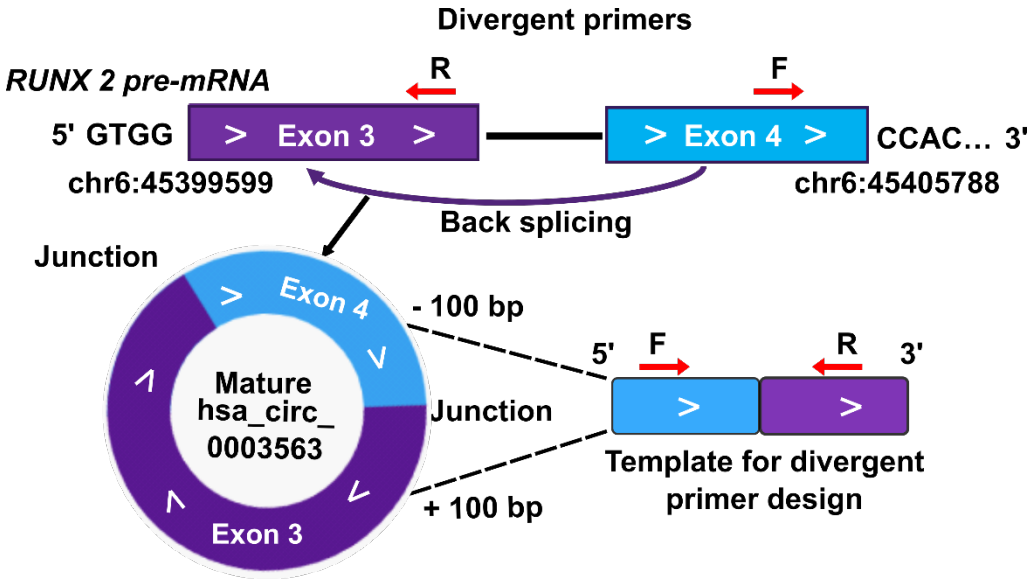

Schematic presentation of hsa_circ_0003563 biogenesis from back slicing of RUNX2 pre-mRNA and divergent primer design using the junction as a template for RT-qPCR analysis.

Hsa_circ_0003563 is expressed from exons 3 and 4 of RUNX2 pre-mRNAs. Divergent primers were designed at 100 bp spanning the back splice junction to ensure that circRNA can be amplified specifically by reverse transcription (RT) followed by real-time quantitative polymerase chain reaction (qPCR) analysis. F: forward primer, R: reverse primer.

Enablers and barriers in dental attendance in Rett syndrome: an international observational study

Researchers

Yvonne Lai[1], Jenny Downs[2,3], Kingsley Wong[2], Laurence Walsh[1], Helen Leonard[2], Sobia Zafar[1]

1. School of Dentistry, The University of Queensland
2. Department of Disability, Telethon Kids Institute, Perth, WA
3. School of Physiotherapy and Exercise Science, Curtin University, Perth, WA

Objectives

To investigate caregivers' perceptions regarding access to dental care for those with Rett syndrome (RTT), and associations of dental treatments received by those with RTT with their caregivers' perceived value of oral health and dental anxiety.

Methods

Retrospective observational data of those individuals with confirmed MECP2 mutations in the InterRett database(1) (n=216) were used to explore caregiver-related factors and their relationships with longitudinal data on dental service utilisation, using negative binomial regression.

Results

The main reported barriers to dental care access for individuals with RTT were primarily dentist-related in nature, regardless of dental service history. Those with reported dental non-attendance were of older age. Increasing levels of caregiver-reported dental fear were associated with less frequent dental check-ups or for any appointments for affected individuals.

Conclusions

Dentist-related barriers and caregiver-reported anxiety may both adversely affect dental attendance for those with RTT. Future research should explore caregivers' beliefs and oral health literacy as factors that could alter the pattern of attendance to make this more focussed on prevention rather than restorative treatment.

References

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Facial anthropometrics: epidemiology and concordance in Australian children and their parents

Researchers

Radin Manafi-Khosroshahi[1], Susan Clifford[2,3], Katherine Lange[2,3], Melissa Wake[2,3], Nicole Stormon[1]

1. School of Dentistry, The University of Queensland
2. Murdoch Children's Research Institute, Parkville, VIC
3. Department of Paediatrics, University of Melbourne, Parkville, VIC

Background

Facial anthropometry measurements of the body are used in many disciplines. Such measurements are central in diagnostics and treatment planning in reconstructive surgeries, orthodontics, prosthetic fabrication, and forensics. The advancement of digital imagery has innovated the science of anthropometry, allowing for ease and reproducibility in measures and new analytic techniques. The study aims to describe the facial anthropometry of Australian children aged 11-12 years and their parents, and the concordance of facial measurements between children and parents.

Methods

The Child Health CheckPoint is a nested study in the Longitudinal Study of Australian Children (LSAC). A subset of the LSAC birth cohort children and their parents had three-dimensional photograph undertaken. The software 3dMDvultus was used to calculate thirty common horizontal and vertical facial measurements in millimetres on these images. This study reports the distribution of facial measures in study children and an independent t-test was used to compare measured by sex.

Results

Of all participating CheckPoint families (n=1874), facial anthropometric data were available for 1206 children (49% girls; mean age 11.9 years) and 1108 parents (88% mothers; mean age 44.3 years). Boys had a significantly larger mean total facial width (139.1, SD 6.1) compared to girls (134.8, SD 5.5) ($t(12.3)= 1110$, $p = 0.000$). Boys also had significantly larger mean total facial height (118.7, SD 6.5) compared to girls (117.2, SD 6.8) ($t(3.8) = 1195$, $p = 0.000$). Concordance between parent and child facial anthropometries were moderate, with highest overall concordance observed for zygomatic width (CC 0.53, 95% CI 0.48 to 0.57). Father-daughter pairs (n= 95) had the strongest concordance in 10 of the facial measurements.

Conclusions

The results of our findings establish a strong parent-child facial anthropometric concordance, as well as intra-population variability of facial measurements stratified by gender. Such findings provide population-norms for clinicians which can be used in diagnosis and enhance operative treatment planning to optimise patient outcomes.

The evaluation of undergraduate dental students' experiences in paediatric dentistry

Researchers

Harmeet Kaur[1], Divyadarshini Mohanasundaram[1], Nadeem Hossain[1], Hanny Calache[2], Sobia Zafar[1]

1. School of Dentistry, The University of Queensland
2. Department of Dentistry & Oral Health, La Trobe Rural Health School, La Trobe, VIC

Objectives

To investigate final year dental students' attitudes towards paediatric dentistry training and their confidence in working with paediatric patients.

Methods

A 55-item questionnaire was distributed online and physically to the final year BDSc (Hons) students at The University of Queensland. The questionnaire consisted of five parts (1) demographic information; (2) theoretical knowledge; (3) paediatric observational experience; (4) preclinical and (5) clinical knowledge and skills related to paediatric dentistry. Jamovi (Version 1.6.3) and GraphPad Prism (Version 9.1.1) were used for data analysis and creation of graphs.

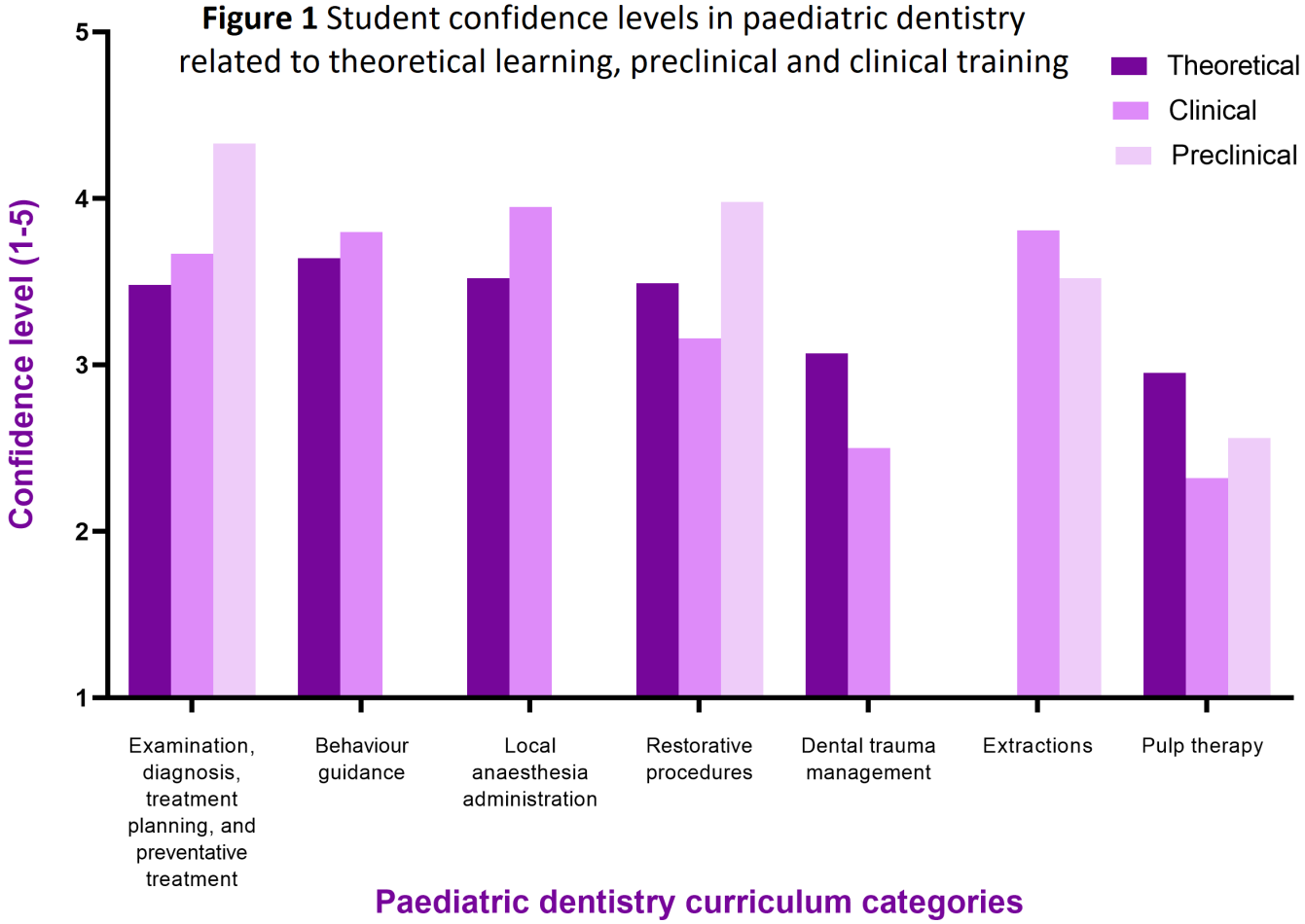
Results

A total of 47 students (77% response rate) completed the questionnaire. 33 (70%) of these participants had paediatric dentistry observational experience. The most common procedures observed were fissure sealants (75.8%), restorations (72.7%), behaviour management techniques (66.7%) and extractions (60.6%). Strip crowns (12.1%) and pulp therapy (12.1%) were the least observed. 69.7% of students which had observational experience reported that observations helped them feel more confident treating paediatric patients. Students were least confident in the pulp therapy procedures and the most confident in behaviour guidance and local anaesthesia administration. Confidence in preclinical training was higher than confidence in theoretical and clinical training in all categories except pulp therapies related to paediatric dentistry.

Conclusions

The study showed that students gained more confidence from observation and preclinical training compared to theoretical and clinical application.

Figure 1 Student confidence levels in paediatric dentistry related to theoretical learning, preclinical and clinical training



Audit of educational, social and economic benefits of rural Indigenous community dental student clinical outplacement

Researchers

Sandra March[1], **Clare Mangoyana**[1], Padraig Oakley[2], Steven Birch[2], Ratilal Lalloo[1], Laurence Walsh[1]

1. School of Dentistry, The University of Queensland
2. Centre for the Business and Economics of Health The University of Queensland

Objectives

To enumerate educational, social, and economic outcomes stemming from operation of a University of Queensland (UQ) and Goondir Health Services (GHS) partnership Outplacement Dental Clinic in Dalby, rural South East Queensland to affirm sustainability of the program.

Methods

A mixed methods qualitative and quantitative study was devised after consultation with Goondir Indigenous community representatives to guide respectful culturally sensitive research. Methods employed included an on-line student survey, recorded clinical support staff telephone interviews, recorded Indigenous community focus group discussions using purposeful selection sampling strategy, as well as recorded GHS staff focus group discussions. An in-person exit survey of Outplacement Clinic patients, review of UQ/GHS Dental Clinic economic and service provision data, and review of relevant Queensland Health (QH) Services Dalby Dental Clinic service and waitlist data to calculate impact of the student outplacement clinic on local QH services completed the study.

Results

Students appreciated the positive learning value gained from the rural Indigenous outplacement experience, with educational benefits outweighing any social and economic deficit. The Indigenous community perceived positive benefit in general and oral health awareness, improved access to dental care in their own safe space, while assisting student learning. Suggestions for mutual enhancement of the experience were offered. Changes in the Outplacement Clinic service provision mix from urgent care and tooth replacement towards more conservative and preventive care over time indicated improvement in community oral health. Decreased QH Dental Clinic treatment waitlist times indicated more timely access to care available to the wider community.

Conclusions

Partnership between a University and an underserved community organisation provides sustainable positive educational benefits for students, and social and economic benefits for the Indigenous and wider community served. Translation of this successful model of care would benefit other dental and healthcare professional educators and underserved communities worldwide.

A structured approach modelling child-level predictors of children's dental caries

Researchers

Nicole Stormon, Christopher Sexton, Pauline J Ford, Ratilal Lalloo

School of Dentistry, The University of Queensland

Objective

Social and structural determinants of oral health are critical to understanding patterns of child dental caries at the population level. This study aimed to estimate the effect of a broad set of distal child-level influences on children's oral health using the Longitudinal Study of Australian Children (LSAC), a nationally representative cohort study.

Methods

A total of 10,090 children were recruited at baseline and seven waves of data collected by computer and telephone-assisted questionnaire are currently available. Data were used to create two models of child-level factors with structural equation modelling for carer-reported caries experienced at ages four and eight respectively.

Results

Past dietary behaviours had a direct effect on dental caries at 4/5 years (β= .28, 95% CI [.22, .32]) and 8/9 years (β= .10, 95% CI [.05, .14]). The greatest predictor of carer-reported dental caries at age four was diet, whereas a history of carer-reported dental caries was the greatest effects observed in eight-year-old model (β= .26, 95% CI [.20, .32]). In both models, significant indirect effects of Indigenous status and childhood development on carer-reported caries mediated through diet.

Conclusion

It is evident dental caries is a chronic disease, as the greatest predictor of caries in mid-childhood was a past experience of caries. Preventive interventions in early childhood should be prioritised to prevent current and future increased risk and susceptibility to caries. There is some evidence indicating early preventive oral health interventions have been successfully implemented in Australia and future studies are needed to investigate the extent and effectiveness of these interventions on children's oral health. Consequences of caries modelled in this study highlight the importance of managing disease to prevent impacts on future health and development.

SMS reminders to improve public outpatient attendance: a retrospective study

Researchers

Christopher Sexton[1], Kelly McGowan[2], Cecilia Chen[1], Elizabeth Hsu[1], Pei-Chen Chen[1], Nicole Stormon[1]

1. School of Dentistry, The University of Queensland
2. West Moreton Oral Health Service

Background

Patients who miss scheduled appointments reduce clinical productivity and delay access to care for other patients. Reminders have improved attendance for healthcare appointments previously, but it is not known if short message service (SMS) implementation reduces incidence of patients unable to attend (UTA) or who fail to attend (FTA) appointments in the public dental service.

Objective

This paper studied the effectiveness of SMS reminders in increasing appointment attendance at a public dental outpatient sector in Queensland.

Methods

Data was sourced from the adult service and the children and adolescent oral health service (CAOHS) at West Moreton Hospital and Health Service (WMHS), a public dental service in Queensland. A total of 63,238 appointments pre-implementation of SMS reminders and 55,028 appointments post-implementation over a period of two years were analysed for rates of attendance, UTA and FTA. Characteristics of UTA and FTA appointments were analysed to identify factors that hindered improvement after implementation of reminders.

Results

For the CAOHS, the attendance rate decreased 4% (95% CI: 2%, 6%) following SMS implementation. The UTA rate also increased by 20% (95% CI: 15%, 25%). Following SMS implementation in the adult service, the attendance rate increased from 73.5 (95% CI: 72.6, 74.4) to 77.7 (95% CI: 76.6, 78.8) per 100 appointments. The FTA rate post-implementation was 1.08 (95% CI: 1.00, 1.16) times that from pre-intervention, and the UTA rate decreased from 21.7 (95% CI: 21.2, 22.2) to 17.1 (95% CI: 16.6, 17.7) per 100 appointments.

Conclusions

The SMS reminders had a mixed effect on the attendance, UTA and FTA rates for the CAOHS and adult services. Reminders reduced the rates of UTA for the CAOHS service and increased the rate of attendance for the adult service, which was counteracted by an increase in the FTA rate for both services.

The Queensland birth cohort study for early childhood caries (ECC): Results at 7 years

Researchers

Leigh Harrison-Barry

School of Dentistry, The University of Queensland

Background

This study was designed to test prevention strategies, as a series of longitudinal interventions and randomised controlled trials.

Aim

To investigate caries predictors in participants at 7yrs of age and compare the efficacy of home visits (HVs) and telephone contacts (TCs) for ECC prevention.

Methodology

A total of 1052 mothers were recruited during the neonatal period into a targeted preventive education programme. Participants were randomised to receive 6-monthly contact through either HV or TC and attended a clinic appointment at 2yrs of age continuing with 6-monthly appointments until 7yrs of age. At 7yrs, 378 participants completed the program.

Results

The mean caries experience (dmft) of the cohort increased from 0.1 ± 0.5 at 2y to 0.2 ± 1.1 at 3y, 0.5 ± 1.6 at 4y, 1.1 ± 2.4 at 5y, 1.6 ± 2.6 at 6y, and 2.0 ± 2.7 at 7y. The prevalence of mutans streptococci (MS) in the cohort at 2-7yrs was 22%, 36%, 42%, 42%, 39%, and 44%, respectively. MS was strongly correlated with caries prevalence for all years (all $P < 0.001$).

Statistical modelling employing the generalized estimating equations, identified caries predictors as holding a Health Care Card (low socioeconomic status) ($P = 0.009$; odds ratio [OR] = 2.05; confidence interval [CI]: 1.20– 3.52), developmental defects of enamel (DDEs) ($P < 0.001$; OR = 1.09; CI: 1.05–1.14), MS counts ≤105 /mL ($P = 0.001$; OR = 1.63; CI: 1.24–2.14). By contrast, HVs were more protective than TCs for caries ($P = 0.008$; OR = 0.42; CI: 0.22–0.80).

Conclusions

This study provides prospective, evidence that MS, DDEs, and socioeconomic status are strongly correlated with ECC and HVs are more efficacious than TCs in ECC prevention. This study was funded by the NHMRC of Australia (Grant No.1046779).

Oral care provision for older adults with disabilities: Singapore dentists' perspectives

Researchers

Janice Chuang

School of Dentistry, The University of Queensland

Objectives

Singapore's population is rapidly ageing with a growing demand for dental services by older adults. Dentists need to be willing to embrace the complex needs of the older adult, who is on a declining trajectory of frailty with multiple attending disabilities. Unfortunately, existing studies report many practitioner-related barriers that prevent older adults from utilising necessary dental services. This project aimed to understand Singapore dentists' perspectives on caring for older adults with disability, especially the factors influencing their willingness to provide care.

Methods

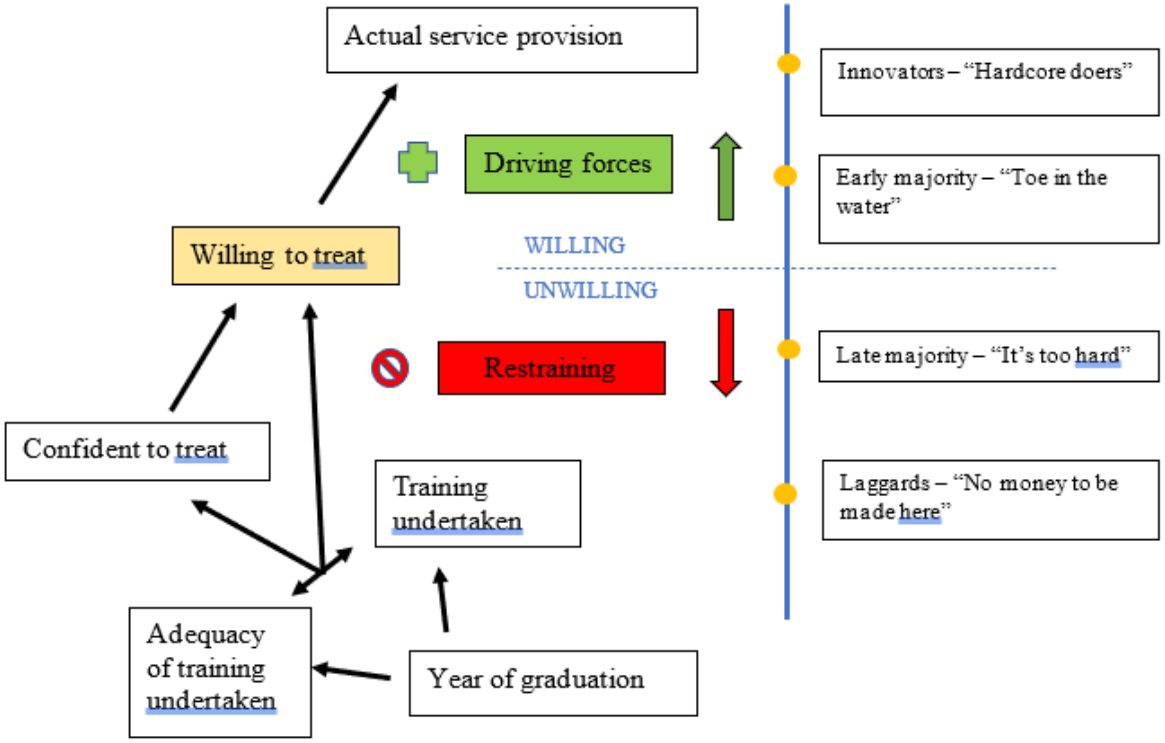
A cross-sectional survey was conducted using a self-administered questionnaire to collect descriptive data relevant to the aims and objectives of this study. Quantitative data analysis was presented in the form of descriptive statistics, followed by bivariate analyses.

Results

Singapore dentists limited their scope of practice to older adults with disabilities as the severity of impairments increased, particularly in the domains of swallowing, communication, cooperation and mobility. The barriers to care of inadequate knowledge and an inadequate work environment were strongly emphasised, as were the enabling motivators of a strong sense of professional duty and being confident to provide care. A key promoter of dentist willingness was previous training in geriatric dentistry. In addition, other restraining and driving forces influenced dentist willingness, reflected by the emergence of distinct dentist profiles who differed in their willingness, demographic characteristics, barriers and enablers motivating their care provision.

Conclusions

The frailest of older adults in Singapore experienced the most pronounced practitioner-related barriers to accessing dental services. This highlights the pertinent areas of training need among Singapore dentists. The results of this study hold promise that efforts to increase geriatric dentistry training will increase Singapore dentists' willingness. The existence of distinct dentist profiles informs the use of specific targeted interventions to encourage more dentists to embrace the inevitable changing tide of geriatric dentistry.



Possible factors influencing dentist willingness to treat and corresponding respondent profiles

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