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School of Dentistry

Student Research Conference 2021

11 November

Abstract Booklet

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Message from the Head of School

Professor Saso Ivanovski

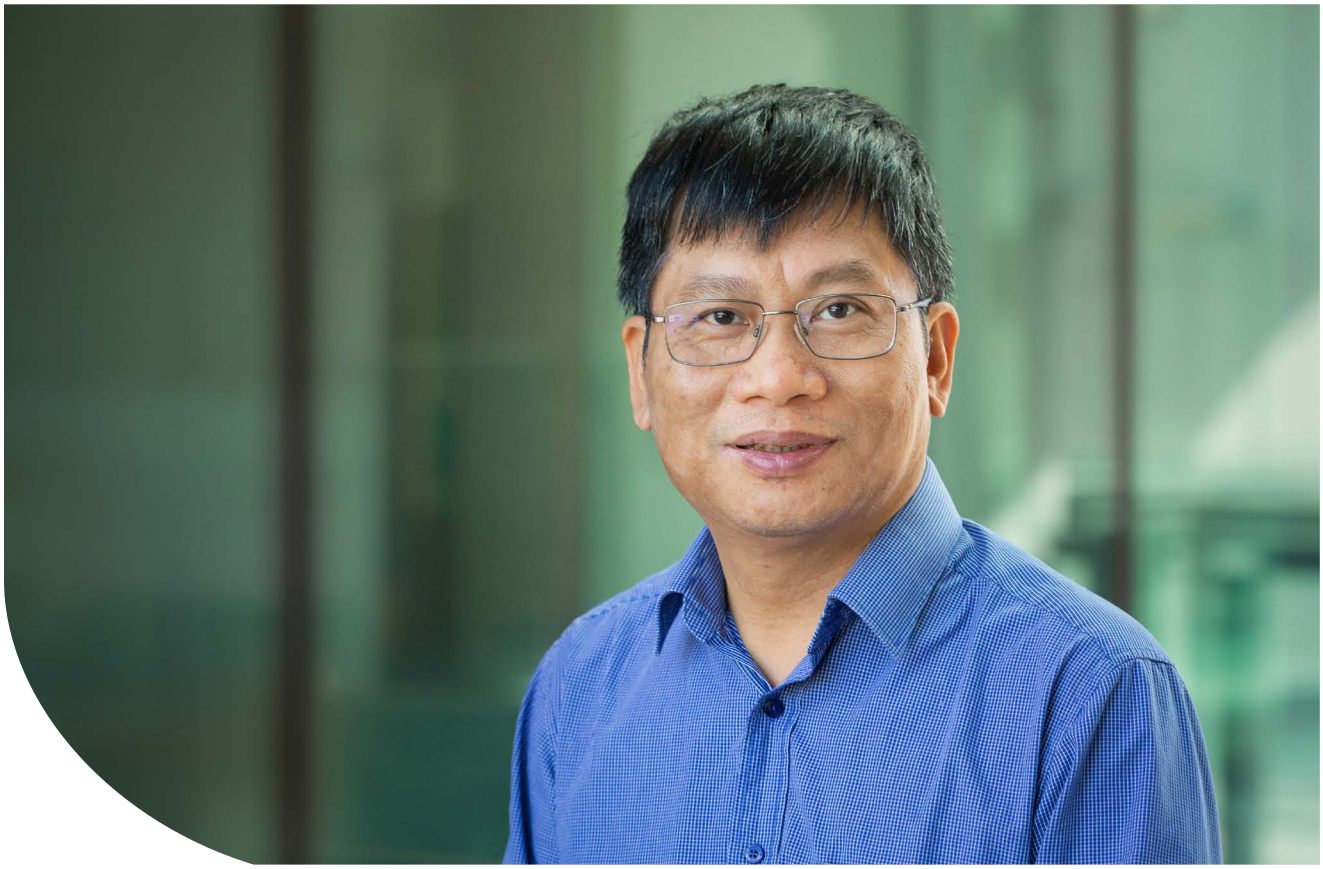
It is my sincere pleasure to welcome you to the 2021 School of Dentistry Undergraduate Research Conference.

The UQ School of Dentistry has a strong research tradition and we are proud to include opportunities to engage with research in our undergraduate program. Our UQ BDSc (Hons) program not only provides the highest quality dental academic and technical skills to equip you for successful careers, but also enriches your experience with complementary skills in research. Participating in research is an excellent way for you to attain the UQ graduate attributes of effective communication skills, independence and creativity, critical judgement and ethical and social understanding. This course has given you the opportunity to gain hands on experience in dental research across a wide range of dental disciplines. Your research has contributed not only to your own academic progress, but also to the success of the School's research agenda, and I thank you for your hard work and dedication this semester. Congratulations on your achievements and I wish you all the best for the future.

I would like to acknowledge the ongoing support of Colgate in making this event possible, and to thank all the staff and students involved in the program in 2021. I look forward to an even better 2022.

Professor Saso Ivanovski

Head of School



Message from the Course Coordinator

Professor Loc Do

As the course coordinator of DENT5023, I would like to thank and congratulate all of our graduating students for a wonderful year.

In addition to the demands of studying to become practising dentists, you have taken on the challenge of designing, carrying out and communicating findings of original research projects. This year saw 71 students collaborate across 24 projects, ably supervised by our team of clinicians and researchers. The projects cover a wide range of research fields including dental materials, clinical research, dental service provision for the general and special populations, and dental education.

I trust that this experience has been a positive one, equipping you with a better understanding of the research environment, new skills, and an appreciation for the importance of the nexus between research and clinical practice.

I hope you enjoy the experience and opportunity to present your research at the School of Dentistry Student Research Conference. This is your conference and you can be proud of it.

I wish to express my sincere gratitude to all of the students, academic and administrative staff, and our sponsor Colgate for another successful student conference. I wish all of our students the best for their future careers in dentistry practice and research.

Professor Loc Do
Course Coordinator

STUDENT ABSTRACTS

Vertical root fracture of molar teeth: A finite element stress analysis of sound and endodontically prepared teeth subjected to occlusal forces.

Researchers: Bonnie Han Chung, Michelle Ruijia Zhang, Su A Kim
Supervisor: Hon Professor Alex Moule, Professor Ove A. Peters, Dr Unni Pillai

Objective

The aim of this study was to investigate the effect of different occlusal forces on the development of tensile stresses in the roots of sound and endodontically-prepared mandibular molar teeth, using finite element analysis (FEA).

Method

The root canals of three-dimensionally printed mandibular molar teeth with natural anatomy were prepared with ProTaperNext (PTN) rotary endodontic files. Canal preparations were made to either 2 mm from, at, or 2 mm beyond the radiographic apex. Micro-computed tomography (microCT) was used to establish boundaries of the internal and external surfaces of the teeth to allow FEA modelling. The tooth, periodontal ligament (PDL), gutta percha and bone were modelled based on mechanical properties in precedent literature. Uninstrumented and instrumented models were tested under three occlusal representative loading conditions (axial, inclined and transverse with axial) of 50 N axial, 50 N inclined, 10 N transverse, and under a simulated intracanal hydrostatic pressure of 0.2 MPa.

Results

Simulated occlusal loading on both uninstrumented and instrumented molar teeth models resulted in the highest overall Maximum Principle Stress (MPS) at the loading area. The highest root MPS was created in the cervical third of the root surface for all simulated occlusal forces. Intra-canal pressures however, did result in some tensile stress on the internal root canal wall, but still in the cervical third of the root. In all instances, the stresses calculated were less than the fatigue tensile strength of dentine.

Conclusion

Within the limitations of this research, static loading does not result in stress concentration at the root apices in any manner that would result in root fracture under normal masticatory loads. Forces applied to the mesial of the molar results in greater stresses in the distal root. Vertical root fractures (VRF) are more likely related to dynamic forces and dentine fatigue.

Keywords

Root fracture, FEA, loading, instrumentation

Teaching of undergraduate implant dentistry in Australia: a study of students' perspectives.

Researchers: An Tran, Annie Bai, Chae Won Lee
Supervisor: Dr Tulio Fernandez-Medina

Objective

The aim of this investigation was to explore undergraduate student perceptions of their implant curriculum and determine the challenges presented in implant education in Australia.

Method

A paper questionnaire was distributed to University of Queensland (UQ) students, measuring confidence and satisfaction with the current curricula and its clinical application, areas of improvement, and the influence of the curriculum on pursuing further studies.

Results

A majority of students reported low confidence in applying implant knowledge clinically (34, 65.4% to 42, 80.7%), with a notable increase in confident responses in understanding theory following the practical workshop (from 4, 7.7% to 17, 32.6%). Most students regarded their implant training with Neutral satisfaction (22, 42.3%) followed by similar numbers of students who were Unsatisfied (11, 21.2%) and Satisfied (15, 28.8%) with the curricula. Overall, there were more satisfied responses for the delivery, amount and timing of theoretical content compared to the practical. Students unanimously agreed that improvements were needed, and suggested more clinical observations (41, 78.8%) and preclinical training (40, 76.9%).

Conclusion

Although this was the first Australian report investigating student perceptions on the undergraduate implant curricula, the results were not generalisable and should be taken with caution.

Keywords

Undergraduate, implantology, Australia, questionnaire, perception

Understanding the building blocks of the paediatric dentistry curriculum for undergraduate students.

Researchers: Harmeet Kaur, Divyadarshini Mohanasundaram, Md Nadeem Hossain
Supervisor: Dr Sobia Zafar

Objective

To investigate the attitudes of final year dental students towards their paediatric dentistry training and their confidence in treating child patients.

Method

A 55-item questionnaire was distributed online and physically to final year BDSc (Hons) students at The University of Queensland (UQ). The questionnaire consisted of three parts: theoretical knowledge, preclinical training and clinical training in paediatric dentistry. Self-reported confidence was recorded using five-point Likert scale questions ranging from 'not confident at all' to 'completely confident', which were allocated the numbers 1 to 5 respectively. Jamovi and GraphPad Prism were used for data analysis and the creation of graphs.

Results

A total of 47 students completed the questionnaire giving a response rate of 77%. Approximately two-thirds of participants had previous experience working with children. The students reported the lowest level of clinical confidence for pulp therapy (M=2.32; SD=1.08). The clinical confidence in dental trauma management was also reported to be low (M=2.50; SD=1.15). The clinical administration of local anaesthetic (LA) had the highest level of confidence (M=3.95; SD=1.03). The students reported that they were highly confident in the theoretical knowledge of behaviour guidance techniques (M=3.64; SD=0.97) and preclinical training involving examination, treatment planning and preventative procedures (M=4.33, SD=0.67).

Conclusion

This study showed that students reported low levels of confidence in pulp therapies and trauma management in children as compared to other aspects of paediatric dentistry. Students indicated the need for more preclinical and clinical training sessions, as well as more opportunities to perform a wider variety of treatments on paediatric patients.

Keywords

Confidence, curriculum, education, paediatric dentistry, undergraduate

Parental and training coach' knowledge and attitude towards dental trauma management of children: a questionnaire-based cross-sectional survey.

Researchers: Juliana Tian, Jonathan Lim Jun Jie, Francis Moh
Supervisor: Dr Sobia Zafar, Dr Jessica Zachar

Objective

Traumatic dental injuries (TDIs) are one of the challenging oral health problems in children with implications affecting their overall quality of life. The aim of this study was to evaluate parental and training coaches' knowledge and attitude towards TDI management in children.

Materials and Methods

A 31-item questionnaire was distributed to the parents and training coaches attending local sporting clubs in Brisbane region, Australia. The questionnaire consisted of five parts (1) demographic and professional information; (2) TDI in primary dentition; (3) fractures and subluxation to permanent teeth (4) avulsion to permanent teeth, and (5) information and knowledge related to the management of traumatised teeth. The jamovi (Version 1.6.3) and Microsoft Excel and GraphPad Prism were used for data analysis and creation of graphs.

Results

A total of 233 participants were surveyed, 211 parents and 22 coaches. Of all types of injuries, parental knowledge of managing avulsion to permanent teeth was poorest (9.5%), followed by management of primary tooth (17.5%) and management of fractures and subluxation to permanent tooth (29.4%). Parents in healthcare occupations were more satisfied with their current knowledge on TDI management. However, there was no significant difference in knowledge levels between healthcare personnel and other professions ($p=0.128$). Both parental and coaches had moderate levels of TDI management knowledge. Independent sample t-test was performed to confirm that there were no significant differences in knowledge among parents and coaches.

Conclusion

The study showed a gap in parents' and training coaches' knowledge regarding TDI management in children.

Keywords

Children, coach, knowledge, parent, trauma

Association between lack of dental service utilisation and caregiver-reported caries in Australian Indigenous children: a national survey.

Researchers: Jia Ru Toh, Nadine Wooi, Si Ning Tan
Supervisor: Dr Sobia Zafar, Dr Claudia Lopez Silva

Background

The Aboriginal and Torres Strait Islander population in Australia has been identified as a priority population with a greater proportion of unmet dental needs. Australian Indigenous Children have a greater risk for caries, and face greater barriers to accessing dental services compared to their non-Indigenous counterparts. Investigating the associations between dental service utilisation and caregiver-reported caries provides direction to implement oral health interventions tailored to the Australian Indigenous population.

Objectives

To investigate the association between the lack of dental service utilisation and dental caries in Australian Indigenous children.

Methods

Data from the Longitudinal Study of Indigenous Children, which is a longitudinal population-based cross-sectional study in Australia was analysed. A total of 1,258 children were included, consisting of the baby cohort (6.5-8 years) and the child cohort (9.5-11 years) at Wave 7. Logistic regression analysis was conducted to examine the association between caregiver-reported child dental caries and dental service utilisation. Multiple imputation using the fully conditional specifications approach was used to account for missing data.

Results

Around one-tenth (12.3%) of Indigenous children did not see a dentist when required. The lack of dental service utilisation was associated with an increased likelihood of caregiver-reported dental caries (OR 2.4;95% CI 1.5-3.8) and teeth removed due to dental caries (OR 2.3;95% CI 1.1-4.7). These associations remained after adjusting for confounders (caregiver-reported dental caries OR 2.4;95% CI 1.5-3.8; teeth removed due to dental caries OR 2.1; 95% CI 1.0-4.3). The reasons reported for not utilising dental services when required were the lack of an available dentist (31.4%), difficulties with physical access (19.8%), long waiting times (13.9%), financial issues with cost (5.8%) and feeling that 'they could cope' (4.6%).

Conclusion

The lack of dental service utilisation was associated with dental caries and extraction due to caries in Australian Indigenous Children.

Keywords

Indigenous children, dental attendance, dental caries

Addressing the needs or demand: a geospatial analysis of dental practices in Queensland.

Researchers: Chi Ian Kuong, Sai Tung Cheng, Siu Hei Tsung
Supervisor: Mr Christopher Sexton

Background

Australia is one of the most sparsely populated nations. This is a major challenge to overcome in order to provide equal access to dental services to all Australians. The research aims to investigate the relationship between the distribution of private and public dental clinics and the population demographics, thus providing an insight into whether Queenslanders' oral health services demand are met by the current supply of dental services.

Method

Public and private dental clinics information were collected from the Australian Dental Association (ADA) website and Google Map. The information was geo-coded and overlaid with remoteness data and Index of Relative Disadvantage (IRSD) decile obtained from 2016 Census data using ArcGIS.

Results

There was an uneven distribution of private and public dental clinics across Queensland and clinic availability was influenced by both remoteness and socioeconomic status (SES). Dental clinics were clustered in high SES areas in major cities whereas more dental clinics were found in low SES areas in regional and remote Queensland. It was also observed that in regional and remote Queensland, the provision of dental services relied heavily on public dental clinics.

Conclusion

The observations from this research provided useful information about the possible effects of remoteness and SES on the maldistribution of dental services in Queensland. Thus, policymakers can implement incentives that aim to tackle the inequalities and inequities in access to oral health care in Queensland.

Keywords

Geo-spatial analysis, population-to-clinic ratio, socioeconomic status, remoteness, inequalities

Utilisation of Government Dental Schemes and Physical Access to Services for Australian Children.

Researchers: Ahranni Sivakumar, Benjamin Perera, Zazi Brennan
Supervisor: Professor Marc Tennant, Professor Estie Kruger, Dr Gillian Jean, Dr Nicole Stormon

Background

The Child Dental Benefits Scheme (CDBS) commenced in 2014. It remains the current dental policy for Australian children, yet the scheme has been underutilised. Out of three million eligible children only 33% utilised the services in 2015. This study aimed to describe geospatial access to dental services for a representative cohort of Australian children and explore relationships between physical access and CDBS utilisation.

Methods

LSAC participant Medicare usage data from 2014-18 was linked to geospatial practice density data by the common identifier Statistical Areas Level 2 (SA2). Practice densities were recoded into zero, low, medium and high densities. Item codes were categorised then dichotomised into invasive and non-invasive treatment types. Rates of claims for the study population were calculated for SA2 areas. The influence of practice density on rate of claims was investigated using multiple linear regression, adjusting for confounders.

Results

Claim rates increased significantly between zero-practice areas and areas with any practices. When looking at SA2s with low, medium and high densities of practices, claim rates did not differ after adjusting for remoteness and socioeconomic status.

Conclusion

The presence of at least one dental practice (versus zero) in close proximity does improve access. However, increasing practice density any further does not affect utilisation. Practice density does not strictly equate to improved access. Therefore, physical access to care in terms of proximity need only be reasonable. Achieving that, many other barriers to accessing care must then also be investigated to better inform oral health policy.

Keywords

Child Dental Benefits Scheme, Longitudinal Study of Australian Children, Physical Access, Dental Practice, Health Policy

Patterns of service use of the Child Dental Benefits Schedule amongst priority groups of Australian children.

Researchers: Daniel Leung, Jessica Zhuang, Neema Safari
Supervisor: Dr Nicole Stormon

Background

The Child Dental Benefits Schedule (CDBS) provides funding for children aged 2-17 years from low-income families for dental treatment. The Australian National Oral Health Plan (NOHP) identified four priority groups within the population which experience poorer oral health outcomes. These groups are individuals with low income or social disadvantage, Aboriginal and Torres Strait Islander, residents of regional and remote areas, and individuals with specialised or additional healthcare needs.

Objective

Through Medicare linked data in a nationally representative cohort of Australian children, proportions of children using different dental service types under the CDBS was investigated, with these patterns of use correlated to the priority groups as outlined by the Australian National Oral Health Plan.

Method

The Longitudinal Study of Australian Children (LSAC) is a cross sequential dual cohort study. Subjects of this study were limited to LSAC participants who have utilised CDBS services. Population weightings were assigned to the dataset. Descriptive analysis of participants, CDBS claims by year and frequencies of service utilisation across each LSAC variable were analysed.

Results

This study had participant numbers inflated with population weightings. Proportion of preventative services increased as SEIFA increased, highest in high SEIFA (50.5%). Lowest proportion of oral surgery can be seen in high SEIFA (4.1%). Low SEIFA had the highest proportion of restorative services (10.3%). Higher proportion of non-ATSI children utilised preventative services (46.2% versus 40%). Higher proportion of special needs children utilised restorative services (14.7% versus 9.2%).

Conclusion

This study found children within priority groups had CDBS claim patterns of lower proportions of preventive services and higher proportions of restorative and oral surgery services compared to other participants. Understanding of CDBS usage patterns within priority groups could provide evidence to inform and improve policy, funding and service delivery of the scheme.

Keywords

Child Dental Benefits Schedule, dental service, oral health

The application of failure modes and effects analysis (FMEA) in the clinical risk assessment of a biodegradable 3D-printed patient-specific scaffold designed for bone regeneration in the oral cavity.

Researchers: Ping Qi Lim, Sue Huey Lim, Maria Sherilyn
Supervisor: Dr Tulio Fernandez-Medina, Dr Sepanta Hosseinpour

Objective

Rapid developments have been made in the field of alveolar bone regeneration within the past few decades. To address the drawbacks of current regenerative technologies, the University of Queensland's Centre for Orofacial Regeneration, Reconstruction, and Rehabilitation (COR3) has developed a new 3D-printed scaffold that is both biodegradable and tailored to the patient's specific defect. Preliminary in-vitro and animal studies have already demonstrated the product's feasibility and efficacy, but its safety for use in humans still remains to be evaluated. Therefore, in order to enable a safe transition to in-human trials and subsequent clinical use, this study aims to carry out a risk assessment to identify and rectify potentially significant risks.

Method

A survey was used to assess clinicians' perceptions regarding the current use of scaffolds in the treatment of alveolar bony defects and conduct clinical risk assessment of the newly-developed scaffold using the Failure Modes and Effects Analysis (FMEA) framework. The questions were designed using the ISO 14971:2019 guidelines, then subjected to review by experienced periodontists and oral-maxillofacial surgeons to assess its validity and reliability. The finalised survey was hosted on Google Forms and disseminated via email to 46 Queensland members of the Australian and New Zealand Academy of Periodontists (ANZAP).

Results

The response rate was 89.1% with a total of 41 responses received. More than half of the clinicians considered 3D-printed meshes superior to regular porous scaffolds in terms of mechanical stability and facilitation of bone regeneration. The most frequently chosen advantage of biodegradable 3D-printed scaffolds was the absence of requirement for post-treatment surgical removal (24%). Two particular failure modes were identified as high priority through the clinical risk assessment conducted. The highest mean Risk Priority Number (RPN) was obtained by the failure mode 'failure of healing following scaffold placement due to patient risk factors' (45.7 ± 27.7), followed by 'insufficient soft tissue area and volume to facilitate flap management during scaffold placement' (37.8 ± 24.1).

Conclusion

The research indicates a positive perception of clinicians towards 3D-printed biodegradable scaffolds. The clinical risk assessment conducted using the FMEA framework has revealed two failure modes that should be prioritised for risk mitigation for a safe clinical translation of this scaffold: (i) failure of healing due to patient risk factors and (ii) insufficient soft tissue area and volume to facilitate flap management.

Keywords

Scaffold; alveolar bone; periodontal regeneration; risk analysis; FMEA

Orthodontic treatment need, facial anthropometrics and quality of life in Australian children.

Researchers: Kiana Baban, Murshidah Kafrawi, Astrid Klatte
Supervisor: Dr Nicole Stormon

Background

Physical facial characteristics and malocclusion are taken into consideration during orthodontic treatment planning with the aim of improving a patients quality of life. However, little research exists on exploring the relationships between facial characteristics, quality of life and orthodontic treatment need. This study aims to explore those relationships in Australian children.

Methods

Data was collected in the Child Health Checkpoint, a nested study within the Longitudinal Study of Australian Children. Quality of life was measured using the Child Health Utility Score at 11-12 and 14-15 years old, and the PedsQL Measurement Model at 10-11 and 12-13 years old. The aesthetic component of the Index of Orthodontic Treatment Need and 3D facial anthropometric measurements were recorded at 11-12 years old. Linear regression analyses were used to to investigate relationships between measures adjusted for confounders.

Results

A total of 811 participants were included in this study. Index of orthodontic treatment need showed a significant association with facial angle (β -.04, 95% [-.08, -.01]). Facial angle (β = 0.27, 95% CI [0.04, 0.49]), zygomatic width (β -0.26, 95% CI[-0.46, -0.00]) (β = -0.26, 95% CI[-0.49, -0.04]), labiomental sulcus (β -0.00, 95% CI [-0.00, 0.00]) and upper lip to E-line (β -0.01, 95% CI[-0.02, -0.00]) showed a significant association with quality of life measures.

Conclusion

Quality of life in adolescents is predominantly driven by characteristics of the lower face. Facial angle was the only physical characteristic associated with orthodontic treatment need indicating jaw position predominantly influences orthodontic treatment need. While statistically significant associations were found, further research is required for results to be clinically relevant.

Keywords

Facial anthropometry, orthodontics, quality of life, mental health, demography

Tissue changes around immediate implants in the maxillary anterior region – A retrospective study.

Researchers: Junyoung Park, Hyunwook Ham, Joshua Shieh
Supervisor: Dr Himanshu Arora, Prof Saso Ivanovski

Objective

This study evaluated the impact of immediate implant placement on facial soft tissue dimensional changes, buccal bone thickness, and aesthetic outcomes in the maxillary anterior region.

Material and Methods

This retrospective study included 25 patients (13 male and 12 female) aged above 18 requiring replacement of a single anterior maxillary tooth (13-23). Inclusion criteria were the presence of adjacent natural teeth, absence of gingival marginal pathology, and adequate bone height to allow sufficient primary stability for immediate implant placement. Smokers (> 10 cigarettes per day) were excluded. Bone level immediate implants were placed with a non-submerged healing protocol, which was followed by crown placement 3-4 months later. Data collection included a preoperative CBCT scan, intraoral digital photographs, and study models prior to extraction and immediate implant placement. Photographs and study models were repeated at 1 year follow-up time-point. Facial soft tissue dimensions were measured by superimposing digital scans of study models at baseline and 1 year follow up over preoperative CBCT using an implant planning software. The aesthetic outcomes were measured using the pink esthetic score (PES).

Results

All implants remained osseointegrated at 1 year follow up with implant tooth, distal tooth and mesial tooth showing a mean mid-facial recession of 0.79 + 0.44mm, 0.29 + 0.40mm and 0.36 + 0.47mm, respectively. Distance from soft tissue to bone crest level showing a statistically significant correlation of 0.515 ($p = 0.01$) with mid-facial recession at implant tooth. Improvement in PES was observed at implant tooth from preoperative measurement (mean = 9.3 + 2.12) to 1-year follow up (mean = 9.65 + 1.8).

Conclusion

Immediate implant placement in the anterior maxilla showed favourable clinical and aesthetic outcomes and limited soft tissue recession. Pre-operative mid-facial bone loss showed a tendency towards increased recession after implant placement.

Keywords

Aesthetics, dental implants, immediate implants, soft tissue, recession

Association between disability status and dental attendance patterns in Australian children: a national survey.

Researchers: Seerat Sawhney, Cantho [Theresa] Vu, Fiona Chen
Supervisor: Dr Claudia Lopez-Silva, Dr Sobia Zafar

Objective

This study investigated the dental attendance patterns of Australian children with and without disabilities using data from Growing up in Australia: The Longitudinal Study of Australian Children.

Methods

Data on 6,470 participants within two study groups were observed (B cohort: n=3,381; K cohort: n=3,089) to examine dental attendance. Binomial regression models were fitted to test the association between disability status and dental attendance. The models were adjusted for gender, parent's country of birth, region of residence, highest parental education and household weekly income. Stata was used to analyse the data.

Results

2.4% in the B, and 3.8% in the K cohort had a disability. Unadjusted model revealed the risk of irregular dental attendance in children with and without disability was 1.07 (95%; CI, 0.78-1.46) in the B cohort and 1.15 (95%; CI, 0.93-1.42) in the K cohort. After adjusting for confounders and imputation, the risk of irregular dental attendance in children with disabilities compared to those without in the B cohort was 1.04 (95%; CI, 0.76-1.42), while for the K cohort, the risk was 1.09 (95%; CI, 0.89-1.34).

Conclusion

This study showed an association between dental attendance patterns and the disability status of Australian children.

Keywords

Children, dental attendance, disability

Dry mouth effects from drugs used for depression, anxiety, schizophrenia and bipolar mood disorder in adults: A Systematic Review.

Researchers: Cherilyn Teoh, Millie Thing, Serene Lau
Supervisor: Professor Steve Kisely, Dr Meng-Wong Taking, Dr Sarah Chaw

Background

In the management of depression, anxiety, schizophrenia and bipolar mood disorder, psychotropic drugs are commonly used. A side effect of psychotropic drugs is dry mouth, which increases the risk of oral diseases. However, the severity of dry mouth effects from these drugs have not been well established. This systematic review aims to analyse the severity of dry mouth due to psychotropic drugs in adults above 17 years of age, to provide practitioners guidance in the dental management of psychiatric patients.

Method

A search was conducted on the following databases: PubMed, EMBASE, PsycINFO, Cochrane Central Register of Controlled Trials (CENTRAL), CINAHL and Web of Science. This review included randomised controlled trials (RCTs) in inpatient and outpatient settings where drug-induced dry mouth, including xerostomia and hyposalivation, was recorded in adults above 17 years of age. Observational studies and patients with burning mouth syndrome (BMS) were excluded. Data on the severity of drug-induced dry mouth was collected and reported via a table of included studies. Included studies were evaluated using Cochrane risk of bias tool.

Results

A total of 17 RCTs were included. Severity of drug-induced dry mouth was compared amongst eight psychotropic drug classes and/or against placebo. The eight drug classes were tricyclic antidepressants (TCAs), selective serotonin reuptake inhibitors (SSRIs), tetracyclic antidepressants (TeCAs), monoamine oxidase inhibitors (MAOIs), norepinephrine–dopamine reuptake inhibitors (NDRIs), serotonin antagonist and reuptake inhibitors (SARIs), norepinephrine reuptake inhibitors (NRI) and mood stabilisers. There were a total of 588 participants, including healthy subjects and subjects with depression. In general, TCAs caused more severe dry mouth on both objective and subjective measures in comparison with placebo and other drug classes. Newer psychotropic drugs were associated with less severe dry mouth objectively and subjectively.

Discussion

All studies were published 20 to 40 years ago and most investigated older psychotropic drugs. Meta-analysis was not feasible due to design heterogeneity, such as inconsistency in methods of measurement of dry mouth effects, and reporting of graphical data without raw numbers. There was limited data on mood stabilisers and antipsychotics, and most studies were conducted on healthy subjects, limiting the generalisability of findings to clinical management of psychiatric patients. Few studies measured both objective and subjective dry mouth, which have different clinical implications.

Conclusion

Newer psychotropic drugs are associated with lesser severity of dry mouth. Practitioners should be more active in managing the risk of oral diseases in patients consuming older drugs such as TCAs. Newer psychotropic drugs could also be considered earlier in the line of therapy to reduce the risk of oral diseases and improve treatment compliance in psychiatric patients. Drug induced dry mouth due to psychotropic drugs is a poorly researched area. Future research with well-designed RCTs investigating newer psychotropic drugs in psychiatric patients using standardised objective and subjective measures is required to improve the dental management of psychiatric patients.

Other

This systematic review is not funded. The PROSPERO registration ID is CRD42021239725.

Keywords

Dry mouth, xerostomia, hyposalivation, psychotropic drugs, psychiatric illness

A method of investigating periodontal bone loss in a genetic mouse model of Hereditary Haemochromatosis.

Researchers: David Liu, Xin Yuan Liu, Yun Hwan Lim
Supervisor: Tianqing Liu, Gregory Anderson, Sašo Ivanovski, Pingping Han

Background

Hereditary Hemochromatosis (HH) is a genetic disorder that results in the elevation of iron levels and has been linked to an increased prevalence of periodontal disease. This study investigated the effect of a genetic mouse model of HH on periodontal bone loss using microCT imaging techniques.

Objectives

To investigate the association between periodontal bone loss and iron overload by comparing changes in the periodontal bone architecture between genetic mice models (Hfe-/- and WT).

To achieve this aim, we have two main objectives.

1. To compare the extent of interproximal periodontal bone loss by measuring the CEJ-ABC and furcation length between WT and Hfe-/-
2. To compare the extent of interradicular periodontal bone loss by measuring furcation fornix to intact interradicular bone level (Fx-BL) and subtracting PDL space between WT and Hfe-/-

Method

6 mice were split into 2 groups: wild type (WT) control and those with an Hfe-/- mutation mimicking HH. Their mandibles were collected and scanned with micro-computed tomography. Analysis was completed with an ImageJ macro that measured interdental and interradicular bone loss by quantifying cementoenamel junction (CEJ) to alveolar crest (CEJ-ABC),s and furcation fornix to intact interradicular bone level (Fx-BL) point respectively.

Results

The Hfe-/- group had a statistically significant increase in CEJ-ABC distance compared to the control group between first and second molars. There were no significant differences for CEJ-ABC distance between second and third molars between WT and Hfe-/- groups, as well as interradicular bone loss at the furcation area.

Conclusion

The method of using microCT imaging to identify bone levels employed in this pilot study has demonstrated that a genetic mouse model of HH is associated with increased periodontal bone loss in the interproximal areas between first and second molars compared to a control group.

Keywords

Hemochromatosis, iron loading

The effect of instrument lubricant on surface roughness and colour change of dental restorations over time.

Researchers: Cedric Choy, Jabez Chow, Jolyn Ho
Supervisor: Dr Ian Meyers

Background

There is an increased prevalence of instrument lubricants being used to shape and contour restorative materials. Lubricants help tackle the problem of restorative materials sticking to instruments. However, these benefits potentially come at the cost of surface roughness and colour.

Objective

This laboratory study compared the changes in surface roughness and colour change when five different popular instrument lubricants (G2-Bond Universal [G2BU], G-Premio Bond [GPB], Composite Wetting Resin [CWR], Petroleum Jelly [PJ], Water) were used on two composite resins (CRs) (G-aenial Anterior, G-aenial Posterior) and two glass ionomer cements (GICs) (GC Fuji II LC and GC Equia Forte).

Methods

Discs of each restorative material were shaped with the respective instrument lubricants. Subsequently, the discs were submerged into red wine, black tea, and water. The ease of manipulation and changes in surface roughness were recorded. The change in colour was compared quantitatively via the measure of luminance.

Results

Overall, the use of GPB resulted in a higher change in luminance (ΔL) in composite resins (CRs) while the use of G2BU generally resulted in a lower ΔL in CRs. Water resulted in the greatest change in surface roughness of the materials while G2BU had the least effect on surface roughness. In addition, G2BU lubricant and G-aenial Anterior restorative material scored the highest with regards to ease of use.

Conclusions

This study found that unconventional lubricants such as PJ and water should not be used as instrument lubricants on CRs and GICs due to their adverse effects on the surface roughness. A lubricant should feature a hydrophobic composition and not be overly acidic in order to achieve the best aesthetic results.

Keywords

Colour change, surface texture, lubricants, composite resin, glass ionomer cement

The effect of different mixing times on setting time and handling properties of encapsulated GICs.

Researchers: Brenda Ang, Ho Xing Yee, Nicole Y Low
Supervisor: Professor Ian A Meyers

Background

Glass-ionomer cements (GICs) make up an important part in restorative dentistry and their use has become increasingly popular over the years. Although manufacturers' instructions have outlined the recommended mixing time for the GIC capsules, mixing regimes are often altered by clinicians to give rise to different handling characteristics.

Objective

This study evaluated the effect of mixing time on four different GICs (GC Fuji VII EP, GC Fuji Bulk, GC Fuji IX EXTRA, and GC EQUIA Forte Fil). There are limited studies which investigated the potential changes in properties of GICs which might be caused by mixing time variation.

Methods

Seven samples of each GIC were mixed for either 5, 10 or 15 seconds. Measurements were made of setting time (initial set and final set) as well as assessing properties affecting usability (i.e. extrusion pressure, manipulation property, and marginal adaptability).

Results

The results showed that there was a trend towards a decrease in setting time when the mixing time was increased. A longer mixing time also contributed to greater extrusion pressure for the majority of the samples. The manipulation properties were affected by changing mixing time but with no clear trend. No significant trends were observed for marginal adaptability.

Conclusions

The results of our study found that 10s was the most optimal mixing time for encapsulated GICs. Therefore, clinicians should adhere to the manufacturers' recommended mixing times in order to obtain a material with optimal clinical handling characteristics and setting time.

Keywords

Glass-ionomer cement (GIC), Setting time, Mixing time, Handling property, Encapsulated

Awareness of loupes amongst dental students.

Researchers: Natalie An Qi Lim, Shan Li Ong, Jun Keat Low
Supervisor: Emeritus Professor Laurence J. Walsh AO, Dr George Bogen

Background

There are still misconceptions and misunderstandings around magnification when it comes to dentistry. There are currently many studies that report the advantages of using loupes, however there is limited research on the awareness of loupes amongst dental students. The aim of this study is to give a viewpoint on the students' perception of loupes and the perceived advantages of using loupes.

Objectives

The main objective of this study was to find out students' perspective on loupes and if they were aware of loupes. The second objective was to find out the perceived advantages of using loupes amongst students, and any misconceptions they had. Finally, the study explored why some students used loupes while others did not.

Methods

An online questionnaire was distributed to dental students across Australia in March 2021.

Results

A total of 297 students responded, with 3 results excluded due to incompleteness of answers in the questionnaire. 94.4% of junior students were not using loupes, while 99.3% of students were aware of loupes. The highest rated perceived benefit was greater visualisation, across all universities and all year groups. 87.8% of junior dental students reported that there was still a lack of information available on dental loupes. To address this, most respondents believed that awareness should be improved by more education on this topic.

Conclusions

Overall, dental students are aware of dental loupes. Despite this, there are still barriers to their widespread use.

Keywords

Dental students; loupes; magnification; Australia

The accuracy of intra-oral scanner impressions vs conventional impressions in periodontally compromised dentition.

Researchers: Nathan Tran, Amirmiya Malek
Supervisor: Dr Bilal El Masoud, Dr Sobia Zafar, Dr Amro Farag

Objectives

Traditionally, the capture of a periodontally compromised dentition has been undertaken using alginate impression materials. The advent of intra-oral scanners offers an alternative impression modality. However, no studies currently exist investigating the efficacy of intra-oral scanner (IOS) use on periodontally compromised teeth. The aim of this study is to investigate how dimensionally accurate an IOS is compared to alginate impressions in a periodontal setting.

Methods

Tooth models consisting of three teeth (#34, 35 and 36) were created with varying interdental periodontal heights of 0 mm, 1 mm, 2 mm and 3 mm. Six alginate impressions at each periodontal height were taken from these models and die stone models were poured up. The alginate models were digitised using a high-precision digital scanner (Dentsply Sirona CEREC Omnicam). The periodontal tooth models were scanned six times at each periodontal height using an IOS. Each periodontal height was scanned once with a high-precision digital scanner. The interdental areas between the 34 and 35 (A), and 35 and 36 (B) were analysed using STL files (n=52) in Blender software. Data were tabulated and graphed using Microsoft Excel.

Results

The IOS consistently out-performed alginate impressions in interdental area size capture at all periodontal heights across interdental areas A and B. The IOS displayed, on average, smaller variance in interdental area size readings across interdental areas A and B.

Conclusion

As the IA size varied, the IOS produced more dimensionally accurate impressions with lower variance than alginate impressions.

Keywords

Alginate, Blender, Impression, Intra-oral scanner, Periodontitis

Intratubular Penetration of MTA in Endodontic Retreatment: A confocal microscopic study.

Researchers: Phoebe Cho, Vivian A. K. V. Dao, Eric Zong
Supervisor: Dr Yu-Yao Teoh, Dr George Bogen

Introduction

The Mineral Trioxide Aggregate (MTA) biomineralisation phenomenon within dentinal tubules may contribute to bacterial neutralisation during retreatment and improve healing outcomes. This study investigated teeth obturated with sodium fluorescein tagged MTA and the intratubular crystallisation process along dentinal tubules after non-surgical endodontic retreatment.

Methodology

Thirty extracted teeth with single canals were decoronated to a uniform 12mm root length, and chemo-mechanically prepared using rotary NiTi instruments. Roots were assigned to two treatment groups (n=15) : Group A (Control group) – Obturation with fluorescein tagged ProRoot MTA and Group B (Experimental group) – Initial obturation with gutta percha (GP) and epoxy resin sealer followed by non-surgical endodontic retreatment at 4 weeks and obturation with fluorescein tagged ProRoot MTA. After 4 weeks, the GP root filling in Group B samples were chemo-mechanically removed, re-obturated with fluorescein tagged ProRoot MTA and stored for a further 4 weeks. At the end of the incubation period (t=4 weeks for Group A; t=8 weeks for group B), the roots were embedded in acrylic and sectioned for examination using confocal laser scanning microscopy to determine MTA penetration depth and area.

Results

In the apical root section, the retreatment group exhibited significantly less penetration depth and area of MTA than the control group. In the coronal root section, no significant statistical difference was observed between groups.

Conclusion

Conventional non-surgical endodontic retreatment can effectively remove gutta- percha and epoxy resin sealer in the coronal third of the root canal system. Intratubular mineralisation of MTA cement into dentinal tubules is able to penetrate to the limits of the radicular cementum, equaling or exceeding the known limits of bacterial colonisation depths. The characteristics of the apical third presents poor access and decreased dentinal tubule size, introducing barriers to complete chemo-mechanical preparation of the root canal system and MTA biomineralisation.

Keywords

Confocal Laser Scanning Microscopy, Mineral Trioxide Aggregate, Retreatment, Penetration, Intratubular mineralisation

A Systematic Review and Meta-Analysis of the Association Between Periodontal Disease and Severe Mental Illness.

Researchers: Vickie Cai, Chee Peng Ng, Jenny Zhao
Supervisor: Professor Steve Kisely, Professor Dan Siskind

Background and Objective

Periodontal disease represents a global public health concern, with a disproportionate burden of the disease being borne by vulnerable populations such as people with severe mental illness (SMI). This study determined if people with SMI had poorer periodontal health than the general population.

Methods

We conducted a systematic search for studies published before March 2021 on the periodontal health of people with SMI using the following databases: PubMed, PsycINFO, EMBASE, China National Knowledge Infrastructure (CNKI) and Chongqing VIP (CQVIP). Outcomes were the presence of periodontal disease, as well as shallow and deep periodontal pockets. Results were compared with the general population.

Results

11 studies had sufficient data for a random-effects meta-analysis, consisting of 3263 psychiatric patients and 70,976 controls. People with SMI had 4.28 times the odds of having periodontal disease compared with controls (95% Confidence Interval [CI] = 2.54-7.21). They also had 3.65 times the odds of shallow pockets (95% CI = 1.80-7.42) and 2.76 times the odds of deep pockets (95% CI = 1.10-6.93).

Conclusion

Our findings highlight the increased prevalence and severity of periodontal disease in people with SMI. Oral health is often considered the gateway to overall health, and should be a public health priority for this population.

Keywords

Bipolar disorder, periodontal disease, periodontitis, schizophrenia, severe mental illness

Comparison of MTA and a Novel Calcium Hydroxide Cement (Supercal) for Prolonged Antibacterial Effect using a Colourimetric Assessment.

Researchers: Dean Galanos, Kia Hoveydai, Anna Kelly
Supervisor: Dr Yu-Yao Teoh, Dr George Bogen, Emeritus Professor Laurence J. Walsh

Background

Resistance of microbial invasion is a desirable property for an endodontic obturation material. Alkaline endodontic materials elicit anti-microbial activity by releasing high levels of hydroxyl ions into dentine. Mineral-trioxide-aggregate (MTA) is a popular contemporary alkaline cement, but its antimicrobial effects are limited after a period of time. Supercal is a novel formulation of calcium hydroxide with properties allowing it to be used as an alkaline cement. Previous research has demonstrated its potential for pronounced antibacterial effect and suitability as a root filling material.

Objective

This study assessed whether Supercal is an effective obturation material for clinical use.

Methods

Single-rooted human teeth were stained in anthocyanin dye, a pH indicator, and filled with either MTA or Supercal. The changes in pH at designed areas of interested were assessed over 4 weeks using a colourimetric analysis under standardised conditions. Digital photography was used to track and analyse the colour change over this period.

Results

Colour changes in both treatment groups could be visually observed, indicated an elevated pH. The Supercal group showed significant changes at all designated depths and time points. Whilst the MTA group did show some significance compared to baseline, the results were not consistent at all data points. Supercal had its greatest therapeutic effect in the first 14 days at all depths from 250 to 1500 µm, and then began to stabilise or slightly decrease over the next 14 days. No significant colour changes were noted in the control group.

Conclusions

Supercal demonstrated improved antimicrobial resistance versus MTA over a 28-day period, showing promise for clinical use as an obturation material.

Keywords

MTA, calcium silicate cements, root filling material, alkaline cement, calcium hydroxide

Investigation of the chemical and microstructural properties of enamel, dentine and cementum layers in young and healthy populations by Nano-FTIR, FTIR and Raman spectroscopy analysis.

Researchers: Michael Au, James Paek, Sujin Lee
Supervisor: Dr Abdalla Ali

Background

Teeth serve as an essential part of our daily lives in eating, speaking, and smiling. Once tooth structure is lost, it is vital to replace it with material that closely mimics the microstructure, physical and chemical properties of teeth. Current dental materials have several inherent drawbacks in their use that limit their long-term viability including thermal expansion, polymerisation shrinkage and low wear resistance. A closer study of the characteristics of teeth is needed to advance the development of quality dental materials.

Fourier transform infrared (FTIR) spectroscopy is a commonly used tool in material analysis. However, the spatial resolution is limited to the micrometres and cannot be applied in the analysis of nano-scale materials.

Fourier transform infrared nano-spectroscopy (nano-FTIR) is a recent development in spectroscopy which, in combination with Raman spectroscopy and scanning near-field optical microscopy, allows for the study of materials at a nano-scale.

Objectives

The purpose of this pilot study is to investigate the chemical composition and biomechanics of virgin premolar and molar teeth at a nano-scale.

Methods

Teeth were collected and sectioned into crown, mid-section and root, and investigated using conventional FTIR, nano-FTIR and Raman Spectroscopy.

Results

Analysis using Raman Spectroscopy and nano-FTIR identified organic and inorganic compounds at measurements that aligned with available literature. The presence of carbonate ions, phosphate ions and collagen was confirmed and corresponded with previous research.

Nano-FTIR analysis of the cementum showed an absorption band at 1800cm-1 which has not been recorded in previous literature.

The biomechanics analysis of cervical-third cementum showed a Young's elastic modulus of 8.0GPa.

Conclusion

The study confirmed that Raman Spectroscopy and nano-FTIR are suitable methods to observe the chemical composition and biomechanics of teeth at a nano-scale. Further studies using nano-scale spectroscopy will vastly improve the understanding of the chemical and biomechanics of teeth and progress the development of superior dental materials.

Keywords

Teeth, Nano-FTIR, Raman spectroscopy, Chemical composition, Biomechanics

A cohort study of dental students' clinical exposure a quantitative review.

Researchers: Virginia Han, Wan-Ting Huang, Hannah E. Pouw
Supervisor: Christopher T. Sexton, Aus Hmud

Background

Modern dental education is designed to be patient-focused, competency-based and student-centred. The outcomes of this and other styles of dental education have primarily been reported on qualitatively. This study aims to complement these qualitative studies through quantitative evaluation of the treatment scope of dental students.

Objective

This study determined if undergraduate dental students' clinical experience provides adequate exposure to the full range of dental treatments. It also identified the range of frequencies obtained for each group of treatments and treatment areas that students were lacking exposure in.

Methods

The data used in this study was collected from the University of Queensland's Oral Health Centre based in Brisbane, Queensland, Australia. The median number of treatments provided per year and percentage of clinicians with no treatment experience were assessed.

Results

Fifth year students have similar treatment variation to dental officers, though fifth years provide a greater amount of treatment – 396 student versus 284 dental officer treatments per clinician. When assessed by percentage, there was a substantial degree of variation in clinician experience within and between student years and dental officers in most clinical categories.

Conclusions

Dental students receive adequate exposure to most treatment types except in prosthodontics and oral surgery. COVID-19 and clinical curriculum changes had a significant impact on the amount and variance of treatment types.

Keywords

Student clinical experience, dental education, competence-based education, treatment expectations, scope of practice

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Effect of Post Depth and Diameter on Residual Dentine Thickness in Maxillary Premolars: A Radiographic Analysis.

Researchers: Zhi Yang Chong, Hsin Teng Michelle Loke, Yuexin Casey Shi
Supervisor: Prof Ove Peters, Dr Bilal El Masoud, Dr George Bogen, Prof Paul Monsour

Background

In root-canal treated bifurcated maxillary premolars, post space preparations in either the buccal or palatal root can compromise the residual dentine thickness (RDT) and increase the risk of perforations or root fractures. The effect of placing parallel-sided posts at various depths on RDT in buccal or palatal roots of bifurcated maxillary permanent premolars has not been well investigated using cone beam computed tomography (CBCT).

Objective

The purpose of this study was to investigate the RDT of bifurcated maxillary premolar roots following the placement of digital post analogues of different diameters, positioned at various distances from the radiographic apex in buccal and palatal roots by using CBCT.

Methods

258 deidentified CBCT data sets containing at least one double-rooted maxillary premolar were randomly selected. Simulated parallel-sided posts were superimposed onto the CBCT coronal images at various depths. The minimum RDT for each analogue was determined and grouped into 3 categories: no RDT, inadequate RDT, and adequate RDT. The differences were analysed using binomial logistic regression (α=.05), with RDT as the independent measure; post diameters, post depth and tooth type and location were dependent measures.

Results

Significant differences in RDT were found at all tested depths and between the buccal and palatal root ($P<.001$). Generally, the amount of RDT increased as the post depth was reduced. Results of the binomial logistic regression indicated that post depth, placing the post in the buccal or palatal root, and first or second premolar, were the significant predictor variables ($P<.001$) of inadequate RDT (RDT≥1 mm) after post placement. Predictors such as post diameter and post placement in left or right maxillary premolars were not statistically significant ($P>.05$).

Conclusion

Placing a conservative post at a depth equal to the height of the clinical crown reduces the likelihood of having insufficient RDT. Post placement in the palatal root may not always have a smaller risk of insufficient RDT as compared to the buccal root in bifurcated maxillary premolars. Using CBCT images prior to post placement in maxillary premolars may be beneficial in determining the more suitable root and predictability of treatment.

Keywords

Maxillary premolars, residual dentine thickness, posts, root canal-treated teeth, cone beam computed tomography

The UQ School of Dentistry gratefully acknowledges the support of Colgate-Palmolive for the Undergraduate Research Conference.

ISBN: 978-1-74272-340-2 (e-copy)
CRICOS Provider Number 00025B