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Quiver tree (Aka Kokerboom) Aloidendrondichotomum

The quiver tree is the largest known aloe species. It is unusual in its class as it can reach heights of up to 7m, very unlike a typical succulent. There are three subspecies of the quiver tree, the largest, the giant quiver tree (Aloe pillansii) is critically endangered. Seeing one of these relics equals witnessing a piece of history as they can live for up to 380 years.

The Namib people used dried bark as a base for their arrows. Boiled roots can treat asthma and crushed leaves can ease discomfort from skin disorders or burns.

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The Vital Role of Dental Schools in University Prestige and Community Health

SADJ MAY 2024, Vol. 79 No.3 p183-184

Prof NH Wood, Managing Editor, SADJ - BChD, DipOdont(MFP), MDent(OMP), FCD(SA), PhD

In the evolving landscape of higher education, universities are continually seeking ways to distinguish themselves and affirm their commitment to excellence. One compelling indicator of a university's dedication to comprehensive health education and community service is the presence of a dental school. This specialized institution not only enhances the university's prestige but also serves as a cornerstone for multidisciplinary education, cutting-edge research, and vital community healthcare services.

Studies have shown that universities with dental schools not only provide advanced healthcare education but also play a crucial role in community health through their outreach programs and clinics. One such example is a report published by the American Dental Education Association highlights that dental schools in the United States deliver care to millions of underserved patients annually, emphasizing their vital role in community service (American Dental Education Association, 2020). Moreover, there are many examples throughout the world of universities, such as the University of California in San Francisco which houses a top-ranked dental school, that are recognized for their integrated health programs that combine education, research, and community service, thus enhancing their prestige and impact (UCSF School of Dentistry, 2022).

Not only is a dental school within a university a symbol of prestige; it is a dynamic entity that fosters academic rigor, innovation, and societal impact. By integrating dental education with other health disciplines, these schools create a synergistic environment that benefits students, faculty, and the community at large. The significance of a dental school extends beyond the campus, addressing critical healthcare needs and contributing to the economic and social fabric of the local community. Through this opinion piece, we will explore the multifaceted benefits of a dental school and underscore its necessity as a fundamental component of a prestigious and impactful university.

Comprehensive Health Sciences Education

Interdisciplinary education is becoming a cornerstone in modern healthcare education. The integration of various health disciplines fosters a holistic approach to patient care, ensuring that future healthcare professionals are equipped to address the multifaceted needs of their patients. Dental schools play a crucial role in this interdisciplinary framework, bridging the gap between dental education and other health sciences to provide a comprehensive educational experience.

Interdisciplinary education in health sciences is essential for several reasons. First, it reflects the reality of modern healthcare, where collaborative practice is necessary for optimal patient outcomes. Studies have shown that interdisciplinary teams improve the quality of care, enhance patient satisfaction, and reduce medical errors (World Health Organization, 2010). By training dental students alongside their peers in medicine, nursing, pharmacy, and allied health sciences, universities create a learning environment that mirrors the collaborative nature of professional healthcare settings.

Dental schools integrate with other health science disciplines through various initiatives and programs. For instance, interprofessional education (IPE) programs bring together students from different health disciplines to learn with, from, and about each other (Reeves et al., 2016). These programs often include joint courses, collaborative clinical rotations, and interdisciplinary research projects. For example, at the University of Toronto, the Centre for Interprofessional Education offers programs that integrate dental students with their peers in medicine, nursing, and pharmacy, emphasizing teamwork and collaborative practice (Centre for Interprofessional Education, University of Toronto, 2021).

Furthermore, dental schools contribute to a holistic education by incorporating elements of public health, ethics, and communication skills into their curricula. This comprehensive approach ensures that dental graduates are not only skilled clinicians but also empathetic communicators and advocates for public health. Research indicates that such well-rounded education is critical for addressing the diverse needs of patients and improving overall healthcare delivery (Blue et al., 2010).

We must recognize therefore that the integration of dental schools within the broader health sciences framework enhances the quality of education and prepares students for the realities of collaborative healthcare practice. By promoting interdisciplinary learning and providing a holistic education, dental schools play an indispensable role in shaping the future of healthcare.

Advancing Research and Innovation

Dental schools are at the forefront of advancing research and innovation in oral health and its connections to overall health. The unique position of dental schools within universities allows them to contribute significantly to the broader field of health sciences, leading to groundbreaking discoveries and improved healthcare outcomes.

One area where dental schools excel is in research on the links between oral health and systemic diseases. It is well-established that oral health is a window to overall health, with conditions such as periodontal disease being linked to cardiovascular diseases, diabetes, and adverse pregnancy outcomes (Sanz et al., 2020). Dental schools conduct research that explores these connections, contributing to a deeper understanding of how oral health impacts systemic health.

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Dental schools are also hubs for innovation in dental materials and technologies. Advances in biomaterials, digital dentistry, and regenerative medicine often originate from dental school laboratories. These innovations not only enhance dental care but also have applications in broader medical fields. The development of biocompatible materials and 3D printing technologies are prime examples of how dental research contributes to medical advancements. A study by Rupp et al. (2019) highlights the innovative use of 3D printing in dental restorations, which has implications for personalized medicine and custom medical devices.

The impact of dental research extends beyond the academic and clinical settings, attracting substantial funding from governmental and private sources. This funding supports not only dental-specific research but also interdisciplinary projects that involve collaborations with other health science disciplines. Such collaborations are essential for tackling complex health issues and driving forward comprehensive healthcare solutions. For instance, the National Institute of Dental and Craniofacial Research (NIDCR) funds numerous interdisciplinary projects that bring together experts from various fields to address critical health challenges (NIDCR, 2021).

Dental schools also play a crucial role in disseminating research findings and translating them into clinical practice. Through publications in high-impact journals, presentations at international conferences, and partnerships with industry, dental schools ensure that their research has a broad impact on both the academic community and the general public. This dissemination of knowledge is vital for advancing the field of dentistry and improving patient care globally.

In conclusion, dental schools are indispensable in advancing research and innovation within the health sciences. Their contributions to understanding the connections between oral and systemic health, developing new materials and technologies, and securing research funding underscore their pivotal role in the broader health sciences landscape.

Community Service and Healthcare Access

One of the most tangible benefits of a dental school is its impact on the local community. Dental schools often operate clinics that provide affordable or even free dental care to underserved populations. These clinics serve as vital healthcare access points, especially in areas where dental services are scarce. By providing comprehensive dental care, these schools help to improve the overall health and well-being of the community. Additionally, dental students gain practical experience and develop a sense of social responsibility by working in these clinics, preparing them to serve diverse populations in their future careers.

The provision of dental care to underserved communities is critical in addressing oral health disparities. Dental diseases such as caries and periodontal disease disproportionately affect low-income and minority populations (Dye et al., 2017). Dental school clinics serve as safety nets, offering essential services to those who might otherwise go without care.

Dental students receive invaluable hands-on training. The provision of this training is one of the core functions of a dental school. Working in community clinics exposes students to a wide range of clinical scenarios and patient needs, enhancing their clinical skills and cultural competence. This practical experience is essential for developing competent and compassionate dental professionals who are prepared to meet the diverse needs of their future patients. A study by Smith et al. (2019) found that students who participated in community-based dental education programs reported higher levels of preparedness for practice and greater awareness of social determinants of health.

Dental schools should also engage in public health initiatives and outreach programs, further extending their impact on community health in South Africa. These initiatives must include preventive education, screenings, and referrals to ensure comprehensive care.

Economic and Social Contributions

The presence of a dental school within a university contributes to local economy and social fabric. Dental schools create jobs for faculty, administrative staff, and support personnel, thereby stimulating local economies. Economically, dental schools attract substantial investments and research funding, which further supports local infrastructure and development. For example, research grants and partnerships with industry can drive local innovation and create opportunities for local businesses to engage with cutting-edge technologies and practices (National Institute of Dental and Craniofacial Research, 2021).

Socially, dental schools promote public health and social equity by providing essential dental services to underserved populations. This access to care helps reduce oral health disparities, improving overall community health outcomes. Dental schools also often engage in outreach programs that educate the public on the importance of oral health, thereby fostering a more health-conscious community. Dental schools are not only academic and healthcare institutions but also vital economic and social contributors. They drive economic growth, enhance public health, and promote social equity, making them indispensable components of their communities.

Enhancing University Prestige

The establishment of a dental school significantly elevates a university's prestige, positioning it as a leader in health sciences education and research. Dental schools attract top-tier faculty, researchers, and students, fostering an environment of academic excellence and innovation. The presence of a dental school demonstrates the university's commitment to providing comprehensive healthcare education, which is essential for preparing future healthcare leaders.

Certainly, dental schools are among the most costly schools within any university, however, universities with distinguished dental schools are often recognized globally for their contributions to the medical and dental fields. This recognition enhances the university's reputation and competitive edge, attracting more funding, research opportunities, and partnerships. For example, institutions like Harvard University and the University of Michigan have achieved international acclaim partly due to their renowned dental schools, which contribute significantly to their overall academic standing (Harvard School of Dental Medicine, 2022; University of Michigan School of Dentistry, 2022).

Additionally, by promoting interdisciplinary collaboration within the university, and by integrating with other health science disciplines to advance holistic patient care and research, this educational experience is enriched and can lead to innovative solutions to complex health issues (Reeves et al., 2016).

Telehealth Transformation: Navigating the Future of Oral Healthcare in 2024

Mr KC Makhubele – CEO, South African Dental Association

SADJ MAY 2024, Vol. 79 No.4 p185

Telemedicine has emerged as a revolutionary force in the rapidly changing healthcare landscape, transforming how oral health professionals interact with patients. As we commence 2024, incorporating telehealth services into dental practices should become a strategic necessity for dentists and oral health stakeholders.

Telehealth, often known as virtual care, has become a key component of modern healthcare delivery, marking a paradigm shift. For dentists and oral health professionals, adopting telehealth means more than just a reaction to global events; it symbolises a paradigm shift in patient care, accessibility, and office efficiency.

Telehealth for Oral Healthcare:

Remote Consultations: Virtual consultations allow dentists to provide preliminary examinations, treatment planning, and post-operative follow-ups without the necessity for in-person visits.

Teledentistry for Education: Using virtual platforms to provide patient education, allowing individuals to better comprehend oral health practices and treatment regimens. Emergency Triage: Giving patients a virtual way to seek counsel during dental crises, allowing for prompt triage and guidance.

Navigating Telehealth Implementation:

Technology Integration: Integrating user-friendly telehealth platforms with existing practice management systems. Patient Education includes explaining the benefits of telehealth to patients and providing detailed instructions for virtual appointments.

Regulatory Compliance: Ensuring compliance with telehealth rules, such as privacy and security standards, to secure patient information during virtual consultations.

Overcoming Challenges:

While telehealth in dentistry offers numerous advantages, there are also drawbacks, such as the limitations of virtual examinations and the requirement for safe data transmission. Achieving a precise diagnosis typically necessitates a comprehensive examination along with the use of diagnostic tools like an x-ray. How can this be accomplished in a virtual context if it all? Dentists must overcome these obstacles by developing clear protocols, utilising emerging technologies, and constantly improving their telehealth practices.

Telehealth improves both access to care and the entire patient experience. Offering virtual consultations increases convenience, lowers travel time, and allows patients to communicate with oral health specialists from the comfort of their own homes.

The future of telehealth in dentistry is expected to grow with advancements in technology. Dentists and oral health stakeholders should stay current on growing telehealth trends, research creative applications, and be proactive in modifying their practices to meet patients' changing demands.

Conclusion: Telehealth in dentistry offers opportunity for oral health practitioners to improve patient care and practise resilience. By incorporating telehealth as a strategic tool in the dental toolset, dentists may not only negotiate current issues but also create the future landscape of oral healthcare in 2024 and beyond.

NOTICE OF POSTPONEMENT OF THE SOUTH AFRICAN DENTAL ASSOCIATION (SADA) 2022 ANNUAL GENERAL MEETING

The SADA FYE 2022 Annual General Meeting (AGM), previously set for 25 April 2024, is postponed due to finalisation of the auditing procedures. The majority of the work has been finalised, but the last lparts are only being finalised in early April 2024. A new date will be communicated soon. We apologize for any inconvenience.

Dr N Osman

SADA Board of Directors

2 April 2024

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Celebrating WOHD 2024: Empowering young smiles with SADA

SADJ MAY 2024, Vol. 79 No.4 p186

Mr KC Makhubele – CEO, South African Dental Association

Introduction:

In our ongoing commitment to promoting oral health awareness and collaboration with stakeholders, the South African Dental Association (SADA) actively participated in the World Oral Health Day (WOHD) event jointly organized together with the Health Professions Council of South Africa (HPCSA) at Thusong Primary School in Kagiso, Johannesburg.

Engagement with Stakeholders:

We were privileged to join esteemed stakeholders including the MEC of the Department of Health, Nomantu Nkomo-Ralehoko, and Mr KC Makhubele, CEO of SADA, along with representatives from various institutions such as Thusong Primary School, health and educational departments, oral health centres, and district services.

Impactful Interventions:

During the event, a pre-screening session identified 979 children, with 424 receiving referral letters for further attention. Grades 0-7 were targeted, and our dedicated teams provided essential services:

Oral Health Education: 517 children benefited from educational sessions conducted by SADA, Wits OHC, and SMU OHC. These sessions covered topics ranging from proper brushing techniques to the importance of regular dental check-ups, empowering children with the knowledge to maintain optimal oral health.

Oral Health Screening and Treatment: A total of 66 learners received screenings and treatment in mobile dental trucks. These screenings detected various oral health issues early, allowing for prompt intervention and treatment to prevent further complications.

Preventive Measures: Fissure sealants were applied to 8 children, providing a protective barrier against decay in vulnerable areas of their teeth. Additionally, 16 children received tooth restoration services, restoring both functionality and aesthetics to their smiles.

Referral Services: 12 children were referred for specialized care, ensuring that those requiring further treatment beyond the scope of the event received the necessary attention from qualified dental professionals.

Commitment to Oral Health:

With over a billion South Africans affected by oral diseases annually, SADA remains steadfast in our mission to combat this escalating issue. Our involvement in initiatives like WOHD reflects our dedication to promoting oral health education and addressing the lack of awareness.

Empowering Future Generations:

At the heart of our efforts lies the belief that informed oral health practices lead to happier, healthier smiles, particularly among our youth—the future leaders and potentially future dentists. We are unwavering in our commitment to providing essential dental services and education to primary schools, ensuring a brighter, healthier future for all.

Continued Collaboration:

SADA reaffirms its pledge to collaborate with any partnership focused on dental education. As the voice of oral healthcare, we are dedicated to advocating for improved oral health outcomes and fostering a culture of preventive care. By working hand in hand with stakeholders across various sectors, we can amplify our impact and reach more communities in need.

Conclusion:

In celebrating WOHD 2024, SADA remains resolute in its commitment to empowering young smiles and working alongside stakeholders to promote oral health education and access to essential dental services. Together, we strive towards a future where every smile radiates with health and happiness, laying the foundation for generations to come to live their lives to the fullest with confident, healthy smiles.

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Predictors of Covid-19 vaccination intention among oral health professionals in South Africa

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SM Matomane[1], ML Machete[2], PD Motloba[3]

ABSTRACT

Background

Dentistry is regarded as a high-risk profession due to increased levels of exposure to oral secretions, aerosols and fomites that harbour infectious microorganism. Yet evidence indicates poor uptake of vaccines against HBV and, most recently, Covid-19. This study sought to investigate the predictors of Covid-19 vaccination intention among oral health professionals in South Africa.

Methodology

In 2022, a representative national sample of oral health professionals was surveyed using an online questionnaire. Consenting practitioners provided demographic data, information on vaccination history and five psychological antecedents of Covid-19 vaccine. Data analysis was undertaken using SPSS ver. 29.0

Results

Our findings indicate high vaccination intention rate among the OHPs (77.9%), especially those with history of influenza vaccination (OR=2.65, p=0.003). The was a positive correlation between the 5C psychological antecedents (confidence and collective benefit) and intention to vaccinate. Positive Covid-19 diagnosis did not affect vaccination intention.

Conclusion

Most oral health professionals intended to get the Covid-19 vaccination. For those showing low willingness to vaccinate, psychological antecedent factors such as complacency and calculation should be addressed to improve vaccination intention and uptake.

Keywords

Covid-19, vaccination intention, oral health professionals, 5C psychological antecedents

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2. Motimedi L Machete: 20%
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INTRODUCTION

Vaccines are regarded among the most effective public health interventions against infectious diseases.[1] However, there has been a worldwide rejection, refusal and hesitancy to take up this preventative intervention.[2] Unlike the general population, health professionals understand the benefits and risks associated with immunisations. Consequently, a significantly higher proportion of health professionals should vaccinate and advocate for mass immunisation. However, studies suggest that health professionals are hesitant to immunise.[3] A study in Turkey showed that only 6.7% of healthcare workers were immunised, while 55% never vaccinated.[4] Oral health professionals (OHPs) are at increased risk of contracting Covid-19 virus due to exposure to aerosols, oral secretions and other occupational hazards.[5,6] Effective vaccines against Covid-19 became available in South Africa in May 2020, during which healthcare professionals were prioritised as frontlines workers to be immunised.[7] Despite the effective vaccination campaigns, the uptake of the Covid-19 vaccination among health workers was not commensurate. Vaccine hesitancy was unproportionally higher among health professionals during this early phase of the pandemic. Vaccine hesitancy is defined as delay in acceptance or refusal to vaccinate despite the availability of vaccination services.[8] Numerous factors such as age, gender, income, education, race and psychological states affect the intention to vaccinate. The SAGE[8] working group on vaccine hesitancy and, recently, Bestch et al[9] proposed five psychological factors that are antecedent to vaccination including against Covid-19. The 5C antecedent factors include confidence, complacency, confidence, calculation and collective responsibility. Collectively, these factors provide an in-depth exploration of reasons why an individual vaccinates or hesitates to immunise.[10]

Confidence scale assesses an individual's trust in vaccines and the systems that provide it.[9] To vaccinate is to take a risk, it is hence reasonable that the individual's agency prevails on whether to vaccinate or not.[11] The individual must trust that the vaccine is effective and safe; and that the systems that deliver the vaccines are authentic. Lack of confidence is associated with negative attitude or low intention to vaccinate, or high levels of hesitancy.

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Complacency measures the lack of perception of diseases as high risk, hence there is no urgency or necessity to prevent disease.[11] The consequence of complacency is low vaccine coverage, poor herd immunity and resurgence of infections.[12]

Constraints are the structural and psychological barriers that impede the implementation of vaccination.[11] These factors include, among others, geographical access, availability, affordability and ability to understand information relating to vaccines.[13]

Calculation signifies the efforts placed in search of information and its eventual use in reaching a decision.[9] Lack of information, misleading information and misinformation may hamper vaccination efforts.

Collective responsibility evaluates the willingness to protect others by developing group immunity.[9] Community beneficence and nonmaleficence drive the desire to vaccinate.[14]

Confidence and collective responsibility are positive antecedent factors, while the other psychological antecedents are indicative of negative attitude and unwillingness to be vaccinated. Vaccine hesitancy is one of 10 major threats to global health and a huge risk to susceptible professions like dentistry.[15] To our knowledge no research has been conducted in South Africa among oral health professionals to appraise the factors contributing Covid-19 vaccination intention. This study will provide critical data on this phenomenon and recommendations on how to improve vaccine coverage among oral health professionals.

METHODS

Study design

This descriptive cross-sectional survey was undertaken using an internet-based Google form sent to oral health professionals in South Africa.

Study population

Study participants consisted of all the cadres of oral health professionals who had current registration with the Health Professional Council of South Africa (HPCSA).

Sampling and sample size determination

The sample size was estimated to be a total of 367 participants based on the following assumptions: (i) 5% margin of error, (ii) level of precision of 95%, (iii) 50% of dentists willing to be vaccinated against Covid-19. An additional 20% (n=73) was added to control for nonresponse, giving a final sample size of (n=440). The weighted proportion for each cadre was determined based on the total number of licensed practitioners South Africa (n=8056). Dentists and dental specialists constitute 75% of the 8,056 registered OHPs, which translates into (n=330). The number of dental therapists and oral hygienists equalled (n=40) and (n=70) respectively. Using a proportionate stratified convenience sampling technique, eligible participants were recruited independently from organisational databases until the requisite samples were achieved.

Measurement of demographic variables

The following demographic characteristics were self-reported by the participants: age, gender; cadre (profession), clinical experience and employment sector.

Assessment of vaccination history and intent

Vaccination history was evaluated using the following questions: (i) In the past two years I have vaccinated against Hepatitis B virus; (ii) In the past two years I have vaccinated against the influenza virus.

The answers to these questions were either yes or no. Regarding the intention to vaccinate against Covid-19, the participants were asked to indicate how likely they were to vaccinate against Covid-19. The following options were given as possible responses (very likely, somewhat likely or not likely).

Assessment of 5C psychological antecedents of Covid-19 vaccination

A validated 5C scale for psychological antecedents to vaccination tool was used in this study.[9] The instrument comprised five domains (confidence, complacency, constraints, calculation and collective responsibility) and each domain was assessed using three questions, resulting in a total of 15 questions overall. The responses to the questions were based on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The higher values represented the greater levels of the construct.

Data collection

The link to the form was sent through to all the dental associations in the country (SADA, OHASA, DPA and DTASA) who used their databases to source emails and or cellphone numbers. These details were used to circulate the link to participants. The online survey remained open until the required sample size was reached for each professional grouping. Several reminders were sent during the six-month period of data collection.

Data analysis

All statistical analyses were undertaken using IBM SPSS Statistics version 25.0. Descriptive data were presented as frequencies, and measures of central tendencies for different variables. A dichotomous variable was created as a measure of vaccination intention. The responses "somewhat likely" and "very likely" were regarded as positive vaccination intention and depicted as "Yes". The answer "not likely" was recorded as "No", indicating no intention to vaccinate. The chi-square statistic and analysis of variance (ANOVA) were used to assess the differences in Covid-19 vaccination intention across study subgroups. A logistic model was created with vaccination intention as the dichotomous outcome variable (1 = Yes, and 0 = No). The exploratory variables included the five psychological antecedents, demographics and vaccination history. Variables that were significant at$\alpha \leq 10\%$ were simultaneously fitted in the multivariate logistic regression model. Odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated. The significance level for data analysis was set at $p<0.05$.

Ethical considerations

The study was approved by the Sefako Makgatho Health Sciences University Research and Ethics Committee (SMUREC/D/113/2021:PG). Informed consent was obtained from all participants using an online form prior to partaking in the survey.

Results

The demographic characteristics of 462 oral health professionals are depicted in Table 1. Most of the participants were female 326 (70.6%), younger than 35

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years 195 (42.2%), worked as dentists 267 (57.4%), employed in the private sector 265 (57.4%), with working experience spanning 10 year or less 220 (47.6%). According to Table 2, as many as 191 (41.3%) of OHPs tested positive for Covid-19. Vaccination histories reveal that few participants immunised against influenza virus 176 (38.1%) and hepatitis virus 102 (22.1%) in the past two years. A total of 360 (77.9%) of OHPs indicated their intention to vaccinate against Covid-19. Factors associated with the Covid-19 vaccination intention are represented in Tables 1 and 2. Vaccination intention increased with increasing age (0.037), was positively correlated with female gender (0.048), history of flu vaccination (<0.001) and lesser clinical experience (0.04). Table 3 shows the average scores of the five psychological antecedents of Covid-19 vaccination.-The mean values for confidence and collective benefit were significantly higher, and lower for complacency, constraints and calculation among OHPs intending to vaccinate. Table 4 shows the results of logistic regression analysis. Among the 5C antecedent predictors, higher confidence and collective responsibility were associated with higher levels of vaccination intention. On the contrary, the high complacency was associated with low vaccination intention. After adjusting for 5C predictors, gender, age and Covid-19 positive tests, influenza vaccination was positively associated with Covid-19 vaccination intention (AOR = 2.65; 95% CI = 1.40 -5.03; p=0.003). Oral health professionals who were immunised against influenza virus had three times greater odds of vaccinating against Covid-19 than those not immunised. Males were more likely to vaccinate against Covid-19, however the effects size was not significant at p=0.43. Age and positive Covid-19 test were not related to vaccination intention.

DISCUSSION

Our study sought to evaluate potential predictors of vaccination intention among the surveyed OHPs. To achieve this objective, we evaluated the demographic variables, vaccination history and 5C psychological antecedents as potential predictors of the outcome. Our results indicate that vaccine intention was high among the OHPs with history of influenza vaccine, and 5C psychological antecedents (confidence and collective benefit). Positive Covid-19 diagnosis, constraints and were not correlated with vaccine intention.

We reported a high Covid-19 vaccination intention rate of (77.9%) in our study, which is comparable to other OHPs worldwide[16] (81%), Italy[6] (82%), Lebanon[17] (86%), Israel[18] (85%) and Greece[19] (82.5%). Comparatively, vaccination intention was lower among other healthcare workers, 76.9%[20], 64%[21] and the general population, 70%[22], 69%[23], 64%[24]. We attribute the high intention to vaccinate among OHPs to perceived and actual risk of contracting Covid-19 given the occupational hazards and practice risks.

The chi-square analysis showed that males were more intentional about vaccination than females. This trend has been observed globally regarding vaccination intention and uptake. The systematic review and meta-analysis by Zintel et al[25] reported a significantly higher likelihood of males intending to vaccinate, OR=1.41 (95% CI 1.28 to 1.55). The study has not evaluated the relationship between vaccination intention and vaccination uptake. However, it is well established that low vaccination intention can seriously undermine any vaccination programme.

The findings of this study confirm a strong and established relationship between receiving influenza vaccine and Covid-19 vaccine.[6,20,26] This result is not surprising because the general attitude towards flu vaccination can act as a significant determinant of vaccination willingness and intention including towards Covid-19 vaccines. We argue that an individual who has overcome structural and psychological constraints related to flu vaccine is more empowered, self-reliant and most adept to receive the Covid-19 vaccine than not. Therefore, taking flu vaccines once or regularly may serve as gateway for other vaccines including the Covid-19 vaccine.

The positive Covid-19 diagnosis among OHPs did not increase vaccination intention among the participants. This association is plausible since infected OHPs would have considered themselves immune or unlikely to develop serious symptoms once reinfected. Additionally, most oral health professionals adhered to infection control measures and safety regulations, including the proper use of PPEs, which lowered the overall work-related perception of risk. There are limited studies among OHPs which have evaluated the association of Covid-19 diagnosis and vaccination intention or uptake.[6]

The concept of confidence incorporates trust regarding the safety and efficacy of the Covid-19 vaccine. Therefore, OHPs willing to vaccinate were reliant on the health system to supply safe and effective Covid-19 vaccines. This positive association has been extensively reported in literature.[6,9,11,16,23] Collective benefit or altruism means that an individual is willing to vaccinate to protect others by building herd immunity. Many OHPs are knowledgeable and understand the significance of building herd immunity, hence the increased level of community benefit in this study. Furthermore, OHPs are morally obligated and expected as health professionals to engage in good clinical practices to protect the wellbeing of their patients, colleagues and families. Therefore, the intention to vaccinate against Covid-19 constitutes for this purpose prima facie professional duty.[6,8-10.]

Complacency was high among OHPs not intending to vaccinate, meaning that perceived OHPs the risk of vaccine preventable disease as inconsequentially low. We argue that OHPs were aware of the inherent risks but believed that the infection control measures and protocols were adequate to mitigate contracting the virus. The early phases of Covid-19 vaccination were marred by logistical and operational challenges which could explain perceived constraints. Overall, South Africa delivered efficient vaccination services, and professionals were the first in line to receive such services. Our results indicate that all OHPs were adequately informed about the Covid-19 vaccines, enabling them to reach a decision to immunise or not. The question is what information was consumed by OHPs not intending to vaccinate? Covid-19 vaccines were rapidly developed and distributed, while the evidence of long-term effects and safety was still indeterminate. This provided an opportunity for antivaxxers to spread misleading information and misinformation about the vaccines. We contend that susceptibility to misinformation contributed to the lower inclination to want to vaccinate, more so that information could not be easily verified during period of hard lockdown. Association of misinformation and low likelihood of vaccination intent and/or uptake is well documented from several global studies.[30-2]

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There are several implications that can be derived from this study: (i) Multiple platforms must be used to convey correct information timeously, and in a user-friendly manner. (ii) Barriers and constraints must be eliminated to improve intention to vaccinate.

Strengths and limitation of the study

This study was adequately powered and employed a stratified proportional sampling technique as a means to obtain representation of various cadres of oral health. The use of multiple databases from several professional associations also contributed to the improved representation of various groups and minimised selection bias. The limitation of this study is that it employed non-probability convenient sampling. The shortcomings of this sampling process were mitigated by large number of participants enrolled in the study. The other limitation is that the 5C psychological antecedents and vaccination intention were assessed at the specific time point and context. Given that Covid-19 vaccination intention and associated predictors change over time, it is conceivable that this study cannot provide a full account of the temporal variations in vaccination intention. Therefore, longitudinal studies will be most appropriate to measure the temporal changes. Despite these limitations, this research represents the first national study undertaken among OHPs during the pandemic, and at the time when the vaccines were available. The findings therefore provide baseline for similar study during future pandemics.

CONCLUSION

Covid-19 vaccination intention was very high among OHPs, attributed to high perceived confidence and collective benefit and less complacency regarding the vaccine. History of influenza vaccine increased the likelihood of intention to vaccinate against Covid-19.

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CPD questionnaire on page 224

The Continuing Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.

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Location of mandibular foramen in adult black South African population: A morphometric analysis and investigation into possible radiographic correlation

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Abstract

Introduction

The mandibular foramen (MF) is located bilaterally just above the centre of internal surface of ramus of mandible, however, its exact position varies amongst different population groups.

Aim

The aim of this study was to determine the exact location of mandibular foramen among black South African population using a possible correlation of radiographic and morphometric analysis.

Methods

A retrospective, cross-sectional study was conducted on a total of 253 adult dry human mandible specimens at Raymond A Dart Bone collection in the School of Anatomical Sciences, University of the Witwatersrand, and twenty-four adult cone beam computed tomographic (CBCT) records of patients in Maxillofacial and Oral Radiology Unit, situated in Charlotte Maxeke Johannesburg Academic Hospital. The length, height, and distance of MF in relation to anterior and posterior border of ramus of mandible; superior and inferior border of mandible as well as distance in relation to coronoid and condyle were measured. Descriptive statistics of mean, standard deviation and frequency was used to summarize the data.

Results

For both radiographic and morphometric analyses, distance of MF to posterior region of ramus was smaller than that of MF to anterior region. Mandibular foramen was found to be situated more towards posterior region of ramus for both radiographic and morphometric analyses in all age cohorts. Males generally showed greater readings than females in all parameters, except mandibular foramen to posterior region (MF-P) measurement. No significant difference was noted amongst different age groups.

Conclusion

The position of MF was constantly observed towards the posterior region of ramus of mandible for both radiographic and morphometric analyses which suggested that the chances of finding MF in the anterior border of ramus of mandible are limited. The anterior border of mandible can therefore be regarded as "safety zone" in a black South African population.

Keywords

Mandibular foramen, morphometric, sexual dimorphism, age

INTRODUCTION

The mandibular foramen (MF) is an important anatomical opening found in the human mandibles. It serves as an entry point for inferior alveolar nerve (IAN) and its accompanying vascular structures known as inferior alveolar artery and vein, which navigate the mandibular canal to provide sensation and blood supply to mandibular teeth[1,2]. The varying position of MF has been reported to be the contributing factor to injury of inferior alveolar neurovascular bundle as well as failure of inferior alveolar nerve block[3].

Thangavelu et al., (2016) reported that several reasons which include absence of a specific bony landmark, variations in width and height of ramus, and variation in IAN position are responsible for failure to achieve anaesthesia[2]. Furthermore, Samanta and Kharb, (2013) reported that accessory mandibular foramen (AMF) was present in 16.66% of mandibles, and that 10% of mandibles had a single AMF, while 6.6% of mandibles had double foramina[1]. Shalini et al., (2016) found that AMF was present in 32.36% of mandibles that they examined.[4]

It is of great clinical importance for oral and maxillofacial surgeons to be able to locate both MF and AMF and be able to avoid injury to nerve and blood vessel while carrying out surgical procedures like bilateral sagittal split osteotomy (BSSO) which are usually performed in orthognathic surgery[1,5,6].Procedures for corrections of mandibular skeletal abnormalities, implant placement and in plastics and reconstructive surgeries also carry risk of damage to the nerve.

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There are reports on post-operative complications such as paresthesia of lower lip due to injuries on IAN[7]. The IAN can be attached to proximal segment of mandible at approximately 39% of BSSO sites[8]

Oncologists and radiologists should also be mindful of IAN when planning radiation therapy in the management of oral carcinomas[1,4]. Furthermore, AMF could provide multiple direct channels for invasion of tumour cells from lateral mandibular surface of cortical bone to underlying cancellous bone[11]. Therefore, maxillofacial surgeons and clinicians are compelled to be aware of location of MF to avoid such fatalities. Several authors have reported that the exact location of MF varies amongst males and females of different ages and from different population groups. [6,9,10,12]

There are no published studies thus far among South African population; therefore, there is dearth of records or data on position of MF in relation to different parameters of ramus of the mandible. Furthermore, use of CBCT in clinical dentistry has become very popular because images of CBCT are three dimensional that gives a more precise visualization of anatomical structures in maxillofacial region. Thus, this study will provide the South African morphometric data obtained from both dry adult human mandibles and radiographic data obtained from CBCT radiographs of patients with the purpose of investigating any possible correlation between the two analyses. Outcome of the investigation will, therefore, facilitate the location of MF in relation to different borders of ramus of mandible, considering sex and age aspects. The information will go a long way to provide dental clinicians with predictable indicators that will assist them to achieve a successful inferior alveolar nerve block (IANB) and surgical procedures such as sagittal split ramus osteotomies (SSRO) without inferior alveolar nerve bundle fatalities.

Aim of the study

The aim of this study was to determine the exact location of mandibular foramen among black South African population using a possible correlation of radiographic and morphometric analysis.

METHODS

Ethics

The Human Research Ethics Committee (Medical) of Faculty of Health Sciences at University of the Witwatersrand approved the study (M151106).

Study design and data collection

A cross-sectional, retrospective study was conducted on a total of 253 adult dry human mandible specimens and 24 adult radiographic data from CBCT records of patients. Both male and female specimen of ages between 16-56 years old and above were examined. Fully or partially dentate (minimum of 6 teeth) dry mandibles including second molar (teeth 37 and 47) were included in the study while completely edentulous mandibles, mandibles with evidence of deformity or pathology, mandibles that have undergone surgery and damaged (e.g., fractured) were excluded from the study. A Galaxis software measuring ruler was used for all radiographic measurements. Linear measurements and heights were calculated on tangential section and length was calculated on axial section. The CBCT images were obtained from Sidexis data base on a Galileos 3D comfort by Sirona Dental systems. All radiographs were obtained from the same machine with the following information: model: Galileos GAX 5 (Compact); serial no: 3351.

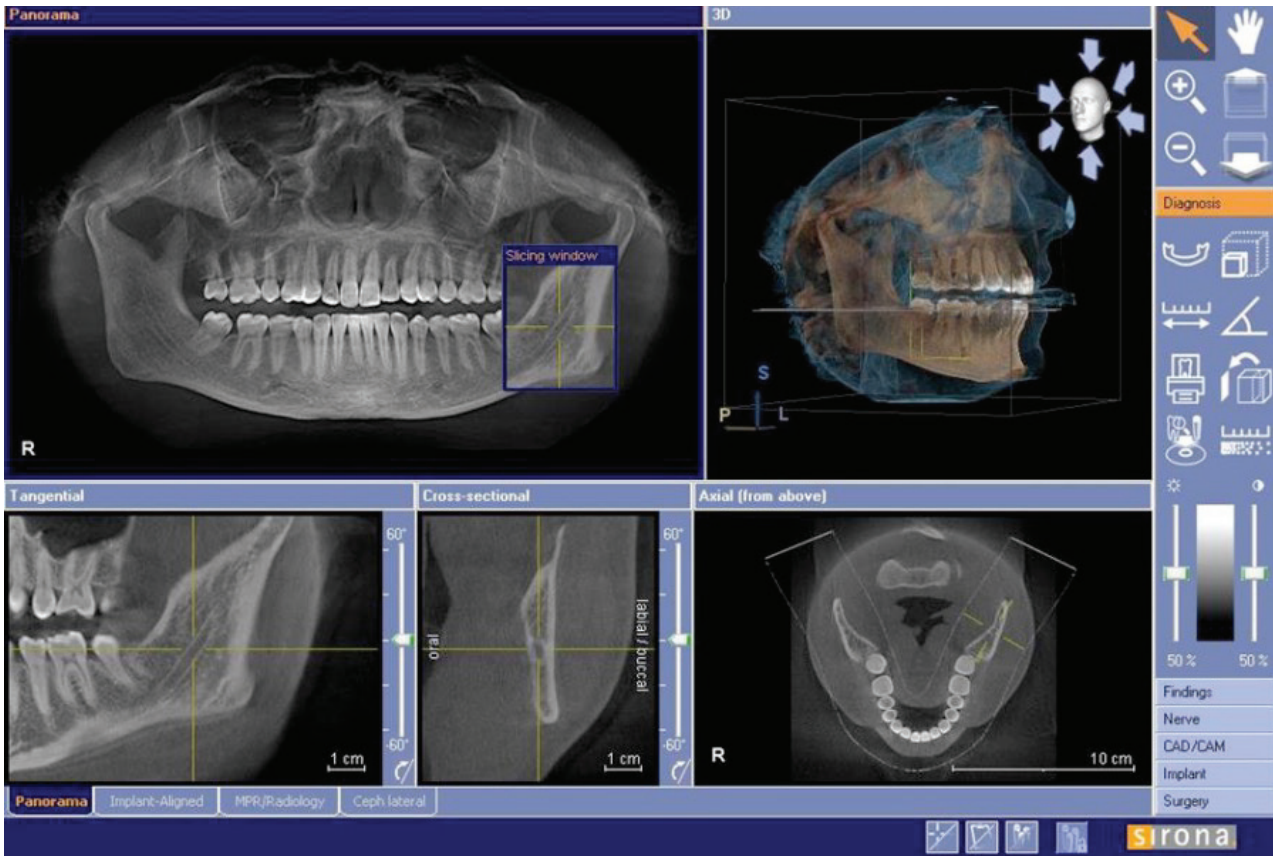

Figure 1. Illustration of some of the measurements carried out in the radiographic study. Internet accessed 23 March 2017.

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Figure 2. Mandibulometer measuring the height and length of mandibular in mm.

Figure 3. Dental digital sliding calliper measuring the distance of MF in relation to different parameters in mm.

ANATOMICAL LANDMARK	DEFINITION
MF-P	Distance from the MF to posterior border of ramus
MF-A	Distance from the MF to anterior border of ramus
MF-S	Distance from the MF to sigmoid notch
MF-GO	Distance from MF to inferior border of ramus
S-GO	Distance from the sigmoid notch to inferior border of ramus
MF-I	Distance from the MF to the highest point on the coronoid process
MF-H	Distance from the MF to the highest point on the condylar process
H-GO	Distance from the highest point on condylar head to the infe-rior border of ramus
GO-M	Length of mandible from the GO to the most anterior point on the menton
P-A	Distance from the posterior border of ramus to anterior border of ramus

Table 1. Various parameters measured on the mandible

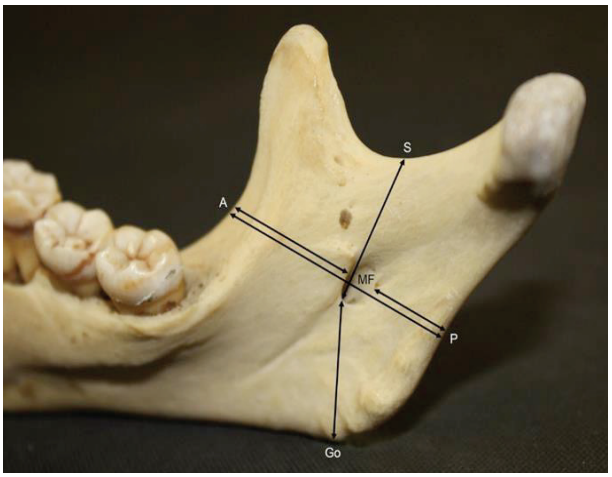
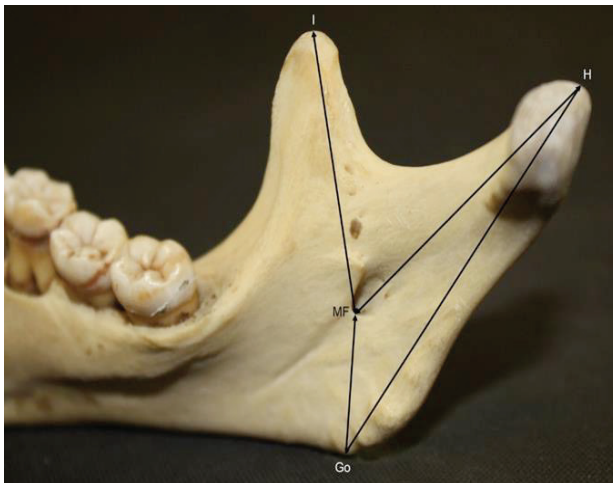


Figure 4: Internal surface of ramus of mandible. MF-A; MF-P; A-P; MF-GO; MF-S.



Figures 5. Internal surface of ramus of mandible. MF-I; MF-H; MF-GO; H-GO.

RESULTS

Table 2 outlines age distribution of morphometric measurements on both left and right sides.

The left and right P-A distance was at its highest point among age cohort 51-55 years and at its lowest point among age 21-25 years. MF-A reading was higher than MF-P distance in all samples irrespective of age. MF-S; MF-GO and S-GO increased significantly with increasing age in all the age cohorts on both left and right sides ($p< 0.05$). Table 3 shows radiographic and demographic distribution of 21-25 years age cohort (Table 3).

Males showed significantly higher readings than females in all parameters on both left and right sides except for MF-P measurement. Radiographic measurements of MF-GO, S-GO, MF-I and H-GO showed a significant difference between males and females on right side ($p< 0.05$). Except for MF-A, mean measurement of all other parameters showed no significant difference between males and females ($p>0.05$).

Table 4 outlines comparison between means for radiographic and morphometric measurements in age cohort 21-25.

There was a significant difference on right side of almost all parameters except MF-GO, S-GO, MF-I and MF-H ($p> 0.05$). The left side also showed significant differences in all parameters except for MF-S; MF-GO and MF-I ($p> 0.05$).

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	16 - 20		21 - 25		26 - 30		31 - 35		36 - 40		41 - 45		46 - 50		51 - 55		>56	
Right	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
MF-P	14.3	2.1	13.3	1.9	13.4	2.4	13.8	1.5	13.7	2.0	13.4	1.7	13.5	2.2	14.7	1.8	13.3	1.8
MF-A	18.4	2.0	18.4	2.7	19.4	2.1	18.6	2.4	18.5	2.9	19.4	2.5	19.2	2.1	19.7	2.4	18.2	2.6
P-A	34.5	2.9	32.4	4.6	34.6	3.3	33.8	3.0	33.9	4.1	35.2	3.1	35.0	3.3	35.7	3.0	33.4	3.2
MF-S	18.1	2.8	20.6	3.1	20.4	3.3	20.7	1.7	20.6	3.2	19.0	3.0	20.3	3.3	20.9	3.1	20.2	2.7
MF-GO	21.0	3.4	22.6	3.5	22.2	3.3	22.9	3.3	22.9	4.4	24.3	4.4	23.8	3.3	22.7	3.3	23.5	3.5
S-GO	41.3	4.3	43.2	4.9	42.6	4.1	43.5	3.4	43.3	5.2	43.3	4.8	43.9	4.7	43.7	5.6	43.5	4.5
MF-I	34.8	3.6	35.3	3.8	35.8	4.1	35.2	2.9	36.2	4.1	34.5	3.9	35.2	3.1	36.9	3.1	34.7	3.5
MF-H	38.5	3.0	39.5	4.1	38.8	3.5	38.9	3.0	39.6	3.4	38.9	2.8	39.7	3.9	40.4	3.9	39.4	2.9
H-GO	46.8	6.6	49.5	7.3	49.2	6.5	49.3	6.2	49.3	6.2	50.9	5.9	51.2	7.0	50.8	7.8	49.4	7.1
G0-M	105.1	4.8	106.5	5.2	106.4	6.1	106.3	6.1	107.3	6.5	107.3	5.0	109.0	7.4	107.4	4.5	107.9	7.2
	16- 20		**21- 25**		**26- 30**		**31- 35**		**36- 40**		**41- 45**		**46- 50**		**51- 55**		**>56**	
Left	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
MF-P	14.0	2.2	13.3	2.1	13.6	2.1	13.2	1.6	13.2	2.4	13.1	1.6	13.3	2.2	14.0	2.5	13.3	1.8
MF-A	18.4	2.0	18.3	2.2	19.6	2.3	18.6	2.4	18.3	2.7	19.4	2.5	19.1	2.5	19.9	3.1	18.5	2.3
P-A	33.6	4.4	33.4	3.6	34.8	3.4	33.7	2.9	33.7	4.1	35.1	3.1	35.1	2.9	35.6	3.4	34.0	3.2
MF-S	17.6	3.1	20.5	3.3	20.3	3.4	20.3	2.0	20.6	3.3	19.6	2.8	20.5	3.3	20.3	3.2	19.8	2.7
MF-GO	21.2	3.5	21.8	3.7	22.8	3.7	21.7	3.8	22.7	3.9	24.0	4.3	23.8	2.6	22.9	3.0	23.3	3.7
S-GO	41.6	4.4	42.6	4.8	42.9	4.2	42.3	4.0	43,2	5.1	43.5	4.3	44.3	4.6	43.4	5.2	43.3	5.3
MF-I	34.8	4.1	35.0	4.0	34.6	3.7	35.0	3.3	35.6	3.7	34.7	3.6	35.2	3.5	36.3	3.3	34.5	3.4
MF-H	38.3	3.4	38.9	3.5	38.4	3.4	38.8	3.0	39.4	3.6	39.3	2.9	40.2	4.1	39.8	3.8	38.7	3.4
H-GO	47.0	6.5	47.6	7.2	47.5	9.0	47.8	6.5	48.9	6.1	49.9	5.7	51.3	6.9	50.2	7.6	48.7	7.2
GO-M	104.9	5.3	106.5	5.2	106.4	6.1	107.2	5.9	107.6	6.4	107.6	5.5	108.7	7.5	107.2	4.6	107.8	7.1

Table 2: Age distribution of the Morphology

	Male		Female		
Right	**Mean**	**SD**	**Mean**	**SD**	**Sig**
MF-P	8.8	2.1	9.6	2.8	0.41
MF-A	11.5	1.2	10.9	2.8	0.46
P-A	22.5	2.9	21.8	2.7	0.6
MF-S	24.9	4.3	22	4.9	0.14
MF-GO	22.5	2.9	19.2	2.1	0.01*
S-GO	48.7	5.1	42.8	5.1	0.01*
MF-I	38.5	4.5	34.4	4.2	0.04*
MF-H	38.6	5	37.6	2.9	0.57
H-GO	64.7	5.6	60.1	4	0.04*
GO-M	45	2.1	43.7	2.6	0.22
Left	**Mean**	**SD**	**Mean**	**SD**	**Sig**
MF-P	7.9	1.4	8.5	2.4	0.45
MF-A	12.3	1.4	9.9	2.2	0.00*
P-A	22.7	3.4	21.4	3.6	0.39
MF-S	22.7	2.8	22.1	4.1	0.71
MF-GO	22.3	2.6	20.1	3.4	0.09
S-GO	47.2	5.6	43.5	3.7	0.09
MF-I	37	4.6	34.2	4	0.14
MF-H	35.8	3.7	34.7	4.9	0.56
H-GO	60.5	12.4	59.5	5.2	0.81
GO-M	44.6	2.3	43.7	2.6	0.4

Table 3. Radiographic measurements of the 21-25 age cohorts.

	Morphology		Radiograph		
Right	**Mean**	**SD**	**Mean**	**SD**	**Sig**
MF-P	13.3	1.9	9.1	2.4	0.00
MF-A	18.4	2.7	11.2	1.9	0.00
P-A	32.4	4.6	22.2	2.8	0.00
MF-S	20.6	3.1	23.8	4.7	0.01
MF-GO	22.6	3.5	21.3	3.1	0.51
S-GO	43.2	4.9	46.5	5.8	0.68
MF-I	35.3	3.8	36.9	4.7	0.24
MF-H	39.5	4.1	38.2	4.3	0.33
H-GO	49.5	7.3	63	5.4	0.00
GO-M	106.5	5.2	44.5	2.4	0.00
Left	**Mean**	**SD**	**Mean**	**SD**	**Sig**
MF-P	13.3	2.1	8.1	1.8	0.00
MF-A	18.3	2.2	11.4	2.1	0.00
P-A	33.4	3.6	22.2	3.5	0.00
MF-S	20.5	3.3	22.5	3.3	0.58
MF-GO	21.8	3.7	21.5	3.1	0.60
S-GO	42.6	4.8	45.8	5.2	0.02
MF-I	35	4	36	4.5	0.52
MF-H	38.9	3.5	35.4	4.1	0.02
H-GO	47.6	7.2	60.1	10.1	0.00
GO-M	106.5	5.2	44.3	2.4	0.00

Table 4. Comparison between the mean measurements of the radiograph and the morphometric.

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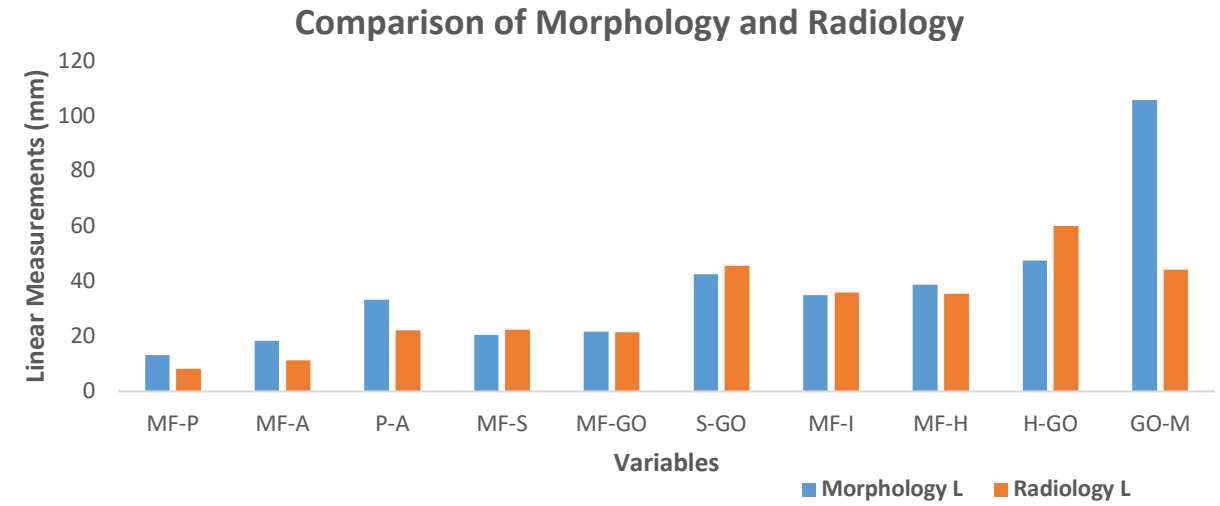

Figure 6. Comparison between the means for the radiographic and morphometric measurements in the age cohort 21-25 on the left side of the mandible.

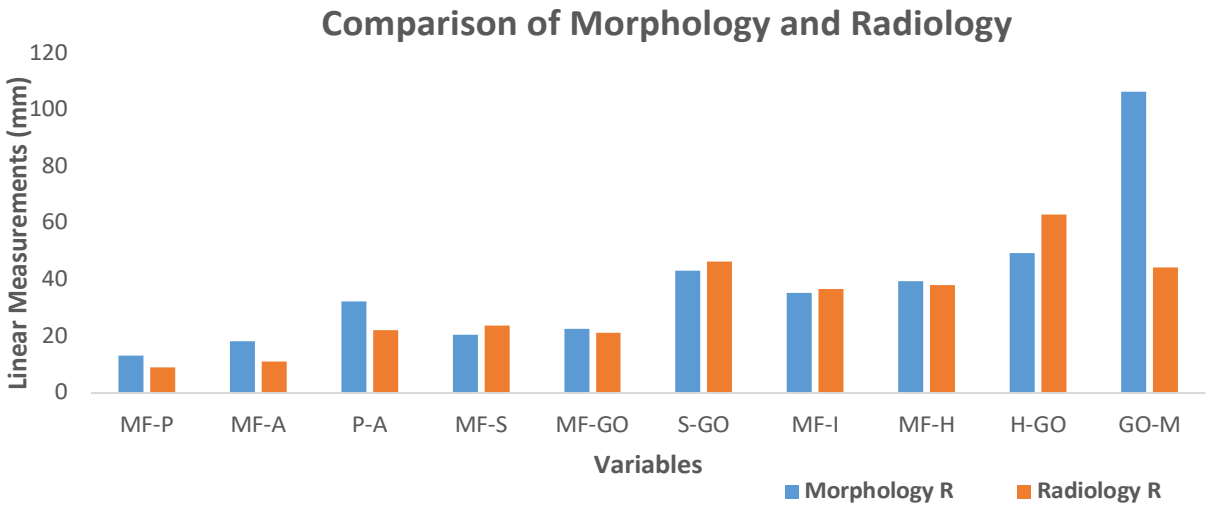

Figure 7. Comparison between the means for the radiographic and morphometric measurements in the age cohort 21-25 on the right side of the mandible.

DISCUSSIONS

Considering the results of morphometric analysis of the current study, all parameters increased with increasing age except MF-A distance, however, the difference was not statistically significant. The results of this study showed that MF is situated more towards the superior border of ramus of mandible than the inferior border. These results were similar to results by Mbajiorgu, 2000; and Shalini et al., 2016 but differed from results of Alves and Deana 2014; and Samanta and Kharb, 2013 which described position of MF to be more towards inferior border of ramus of mandible[1,4,9,13].

Analysis of Anterior-Posterior Dimension of Mandible (MF-A and MF-P)

Anterior-posterior (A-P) dimension of mandible showed the mean of MF-P on both left and right sides to be significantly less than mean of MF-A. The mean of MF-A on right and left were 18.8mm and 18.9mm respectively whereas the mean of MF-P was 13.7mm and 13.4mm on right and left respectively. This suggests that position of MF on dry bones was more towards the posterior border of ramus of mandible than towards anterior border.

The outcomes of this study were similar to that of Alves and Deana (2014); Marzola et al., (2005); Mbajiorgu (2000); Shalini et al., (2016); and Thangavelu et al., (2012), but differs from results by Samanta and Kharb, 2013 which described MF to be at a mean distance of 15.72mm and16.23mm on right and left from the anterior border of ramus of mandible respectively; and at a mean distance of 13.29mm and 12.73mm on right and left from posterior border of ramus of mandible respectively. Although there was a difference in Samanta and Kharb's study (2013), a similar pattern of MF being situated more towards posterior border of ramus of mandible was still observed.

MF-A and MF-P parameters suggested that MF was located more towards posterior border of ramus of mandible. However, these finding were contrary to findings by Trost et al., (2010) which considered posterior border of mandible as "safety zone" where MF is unlikely to be found.

Alves and Deana, (2014) reported that MF is slightly higher in ramus of mandible of younger individual because a statistically significant difference was observed in MF-S distance between younger groups and other groups aged 31-45, 46-60 and 61 years. The authors also reported an ethnic statistically significant difference in mean values of MF-A between white and African individuals. The mean value of MF-A was higher in African individuals than in white individuals.

Analysis of Inferior-Superior Dimension

MF-GO distance was recorded as 22.9mm and 22.7mm on right and left respectively. MF-S was shown to be 20.1mm and 20mm on the right and left sides respectively. There

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was no statistically significant difference between left and right side for both MF-S and MF-GO parameters. Our results show that MF is situated more towards superior border of ramus of mandible than inferior border. These results were similar with results by Mbajiorgu, (2000) and Shalini et al., (2016). Albeit the results of Alves and Deana (2014) and Samanta and Kharb, (2013) described the position of MF to be more towards inferior border of ramus of mandible.

Analysis of MF-GO

Singh et al., (2015) reported on location of MF with respect to GO angle. They stated that mandible undergoes substantial morphological and dimensional changes, therefore, the dimensions vary with age and state of dentition. They attributed these changes to action of muscles of mastication. Singh et al., (2015) found a strong negative correlation between GO and distance of MF from angle of mandible, suggesting that a decrease in GO correlates with an increase in distance of foramen from angle of mandible. The authors noted that the mean GO varies in different racial populations and decreases with age. Our study noted that a decrease in GO correlates with a decrease in angle of mandible.

Analysis of MF-I and MF-H

The average distance of MF-H was shown to be 39.3mm and 39.1mm on the right and left sides respectively. MF-I was recorded as 35.3mm and 35mm on the right and left sides respectively. Marzola et al., 2005 examined the position of MF in relation to condyle and reported that MF was positioned at 21mm from the top of condyle on both left and right sides. However, only thirty mandibles were used in their study, of which sex and age were unknown. MF-I was not measured in their study; therefore, a comparison between those parameters could not be ascertained.

Analysis of Mandibular Ramus (PA)

The total width of mandibular ramus demonstrated no significant difference between left and right sides. Our results were similar to results by Oguz and Bozkir, (2002); Shalini et al., (2016); Thangavelu et al., (2012) and Padmavathi et al., (2014). However, our results demonstrated that the mean value of P-A distance was significantly greater in males than in females ($P<0.001$) on both left and right sides.

Analysis of S-GO

The average distance from sigmoid notch to inferior border of ramus of mandible in our study was recoded to be the same on both left and right sides, with average distance of 43.2mm and 43mm on both right and left respectively. There was no statistically significant difference noted between left and right sides. However, our results demonstrated significant difference between males and females which was similar to Padmavathi et al., (2014) and Thangavelu et al., (2012) findings.

Sexual Dimorphism in the Location of MF

Males demonstrated greater readings in most parameters than females. About 80-90% of parameters in our study showed statistically significant difference between males and females. Alves and Deana, (2014) reported that MF-S value in African females was significantly higher than in white females, while in males, mean values for Africans and whites were similar. Shiny Vinila et al., (2017) found that variable distance from MF to anterior borders of ramus of the mandible was found to be mostly dimorphic for sex determination followed by distance between MF to inferior border of mandible by using discriminative function analysis test. Furthermore, the study was able to determine sex (gender variation) of isolated mandible with 90% accuracy by using distance from centre of MF to borders of ramus of the mandible. Jambuhath et al., (2016) used two methods; the ramus method in which measurement of ramus height and breadth were used and gonial method in which measurements of gonial angle and bigonal width were measured. They reported that, in the ramus method, condylar, coronoid and projection of height of ramus were higher in males, whereas, in gonial methods, gonial angle was higher in females. Though both methods were not different, both can be used for sex determination. The ramus method has proved to be more accurate than the gonial method.

Location of the MF in relation to Age

The location of MF also varies with age. Kilarkaje et al., (2005), found that the distances from MF to all various landmarks were shortest in young individuals and longest in adults. They concluded that location of MF maintains absolute bilateral symmetry in human mandibles, regardless of age. Trost et al., (2009) suggested that MF was always situated in ventral and inferior two-thirds of ramus without difference according to side, sex or age. Ashkenazi et al., (2011), conducted a study to determine the location of MF in anterior-posterior dimension in primary, mixed and permanent dentition of dry mandibles of Israelis and correlated these changes with size of gonial angle. They found out that MF are located in the 3rd quarter of ramus in A-P dimension, and it shifts anteriorly with age. The gonial angles decrease with age and with changing dentition from mixed to permanent dentition. Keros et al., 2001 studied the variability in position of MF which could be responsible for the occasional failure of IANB anaesthesia in Croatians patients. They found no significant difference in sex and age among patients involved in the study.

Location of MF in Relation to Occlusal Plane and Ethnic Differences

Shukla et al., 2018 conducted a study aimed to correlate position of MF with occlusal plane as a clinical guide for inferior alveolar nerve block (IANB) injection in children aged 3-13 years using panoramic radiographs. They concluded that the bony landmarks within the jaws keep changing their position along with skeletal growth, thus the gonial angle values decreases with increasing age. Therefore, it was suggested that the needle for IANB should be placed below the occlusal plane in 3-4years old children (1.26mm approximately), almost at the level of occlusal plane in 5-7years old (0.33mm), above occlusal plane in 7-9 years (1.54mm), 9-12years (1.64mm), 11-12years(1.98 mm) and 12-13years (2.9mm) olds respectively. Thangavelu et al., (2016) noted that MF is situated at or below occlusal surface of mandibular teeth and without significant difference between right and left side. Their results showed that MF was situated at 2.75 mm posteriorly from midpoint of width of ramus and 3 mm superiorly from midpoint of vertical height (between sigmoid notch and inferior border). Nicholson, (1985) found MF to be below the occlusal plane of mandibular teeth in 75% cases, and at occlusal plane in 22.5% cases of East Indian ethnic origin.

Mbajiorgu, (2000), while examining anatomical specimens of adult black Zimbabweans, stated that position of MF was

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individualistic due to wide range variations in measurements of individual mandibles and that there was no sex variation of position of the foramen. It was found position of MF was at the same level as occlusal plane in 47.1 % of specimen studied, 29.4 % of specimen had MF above the occlusal plane, while 23.5% was below the occlusal plane and on average lies at about 2.56 mm (Right) and 2.08 mm (Left) behind mid-point of ramus width. There was a bilateral symmetry in position of MF. While Aglarci et al., (2015) found MF located just anterior-superior to the midpoint of ramus and below occlusal plane in Turkish populations, they also reported a significant difference for location of MF among males and females.

Hoque et al., (2013) found no significant difference in values from both sides of Bangladeshi dry adult human mandibles; therefore, MF was at the same distance from each landmark on both sides of mandible demonstrating symmetry. Russa and Fabian, (2014) found MF to be above occlusal surface of first mandibular molar (about 10mm above the occlusal plane) and above occlusal surface of second premolar (about 14mm above the occlusal plane). They also found MF to be located about 20 mm and 12 mm from anterior and posterior borders of ramus respectively, meaning that MF was located more frequently on posterior half of ramus of mandibles in adult black male Tanzanians aged 35- 45 years population.

Radiographic Component

In our study, the right side showed significant difference between males and females in MF-GO; S-GO; MF-I and H-GO parameters. Contrary to left side, a significant difference was noted on MF-A parameter only. Males showed higher readings than females in all parameters except for MF-P distance (figure 7); however, these findings could be biased because more male specimens than females were used. The mean value of MF-A distance on both left and right showed higher readings than mean of MF-P distance in both males and females (figure 7). MF-A was recorded to be 11.5mm and 12.3mm on both right and left sides respectively in male population. In females, it was recorded to be 10.9mm and 9.9 mm on both right and left sides respectively. MF-P distance was recorded to be 8.8mm and 7.9mm on both right and left sides respectively in male population whereas in female population, it was recorded to be 9.6mm and 8.5mm on both right and left sides respectively. Furthermore, MF was noted to be more towards the posterior border of ramus of mandible. These results were aligned with morphometric results of our study suggesting a possible correlation in the studied distance. In a study by Park and Lee (2015), the findings were significantly greater than findings of our study. However, the pattern of their MF-A findings aligned with those of morphometric and radiographic analyses in the current study. Males showed greater readings than females; however, no statistically significant difference was noted between males and females. They also confirmed that the average radiographic distance of MF from mandibular notch differs with different occlusions.

Conclusion

MF-A distance was constantly greater than MF-P distance suggesting that MF is situated more in posterior than anterior region of the mandible. The comparison between radiographic and morphometric analysis showed no significant difference in most parameters. This outcome confirms a correlation between morphometric and radiographic measurements, reemphasizing the importance of preoperative CBCT radiographs to minimise injuries to IAN bundle. Therefore, anterior border of ramus of mandible can be regarded as “safety zone” during surgical procedures among South African black population.

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Conflict of interest

The authors declare that they have no conflict of interest related to any aspect of this research project.

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Paediatric Inflammatory Multisystem Syndrome associated with Covid-19 infection (PIMS-TS): Guidance for Oral Healthcare practitioners

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ABSTRACT

Paediatric Inflammatory Multisystem Syndrome temporally associated with SARS-CoV-2 infection (PIMS-TS) has been reported globally since the outbreak of the coronavirus disease. The syndrome shares similarities with Kawasaki disease (KD). The manifestation of oral changes in both PIMS-TS and KD warrants that the oral health practitioner has an awareness of these conditions to facilitate timely management.

Introduction

The outbreak of the coronavirus disease 2019 (Covid-19) was an unprecedented global public health disaster which led to significant morbidity and mortality worldwide. Elderly patients infected with SARS-CoV-2 have been reported to be at higher risk of complications and death[1] than children who have contracted the severe acute respiratory syndrome. In rare cases, children – even with mild or asymptomatic Covid-19 infection – have developed severe disease, including Multisystem Inflammatory Syndrome in Children associated with Coronavirus Disease 2019 (MIS-C), also known as Covid-19 associated Paediatric Multisystem Inflammatory Syndrome or Paediatric Inflammatory Multisystem Syndrome temporally associated to SARS-CoV-2 infection (PMIS-TS).These disease presentations share similarities with Kawasaki Disease (KD).[2,3,4]

MIS-C emerged towards the end of 2020 as a serious paediatric manifestation of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and has now been described globally.[5] Affected children may require extensive care by a multidisciplinary team of experts in paediatric critical care, rheumatology and infectious disease practitioners.

The aim of this review is to describe the clinical manifestations of KD and MIS-C in the paediatric population and to create awareness among oral healthcare practitioners of the oral manifestations these children might present with.

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Kawasaki disease

Kawasaki disease (KD) was first described by Tomisaku Kawasaki in Japan. KD is a rare, acute, febrile and usually self-limiting vasculitis of medium-calibre vessels affecting predominantly healthy children under the age of five years.[6] Males are affected slightly more than females with a ratio of 1.5:1.[7] Though reported globally, the highest relative risk is in Asian children, especially of Japanese ancestry.[8]

The aetiology of KD remains unknown, although it is probably multifactorial. The frequent association of KD with an infectious pathogen has led to the hypothesis that it is an atypical response of the immune system to one or more unidentified pathogens in genetically predisposed individuals.[9,10]

KD, also referred to as mucocutaneous lymph node syndrome, classically presents with fever, mucocutaneous changes and cardiac involvement. The vasculitis which is characteristic of KD demonstrates a predilection for coronary arteries with coronary artery aneurysms being its main complication.[8] In developed countries it is the principal cause of acquired heart disease in children, accounting for 50% of cases in individuals of <2 years of age and 80% in those <5 years of age.[11]

There is no diagnostic test for KD given its multifactorial aetiopathologies; hence, its diagnosis relies entirely on clinical features and laboratory findings indicative of inflammation and positive echocardiography. It can thus be challenging to diagnose considering the wide spectrum of clinical presentations that overlap with many common paediatric febrile illnesses. Principal clinical findings and the descriptions thereof have shaped diagnostic criteria for KD.[12]

Diagnostic criteria include: fever, conjunctivitis (bilateral, bulbar, conjunctival injection without exudate), cervical lymphadenopathy (usually unilateral), rash (maculopapular, diffuse erythema or erythema multiforme), changes to lips and oral mucosa (red cracked lips, "strawberry" tongue or diffuse erythema of the oropharynx) and changes to the extremities (erythema and oedema of palms and soles in acute phase and periungual desquamation in subacute

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phase). A fever of five or more days along with any four or five of the other diagnostic criteria is required for a diagnosis of KD. However, KD may be diagnosed with fewer than four of these criteria if coronary artery abnormalities are detected. Should erythema and oedema of the hands and feet be present as one of four or more of the principle features, then KD may be diagnosed even if there is only a four-day history of fever. A thorough history of the clinical presentation is essential to the diagnosis since principle features may have been present, but could have resolved by the time a clinical examination is performed. The non-specificity of principal clinical findings warrants the consideration of other viral infections that may include rubeola, adenovirus, respiratory syncytial virus, coronavirus and influenza.[13-16]

Intravenous immunoglobulin therapy together with acetylsalicylic acid (ASA) forms the backbone of primary treatment. These drugs aim to reduce inflammation and arterial damage and to prevent thrombosis in patients with coronary artery abnormalities. Primary adjunctive therapy is advocated for patients at high risk for the development of coronary artery aneurysms.[12]

Due to the fact that PIMS-TS may present with features of classic or incomplete (atypical) KD, with or without cardiac involvement, the Royal College of Paediatrics and Child Health (RCPCH), the CDC and World Health Organization provide case definitions of this syndrome in children.

Children with PIMS-TS, according to the RCPCH case definition, may present with persistent fever, inflammation and evidence of single or multiorgan dysfunction (shock, cardiac, respiratory, renal, gastrointestinal or neurological disorder) with additional clinical features. These additional clinical features include abdominal pain, confusion, conjunctivitis, cough, diarrhoea, headache, lymphadenopathy, mucous membrane changes, neck swelling, rash, respiratory symptoms, sore throat, swollen hands and feet, syncope and vomiting.

Although the clinical presentation of PIMS-TS patients shares similarities with KD, there are several differences. Patients with PIMS-TS, by definition, lack microbial confirmation of a staphylococcal or streptococcal infection. Compared to classical KD, patients with PIMS-TS more often present with prominent gastrointestinal and neurologic symptoms, and the incidence of cardiac involvement is higher in PIMS-TS patients. More than 50% of children with PIMS-TS develop some sort of cardiac involvement, defined by elevation of cardiac biomarkers, systolic or diastolic myocardial dysfunction or even cardiac shock.

The median age range of patients with PIMS-TS is between 2 and 16 years of age compared to that of classic KD in which most patients present younger than 5 years old.[18] Unlike KD which affects predominantly healthy children, a third of patients diagnosed with PIMS-TS have been reported to have asthma and obesity as comorbidities.[18]

Some studies have reported on the oral manifestations associated with PIMS-TS. Lips and mucosal changes were detected in 87%, 53%, 50% and 29% of the reported cases in France, US, Italy and UK respectively.[19-22] Oral mucosal changes can present as cheilitis, dryness, fissuring, peeling, vertical cracking and bleeding of the lips and glossitis (otherwise described as “strawberry tongue”) with prominent fungiform papillae, or diffuse erythema of the oral and pharyngeal mucosa with no focal lesions, ulcerations or exudates.[12] Patients with PIMS-TS may also demonstrate sore throat and lip swelling which rarely are evident in KD.[23] It is worth noting that oral changes are the only symptoms to be recognised with equal frequency in both typical KD and KD with atypical features.[24] In most instances, these oral manifestations in KD patients are self-limiting and require only supportive management; healing takes place without sequelae.

PIMS-TS might characterise a post-infectious inflammatory syndrome, which may be antibody or immune-complex mediated. If it is antibody mediated, it may explain why some children become severely ill while others are asymptomatic.[25] Children diagnosed with PIMS-TS have been reported to present with a cytokine storm different from acute Covid-19 infection and other hyperinflammatory conditions.[26] PIMS-TS patients who present with systemic/cardiac shock generally show laboratory abnormalities that are significantly more abnormal compared to KD shock. Patients with PIMS-TS who go on to develop shock have elevated C-reactive protein and ferritin levels. Other laboratory features of note are lymphopaenia, thrombocytopenia and low albumin levels. The platelet counts normalise after the acute phase is over. The most significant clinical feature in PIMS-TS is myocardial involvement causing significant myocardial dysfunction with laboratory markers of raised Troponin and Brain Naturetic Peptide (BNP).

Although different treatment guidelines for PIMS-TS are followed in different settings, most treatment protocols will use immunomodulatory treatment. The most commonly used medication includes the administration of intravenous immunoglobulin (IVIG and methylprednisolone). In patients who are refractory to IVIG, additional treatment may include the use of recombinant IL-1 receptor antagonist.

CONCLUSION

Following the guidance provided by the RCPCH, CDC and WHO, it is important for clinicians to note the presentation of paediatric multisystem inflammatory syndrome temporally associated with Covid-19 with clinical manifestations of fever, evidence of inflammation and evidence of single or multisystem organ injury.

The different presentation of PIMS-TS to classic KD warrants an understanding of the pathophysiology of this emerging phenomenon to ensure prompt and aggressive management. The complex nature of this disease warrants multidisciplinary collaboration, inclusive of oral healthcare practitioners, given that oral findings can be seen in this subset of patients.

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Cervical margin relocation in indirect restorations

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ABSTRACT

Cervical margin relocation (CMR) is a technique used to raise the deepest portion of a cavity preparation from a subgingival to a supragingival level. This paper presents an overview of the technique and an analysis of current thinking and practices regarding the use of CMR when carrying out indirect restorations on teeth with deep subgingival margins. Despite promising results, the procedure is still controversial and most studies have been focused on laboratory-based testing of parameters such as bond strength, marginal integrity and fracture behaviour of the restorations. Although long-term clinical survival rates are reportedly high (96%), debate continues regarding the procedure's impact on gingival health. This paper will explore the historical and clinical development of CMR, its indications, advantages and disadvantages, as well as the time and cost implications, and long-term prognosis. While CMR appears to be safe and effective in appropriately selected cases, with meticulous application techniques, further randomised controlled clinical trials are necessary to draw definitive conclusions.

INTRODUCTION

Teeth with large interproximal carious lesions located below the cementoenamel junction (CEJ) almost always require some form of prosthodontic rehabilitation to restore the anatomy and function appropriately.[1] However, the preparation for indirect restorations poses both biological and technical operative challenges.[2] The main biological problem is the potential violation of the biological width, which typically requires a minimum distance of 3mm to be maintained between the restorative margins and the alveolar crest to prevent detrimental effects on the surrounding soft and hard tissues.[3] Technical challenges include inability to visualise the margins, difficulty in placing a rubber dam before carrying out the tooth preparation, salivary control during impression taking and cementation, and access for finishing and polishing the margins.[2,4] Historically, the recommended procedures used to expose deep margins located below the CEJ include clinical crown lengthening or orthodontic tooth extrusion.[1,3] However, in private clinical practice it is often not possible or viable to refer the patient for these procedures due to financial constraints, patient unwillingness to accept invasive surgical procedures, or time implications in situations where multiple appointments are needed.[1] In 1998, Dietsci and Spreafico[2] introduced the cervical margin relocation (CMR) technique, also known as the deep margin elevation technique.[2] Other names for this technique include the proximal box elevation technique or the coronal margin relocation technique.[1]

The CMR technique involves the placement of a composite or glass ionomer material in the deepest portions of the proximal areas to reposition the margin supragingivally.[1,2,5-8] The aim is to make it easier to perform rubber dam isolation, improve impression-taking and adhesive cementation. Early biomechanical studies suggested that restorations placed after using the CMR technique were superior to those done without its use.[9] However, there are a number of factors that need to be considered before deciding to attempt CMR. A recent systematic review by Juloski, Mokken and Ferrari revealed that the success of CMR depends on the periodontal health, meticulous execution of all steps, marginal quality of the adhesively bonded restoration, fracture behaviour of the treated posterior tooth, bond strength, material choice and treatment of the relocated margin prior to bonding of the indirect adhesive restoration.[1] A long-term follow-up study by Bresser et al found a survival rate of nearly 96% in 197 restorations followed up for times ranging up to 12 years after placement. They used composite resin for their CMR and postulated that with appropriate case selection and meticulous execution of the technique, high survival rates appear to be achievable.[4] The above mentioned factors will be considered individually.

Periodontal health

In a controlled study conducted by Ferrari et al, the effect of CMR on periodontal health was investigated.[3] The study included 19 patients who received CMR with resin margins and an indirect restoration of lithium disilicate. At the one-year follow-up, despite a 100% survival rate and no bone loss detected radiographically, they found that 53% of the treated teeth had bleeding on probing (BOP), indicative of an uncontrolled inflammatory response. They, however, did not specify the degree of BOP according to any recognised classified system such as that of Ainamo and Bay.[3]

In a randomised double blind study conducted by Ismail et al they performed CMR on 120 teeth using the sandwich techniques and four different materials, namely resin modified glass ionomer, bulk fill flowable composite, bioactive resin and conventional viscous resin. They found that with all the materials there was epithelial tissue reattachment and no bone loss after a two-year follow-up period.[10] They concluded that subgingival restorations were safe for the

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gingival health with all the materials and techniques they tested.[10] However, they did not test conventional self-cure glass ionomers. Their results support the observations of Mente et al,[7] that as long as the subgingival restoration is well bonded and there are no major overhangs, the restoration will be tolerated by the subgingival tissues.[3] The clinical problem for practitioners is that it is not easy to see or detect subgingival overhangs unless a radiograph is taken after placement and, even if present, they may be difficult to reduce in this location.

Application technique

Success of this technique relies heavily on adequate tooth isolation, matrix selection and placement, careful preparation, accurate impression taking and cementation and finishing procedures.[7] Cervical margin relocation is indicated when the margins of the tooth cannot be visualised, or where it cannot be isolated by rubber dam alone and a matrix band is required to fully seal off the lesion from the oral environment in order to avoid contamination and overhangs.[1] According to the classification system of Veneziani, CMR may be considered in Grade 1 interproximal carious lesions when a matrix band can be fitted and it fully circles and seals the margin. In Grade 2 lesions, surgical exposure of the margin may be necessary, while in Grade 3 lesions clinical crown lengthening will be needed and CMR should not be attempted beforehand. Thereafter CMR can be carried out, but in all cases rubber dam isolation is crucial.[8]

To achieve a tight subgingival fit, the use of curved matrices and wedges is recommended, with the height of the matrix reduced to 2-3mm above the height of the CMR.[1] In extremely deep cases, a matrix within a matrix technique can be employed where a layer of MTA is carefully packed in the deepest portion of the matrix band where there are still openings in order to fully seal the restoration.[7] Contamination of the operative field remains a concern, and operators should take great care in avoiding this.[1]

Marginal quality of the adhesive restoration

Ferrari et al reviewed six articles that evaluated the marginal integrity of teeth treated using CMR prior to placement of an indirect restoration. While most of the papers concluded that there were no differences in marginal integrity for indirect restorations placed directly on dentin versus those placed above margins lifted using CMR, one study suggested that the conventional luting procedure directly onto dentin still had superior integrity after teeth had been subject to thermomechanical loading.[1] When evaluating if polymerisation shrinkage may play a role in marginal integrity of CMR, three studies found that if composite resin was placed in three or more increments of 1mm each, there was significantly better marginal integrity than when it was placed in one thicker layer, and a comparable marginal integrity to indirect restoration luted directly to dentin.[1] One has to be cautious that most of the studies were carried out in vitro and thus success rates and clinical safety cannot be assumed.

With regard to choosing which indirect restorative material to use, no conclusive evidence could be found in the literature. Ilgenstein et al showed that composite restorations had better marginal integrity than ceramic materials.[6] They also found a significant reduction in marginal quality in specimens restored with ceramic onlays, whereas teeth restored with composite onlays did not show a reduction in marginal quality.[6] Resin onlays were also more likely to lead to crown root fractures than ceramic crowns, while ceramic crowns were more likely to lead to fractures of the onlay itself.[6] They also suggested that resin-based indirect restorations should not be used for full crowns in the posterior region and only for inlays and onlays, while lithium disilicate could be used in the anterior and posterior for both full crowns or onlays.[1,6] Thus, in partial restorations, a resin-based material is ideal, while in full circumferential crowns lithium disilicate seems to be better to avoid crown fracture.

Grubbs et al suggested filling the entire CMR restoration area with glass ionomer due to its bio-inert nature, natural adhesion to tooth structure, similar coefficient of thermal expansion to dentin, inertness when close to the pulp, and ability to set in a moist environment.[5] They also found that the glass ionomer did not degrade under thermocyclic loading when the material Lava Ultimate was used as the indirect restoration, and it was sufficiently strong in this site and procedure.[5] The biocompatibility profile of glass ionomer thus makes it an attractive choice for use with CMR.

Fracture behaviour

Studies on the fracture behaviour (fracture resistance and pattern) of root treated teeth restored using CMR and subject to thermomechanical loading and load until failure revealed that the group without CMR and restored with feldspathic ceramic onlays had the lowest mean fracture value. The highest mean value was recorded for the group without CMR and resin onlays.[6] The two groups that had CMR and onlay restorations had similar fracture resistances compared to each other and higher than that of feldspathic porcelain without CMR, regardless of the restoration material used for the onlays.[1,6] The only statistically significant difference was found in the groups without CMR in the load to fracture tests. The ceramic restorations had less catastrophic failures when subjected to load until failure, while the resin restorations show the best marginal integrity compared to other crown types after thermomechanical loading.[1,2,5,6] CMR appears not to influence the fracture behaviour of treated teeth compared to controls significantly.

Bond strength

The microtensile bond strength of composite inlays to the proximal box floor has been evaluated to determine the influence of CMR on bond strength.[1] A study was carried out to compare groups of teeth with cervical margins located 1mm below the CEJ and into dentine to those with margins relocated to 1mm above the CEJ via CMR. The study utilised a restorative composite (Filtek Z-250) applied in two 1mm thick increments. It found no differences in bond strength compared to when indirect restorations were placed directly onto dentin[1]. Another study compared the bond strength of self-adhesive cements versus total etch adhesive systems and found that the microtensile bond strength of the inlays was higher to the elevated composite margins than directly to dentin margins. However, the results were only statistically significant when a self-etch adhesive system was used for adhesion of the indirect restoration. It was further noted that the interfaces for failure were different, with bond failure occurring between dentin and resin cement in 60% of specimens using self-etch adhesive systems, while mixed interface failures were observed with adhesive resin.[1,6] Grubbs et al recommended using total etch adhesive resin for the bonding procedure due to its superior bonding to dentine and its capacity to

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bond adhesively to glass ionomer.[5] Total etch adhesive also displays excellent bonding to indirectly luted restoration.[1] Ultimately, the use of indirect restorations has been found to significantly improve the long-term survival rate of the tooth and appears not to be affected by the use of CMR as the long-term survival rate of CMR in indirect restorations is comparable to indirect restorations placed directly onto tooth structure.[4]

CMR material

Numerous recommendations regarding the most appropriate composite material for CMR and adhesive systems have been proposed.[1] Most authors recommended a traditional three-step adhesive system which involves etching, application of a primer and a bonding agent. Both bulk fill flowable composite and traditional viscous composite can be used; however, the flowable composites should be placed in increments no larger than 1.5mm, while the traditional viscous composites in increments no larger than 2mm to compensate for polymerisation shrinkage. However, due to the thin layer or absence of enamel below the CEJ, etching cannot be carried out for longer than five seconds.[1] Bonding to enamel is considered safe and consistent, but bonding to dentin and cementum relies on a myriad factors, including the substrate morphology, adhesive type and sensitive application technique.[1] The main problem at the moment is that progressive degradation of the hybrid layer cannot be prevented and thus alternative materials must be considered to improve long-term success rates.[1,11]

The use of glass ionomer for CMR has been proposed. Glass ionomer is a biomaterial consisting of fluoro-aminosilicate glass that naturally bonds to tooth structure (enamel and dentin) and is capable of bonding adhesively to MTA. Extensive literature supports its use in both class 1 and 2 cavities.[12-14] Glass ionomer is frequently recommended as a periodontal restoration in root caries, and the addition of hydroxyapatite enhances fibroblast proliferation and attachment.[12] Due to its bio inert and potentially bioactive nature, it appears to be an ideal material for CMR. Additionally, glass ionomer releases fluoride over time, which can assist in the remineralisation of tooth structure and prevent restoration leakage.[12-14] Fluoride also exhibits mild antibacterial properties which is beneficial for preventing bacterial overgrowth which may lead to gingival inflammation, and appears to be biocompatible in subgingival restorations.[10,13] A glass ionomer primer composed of polyacrylic acid can be used to bond glass ionomer to dentin without the need for etching and other surface treatments, but a glass ionomer primer appears to be beneficial in wetting and uniform adhesion to tooth structure.[14] Furthermore, glass ionomer materials have been proven safe as subgingival open sandwich restorations so may be a suitable material for CMR as well.[10]

Treatment of CMR prior to bonding

When using CMR technique, finishing and polishing of the area is required before impression taking to obtain well-defined margins.[1] It has been suggested that margins can be reduced with fine diamond burs of decreasing grit. However, a challenge lies in assessing how deep the margins are that need to be polished, as well as how far one can go below the CEJ and gingival margin to remove overhangs and achieve a smooth restoration without causing too much soft tissue damage. Radiographic x-rays have been recommended to aid in determining the areas needing refinement.[1] Some authors have suggested that sandblasting could be used to prepare the margin prior to bonding; however, this opinion was not widely supported due to its uncontrollable nature and potential for damage.[1] Minor adjustments, such as removing visible overhangs and improper contours, should rather be made with fine diamond burs, under radiographic guidance. Dentine sealing must be carried out on the tooth immediately following preparation to ensure ideal bonding.[15] While initial studies have suggested that resins may be safe subgingivally provided there are no overhangs, short margins, voids or air bubbles present, glass ionomers may be preferable, however, as they do not appear to cause as much gingival inflammation after placement.[10,12,13,15]

DISCUSSION

The concept of using a base layer to address the challenges of deep restoration margins originated from the open sandwich technique.[3] This led to the concept of CMR to raise the margins of teeth with deep subgingival margins. Early clinical studies have shown promising results when CMR is carried out with both resinous and ionomer-based materials.[10] The assumption is that it will then be safe to place indirect restorations on top of these elevated margins. Advocates of CMR also propose that the newly elevated margins will help improve contact and prevent food trapping between the teeth.[4] While most studies on this topic have been conducted in laboratory settings, they have shown no significant difference between indirect restorations placed directly onto dentin and those placed onto an elevated material.[5] Furthermore, the use of the CMR technique appears to offer biomechanical advantages[9] and it does not impact the bond strength, marginal integrity or fracture behaviour of indirect restorations, regardless of the materials used.[7]

Microleakage concerns have been investigated with resinous materials for CMR. While laboratory studies found no difference in leakage after thermomechanical loading, the biggest challenge is how to avoid moisture contamination in clinical setting.[5] Glass ionomer-based materials may be a more viable option to address this problem due to their natural adhesive properties to dentine and cementum, as well as their ability to set in a moist environment. The biocompatibility of ionomer-based materials has been extensively studied, with reports indicating that glass ionomer does not cause gingival inflammation when placed subgingivally.[10,12-14] Additionally, it has been used successfully in apicoectomy, external cervical resorption cases and orthopaedic surgery, demonstrating a clinical ability to bond to bone. Further research is recommended using glass ionomer as a base layer in the CMR process.[3] More research is needed to investigate parameters such as long-term success and survival of restorations placed after CMR, as well as patient preferences with regard to clinical crown lengthening or orthodontic tooth extrusion. While these methods are the preferred clinical procedures, they may not be desirable to all patients due to cost and time factors.

CONCLUSION

Initial studies using the CMR technique show promising results with reportedly high survival rates over a number of years. The biggest drawback is that it is still recommended to maintain at least 3mm space between the alveolar crest and restorative margin, and determining the depth and extent of this gap during the procedure is challenging. When considering whether to attempt CMR in place of

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crown lengthening, factors such as connective tissue compartment violation, inability to place a matrix band and inability to isolate the field are contraindications for the former. The main concern with proposing CMR for widespread clinical use at the present time is that there is a lack of large controlled clinical trials and further research is recommended in this potentially viable treatment modality.

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Plasmablastic lymphoma: a case report

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SP Mpungose[1], M Mashamba[2]

ABSTRACT

A male patient presented at the University of Witwatersrand with a rapidly growing mass on the palate extending across to the buccal aspect. The growth had a history of three months and presented with symptoms of pain together with spontaneous bleeding. Examination revealed that the patient was a smoker and tested seropositive for HIV despite being unaware of the condition.

Radiographic bone loss is evident on a panoramic radiograph and clinically corelated by grade three mobility of involved teeth. The biopsy revealed a definitive diagnosis of plasmablastic lymphoma which is linked to oncogenesis potential of Epstein Barr virus. Presented in this paper is a case study of an HIV positive male who developed plasmablastic lymphoma.

ACRONYMS AND ABBREVIATIONS

EBV – Epstein Barr Virus
PTLD - Post-transplant lymphoproliferative disease

KEYWORDS

Epstein Barr Virus
Plasmablastic lymphoma
Lymphoma
Virus oncogenic potential

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INTRODUCTION

Until the middle of the 20th century, infectious agents such as viruses were not considered to play a role in oncogenesis.[1] The idea gained prominence when married couples contracted the same cancers and both mother and child had infections or certain cancers, suggesting transmission of the infectious agent from one person to the other. Viral infections are responsible for an estimated 15 to 20 % of all cancers in humans. The Epstein-Barr virus infects more than 90 % of the human population worldwide.[2] It has the ability to transform resting B cells into rapidly growing lymphoblastoid cell lines.[3,4]

According to Bu et al. (2022), the Epstein Barr virus is classified as a class 1 oncogenic virus by the WHO and is responsible for about 200,000 cancer cases and 1.8% of cancer-related deaths per year.[5] Burkitt's lymphoma, nasopharyngeal carcinoma, Hodgkin's lymphomas, and other epithelial, B, T, and natural killer cell cancers are linked to EBV.[6] Autoimmune conditions like multiple sclerosis and systemic lupus erythematosus have been linked to EBV.

CASE PRESENTATION

A 53-year-old male patient presented at the Wits Oral Health Center with the main complaint of "enlarging gums" that he started noticing for two months prior to seeking medical attention. He noticed progressive growth, constant pain and bleeding on the site especially when trying to brush his teeth. Upon conducting further clinical examination the patient revealed that he is hypertensive, has a history of malaria fever with which he was hospitalized for three months. At the time of initial consultation, the patient was not aware of his HIV status which was later found to be positive upon further investigations.

An intra-oral examination revealed an exophytic pedunculated mass on the palatal aspect of the first quadrant spanning from the 12 to the 16 area. (see figure 1) The same lesion extends to the buccal aspect also an exophytic mass with the same colour consistency as the surrounding mucosa. (see figure 2) The surfaces of the pathologic tissues were smooth with the palatal aspect showing some erythematous outlook.

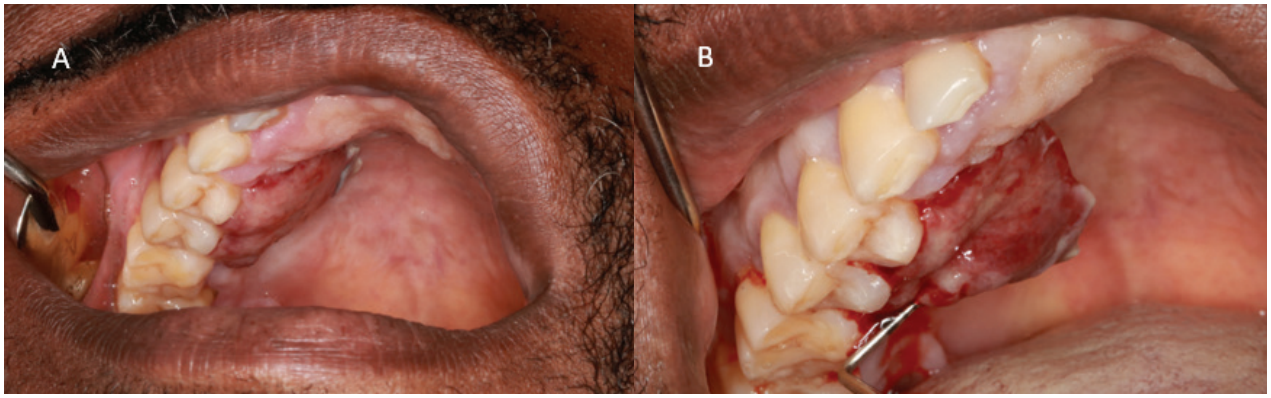

Figure 1: Shows the exophytic pedunculated soft tissue mass on the palate

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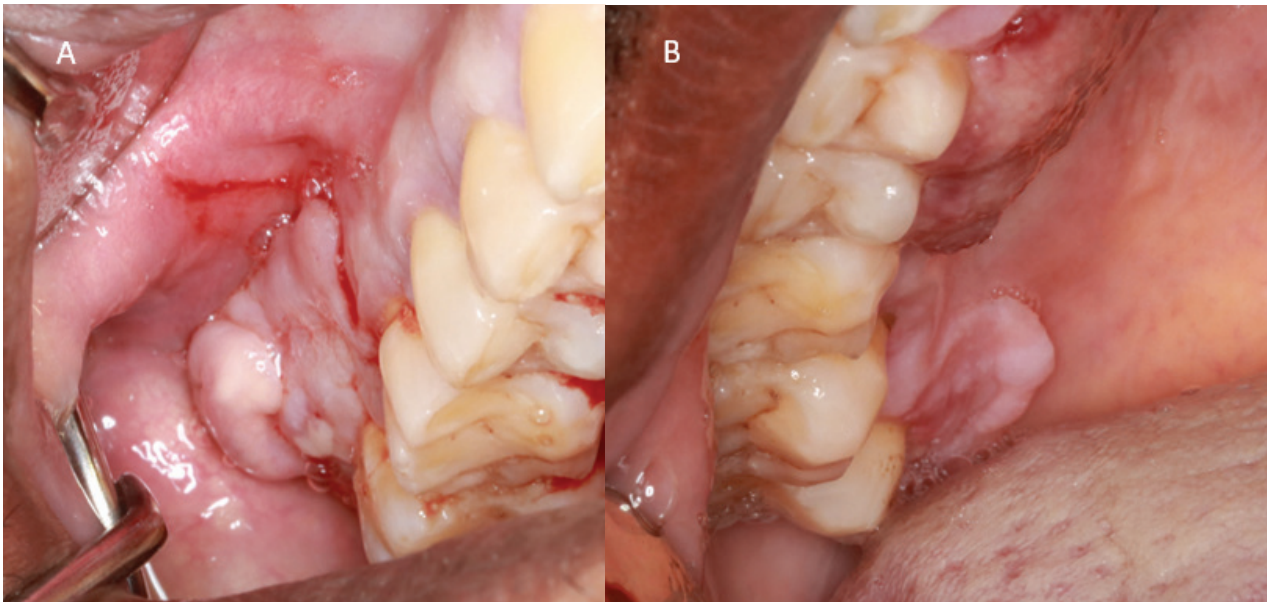

Figure 2: Shows the posterior exophytic mass with the same colour consistency extending from the palatal aspect to the buccal aspect. The picture marked B shows both anterior and posterior lesion on the same quadrant.

Radiographic examination showed loss of bone on the first quadrant involving 18, 17 and distal 16. This was confirmed clinically with the patient presenting with grade three mobility of the teeth 18, 17 and 16.

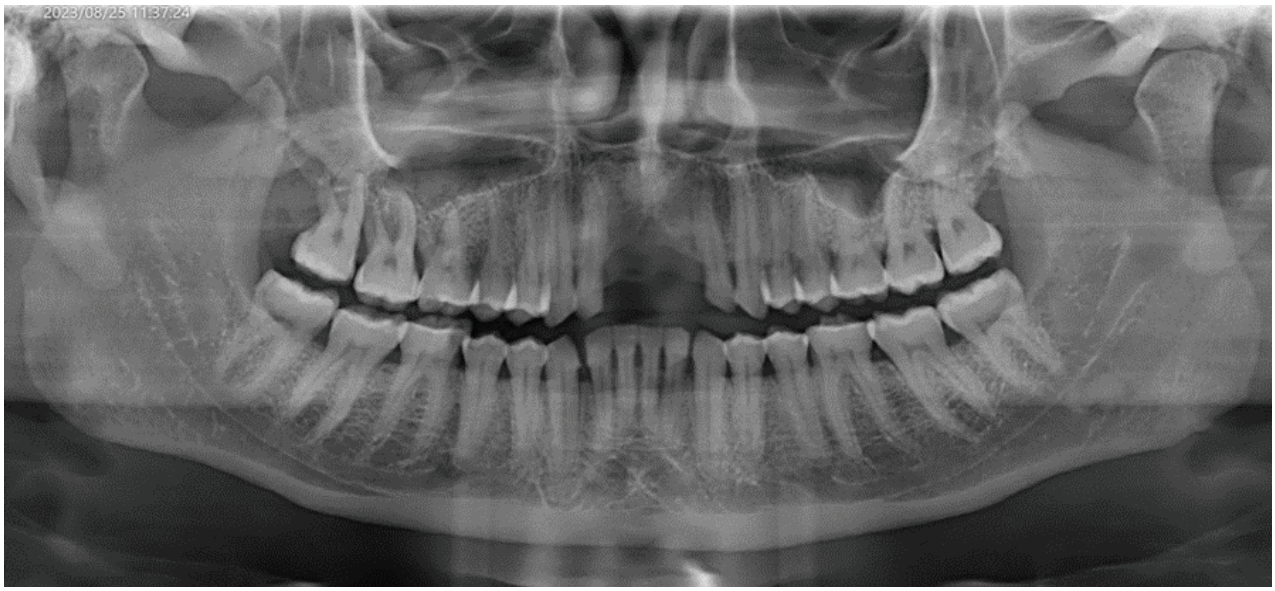

Figure 3: Panoramic radiographic view showing advanced loss of alveolar bone on the first quadrant around teeth 18, 17 and 18.

Histology report

Sections show representation of a haematolymphoid neoplasm with overlying intact and ulcerated stratified squamous mucosa. The tumour comprises large cells arranged in a diffuse growth pattern with scanty intervening stromal connective tissue. The tumour cells have varying amounts of amphophilic cytoplasm. Tumour cell nuclei are pleomorphic, round to oval with course chromatin and prominent centrally located nucleoli. There is brisk mitotic and apoptotic activity.

Immunohistochemistry chart

CD3	Positive in reactive T-cells
CD20	Negative in the tumour cells
EMA	Positive in the tumour cells
CD30	Negative in the tumour cells
CD38	Negative in the tumour cells
CD138	Positive membranous staining of the tumour cells
MUMI	Diffuse nuclear staining of the tumour cells
Ki67	80% tumour proliferation index

Table 1

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Figure 4: Shows a one-week follow-up of the lesion after an incisional biopsy was taken. It is noted that the soft tissue pathologic tissue persists and in line with the definitive diagnosis of lymphoma and immunohistochemistry report provided a conclusion consistent with plasmablastic lymphoma. The extraction of mobile teeth was done only after a definitive diagnosis was obtained and the patient was referred appropriately to the ENT and Oncology clinic for further treatment.

DISCUSSION

The EBV biology and life cycle

The 173 kb long EBV encodes more than 30 functional RNAs and roughly 85 protein-coding genes.[5] EBV type 1/A and EBV type 2/B are the two genetically distinct types of the virus; they are identified by allele polymorphism in the gene that codes for the nuclear antigens. While type 1 strains are more common in western nations, type 2 strains are more suited to specific demographic locations.[7] According to reports, type 2 EBV infection predominates in New Guinea and sub-Saharan Africa.[8]

The latent and lytic stages make up the biphasic life cycle of EBV. B cells have latent infection, while epithelial cells have lytic infection.[5] When a host is immunocompetent, the virus will only replicate briefly at the infection site after the first infection.[6] EBV infects cells in both latent and lytic forms, and, like all herpes viruses, it remains in the host for life.[8] In B cells, the virus goes dormant, and the viral DNA is permanently preserved in the nucleus.[9] After entering the nucleus, the virus delivers its linear genome there. After that, it recombines its terminal ends to form a circular genome.
According to Bu et al. and Niedobitek et al., EBV replicates in epithelial cells and survives in the epithelial basal cell, where it produces progeny virions. Lytic genes that encode very early, early, and late proteinases are expressed during the early stages of the EBV primary infection.[4,5] Lupo et al., showed that virions exhibiting a linear DNA presentation are indicative of a lytic or productive infection. BZLF1 and BRLF1 are the switch driving genes that propel the virus's reactivation from the latent phase to the lytic phase.[5,10]

Transmission of EBV

Family members can contract EBV early in childhood and become infected themselves. This is typically dependent on the standard of cleanliness procedures. Asymptomatic or moderate EBV primary infections are the norm.[4,10,11] Children typically contract an infection from contaminated saliva on their fingers, toys, or other objects, but close contact is necessary for the infection to take hold. Since EBV is present in saliva, young adults frequently spread it by kissing. Studies have also shown the virus in the vaginal fluids of both men and women, but there is little proof that this is the case.[11]

EBV entry into B lymphocytes

Infection to B lymphocytes begin with viral attachment of the glycoprotein gp350/220 to the complement receptor CR2/CD21 on B cells.[12,13] Entry is facilitated by additional glycoproteins gH, gL and gp42.[5] The initial attachment results in endocytosis of the virion, followed by a trimeric complex that forms between with the gH and gL binding to HLAII thereby allowing fusion with the endocytic membrane by the Gb EBV glycoprotein.[13] B lymphocytes are rich in areas such as the Waldeyer's ring. The Waldeyer's ring consists of the palatine, lingual tonsils, pharyngeal and tubular tonsils, memory B cells are primary reservoir of the virus for virus long persistence.[9] After the virus enters the cell the naive B-cell become proliferating blasts.[6] Infected Latent memory cells circulate in the Waldeyer's ring and the blood without immune cells recognition.

EBV's carcinogenic potential

EBV relies on B cell activation and differentiation to remain persistent in lymphoid tissue. EBV persistence has been linked to several lymphoid and epithelial cancers, most frequently in the mouth cavity, though reports have also included other anatomical locations.[10] While LMP1 mimics CD40 signalling and LMP2 mimics B-cell receptor signalling, together these proteins play a role in transcriptional control and provide signals essential for B-cell activation, proliferation, and survival.[9] EBV-infected B cells are immortalized and capable of endless proliferation, which is a typical feature in the development of tumours.

Even though EBV stays in latent phase, the virus in latency allows for expression of viral oncogenes while evading detection by the immune system. The increased number of viral proteins has been associated with tumour development, more so in individuals with previous infectious mononucleosis infection who carry a four-fold risk of developing Hodgkin's lymphoma.[9] EBV associated malignancies have since expanded to include Hodgkin's lymphoma, natural killer/ T cell lymphoma, nasopharyngeal carcinoma, gastric carcinoma, and oropharyngeal squamous cell carcinoma.[2]

EBV infected B cells that present with genetic alteration can interfere with cellular homeostasis, by promoting cell growth, immune evasion and apoptosis inhibition.[10] The Virus DNA is methylated and undergoes histone modification to have similar structures as the host genome, facilitating in the host immune evasion.[9] EBV can cause epigenetic changes in gene expression that do not result in DNA mutation. EBV can be reactivated in an immune suppressed host who was previously infected and this can contribute to neoplasia.[9, 14]

Most B cell that are infected have demonstrated in definitive proliferation in vitro. Apoptosis or programmed cell death is an active process resulting in cell death, it serves as an important cellular response to a damaged genome.[15] p53 is an important mediator of cell cycle arrest by inducing G1 arrests (quiescence and senescence) and apoptosis in some instances. Most viral DNA interact with p53 directly by suppression its activity.[15]

On the other hand, micro-RNA, small noncoding RNA are able to regulate gene expression. They are regulatory molecules that play a role in differentiation, cell proliferation and apoptosis.[16] Abnormal expression of micro-RNA indicates their role in cancer in malignant transformation. Expression of different profiles of micro-RNA can determine the cancer differentiation stages.

EBV encoded genes such as LMP1 acts as an oncogene by promoting B cell proliferation. LMP1 also uses the NF-KB and JAK/ STAT pathways, both promote B cell proliferation and survival. The virus uses this pathway to increase the pool of infected cells.[16]

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EBV and Lymphomas

The most prevalent lymphomas originate from B cells that have moved into germinal centers subsequent to activation by antigens. B cells in the germinal center swap immunoglobulin classes, enabling them to express immunoglobulins other than IgM. Hypermutation may happen during this phase, which could result in B cell cancer. Since lymphoid neoplasms are clonal, they originate from a single altered cell.[15]

Porter et al., formulated that there are three main classifications for lymphomas in the Revised European American lymphoma (REAL) classification: B-cell lymphomas, T-cell lymphomas and presumed natural killer cell neoplasms, and Hodgkin's disease.[17] Unlike earlier morphologically based lymphoma classifications, the new classification is based on clinical, histologic, and immunohistochemical characteristics.[17] Lymphomas in the oral cavity are uncommon and account for less EBV is associated with Hodgkin's lymphomas in 50% of the cases but they rarely appear in the oral cavity, although that are reported cases that occur on the tongue, palate, and tonsils. Diffuse large B cell and Burkitt lymphoma are the most common EBV associated non-Hodgkin's lymphoma that occur in the oral cavity.[9, 17] The increased frequency of non-Hodgkin's lymphoma has been reported in homosexual males and drug users who use injection methods.[17]

Oral diffuse large B cell lymphoma

Most common type of adult lymphoma representing 30% of all non-Hodgkin's lymphomas.[10] Can appear in any organ or tissue, but the most common extra nodal site is the gastrointestinal tract. Patients presents with asymptomatic masses at one or several sites. Associated with EBV in the elderly in Asia and to a lesser extent in Europe and North American.[9] EBV associated diffuse large B cell lymphomas arise in the setting of HIV and immunosuppression in transplant patients and the elderly. Polyclonal B cell proliferation driven by EBV, may regress after restoration of immune function.

There are different clinicopathological subtypes namely, EBV associated diffuse large B cell lymphomas- (discussed above), Kaposi sarcoma herpesvirus (HHV8)- tumour arising within the pleural cavity, pericardium, and peritoneum and lastly the mediastinal large B cell lymphoma-in young women, tends to spread in the abdominal viscera.

One third of diffuse large B cell lymphomas have a BCL6 gene rearrangement. EBER positive cells vary with a presentation of 20 to 50% being positive of EBER cells, this can serve as a marker for this tumour.[9] EBV positive DLBCL carries lower frequency of P53 mutation, however it has a poor prognosis, and has increased macrophages infiltration in relation to the EBV negative type.[9]

EBV positive DLBCL is aggressive and carries a poor prognosis in comparison the EBV negative DLBCL.[10] Without treatment they are rapidly fatal. A combination therapy of chemotherapy and anti-CD20 immunotherapy can achieve complete remission in 60-80% of patients. Stem cell transplantation can be used in cases that do not respond to a combination therapy.

Oral lymphomas in the immunocompromised host

Immune suppression due Acquired immune deficiency syndrome poses an increased risk of lymphomas.[9] Recent studies have shown the synergistic role of EBV and HIV in laymphomagenesis, where HIV induces immune dysregulation that increases the EBV infected cells pool.[10] HIV infection present with high level of B cells activation, if those cells are already infected by EBV the load will increase exponentially.[10, 11] Before the introduction of antiretroviral therapy patients with AIDS presenting with a 60-200 fold increase in development of lymphomas compared to HIV negative individuals.[10]

A study done in HIV-positive persons in South Africa demonstrated a marked increased risk of Plasmablastic lymphoma development.[18] EBV has been isolated in about 70% of those lymphomas.[9, 18]

PLASMABLASTIC LYMPHOMA

Plasmablastic lymphoma is a variant of Diffuse B cell lymphoma with immunoblastic morphology associated with latent EBV infection. Plasmablastic lymphoma present as an aggressive oral lymphoma that occurs in the oral mucosa and jaws of patients with AIDS causing local soft tissue and hard tissue destruction.[9, 17] Less commonly affected extraoral sites are gastrointestinal tract, skin and lymph nodes.[18] There are variants that have been described in immunocompetent individuals.[18]

Histopathological features include a diffuse immunoblasts like large cells with notable plasmacytic differentiation. The presence of EBV encoded RNA confirms plasmablastic lymphoma. VS38c marker is expressed in all Plasmablastic lymphomas.[16, 17] Plasmablastic lymphoma carries a poor prognosis although some patients can still experience better clinical outcomes with introduction of highly active anti-retroviral therapy containing protease inhibitors. Overall survival rate of less than 1 year.[17, 19]

Post-transplant lymphoproliferative disease (PTLD) In patients who undergo organ transplant, a life-threatening complication can be post-transplant lymphoproliferative disease (PTLD). PTLD comprises of spectrum of disorders ranging from benign polyclonal lymphoid proliferation to malignant/clonal lymphomas.[9] WHO classifies the PTLD according to their histopathological appearances and clonal characteristics namely, Non-destructive PTLD- non clonal, Polymorphic PTLD-clonal, Monomorphic PTLD- clonal and classified according to the lymphoma they correspond to Classic Hodgkin lymphoma PTLD- clonal. PTLD occurs mainly in gastrointestinal tract and a few cases have been observed on the gingiva, hard palate, and tongue.[9] Latent EBV associated with 80% of PTLD.

PTLD risk is associated with the EBV status of the patient, age, duration and type of immune suppression, and type of organ transplanted.[9] The decreased cytotoxic T-cell surveillance caused by immunosuppression in patients with PTLD also facilitates the actions of EBV.[19] Symptoms of PTLD may include infectious mononucleosis(tonsilitis, pharyngitis, fever, fatigue), hepatic and haematological disorder, and organ specific disease.[10] Investigations such as in situ hybridisation show EBV micro-RNA and EBNA. EBV viral load can be used as a screening tool for early detection of PTLDs. Monitoring patients who received transplants from EBV seropositive donors is essential as this could be the

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1st encounter to the virus leading to symptomatic disease.[10] European guidelines recommend weekly follow-up from the first week to the fourth month after transplantation followed by monthly or bimonthly monitoring for 1 year. Sudden increase in EBV DNA can be indicative of PTLDs.[10]

CONCLUSION

Because EBV-related entities can resemble many well-known clinical entities, it's critical to have a high index of suspicion and to be aware of the broad range of diseases and/or cancers that can be associated with EBV.[10, 16] It is impossible to overstate the significance of understanding the many serology markers and how to interpret them.

Since EBV has a global infection rate of over 90% and no clinically licensed prophylactic vaccination exists as of yet, new approaches to prevent infection and related disorders are required.[20] The variability of viral glycoproteins across individuals poses a challenge to the precise mechanisms behind viral entrance processes. One of the most commonly spread viruses in the world, EBV is linked to several autoimmune conditions as well as cancer and continues to be a major health concern.[5]

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CPD questionnaire on page 224

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What's new for the clinician – summaries of recently published papers (May 2024)

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Edited and compiled by Prof V Yengopal, Faculty of Dentistry, University of the Western Cape

1. Can concentrated growth factor prevent postoperative complications of impacted third molar surgery? A split-mouth randomised double-blind trial

Extraction of impacted mandibular third molars is often associated with several postoperative complications such as bleeding, pain, swelling, trismus, nerve injury and alveolar osteitis.[1] Additionally, alveolar bone defect distal to the second molar is a common sequela after impacted third molar extraction.[1]

The causes of such sequelae are presumed to be due to pericoronitis, difficulty of operation, duration of surgical procedure, peri-operative infection and so on. Besides adopting a minimally invasive surgical procedure and conscientious peri-operative care, other strategies have been utilised to minimise the risk of complications and limit their intensity, such as drug therapies, laser treatment and blood concentrates which have been shown to decrease inflammatory signs and symptoms after mandibular third molar surgery.[1]Growth factors are considered as the best tissue regenerative stimulus, which have been clinically proven to promote wound healing and tissue regeneration.[1] Platelets are one of the major resources of autologous growth factors. Platelet concentrate (PC) products have developed from platelet-rich plasma (PRP) and platelet-rich fibrin (PRF), to the third autologous generation-concentrated growth factor (CGF).[1] It is a biomaterial providing a sustained release of various growth factors, including transforming growth factor β-1(TGF β-1), platelet derived growth factor (PDGF) and vascular endothelial growth factor (VEGF). In addition, several pro- and anti-inflammatory cytokines can also be produced by CGF, such as tumour necrosis factor-α (TNF-α), interleukin 4 (IL-4), interleukin 6 (IL-6) and interleukin-1 β (IL-1β).

There has been very little research into the effects of concentrated growth factor (CGF) on postoperative complications and tissue remodelling following third molar extraction.[1] Haung and Xu (2024)[1] reported on a randomised clinical trial that sought to determine whether local application of CGF in the extraction socket could minimise postoperative complications, as well as hard tissue regeneration in patients who underwent mandibular third molar extractions.

MATERIALS AND METHODS

A split-mouth randomised double-blind clinical study was performed among 25 patients (50 sites) requiring bilaterally impacted mandibular third molar extractions at a hospital in China.

All the patients had undergone clinical and radiographic examination preoperatively. Inclusion criteria were as follows: (1) patients aged between 18 and 35 years; (2) patients having bilaterally impacted mandibular third molars in comparable positions (mesioangular or horizontal); (3) good oral hygiene and CPI is no more than 3; (4) absence of systemic diseases such as hypertension, diabetes mellitus, systemic endocrine disorders, kidney diseases and osteoporosis; (5) coagulogram showing normal platelet count (150,000-400,000 p/mm^3); (6) cooperative participants able to attend follow-up appointments.

Exclusion criteria were: (1) pericoronitis in the surgical region; (2) periodontal disease at the time of operation; (3) absence of adjacent second molars; (4) antibiotic or steroid use in the previous three months; (5) patients under orthodontic treatment; (6) smokers or alcoholics; (7) women during the period of menstruation, pregnancy or lactation

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Randomisation was performed by coin toss to choose the test and control sites before the commencement of surgery. CGF was placed in the extraction socket and the socket was sutured (test group), while the contralateral socket was only sutured (control group). Each patient acted as their own control. The surgical procedure, from administering local anesthesia to extraction of the two teeth, was carried out by the same surgeon who was blinded to the CGF placement site to avoid performance bias. To blind the patients regarding the site in which CGF was inserted, they received dark glasses and the second operator manipulated both sockets in the same manner simulating insertion of CGF in both sites. The evaluation and analysis of outcomes were performed by the same assessor who was also blind to the randomisation of the groups until study completion, ensuring the concealment of the allocation sequence at the time the patients were recruited.

CGF was prepared according to the technique described by Sacco.[1] Fresh venous whole blood was obtained from the patients in sterilised 10ml tubes without anticoagulants, which was centrifuged immediately using CGF centrifuge equipment under the following measures: 2 min at 2,700rpm, 4 min at 2,400rpm, 4 min at 2,700rpm and 3 min at 3,000rpm. After the procedure, there were three layers in the tubes: the upper layer containing platelet-poor plasma (PPP), the middle layer containing growth factors and unipotent stem cells and the lower layer containing red blood cells (RBC). The CGF clot was taken out of the tube after centrifugation and separated from the red blood cells using scissors.

Patients underwent bilateral surgical extraction at the same appointment using a standardised approach. An incision in the distal region of the gingival sulcus of the second molar and an oblique mesial side incision were applied and the mucoperiosteal flap was raised. The third molars were luxated and extracted using elevators. The bone, soft tissue residue and debris in the sockets was removed. The sockets were then thoroughly irrigated with sterile 0.9% saline. On the test site, CGF clot was placed in the socket, while on the control site, there was no application to the extraction socket. Primary closure of both extraction sockets was performed with 4/0 atraumatic silk sutures. Postoperatively,

all patients were prescribed antibiotics (amoxicillin, 500mg, 8 hourly for 3 days) and mouthwash (0.2% chlorhexidine twice daily for 7 days). Patients were told about the postoperative instructions and periodic follow-up. Sutures were removed on the seventh postoperative day.

The primary outcome were pain and facial swelling on the first, third and seventh postoperative days. Pain was assessed by visual analogue scale (VAS). Facial swelling was first measured before surgery as the baseline. The secondary outcomes were bone healing in extraction sockets through the evaluation of alveolar bone height (ABH) and alveolar bone density (ABD) by cone beam computed tomography (CBCT) immediately after extraction and after three and six months. The radiographic variables were ABH and ABD on CBCT images immediately after extraction (at baseline) and after three and six months.

RESULTS

A total of 25 patients, 12 female and 13 males, with an age range of 18 to 35 years (mean age 29.17 ± 5.32 years), underwent bilateral mandibular third molar extraction surgeries ($n = 50$). Each patient acted as their own control. There were no significant differences between groups in age, gender, operation duration and the baseline study variables ($p > 0.05$). The surgeries were well accepted by all patients, and there were no serious adverse effects such as infection, alveolitis, paraesthesia or fracture through the follow-up period in all of the cases.

The test group showed a statistically significant decrease in the VAS scores on the third and seventh postoperative days as compared to the control one, although there was no statistically significant difference in the VAS scores between the groups on the first postoperative day (third day, $p = 0.009$; seventh day, $p = 0.039$). The mean values of the facial swelling level were slightly lower in the test group than the control group postoperatively, but no statistically significant difference was found ($p > 0.05$).

Although CBCT evaluation showed significantly higher ABH and ABD of both groups after three and six postoperative months compared to the baseline (immediately after extraction), there were no statistically significant differences in ABH and ABD between the CGF and control groups at different time intervals ($p > 0.05$).

CONCLUSION

The researchers found that the local application of CGF had a positive effect on postoperative pain relief after the extraction of mandibular third molars even though CGF does not add any advantages in minimising facial swelling and promoting bone generation compared to natural healing.

IMPLICATIONS FOR PRACTICE

CGF is recommended during third molar extractions due to its good biological effects, low cost and simple preparation procedures.

REFERENCE

Huang C, Xu Y. Can concentrated growth factor prevent postoperative complications of impacted third molar surgery? A split-mouth randomized double-blind trial. Clinical Oral Investigations. 2024 Apr 1;28(4):234.

2. Complementary and alternative therapies for managing postoperative pain after lower third molar surgery: a systematic review and network meta-analysis

Lower third molar surgery (LTMS) stands out as a procedure often associated with the highest incidence of postoperative complications in dentistry. Thus, oral surgeons are keenly int erested in strategies to mitigate these complications, particularly postoperative pain, which ranks as the most significant issue, followed by swelling, trismus, paraesthesia, anesthesia, dysesthesia, hyperalgesia and allodynia.

Many approaches have been explored to identify optimal methods for controlling postoperative pain following LTMS, including pre-emptive analgesia, postoperative analgesia and intrasocket interventions.[1] Pre-emptive and postoperative analgesia have been well established in the literature, testing a range of medications such as corticoids or non-steroidal anti-inflammatory drugs, which demonstrated efficacy. Intrasocket interventions, specifically platelet-rich fibrin (PRF) and chlorhexidine, have also emerged as favourable choices for controlling postoperative pain. Despite conventional methods, a substantial number of patients report moderate to severe pain in the initial days following LTMS.

In this context, alternative and complementary medicine presents itself as a potential avenue for enhancing postoperative pain control. Techniques such as lower-level laser therapy (LLLT), kinesio tapping (KT), ozone therapy (OT), ice compression and acupuncture, commonly used in other medical domains to manage pain, are now being explored for their applicability in the context of LTMS.
This systematic review aimed to assess whether alternative or complementary treatments, when compared to placebo or non-treatment, can indeed reduce postoperative pain after LTMS.

METHODS

The present systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines, with extension for networking meta-analysis (PRISMA-NMA). Electronic databases were searched: Embase, MEDLINE (PubMed) and Cochrane Library. Clinical trials and the grey literature (Google Scholar) were also assessed to find potential ongoing and unpublished studies. The search strategy in each database was conducted up to May 2022. There were no publication date and language restrictions. Reference lists of previous systematic reviews and of primary studies were also verified.

Two authors performed the search process independently. After duplicates removal, titles and abstracts of the retrieved references were screened. Those not fulfilling the eligibility criteria were removed. The remaining references were assessed in full to confirm their inclusion, following the PICOS question: **(P)** healthy (ASA I or II) patients who underwent asymptomatic impacted lower third molar surgical removal; **(I)** alternative non-pharmacological therapies such as acupuncture, LLLT, KT, massage, cryotherapy, OT, heat therapy, pulsed electromagnetic field

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therapy, lymph drainage etc; **(C)** placebo therapy or non-treatment; **(O)** postoperative pain at first, second, third and seventh postoperative days; **(S)** human randomised clinical trials (parallel or split-mouth designed). At this stage, more articles were excluded and the reasons were recorded.

Exclusion criteria comprised studies in which the primary condition was not the removal of a third molar, and when teeth other than third molars were also extracted. Any disagreement between the two authors in the study selection process was solved consulting a third author.

The same two authors independently extracted data from the included studies based on a previous designed extraction data form. Collected data comprised: author and year of publication, country of origin, study design (parallel or split-mouth), sample size, sex, mean age, third molar extracted in each surgery, type of anesthesia (local or general), drug protocol, tested treatments and evaluated outcomes. If necessary, the authors of the included studies were contacted for any important missing data.

The risk of bias of the included studies was assessed through the Cochrane risk of bias tool of parallel or crossover randomised trials (RoBs 2). The checked domains were: (1) randomisation process, (2) deviations from intended interventions, (3) missing outcome data, (4) measurement of the outcome, (5) selection of the reported results. Each domain has some questions generated by an algorithm. At the end, the overall risk of bias was classified as low, unclear or high.

The web application Confidence in Network Meta-Analysis (CINeMA) was used to assess the certainty of evidence by results from networking meta-analysis. In this system netmeta package from R System was used to analyse heterogeneity and relative effect from studies. The assessment involves the following six domains: within-study bias; reporting bias; indirectness; imprecision; heterogeneity; and incoherence. Each domain was judged as no concerns, some concerns or major concerns. Thus, judgments across the six domains were summarised in four levels of confidence: very low, low, moderate or high.

To perform statistics for pain, the type of alternative treatment, mean pain value, standard deviation and number of participants in each treatment group were extracted from the included RCTs. First, pairwise meta-analysis was performed to compare placebo to each type of treatment and verify the effectiveness of interventions. Then, three Network meta-analyses (NMAs) were performed: the first one with placebo or no-treatment as the comparison group; the second with only placebo as the comparison group; and the third one with only no-treatment in the comparison group.

RESULTS

A total of 1,965 papers were initially identified. After duplicates removal, 1,280 papers underwent screening. Initially, 1,090 papers were excluded based on the reading of titles and abstracts. Subsequently, 82 papers were included in the qualitative analyses and 33 of these integrated into the meta-analysis. Twenty-one papers were split-mouth trials and 12 were parallel RCTs.

A cohort of 4,575 individuals underwent third molar surgery. From these, 1,428 participants were considered for the Network meta-analysis (NMA). NMA revealed that drainage tube and kinesio-taping were superior in controlling pain 24 hours postoperatively than no treatment. At 48 hours' follow-up, kinesio-taping and LLLT (laser) were more effective than placebo and drainage tube; and kinesio-taping and LLLT were superior to no treatment. At 72 hours postoperatively, ozone therapy was superior to placebo; and drainage tube, kinesio-taping and LLLT were better than no treatment. At seven days' follow-up, ozone and LLLT were superior to placebo; and LLLT (laser) and kinesio-taping were superior to no treatment. The SUCRA-ranking placed drainage tube was the top-ranking intervention at 48-hour (98.2%) and 72-hour (96%) follow-ups, and ozone (83.5%) at the seven-day follow-up.

CONCLUSION

The review findings suggest that these alternative and complementary therapies may be useful in reducing postoperative pain after lower third molar surgeries, and may offer advantages when combined with traditional pain management methods.

IMPLICATIONS FOR PRACTICE

This review found that some of these alternate therapies, specifically kinesio-taping and drainage tube, were effective in controlling postoperative pain after third molar surgeries. These findings have important implications for clinical practice as they highlight the potential benefits of incorporating these therapies into postoperative pain management plans.

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CPD questionnaire on page 224

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Supersession: Collegiality to the rescue

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MI Makoea[1], ML Machete[2], T Bapela[3], PD Motloba[4]

BACKGROUND

An extensive search of the literature shows a huge dearth in scholarly opinion on supersession. The debates surrounding supersession have evoked deep emotions and polarised the cadres of oral health. Allegations of practitioners completing dental treatment on a patient without consulting the original dentists are rife. We speculate that this concept is unknown, poorly explained and understood, hence the difficulty to implement it in different clinical scenarios. A random survey of oral health professionals was undertaken to canvass views, opinions and understandings of the concept and application of supersession. The findings indicate a multiplicity of viewpoints and understandings of supersession. Additionally, Rule No 10 of the HPCSA was considered to be unclear, "murky" and less instructive on how to avoid supersession. For these reasons, practitioners tend to act out of sync with the expected provisions from the regulator. It is hence the objective of this paper to provide very clear criteria and a roadmap in dealing with alleged supersession.

EXPLORING RULE NO 10 OF THE HPCSA: SUPERSESSION

1. Unpacking the legislative expression of Rule No 10

Definitions of supersession

Supercession and supersession are homophones often and erroneously used interchangeably, despite their distinct meanings and contextual applications. Fundamentally, these words involve the replacement of one thing by another. Supercession is a term commonly encountered and used in fields such as law, philosophy and theology. It describes the act of replacing one law, philosophy or doctrine with another. In such cases, the new law or theory may eventually render the older law or doctrine obsolete. Supersession has a more specific meaning, referring to the act of replacing one thing with something that is considered superior or more advanced. Supersession is not gradual, but abrupt and less tolerant of engagement with the status quo, as it seeks to displace or take the place of something or someone completely. For example, the innovation may replace, supersede or supplant the older technology, rendering it obsolete.

The definition of supersession in health care is based primarily on Rule No 10 of the HPCSA, which states that "a practitioner shall not supersede or take over a patient from another practitioner if he or she is aware that such patient is in the active treatment of another practitioner".[1,2] This legal pronouncement bestows rights while also imposing limitations on the same rights under specific conditions. The above regulation permits the taking over of a patient from another practitioner but imposes conditions under which the takeover can happen. Therefore, the conduct becomes supersession only when the limitations are infringed. Most notable is the use of the negatively worded expression "shall not" which imposes an absolute and mandatory obligation to refrain from doing something. It is not uncommon for legislation to forbid rather than permit. Other definitions of supersession exist, providing different impositions and prohibitions. For example, the Department of Trade, Industry & Competition provides that "should a practitioner take over the care of a patient, such practitioner has an obligation to inform the erstwhile practitioner, prior to proceeding with any treatment, or such take over".[3] This definition does not forbid or restrict takeover but imposes conditions to be satisfied for the takeover.

Similarly, McQuoid-Mason emphasises two conditions that are necessary for supersession to occur. According to McQuoid-Mason, supersession is the "practice of taking over the patient of another doctor without informing the other practitioner in situations where the patient has not terminated the other healthcare provider's services".[4] The similarities, differences and points of emphasis in the definitions of supersession above highlight the nuances and complexity of this concept. To fully understand the legal expression of Rule No 10 and the definitions above, we invoke George Coode's system.[5] This formulation divides the language of the written law into performative and deontic declarations, which confer and describe the obligations or permissions respectively. Coode's system further simplifies a legal sentence by suggesting four parts: (i) the case or the circumstance in which the legal action applies (ii) the legal subject, which details the person to whom rights and obligations are conferred; (iii) the legal action, rights and obligations conferred; and (iv) the condition, which details what must be done for the legal action to arise.

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4. PD Motloba – conceptualisation, writing and final review (25%)

Application of Coode's system to Rule No 10 about supersession

Applying Coode's system framework to Rule No 10 raises critical questions which, in our view, are the crux of the debate about supersession. Clear, unambiguous clarification of these questions is a prerequisite to understanding and interpretation of the rule.

The case: supplant behaviour, supersession or taking over of a patient has occurred (averred or definite).
Legal subject: (1st) practitioner from whom the patient was taken over by the 2nd practitioner.
Legal action: lodging a complaint with the regulator (HPCSA) by 1st practitioner.
The conditions to be satisfied: (i) the patient is receiving active treatment; or (ii) the patient has not terminated treatment, (iii) the 2nd practitioner is aware of the nature of the treatment.
The multiplicity of definitions of supersession are instructive in providing clarity to the concept. However, the primary reference in understanding supersession should be based on Rule No 10 of the HPCSA.

2. Decoding the definitional elements of Rule No 10, of the HPCSA

The essence of supersession is intricately immersed in the following conditions as defined by George Coode: (i) active treatment; (ii) practitioner's awareness; and/or (iii) taking reasonable action. We provide below a clarification of the elements.

The concept of active treatment in dentistry

What is active treatment in the context of oral and dental care?

An extensive search of the literature did not yield any comprehensive definition of active treatment. However, according to the Thesaurus, the word "active" is defined as "effective", "functioning", "progressive", "efficacious", "in force" and so on. While treatment means any intervention given to the patients seeking relief from dental and oral health challenges. Therefore, active treatment can be defined as an ongoing, effective intervention aimed at providing efficacious outcomes. On the contrary, passive treatment would be treatment that is unlikely to produce effective results for the patient because it is not progressing or has stalled. We are safe to assume that the beginning of active treatment follows any intervention given to a patient to address the ailments diagnosed by the practitioner. The intervention may include consultation, counselling, medication, surgery or any other intervention. The treatment can be scheduled for a specific period or in perpetuity, depending on how the patient responds to the treatment. Yet, treatment must end at some point. Either the patient recovers, or treatment is considered ineffective, in which case a new regime must be given as a continuation or beginning of new treatment. For the sake of this paper, a change in treatment for the same ailment is still ongoing treatment. In cases where the patients recover from the ailment, it is good clinical practice for the practitioner to have a final, closing consultation with the patient to counsel them about self-care and future consultations should the need arise. This critical final engagement with the patient marks the end of active treatment by the practitioner. Active treatment could be based on a single intervention for a complaint or the entire treatment plan.

Does active treatment encompass the entire "planned" treatment or is it based on procedures?

Dental treatment is based on individual procedures which form part of a planned treatment for the patient. For example, a patient might need management of an active infection before rehabilitation. The planned treatment will invariably include scaling, polishing and root planning to manage periodontal problems. Additionally, direct restorations might be indicated to arrest ongoing dental caries. Lastly, orthodontic and/or full prosthodontic mouth rehabilitation will be provided to complete the planned treatment. It is critical for practitioners to complete individual procedures in pursuit of finalising the planned treatment. Extraneous factors often hamper the completion of treatment plans within the scheduled timeframe. Hence the importance of completing procedures rather than a treatment plan. Imagine an orthodontic patient whose appliances have not been activated in more than six months. Can a treating orthodontist claim that the patient is on active treatment? Or can he be charged with patient abandonment and neglect? Prima facie, such a patient is not on active treatment; instead, the orthodontist has failed in their duties to complete the procedure and has neglected the patient. Other factors, such as compensation, do not form part of the supersession. Unfortunately, many practitioners tend to invoke finances and the failure of patients to compensate as a defence for stalling or terminating treatment.

When is a specific dental procedure or treatment completed?

When does dental treatment begin and end? Generally, a procedure is completed once a patient has been recalled following the intervention. This consultation allows for the practitioner and patient to share the notes and review the treatment, how the patient is progressing and any other related issues. If the expected patient and practitioner outcomes have been achieved, the patient is discharged to practice self-care. If not, changes and adjustments are made to the planned treatment, and the patient is followed up until they settle into their new and restored dental status. Though uncommon in practice, it is good clinical practice for a patient to return to the practitioner following an extraction, restorations, scaling and polish, or after delivery of a prosthesis or even surgery. Due to unrelated and compelling social, economic and health system issues, most patients never report for their recalls, nor do practitioners insist on recall as part of treatment.

What about emergency dental treatment?

A patient consults a dentist due to a complicated crown fracture and pulpal exposure. The dentist performed emergency root canal treatment (ERCT) and restoration on the tooth. The patient was discharged and never went back to the dentist to complete the treatment. Three months later, the patient consulted another dentist with definite signs of pulp necrosis and infection of the root canal system. The patient was treated and advised to return to complete the treatment. Does the emergency dental treatment constitute a complete intervention? Is the second practitioner supplant in providing care without informing the first practitioner? While it is preferable for the patient to visit the first practitioner for further care, Section 5 of the National Health Act imposes an absolute obligation on the second practitioner to treat and not abandon any patient presenting with a dental emergency. Therefore, dental emergencies, as per the National Health Act and Section 27(3) of the Constitution,

are not a necessary condition for supersession. In the case of ERCT, there cannot be an expectation from the first practitioner; consequently, the second practitioner will not be "taking over" the patient from "another" since the patient will not be in "active treatment". In other words, emergency treatment cannot be classified as active treatment as per Rule 10 of the HPCSA.

SUMMARY

Active treatment involves ongoing, effective intervention based largely on the procedure(s) undertaken by practitioners, inclusive of recall. It is incumbent on the practitioner to inform the patient about these processes, including their responsibility in completing the treatment. Except for dental emergencies, dentists must take reasonable steps to liaise with other practitioners before treating any patient.

Can a practitioner be unaware of a patient's active treatment?

Is it possible, permissible or justifiable for a practitioner to be unaware of continuing patient treatment? It is very unlikely for a practitioner to be unaware of an ongoing patient's dental treatment. We argue that a good rapport with the patient is the first step in fully managing any patient. Intimate and personal information is shared when the patient trusts their dentist. Lack of trust and confidence can result in patients withholding critical information, thereby compromising patient care. A full and comprehensive medical and dental history and clinical assessment are prerequisites for any dental treatment planning. Meticulous records allow dentists to reach a proper diagnosis and document historical and current conditions. It is therefore possible, but not permissible or justifiable, for a practitioner to be unaware of ongoing dental treatment. If in doubt, previous practitioners should be contacted to provide further clarification and information. It might not be justifiable or reasonable for a dentist to be unaware of a patient's active treatment.

THE NOTION OF REASONABLE(NESS) IN RULE No 10

According to Rule No 10: A practitioner shall not supersede or take over a patient from another practitioner if he or she is aware that such patient is in active treatment of another practitioner, unless
he or she takes reasonable steps to inform the other practitioner that he or she has taken over the patient at such patient's request.

What does the expression "reasonable" steps mean?

Rules, legal instruments and case law are replete with the notion of reasonable(ness). It suffices to say that every stage of judicial reasoning is laced with the notion of reasonable(ness).[6,7] Whether it is the determination of facts, qualification or interpretation of rules, the notion of reasonable(ness) is reminiscent of similar notions such as equity, fairness, justice, adequate, averageness, welfare maximisation, normality and good to ideal.[6-8] Yet again, the notion of reasonable is profoundly ambiguous and should be treated as such. The International Court of Justice in its ruling stated that "what is reasonable and equitable in any given case must depend on circumstances".[10] This means the court could not ascertain the meaning of reasonable(ness), since it depended on circumstances. At the same time, the court could draw a formulation to judge what is reasonable given the circumstances of a particular case. It appears, therefore, that the notion of reasonable(ness) is both definable and undefinable or an indication of an agreement or a lack of agreement. Nonetheless, reasonable(ness) remains the standard of review used to determine the constitutionality or lawfulness of an act or rule. Reasonable(ness) serves to judge whether an act or rule is justifiable vis-à-vis the desired outcomes and the constitutional rights to be protected. This substantive model of reasonable(ness) assumes a causal link between a legitimate objective sought and the behaviour that one seeks to establish as reasonable. Given the explanation above, what criteria would be considered in assessing whether the behaviour of the practitioner (steps or measures taken) is "reasonable" or "adequate"?

- The extent to which the measures taken were deliberate, concrete and targeted towards the fulfilment of objectives. In other words, were the steps taken rational and justifiable?
- Were the channels of communication used appropriate and deliberate?
- In contacting the other practitioner, were the steps followed fair and equitable?
- Whether the practitioner exercised his discretion in a nondiscriminatory and nonarbitrary manner? In other words, the steps taken did not limit or violate the rights of the practitioner and the patient.
- Whether the steps taken considered the prevailing circumstances of the other practitioner.
- The time frame in which the steps were taken is acceptable.

Application of reasonable(ness) to Rule No 10 of the HPCSA

The analysis of reasonable(ness) must be cautious beyond mere technical and dogmatic approaches. Instead, a more pluralistic view must embrace legal, philosophical and sociological approaches in the quest to develop a broader view of reasonable(ness). The character of reasonable(ness) is thus best assessed or predicted by interrogating what is relevantly average and ideal together, rather than by average and ideal alone. This viewpoint presents a spectrum from the "average" to the "ideal or prescriptive".[7,8] This means judgment will be based on what is common and expected to what superlatively maximises welfare, and entrenches professional values, is virtuous, ethical and respects rights. In our case, analysing whether a practitioner took reasonable steps should include a combination of the following factors:

- Did the practitioner act like an average dentist would act, or like an ideal practitioner ought to act?
- Did the action of the practitioner result in benefit for the patient? Were the cost benefit or efficiency considerations met?
- Did the action cause harm to the practitioner or the profession?
- Did the practitioner, on average, act appropriately in all respects?
- Did the practitioner act like a person who cherishes or pursues high and noble principles, purpose or goals? Idealism constitutes the extreme end of reasonable(ness).

To the best of our knowledge the notion of reasonable(ness) has not been tested in dental practice. Extensive research is necessary to provide case law and precedence on the interpretation of reasonable(ness) in allegations of supersession.

The interactions between practitioners as a moral necessity.

We argue that the 2nd practitioner is not legally or morally

obligated to contact the 1st practitioner as a matter of compliance. In fact, there is no mutual reason or requirement for the 2nd practitioner to inform the first that "your" patient is seeking treatment at my establishment. Beneficence and nonmaleficence create the moral necessity for the practitioners to interact in the best interest of the patient. As indicated in Rule No 10, the objective of communication between the practitioners is to ensure that the treating practitioner is well informed about the patient's diagnosis, prognosis and treatment. The 2nd practitioner does not require permission to treat but needs adequate clinical information to provide the best care. Practitioners ought to recognise that the absolute reason for engagement is to ensure the continuity of care and the best clinical outcomes for the patient, nothing else. This need to interact is underpinned first by the principle of medical beneficence,[9,10] the moral obligation of the practitioner to act for the benefit of the patient. Second, nonmaleficence,[11,12] or the obligation not to cause harm, pain, suffering, offend or deprive of a good life. Third, the promotion of a patient's overall health and wellbeing.[13]

Termination of dental treatment as a triumph of autonomy

The principle of autonomy guarantees the patient's absolute agency which implies, *inter alia*, that the patient can terminate treatment at any point during care.[14] However, certain safeguards such as competence, voluntariness and informed consent must be satisfied *apriori*. Once these conditions are met, the patient cannot be impeded from terminating their relationship with the treating practitioner. On the contrary, incompetent patients must be protected from making irrational decisions including the termination of care. In such cases, paternalism is justifiable, advisable and necessary. According to Rule No 11 of the HPCSA, a practitioner has a duty "not to impede his/her patients from obtaining an opinion from another practitioner or from being treated by another practitioner".[1] Hence the debate over whether a practitioner can truly take over a patient from another practitioner or patients can consult whichever practitioners they choose. We believe that, within reasonable limits, the patient has the absolute and uncontested right to consult a practitioner of their choosing. The protection of the respect for autonomy in dental practice is the first step towards a dentist-patient relationship and shared decision-making.[15]

CONTRACTS, COMPENSATION AND SUPERSESSION

The consensus between the patient and practitioner about the nature of the service and commensurate compensation creates an obligation. This obligation becomes a valid legal contract once signed voluntarily by the consenting patient. This formalisation of the contract establishes rights, assigns responsibility and apportions accountability in case of a breach.[16,17] Yet most contracts are implied or tacit, because patients arrive in dental practices and are summarily attended to without clear and valid agreements. It is therefore advisable for practitioners to conclude a valid and legally binding contract before commencing with treatment.[17] The contract must include a clause that deals specifically with breach. Breaching of a contract may occur when (i) the patient unilaterally terminates treatment without agreement with the treating practitioner; or (ii) if the practitioner fails to provide the expressly guaranteed care.[18] Notwithstanding the latter, patients have uncontestable moral agency to make unilateral decisions about their care, including the termination of treatment. However, such a decision does not absolve the patient from their contractual obligations or invalidate the contract. The patient is duty-bound to fulfill their contractual obligations and compensate the clinician for their service, especially financial debts. Similarly, the practitioner cannot impede the patient from seeking care from another practitioner. Instead, the clinician can invoke all manner of avenues to recover the monies owed for the service provided. However, practitioners often resort to (i) withholding continuity of care; (ii) refusing to provide records to the second practitioner; and (iii) alleging that supersession has occurred. The actions of the practitioners as described above also deviate from the contract and may be deemed unethical. Anecdotal evidence suggests a plausible correlation between alleged supersession, amount of unpaid dental bills, type of service provided and nature of practice. Interestingly, practitioners in the public sector are seldom accused of supersession compared to colleagues in the private sector. Why? It is possible that supersession is largely attributable to economics and other material interests that pervade the private sector. During our illustrious years of public service, there has not been any allegation of supersession; instead, private practitioners are willing to refer their patients to the public sector when patients' dental benefits run out. Our study did not evaluate factors associated with the spade of the alleged supersession. While extensive research is critical in understanding the root cause of supersession, practitioners should always have a formalised valid contract to protect their financial interests in case of a breach.

COLLEGIALITY TO THE RESCUE

Supersession is a mere codification and an attempt by the HPCSA to regulate practitioner behaviour and enable the regulator to mete out sanctions and apportion responsibility in line with the law of delict. We contend that collegiality is a more profound and fundamental mechanism to inculcate communal values in the health profession.[19] Collegiality is more than just being "gentlemanly" and "polite" towards another colleague.[20] Collegiality is a "special relationship among doctors based on a common pursuit for medical excellence and a desire to provide good patient care".[21] Collegiality is also characterised by "respect for one another's professional abilities, a genuine humility to accept constructive criticism and learn from one another, and an eagerness to help and serve one another".[19-21] Regrettable factors such as heavy workload and pressure, and a highly competitive clinical environment have contributed to the pervasive uncollegial behaviour among oral health professionals.

Ultimately, interprofessional collegiality improves patient care and enhances clinical outcomes. No clinician can do "it alone".[22,23] Professionals should work closely with each other, having mutual respect for the knowledge, competence and skills that each brings to the provision of patient care.[21,24] Collegiality is the best antidote for supersession. No form of regulation can eradicate uncollegial behaviour among colleagues. The values of mutual respect and cooperation should be encouraged and incorporated into the dental curriculum for future professionals.

CONCLUSION

Taking over a patient is not *prima facie* supersession. Based on Rule No 10, the following conditions are necessary and jointly sufficient for suppression to occur: (i) the practitioner takes over a patient from the other; (ii) the patient is in active treatment; (iii) the patient has not terminated treatment; (iv) the practitioner is aware of ongoing active treatment; (v) the second practitioner did not take "reasonable" steps to contact the first practitioner. How these conditions are applied in practice remains a serious challenge. The failure by a patient to settle outstanding financial debts is a breach of contract, but not a sufficient or necessary condition for supersession. A practitioner may not refuse to provide medical information to colleagues on the ground of financial breach. A review of alleged cases on supersession by the HPCSA could provide valuable insights on how this rule is implemented.

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CASE REPORT

Root development after surgical extraction of impacted right maxillary wisdom tooth

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L Merbold[1], KH Merbold[2]

INTRODUCTION

Eruption of wisdom teeth generally starts between the ages of 18-24 years, with variation in the age range. Impacted teeth are usually third molars that do not erupt into their normal place in the occlusion after their eruption time has passed. This impaction can occur due to an obstruction, lack of space or abnormal positioning. Impacted teeth can cause symptoms like swelling, pain, infection and headaches. These symptoms may be evident at any stage of development and not necessarily only during eruption periods. When this is the case, it may be indicated to remove impacted teeth surgically.[1]

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CASE REPORT

A 19-year-old female patient presented at our clinic for the removal of her third molars (18, 28, 38, 48). She experienced frequent headaches and pain in the region of the third molars. A panoramic radiograph (Figure 1) revealed that teeth 18, 28, 38 and 48 are all vertically angulated, still in the developmental stage with a follicle surrounding the crown and incomplete root development with open apices. The only difference is that tooth numbers 18, 28 and 38 were all in stage D of tooth development and mineralisation according to Demirjian (1973), while tooth 48 was in stage E with early signs of furcation development visible.[2] The patient was referred to a maxillofacial and oral surgeon who removed the 18, 28, 38 and 48 in theatre two months after the radiograph was taken.

The patient, now 26 years old, returned for yearly general check-up appointments. There were no post-treatment radiographs taken and a new panoramic radiograph (Figure 2) was taken after seven years. An incidental discovery was made of an area of increased bone density in the region where tooth number 18 was removed (Figure 2). A decision was made to take a Cone Beam Computed Tomography (CBCT) image. Fully developed roots of tooth 18 with closed apices and an absent crown was visible (Figure 3A-C).

Figure 1. A panoramic radiograph showing incomplete root development and open apices of tooth numbers 18, 28, 38 and 48.

Figure 2. A panoramic radiograph showing a radiopacity in the area of the 18 with absent tooth numbers 28, 38 and 48.

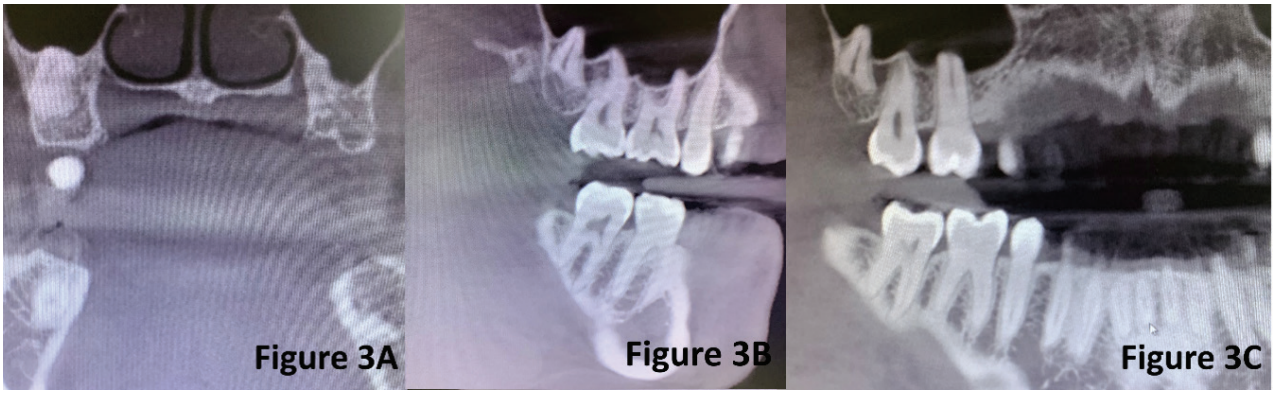

Figure 3A-C. A CBCT showing the roots of the 18 with complete absence of the crown in the coronal- (A), sagittal- (B) and reconstructed panoramic view (C).

DISCUSSION

The development of a tooth is initiated and controlled by reciprocal interaction between the dental epithelium and the ectomesenchyme.[3] A thickening of the odontogenic epithelium is regarded as the first sign of tooth development followed by the condensation of the associated ectomesenchyme. The ectomesenchyme of neural crest origin then becomes involved in the process where there is signalling between the epithelium and ectomesenchyme for the formation of the crown through the bud, cap and bell stages.[4]

Root development will only start after crown formation. This process is initiated through communication between the inner- and outer enamel epithelium of the enamel organ. It starts at the cervical loop and continues apically as a narrow sheath[5] known as Hertwig's epithelial root sheath (HERS).[6] HERS is situated between the dental papilla and dental follicle, signalling the cells of the dental papillae to differentiate into odontoblasts.[6] The odontoblasts secrete predentine that will mature into mineralised root dentine.[7] HERS is thus of critical importance to initiating root development and determining the number, shape and size of the roots.[7] If HERS is disturbed in any way it can result in complications with the root development process.[8] After dentine formation, the TGF-β1 signalling from HERS is responsible for inducing cementoblast differentiation[9] or the HERS cells themselves undergo epithelial-ectomesenchymal transformation into cementoblasts[10].

Thomas and Kollar (1989) showed that HERS could induce odontoblasts to differentiate from cells of the dental papilla only if the dental papillae already had a certain degree of commitment and exposure to signalling factors from HERS.[8] Based on this, we hypothesise that the apical aspect of HERS and the surrounding ectomesenchymal cells of the dental follicle and dental papilla might have been left intact after the surgical procedure. This could account for the continued development of the root of tooth number 18 in the presented case. For the periodontal ligament to develop and be present, like in this case, dental follicle cells also had to be present.

Although the cascade of signalling present at the apical portion of a developing tooth has not been fully explained,[10] based on the data available we can hypothesise that a root of a tooth can continue to develop even if mineralised tooth material (enamel, dentine, root cementum) is absent, but HERS and the surrounding ectomesenchymal cells of the dental follicle and pulp have to be present and is of importance for this signalling cascade to be maintained.

CONCLUSION

It is important to always inform your patient about this complication when removing wisdom teeth before root development is completed, otherwise there could potentially be a litigation case opened by a dissatisfied patient. The incidental finding and discussion of this case report highlight

the importance of adding this as a complication when removing wisdom teeth where the roots are not fully formed yet. In cases where the patient reports post-procedure pain, swelling or infection it is warranted to take radiographs. Another implication which needs to be considered is that of forensic cases following extractions.[11] Reflecting on the specific case discussed above, the finding was incidentally discovered when taking a panoramic radiograph as part of a routine dental check-up and the patient did not experience any signs and symptoms in the discussed area. The patient will be followed up to ensure there are no complications with the root and that no lesions occur around it. This was well documented in the patient's records that if a forensic case for this patient occurred, identification of the patient would be easier since the presence of the 18-root development is a distinct finding.

AUTHORS' DECLARATION

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Conflict of interest
The authors declare that they have no conflict of interest.

Ethics approval
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CPD questionnaire

Predictors of Covid-19 vaccine intent among oral health professionals in South Africa

1. **Which answer is CORRECT: 5C psychological antecedents to vaccination include the following.**
   - A. Competency
   - B. Complacency
   - C. Calculation
   - D. A and B
   - E. B and C

2. **Choose the CORRECT answer. Confidence scale (5C) assesses**
   - A. Individual's trust in vaccines safety and efficacy
   - B. Level of risk associated with vaccination.
   - C. The magnitude of vaccine hesitancy
   - D. Perception of diseases as high risk

3. **Which of the statements is CORRECT. Which statement is true about the 5C psychological antecedent factors:**
   - A. Confidence and collective responsibility are positive antecedent factors
   - B. Calculation and complacency are positive antecedents.
   - C. Constraints and complacency are positive antecedent factors.
   - D. Are evaluated using a 3-point Likert scale
   - E. None of the above

4. **Select the CORRECT option. This 5C antecedent factor is associated with higher levels of vaccine intentions**
   - A. Calculation
   - B. Complacency
   - C. Constraints
   - D. Collective responsibility

5. **Select the INCORRECT options. Which of the following is NOT a definitional element of misconduct?**
   - A. Females were more likely to vaccinate against Covid-19
   - B. Positive Covid-19 test was associated with covid-19 vaccination.
   - C. Older OHPs immunized against Covid-19 compared to younger counterparts
   - D. Influenza vaccination increased likelihood of Covid-19 vaccination 4-folds

Location of mandibular foramen in adult black South African population: a morphometric analysis and investigation into possible radiographic correlation.

6. **Select the CORRECT answer. Where is the mandibular foramen located?**
   - A. Mandibular foramen is located unilaterally above the centre of internal surface of ramus of mandible.
   - B. Mandibular foramen is located bilaterally just above the centre of internal surface of ramus of mandible.
   - C. Mandibular foramen is located bilaterally in the body of the mandible.
   - D. Mandibular foramen is located in the posterior maxilla.

7. **Select the CORRECT statement. What was the aim of the current study?**
   - A. The aim of the current study was to determine the shape of the mandibular foramen among black South African population.
   - B. To determine the size of the mandibular foramen among black South African population.
   - C. To determine the exact location of the mandibular foramen among black South African population.
   - D. To assess the location of the mandibular foramen among black South African population.

8. **What has been reported as the contributing factor to injury of inferior alveolar neurovascular bundle as well as failure of inferior alveolar nerve block?**
   - A. Varying position of the mandibular foramen.
   - B. The size of the mandibular foramen.
   - C. The shape of the mandibular foramen.
   - D. The size of the ramus of the mandible.

Cervical margin relocation in indirect restorations

9. **Select the CORRECT answer. Teeth and / or preparations for indirect restorations with deep cervical margins**
   - A. need a minimum distance of 4 mm between the restorative margins and the alveolar crest
   - B. may pose challenges with placing rubber dam
   - C. should be extracted if margins cannot be visualised
   - D. should only be referred for clinical crown lengthening if non-vital and root treated
   - E. can only be orthodontically extruded if still vital

10. **Which option is CORRECT. Cervical margin relocation (CMR)**
    - A. is also known as deep margin elevation technique
    - B. is also known as proximal box depression technique
    - C. is also known as the deep margin technique
    - D. is also known as coronal margin depression technique
    - E. none of the above are correct alternative terms

11. **Choose the CORRECT answer. Which adhesive system exhibited higher microtensile bond strength to the elevated composite margins in indirect restorations compared to direct restorations placed onto dentin margins?**
    - A. self-adhesive cement
    - B. total etch adhesive system
    - C. self-etch adhesive system
    - D. glass ionomer cement

Paediatric Inflammatory Multisystem Syndrome associated with COVID-19 infection (PIMS-TS) - Guidance for Oral Healthcare practitioners.

12. Select the CORRECT answer. The vasculitis which is characteristic of Kawasaki disease demonstrates a predilection for:

A. Coronary arteries
B. Renal arteries
C. Cerebral arteries
D. Pulmonary arteries

13. Select the INCORRECT option. Which of the following is NOT an oral mucosal change seen in patients with PIMS-TS?

A. Cheilitis
B. Glossitis
C. Ulceration of the pharyngeal mucosa
D. Vertical cracking of the lips

14. Which of the following is CORRECT. Sore throat and lip swelling are:

A. A rare manifestation of Kawasaki disease
B. A common manifestation of Kawasaki disease
C. More common in Kawasaki disease than PIMS-TS
D. Not evident in either PIMS-TS or Kawasaki disease

Evidence-based Dentistry:

15. Select the CORRECT answer. In the Haung & Xu study, double blinding included the following

A. The surgeon and the assistant
B. The assessors and the patient
C. The assessors and the statistician
D. The surgeon and the assessors

16. Select the CORRECT answer. The researchers in the Haung and Xu study found that the local application of CGF had a significant effect on the following variables

A. Post-operative pain
B. Facial swelling
C. Post-operative pain and swelling
D. Bleeding

17. Which option is CORRECT. In the systematic review, which of the following treatments were superior in controlling pain 24-hours postoperatively when compared to no-treatment.

A. LLLT and ozone
B. Ice compression and acupuncture
C. drainage tube and kinesio-taping
D. ozone and ice compression

Radiology Corner

18. Select the CORRECT statement. Which of the following is correct regarding initiation of tooth development?

A. Thickening of the odontogenic epithelium only.
B. The condensation of the associated ectomesenchyme only.
C. A thickening of the odontogenic epithelium followed by the condensation of the associated ectomesenchyme
D. The condensation of the associated ectomesenchyme followed by thickening of the odontogenic epithelium.

19. Which option is CORRECT. Choose the correct order of crown formation:

A. Cap, bud, bell stage
B. Bud, cap. bell stage
C. Bell, bud, cap stage
D. Cap, bell, bud stage

20. Choose the CORRECT option. What is of critical importance to initiate root development?

A. Hertwig's epithelial Root Sheath (HERS)
B. Odontoblasts
C. Cementoblasts
D. Cells of the dental papillae

Ethics: Supersession: collegiality to the rescue

21. Select the CORRECT statement. Supersession is

A. Recruiting a patient from another practitioner
B. Taking over a patient from another practitioner with permission
C. Taking over and treating a patient on active treatment without informing another practitioner.
D. All of the above

22. Choose the CORRECT answer. Termination of dental treatment as a triumph of autonomy

A. The patient cannot terminate treatment before it is completed.
B. under certain conditions the patient can be impeded from terminating their relationship with the treating practitioner.
C. According to Rule No. 11 of the HPCSA, a practitioner has a duty "not to impede his/her patients from obtaining an opinion from another practitioner or from being treated by another practitioner"
D. All of the above
E. A and B

23. What is the CORRECT answer? active treatment encompasses

A. Part of the treatment
B. Treatment plan
C. Procedure
D. Ongoing Procedure
E. All of the above

24. Which of the following is INCORRECT? "reasonable"

A. The notion of reasonable(ness) is reminiscent of similar notions such as equality and justice.
B. reasonable(ness) remains the standard of review used to determine the constitutionality or lawfulness of an act or rule.
C. Using channels of communication that are appropriate and deliberate.
D. All of the above
E. A and B

25. Choose the CORRECT answer. Can a practitioner be unaware of a patient's active treatment?

A. Yes
B. No
C. Maybe
D. Sometimes
E. All of the above

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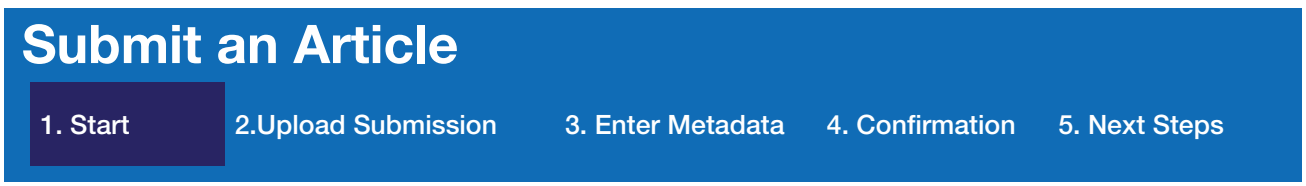

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