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International Earth Day - 22 April

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International Earth Day - 22 April

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Our Front Cover for this Issue…

The theme for the Front Cover of the South African Dental Journal this year showcases various types of masks. Masks have been admired and worn throughout the world for centuries and play an integral part of many activities including customary rituals, cultural events, battles, entertainment, and for protection. The cover for April features a mask commemorating International Earth Day celebrated on the 22nd of April. Read more on page 117.

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E-Doc CC,
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Tel: +27 (0)10 020 1013

Publisher and Project manager

Mr René Smulders

GENERAL AND ADVERTISING ENQUIRIES

Mr René Smulders
Email: rene@edoc.co.za

Design and Layout

Ms Reine Combrinck
Email: production@edoc.com

Website smalls advertising / CPD Enquiries and Member contact detail update

South African Dental Association
Tel: +27 (0)11 484 5288
Email: info@sada.co.za

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International Earth Day - 22 April

SADJ April 2021, Vol. 76 No. 3 p117

LM Sykes

In the 1969 UNESCO Conference in San Francisco, peace activist John McConnell proposed a day to honour the Earth and the concept of peace. The first such event was celebrated on March 21, 1970 to coincide with the first day of spring in the northern hemisphere. A month later the United States Senator Gaylord Nelson proposed the idea to hold a nationwide environmental teach-in on April 22, 1970.

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As the millennium approached, the Earth Day of 2000 focused on global warming and pushed for clean energy. By the time April 22 came around, 5,000 environmental groups around the world were on board reaching out to hundreds of millions of people in a record 184 countries.

Image Source: http://th06.deviantart.com

Leanne M Sykes: *BSc, BDS, MDent, IRENSA, Dip Forensic Path, Dip ESMEA,* Head of Department of Prosthodontics, University of Pretoria, South Africa. Email: leanne.sykes@up.ac.za

It was also the first year that Earth Day used the Internet as its principal organizing tool, which added to its international spread and success.

Earth Day 2020 marked its 50th Anniversary. Celebrations included activities such as the Great Global Clean-up, Citizen Science, Advocacy, Education, and art. The year's theme was "climate action", however due to the COVID-19 pandemic, many of the planned activities were moved online.

One such event was hosted by a coalition of youth activists who organized Earth Day Live in the United States. This was a three-day livestream broadcast of activities cantered around five components: citizen science, volunteering, community engagement, education, and the role of art in furthering the cause.

Earth Day is now an annual event celebrated in over 190 countries worldwide by more than a billion people, and as such is considered to be one of the largest secular holidays in the world.

Text source: https://en.wikipedia.org/wiki/Earth_Day

Stress and burnout among dentists

SADJ April 2021, Vol. 76 No. 3 p118

NH Wood
Managing Editor of the SADJ

Dentists in South Africa are under exceedingly increasing pressure and strain during the past year. In addition to the stressors and influences traditionally associated with burnout in dentists, the COVID-19 pandemic lockdown has added more complex layers within the South African context.

Whether in the private sector or in the public service, dentists all feel the increase psychological and physical pressures associated with a wide variety of stressors during this challenging time. Dentistry has inherent stressors, and these are broadly described as workplace issues, financial matters, conflict, personal health, unpleasant/toxic work environments and other factors.

Dentists have traditionally faced a variety of work-related stressors that range from financial and managerial, to practice management, workplace/work environment, societal influences and even personal circumstances. Not all of these may have a negative connotation. However, a rapid build-up of positive stressors may also prove to be incapacitating to a practitioner.[1] The impact of these stressors and associated factors is different on dissimilar individuals, but the general trend exhibited in the literature indicates a decline in the mental and physical well-being when no intervention is done.

The effects of these stressors may oftentimes manifest in a physiologic manner. The most frequently reported signs and symptoms reported in this regard include lower back pain followed by headaches and abdominal complications among others. Psychologically, dentists reportedly suffer more from anxiety and depression.

The combination of these effects that result from the increased chronic pressure oftentimes leads to professional burnout. Once overwhelmed, the dentist is rendered ineffective, and a vicious cycle ensues. Burnout is characterized by mental and physical exhaustion, by a negative or cynical attitude, and by a dissatisfaction of the self, and of the workplace. This is often accompanied by depression and some form of anxiety disorder.[1,2]

It is therefore of the utmost importance that we as dentists find ways to ensure our mental and physical well-being during this time. Even though this phenomenon is clearly described and documented in the literature, there is little to find regarding correcting this professional burnout in dentists.

This may, unknowingly, be exploited by employers, or even misread. Seeking counselling and professional support is the first line of intervention. Every one of us must take the time and make the effort to take care of ourselves, and also to ensure that appropriate coping mechanisms and support structures are in place.

Take the time to do self-evaluation, a virtual stock-take of your current position and situation to evaluate burnout risk, and determine from there what actions, if any, are required to protect your personal wellbeing. Identifying the source of major stressors early will facilitate a smoother management process to the individual and will allow for a more comfortable approach in dealing with it. In this way your occupational participation stands a better chance of being preserved.

Neil H Wood: Managing editor. Email: neil.wood@smu.ac.za

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Balance billing - It is time medical schemes accept it, it's legal!

SADJ April 2021, Vol. 76 No. 3 p119 - p121

SADA Head Office

The South African Dental Association views the issue of balance billing seriously and highlights its stance on the matter in its latest communication to the Council of Medical Schemes.

The contents of the communication which lays out concerns and their view are laid below:

1. We wrote this to the CMS on behalf of our members who are dentists and dental specialists operating in the private sector.

2. In the present environment, one of the biggest challenges facing dentists as healthcare practitioners is balancing their professional obligations to serve the commercial demands of dental practice.

   Every profession always includes elements of both altruism and self-inteest, of service to others and service to self, of professionalism and commercialism. No profession ever finds an ideal balance of these elements.

3. Currently, one of the major issues that face healthcare practitioners directly is the setting and collection of fees.

4. The Health Professions Council of South Africa (HPCSA) which regulates the dental profession does permit practitioners to balance bill their patients. However, some of the bigger schemes are refusing to accept balance bills from providers of service to their members.

Overview

1. There has been a substantial reduction in medical aid scheme pay-outs towards dentistry over the past 28 years, lack of funds to complete ideal treatment procedure, time and costs incurred in telephoning and writing motivation letters to medical aids etc.

2. The percentage changes in healthcare expenditure per average beneficiary per annum (pabpa) from 2009 to 2019 shows the amount paid in real terms on private hospitals increased by 2.76%, and for specialists increased by 4.33%.

   Expenditure on GPs decreased with an annual average of 0.24% similarly expenditure on dentists decreased with an annual average of 0.57%. The bulk of medical schemes' total expenditure continues to be paid to hospitals and specialists.

3. Expenditure on primary healthcare providers, general medical practitioners and dentists continue to be overshadowed by the expenditure on specialists, hospitals and medicines dispensed.

4. The out-of-pocket payments (OOPs) being the difference between the claimed amount and the amount that was paid from the medical aid risk for dentists is 6% and for dental specialists at 2%.

   The OOPs by splitting the expenditure into proportion from the medical savings account (MSA) and that paid by the member, shows for dentists 4.10% is paid from MSA and 2.19% by the member and for dental specialist 1.09% from MSA and 1.15% by the member.

5. The average number of visits to dental practitioners remained largely unchanged at about 1.8 visits per patient in both open and restricted schemes. About 99% of all dental practitioner consultations took place in out-of-hospital settings.

6. Patients in open schemes rely more on medical savings accounts than risk benefits to fund dental consultations compared with restricted schemes. In addition, the out-of-pocket payment for dental consultations was very high for beneficiaries covered by open schemes.

   Beneficiaries in restricted schemes enjoyed more coverage from risk benefits and lower out-of-pocket

payments for dental procedures, which explains the higher utilisation of dentist services by restricted scheme beneficiaries. The large out-of-pocket and MSA payments are likely to disincentivise beneficiaries in open schemes from using dentist services.

7. Patients covered in both restricted and open schemes experienced a higher-than-inflation increase in out-of-pocket payments when consulting dental specialists.

South African economic outlook

1. The economic outlook sparked by recessions followed by the onset of the COVID-19 pandemic and the grading by credit agencies has exacerbated the country's economic distress.

2. The South African economy is already mired by the impact of a technical recession from subsequent years including many other macro-economic challenges pre-COVID-19.

   Lockdown restrictions have also led to a sharp contraction of the economy. Although government interventions have, to some extent, cushioned the impact on workers and businesses, these have not offset the full impact of COVID-19.

3. The long-run macroeconomic consequences of the current COVID-19 global pandemic is likely to be dire. The COVID-19 induced economic recession is likely to be prolonged with muted demand, lower corporate earnings, higher government debt, rising unemployment rate and dwindling household earnings.

4. We believe that medical inflation, which is the costs both the supply and demand of the healthcare industry continues to track well above CPI. On the other hand, the consumer price index only measures the change in the price level of the market basket of consumer goods and services purchased by households.

   We would argue that medical inflation during the last 10 to 12 years has increased by an average of 11.3% per year approximately 5.3% above the Consumer Price Index (CPI).

5. The medical scheme contributions increase rate has consistently surpassed the CPI. The average contribution increase rate of 8.2 % for 2019, as reported by the CMS was double the average CPI of 4.1%.

6. The tariff increases of schemes for the period 2012 and 2020 ranged from 6.3 to 5.1 while the CPI for the same period was 5.6 to 3.0 and the contribution increase rate was 9.7 to 8.2 in 2019.

Balanced billing

1. The practitioner who does not have any contract with a medical scheme as preferred provider or otherwise, thus is able to determine his or her own fees for services.

   The medical scheme usually pays a rate that has no bearing with the actual costs of the practitioner in providing services and the unsatisfied practitioner is then forced to bill the patient to recover the difference for the services rendered to recover all the costs of services.

2. Medical schemes are deliberately narrowing their dental benefits and shifting more costs onto their members by creating limited benefits and medical savings accounts knowing patients have to pay a greater percentage of their dental bills when they consult a provider of their choice.

3. Balance billing is usually used when the dentist as a health care provider does not have a relationship or contract with the medical scheme or managed care provider and the patient requests that at least some costs up to the extent of their benefits be recovered from their medical schemes and take responsibility for payment for the balance.

4. Patients are often shocked to find that their scheme does not cover the cost of dental treatment from the very first Rand. Patients also seem to have forgotten - or never knew - that most dentists are small businessmen and women who own their own practice.

5. In the present environment, patients who are under increasing financial constraints, are purchasing low-cost medical aid plans, which provide for strict limitations, fewer benefits and restrictions.

   The treatment, financial costs, and quality of professional care can be severely affected by the type of medical plan patients belong to.

6. Despite this, patients expect the same levels of benefit and quality and, in many instances still believe the general statement such as "100% cover" by medical aids which no longer correspond with the costs of all aspects of treatment patients may require.

7. The prevalence of medical debt can be partially attributed to the difficulty and confusion that befalls consumers when initially selecting their medical aid coverage. Consumers tend to believe that once they secure medical scheme cover, they will be protected against unmanageable financial outlays from either everyday medical issues or life-changing accidents and illnesses.

   Unfortunately, that is not always the case. In fact, a sizeable number of consumers do not understand how medical aid plans operate, restrictions, benefits, pre-authorisation requirements etc, and still, leave it up to practitioners to determine these.

8. Patients who are members of medical schemes with limited dental benefits and financial resources are unable to agree to proposed treatment in the absence of some payment by their medical scheme up to the extent of their benefits and the balance payable by patients. This is especially the case where the dentist has no arrangement, contractual or otherwise, with the medical scheme and simply undertakes to submit accounts to their medical schemes to assist patients.

9. In addition, medical schemes are no longer providing for separate dental benefits, but rather provide for dentistry through "savings" or "day-to-day" benefits, which makes it impossible to assess whether payment for procedures will be affected, as it is never certain what other medically related costs precede the submission of the dentist's account to the scheme.

   In many instances where pre-authorisation is provided, payment is withheld or reversed due to the fact that the "savings account" has been depleted subsequent to authorisation having been provided.

10. The reason that members join medical schemes is so that they get financial protection from significant financial strain that is as a result of ill-health. It is therefore a reasonable assumption that whenever scheme members are faced with dental bills they will claim.

    From the member's perspective, it is the reason why they join schemes and there is no harm in claiming. The amount claimed includes in most cases includes a very limited amount of dental expenses faced by members as a result of declining dental benefits.

Need for schemes to accept balance billing

1. While some medical schemes do permit dental practitioners to submit their balance bill showing total costs of treatment, the medical scheme portion payable and the portion payable by the patient. In this way, the medical scheme has sight of the total cost of treatment.

2. However, some of the bigger schemes are refusing to accept balance bills from providers of service to their members. They argue that their benefit or tariffs are sufficient and do not want their members to be out-of-pocket. The truth is that their dental tariffs are not anywhere close to the actual costs of providing services by dentists.

3. As patients' medical scheme will only cover part of the costs of treatment, patients are ready and willing to accept treatment only if part of the fees are recovered from their insurance or medical schemes and self-insure for the balance.

4. This process of balance billing is transparent and subject to an informed consent process between the practitioner and patient. The patient has full information on the self-insurance gap over and above the benefits payable by his or her scheme.

5. The Health Professions Council of South Africa (HPCSA) which regulates the dental profession does permit practitioners to balance bill their patients.

6. We would argue that practically and economically, all signs point to the need for all medical scheme to permit balance billing by dentists. If balance billing is not permitted or if the Council does not encourage or regulate medical schemes to accept balance billing across the board, dentists as providers will be forced to set and determine their own fees, disclose to patients upfront that they would be responsible for the entire bill.

   Patients should have all the facts to make decisions about their treatment, and that includes full disclosure of potential financial liability. Patients will be liable to settle on completion of treatment and claim reimbursement from their medical scheme up to the level of their benefits.

7. In the light of the above, we kindly request the Council to consider issuing a directive to all medical schemes to permit balance billing by practitioners. Schemes will then pay providers on behalf of their members up to the limits of their benefits and leave the member to pay the balance.

8. Balancing the needs of all the players in South African the healthcare system is a delicate endeavour, but ultimately, medical schemes and members need to stop bankrupting practitioners to provide service at a rate lower than actual costs.

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Evaluation of radiation awareness among oral health care providers in South Africa

SADJ April 2021, Vol. 76 No. 3 p122 - p129

P Vilborn[1], A Uys[2], Z Yakoob[3], T Cronje[4]

ABSTRACT

Aims and objectives

The aim of this study was to assess the awareness of oral health care providers and dental students regarding radiation safety, protection and legislation pertaining to dental radiography in South Africa.

Design and methods

An online questionnaire consisting of 20 structured multiple-choice questions was distributed among final year students and oral health care providers.

The mean, median, standard deviation (SD) and frequencies were determined statistically to compare the number of correct answers for each responder group.

Results

In total, 189 questionnaires were analysed. The average number of correct answers was 11.6 out of 20 (58%) for all responders. Dental students presented with the highest percentage (66%) of correct answers.

Higher radiation awareness was evident among the respondents who had undertaken continued education courses.

Conclusion

Radiation awareness among oral health care providers in South Africa needs improvement. Greater emphasis should be placed on dental radiology courses to increase the knowledge and awareness. However, there is no officially established benchmark of radiation awareness in South Africa.

This conclusion can only be drawn from the responders of the study and cannot be made for the overall awareness of oral health care providers in South Africa.

Clinical Implications

Inadequate radiation awareness and knowledge among oral health care providers may result in contributing to the increased risks of radiation exposure and the erroneous utilization of radiographic imaging.

Keywords

Radiation protection, radiography, dental, dentists, health knowledge, attitudes, practice, South Africa.

Author affiliations:

1. **Piret Vilborn:** *BDS, MA Health Management (Finland), MSc Maxillofacial Radiology (UP),* Faculty of Health Sciences, Department of Oral Pathology and Oral Biology, School of Dentistry, University of Pretoria, South Africa.
   ORCID Number: 0000-0001-8296-1689
2. **Andre Uys:** *BChD (UP), MSc Maxillofacial Radiology(UP), PhD (UP),* Faculty of Health Sciences, Department of Oral Pathology and Oral Biology, School of Dentistry, University of Pretoria, South Africa.
   ORCID Number: 0000-0001-8250-7662
3. **Zarah Yakoob:** *BChD (UWC), PG Dip Dent Maxillofacial Radiology (UWC), MSc Maxillofacial Radiology (UWC),* Faculty of Health Sciences, Department of Oral Pathology and Oral Biology, School of Dentistry, University of Pretoria, South Africa.
   ORCID Number: 0000-0003-1966-5574
4. **Tanita Cronje:** *BSc (Hons) Mathematical Statistics (UP), MSc Mathematical Statistics (UP),* Faculty of Natural and Agricultural Sciences, Department of Statistics, University of Pretoria, South Africa.
   ORCID Number: 0000-0002-8861-4466

Corresponding author: Piret Vilborn
Department of Oral Pathology and Oral Biology, School of Dentistry, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa.
P.O. box 195, Highveldpark Postal Office, Southdowns 0123, City of Tshwane, Republic of South Africa.
Email: vilborn@gmail.com

Author contributions:

1. **Piret Vilborn:** Principal researcher, write up - 40%
2. **Andre Uys:** Supervisor, review and revision of write-up - 30%
3. **Zarah Yakoob:** Co-supervisor, review and revision of write-up - 20%
4. **Tanita Cronje:** Data analyses and revision of write-up - 10%

INTRODUCTION

Dental radiography plays an essential role in diagnosis and treatment of dental disease.[1-2] Oral health care providers, however, do not always follow prescribed indications when performing radiological examinations.[3] Radiographs are frequently used for 'routine screening' of new patients.[4] An increase in the number of radiographs is also evident when fee-for-service payments are received.[5]

Ionising radiation from intraoral imaging is small and comparable to daily natural background radiation.[1,6] However, the potentially harmful effects of any radiographic examination cannot be ignored. Each exposure to ionising radiation can cause a biological effect, and increase the potential risk of cancer.[7]

The use of radiation is accompanied by the responsibility to maintain sufficient knowledge and to ensure appropriate radiation protection.[8-10] A need for training

with regards to the attitudes towards radiation protection is evident.[11-13] The level of knowledge regarding dental imaging and radiation risks also differs amongst different oral health care providers.[14]

A remarkable divide is evident between patient expectations and the provision of information regarding ionising radiation.[15-16] Oral health care providers' knowledge and awareness regarding dental radiology and risks is, therefore, a prerequisite for conducting these discussions to obtain informed consent before imaging.[12]

South African law permits only registered dentists, radiographers, dental therapists and oral hygienists to perform radiographic examinations.[17-18] Chairside assistants are not permitted to take radiographs. In reality, the laws and guidelines related to radiation control and safety are frequently neglected in dental practice.[18-19]

The aim of this study was to assess the knowledge and awareness of oral health care providers and dental students regarding radiation safety, protection and legislation for dental radiographic imaging in South Africa.

MATERIALS AND METHODS

A cross-sectional online survey consisting of 20 multiple choice questions was conducted between February to August 2019 (Appendix A). Only registered radiation workers (dental specialists, dentists, and oral hygienists and dental therapists) and final year oral hygiene and dentistry students from the University of Pretoria were invited to participate.

Quantitative variables and demographic data (years in practice, profession, public or private setting and continuous professional development (CPD) in oral and maxillofacial radiology (OMFR) after graduation), were measured with an online questionnaire using the Qualtrics®xm survey platform.

The chosen metric for the level of the knowledge was the percentage of questions answered correctly. Two inclusive questions were added to minimize bias. The questions were based on questions used in similar studies as well as questions formulated specifically for this study.[3,12-13,20]

The mean, median, standard deviation (SD) and frequencies were evaluated by using R Core Team (2018).[21] Additionally, the data was also analysed using the Shapiro Wilk test for normality, Kruskal-Wallis test with a post hoc Dunn test combined with a Bonferroni adjustment, Mann-Whitney-U test as well as the Spearman's Correlation analysis.

Ethical clearance was obtained from the University of Pretoria Faculty of Health Sciences (Ethics reference number: 435/2018).

RESULTS

The final number of 189 returned questionnaires were analysed. Since the dental therapists' sample only consisted of 2 (1%) respondents, the group was combined in analysis with oral hygienists and named Therapist & Oral Hygienist group. **Figure 1** presents the qualification, percentage and number of respondents in each group.

The variability of years of experience had a mean of 11.88 years (SD ± 12.14 years). The dental and oral hygiene students were excluded in the calculation of years of experience as they were not yet registered as qualified professionals. The most common practice setting was a private practice (49%), followed by a public setting (42%), whereas only a few settings were indicated as other. The number of respondents who confirmed that they have had CPD training in OMFR during the past five years, was 53%, while 8 respondents did not submit an answer to this question.

Overview of radiation awareness

The overall average percentage of correct answers was 58 %, (SD ± 13.43). Dental students (66%, SD ± 10.72) scored the highest average of correct answers, followed by the dental specialists (63%, SD ± 9,98). Dentists and oral hygiene students submitted 58% of correct answers (SD ± 12.16 and ± 8.66, respectively). The least number of correct answers was 49% (SD ± 14.44) for the Therapist and Oral Hygiene category.

The Kruskal-Wallis test was performed to determine if a significant difference exists between the score obtained by each study group. A post hoc Dunn's test, with a

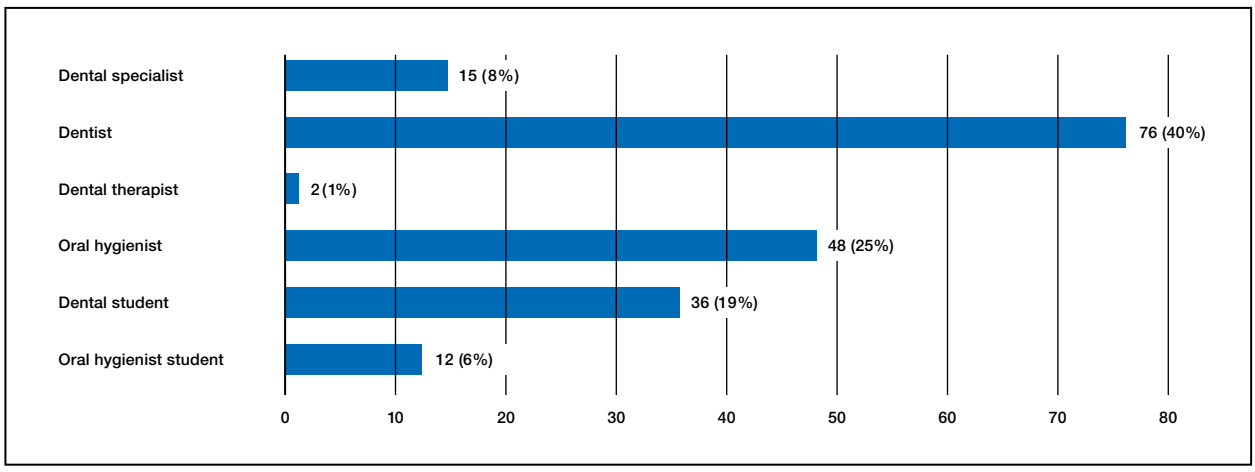
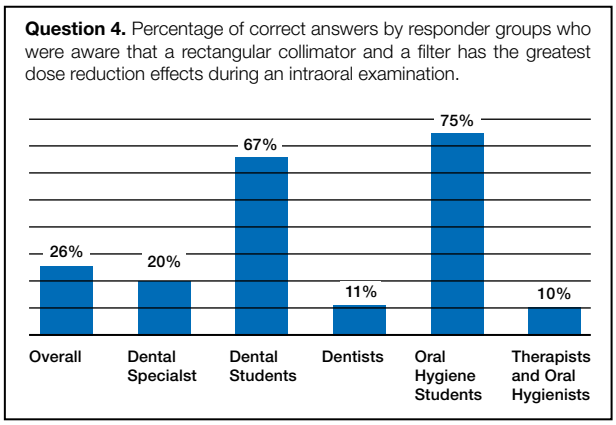
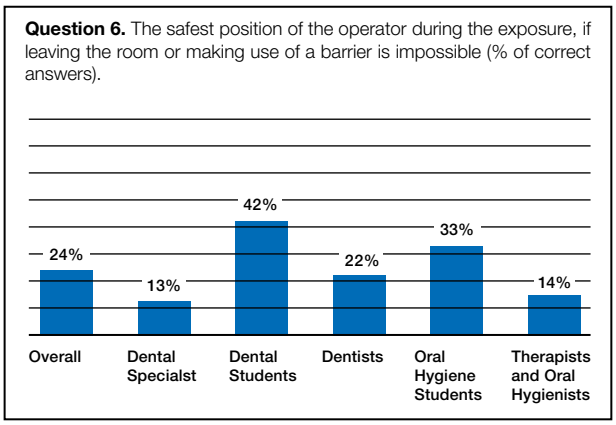
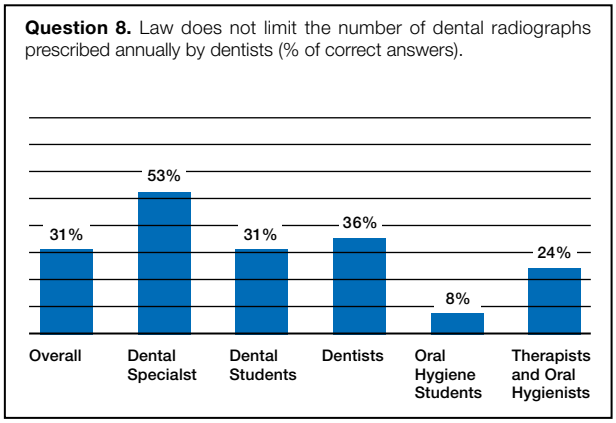
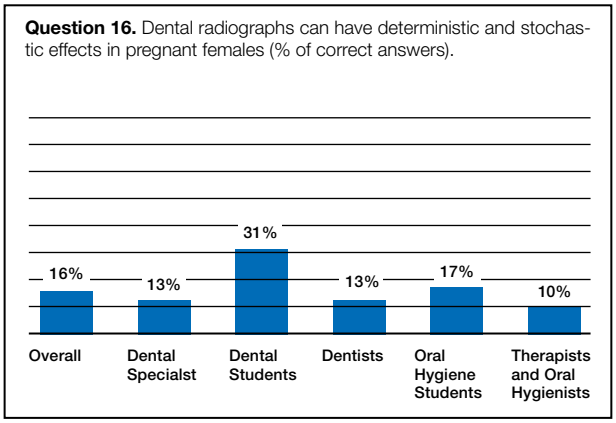


Figure 1. The qualification, number and percentage of respondents (n=189).









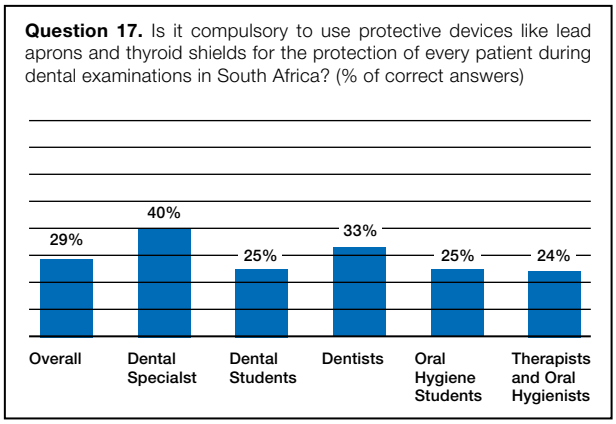


Figure 2. Low scoring questions and the percentage of correct answers per responder group.

Bonferroni adjustment, was then used to investigate between which groups the differences exist. A statistically significant difference ($p<0.05$) was found between the following groups: Dental Student- Therapist and Oral Hygienist, Dental student - Dentist, Dental Specialist - Therapist and Oral Hygienist and Dentist - Therapist and Oral Hygienist groups. There was no statistically significant difference between the remaining groups.

The association between the score and years of experience was assessed using a Spearman correlation test. The correlation value was -0.306 indicating a negative relationship between the questionnaire score of correct answers and the number of years in practice. A non-parametric Mann Whitney U test was used to determine if a significant difference exists between the results of the groups practising in a public compared with the private sector. The p-value (0.0044) of the Mann-Whitney Wilcox on indicates the statistically significant difference between public and private sector results. The average score of correct answers for the private sector was 54% and the public sector 60%.

The p-value (0.01274) results showed a statistically significant difference between the responders who had CPD training in OMFR in the last 5 years and those with no training. The mean value of the two groups was 55% and 60% respectively.

The differences between dental specialists and dentists were also tested. The Shapiro- Wilk test for normality results showed that normality can be rejected at a 5% level of significance for the dentists' scores. Since not all assumptions held, the non-parametric Mann Whitney U tests were used to determine if a significant difference exists between the results of the two groups.

The p-value (0.1354) of the Mann-Whitney Wilcoxon indicates no significant differences exist between the scores of these two groups.

The low-scoring questions

Eight questions had a correct score of less than 50%. The results and respondent groups with the questions to the lowest scoring questions are presented below in Figure 2.

Question 2 and 14 were mutually inclusive and assessed the knowledge related to the amount of radiation received during dental radiological examinations. Results to question 14 indicated that 61% knew that ionizing radiation

used in radiological examinations in dentistry has similar properties to normal background radiation.

Results to question 2 indicated that 42% of respondents correctly knew that the average radiation dose received from one digital periapical radiograph can be considered lower or can be compared with the average daily background radiation dose and 23% were unsure.

Question 9 assessed the awareness of the full-body radiation dose limit of 1 mSv for the general public per year. The results indicated that 49% knew the amount of the annual full-body radiation dose limit for the general public.

Only 49% of the responders were aware of certain conditions enabling the exemption of wearing personal monitoring badges in dental clinics in South Africa, which was assessed in question 15.

As Question 4 (Fig. 3) was a multiple-choice question, the results of the chosen answers have been additionally presented to illustrate the level of knowledge of greatest dose reduction effect during intraoral radiographic examination. Only 26% of respondents knew that using a rectangular collimator with a filter helps to achieve the highest dose reduction effect.

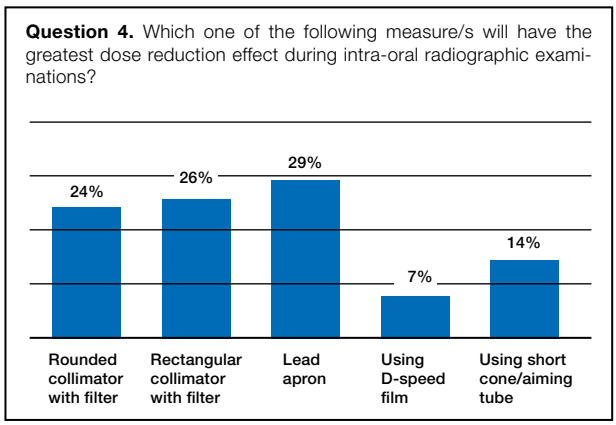


Figure 3. The level of knowledge of greatest dose reduction effect during intraoral radiographic examination.

DISCUSSION

The study assessed the knowledge and awareness of oral health care providers and dental students regarding radiation safety, protection and legislation. All oral health care providers groups were invited to respond to this study. The reason for the low response rate from the dental therapists may be due to the lack of interest shown towards dental radiology. Nevertheless, their scope of practice permits them to take and interpret the full spectrum of images.[22]

There is no officially established level of satisfactory radiation awareness in South Africa as no such study was performed. However, the current grading system at South African Universities requires students to obtain a minimum of 50% as the overall mark for dental and oral hygiene students in OMFR. Hence a final mark of 50% can be considered as a satisfactory benchmark when assessing awareness for practicing oral health care providers in South Africa. In addition, the answers can also be compared to similar studies from other countries, however the questionnaires and requirements may differ.

The results from this study, indicated that radiation awareness among oral health care providers in South Africa is satisfactory as the mean percentage of correct answers was 58%. The results are comparable to Nigeria[23] and Poland,[12] where 59.1% and 64% of correct answers were respectively recorded. The needs for CPD courses, which include theoretical and practical training, is, however, evident.

The mean percentage of correct answers among dentists was 58% . It must be noted that the undergraduate curricula have changed dramatically due to the importance and demand of OMFR. Former undergraduate training lacked sufficient practical exposure to digital radiography and Cone Beam Computer Tomography (CBCT).

Involvement in the form of communication, training and education from the regulatory bodies also needs improvement. However, courses offered in OMFR and radiation safety may not always be as attractive compared to other clinical courses, which may provide financial gain.

The Dental Students and Specialist's category presented with a higher percentage of correct answers compared with the other responder groups. This can be due to the novel and more comprehensive training received in OMFR. The current curriculum, which includes rigorous training in radiation physics, safety, and CBCT, prepares the students better as the results indicate. Dental students scored higher compared to the dentists. This is in contrast to Poland, where dentists showed higher radiation awareness.[12]

The Public oral health care sector in South Africa seems to have a more established radiation safety culture compared to the private sector. In our study, oral health care personnel practising in the private sector showed poorer knowledge of radiation awareness (54%) compared to their public sector colleagues (60%). Privately practising dentists may not receive sufficient information on radiation safety and implementing a radiation awareness culture in the dental practice needs expertise and a conscious effort.[24]

Continues education increased the percentage of correct answers. A statistically significant relationship existed between having received CPD training in OMFR in the last 5 years and the awareness of the greatest dose reduction effects. Studies in Sweden[11] and Poland[12] presented with similar results. In contrast, no significant associations were found when shorter courses ranging from one to three days were attended.[11]

Only 42% of responders knew that ionizing radiation used in dental radiographic imaging has similar properties to normal background radiation. However, 61% were aware that the average radiation dose received from one digital periapical radiograph can be considered lower, or can be compared with the average daily background radiation dose. The low knowledge level regarding radiation doses will complicate patient communication.[25]

The damaging effects of ionizing radiation can be classi-

fied either as deterministic or stochastic. Deterministic effects cause tissue reactions and occur only when certain exposure thresholds are reached, which never happens with exposure levels used in dentistry. Hence, only stochastic effects can occur.[26] In our study, only 16% of respondents were aware that dental radiographs cannot cause both effects. Insufficient knowledge of radiation doses and biologic effects may potentially lead to unnecessary or insufficient utilization of radiographic imaging. In both cases, the result can lead to an increased risk for patients.

A rectangular collimator can reduce radiation exposure by 60% compared with a circular collimator.[27] Only 26% of all our respondents were aware of the effects of a rectangular collimator with a filter and only 11% of the dentists answered this question correctly. We also determined that the oral health care providers who had training in OMFR had more knowledge regarding the greatest dose reduction effects. However, our study only assessed knowledge and not practice. Our results were similar to a Korean[24] study (20%) and higher than previous studies in Belgium, Iran and Australia, where rectangular collimator was used only by 5% - 6% of dentists.[13,20,24,28]

It is alarming that 29% of our respondents incorrectly considered that a lead apron will have the greatest dose reduction effect. It was found that 71% of the oral health care providers were not familiar with the current legislation stating that it is not compulsory to routinely use protective devices like lead aprons and thyroid shields for protection. Outdated knowledge of patient safety measures emphasizes the need for more training and access to updated information.

The lack of set dose limits does not imply that radiographic imaging in dentistry can be performed without justification and optimization.[29] A remarkable amount of Norwegian medical students (89%) were unaware that there are no legal dose limits set for the patients as long as the examination is justified.[27] In our study, only 31% of respondents from the Dental Student's category and 30% of the dentists answered this question correctly.

According to our results, half of the oral health care providers (50%) incorrectly believed that the law sets the limits to the number of radiographs annually prescribed by dentists. This finding is similar to a Polish study, where approximately half of all the responders knew that such a law does not exist.[12] No set dose limits for medical and dental imaging places the responsibility solely to the health care provider to choose the appropriate imaging modality and the exposure size.

The European Guidelines of Radiation Protection and the American Dental Association state that there is no contraindication for taking a radiograph on a woman who is or may be pregnant but that it must be clinically justified.[30-31] In Poland, most of the responders overestimated the risk of dental radiographic imaging of pregnant patients.[12] Thirty-nine percent of Iranian dentists indicated that they would not perform periapical radiographs on pregnant women.[20] In our study, 66% of oral health care providers knew that performing dental radiographic examinations in pregnant women in South Africa is not contraindicated, but risks and benefits must be evaluated. A lack of awareness may lead to neglecting radiological diagnostics for pregnant patients when the benefits out-weight the risks.[12]

Only 24% of oral health care workers knew the safest position for the operator during exposure with only 22% of the Dentist group providing the correct answer. The results for this finding was lower than an Australian survey which found that 87% of the participants correctly indicated that the position should be at least 2 m from the primary beam.[28]

However, most of the Belgian dentists (75%) always stood in the same spot in their dental office regardless of the position of the primary beam.[13] In an Iranian study, only 36% of the dentists used the position and distance rule correctly.[20]

The regulation regarding the exemption of wearing personal monitoring badges were correctly answered by 49%. Only 30% of the respondents from the Therapist and Oral Hygienists group answered this question correctly. In the USA, 22% of oral hygienists who responded to a survey, wore dosimeter badges.[32]

Only 49% of responders to our study knew the amount of the full-body radiation dose limit of 1 mSv for the general public per year. Sporadic knowledge about occupational radiation safety leads to the general underestimation of the potential risks of ionizing radiation exposure.[13]

A limitation of this study was the limited number of respondents, particularly in the dental therapist group. Hence the results cannot be confidently compared between the dental therapy and the other groups. The number of responders in the other responder groups were, however, representative to draw valuable conclusions. The pre-programmed survey tool allowed a responder to proceed to the next question before saving the answer to the question in hand.

Therefore, the findings of this study can only be generalized into the results of the positive responses.

Finally, because the questionnaires were not completed in the company of the researchers, there was always the possibility that some responders were researching their answers on the internet or consulting their peers. Therefore, awareness reported may be overestimated.

CONCLUSIONS

The results from this study clearly indicate a need for improvement in radiation awareness among oral health care providers. The time of qualification and the participation in continues development courses had a positive influence on the results.

Emphasis should, however, be on the development of CPD courses to improve knowledge and to increase radiation awareness. However, this conclusion can only be drawn from the responders of the study and the same conclusion cannot be made for the overall awareness in South Africa.

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Oral hygiene habits and status of orthodontic patients attending the University of Pretoria, Oral and Dental Hospital

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NL Buthelezi[1], TK Madiba[2]

ABSTRACT

Background
Most orthodontic patients struggle to maintain good oral hygiene during treatment.

Aim
To determine oral hygiene habits and status of patients undergoing fixed orthodontic treatment at University of Pretoria, Oral and Dental Hospital.

Design
A cross-sectional descriptive study.

Material and methods
A modified, validated, self-administered questionnaire was used, and clinical examinations were conducted using Orthodontic Plaque Index, Gingival index, and Bleeding index. The questionnaire sought to determine knowledge and practice patterns. Data analysis included frequencies and correlations using chi-square test, with a significance of $p<0.05$.

Results
Fifty patients participated with 34(68%) being female with ages from 10 to 28 and a mean of 18,5. Seventy percent avoided sticky foodstuff, 74% used mouthwash, 56% flossed daily and 84% brushed twice daily. However, 82% consumed sugar containing drinks.

Clinical exam revealed an Orthodontic Plaque Index mean of 2.6, Gingival Index mean of 0.1 while the Bleeding Index was 13.3 and 90% had normal gingiva. There was a significant difference in Gingival Index score between patients at age category 10-19 and 18-24 ($p< 0.05$).

Conclusions
This study revealed a satisfactory oral hygiene status among patients at the institution with the majority of patients maintaining good oral hygiene practices. However, 82% consumed sugar sweetened beverages.

Keywords
Oral hygiene habits, orthodontic patients.

BACKGROUND AND LITERATURE

Orthodontic treatment is received by individuals with dentofacial anomalies and the treatment is done to improve their appearance.[1] Treatment is undertaken using different techniques involving the use of fixed orthodontic appliances, removable appliances, and functional appliances.

The use of fixed orthodontic appliances (archwires and different ligating systems where orthodontic brackets are attached to the teeth) makes it difficult for the patients to keep their oral hygiene to an optimum level of cleanliness.[2,3,4]

Patients' oral hygiene is recognized as an important determinant for orthodontic treatment time and quality of the orthodontic treatment outcome.[5] Poor oral hygiene attracts significant plaque accumulation around the brackets,[6] and subsequent white spot lesions can occur rapidly, usually on the cervical and middle third of the buccal surfaces of bracketed teeth.[7]

Periodontal complications are observed in patients with poor oral hygiene during orthodontic treatment; the complications include gingivitis, gingival hyperplasia, gingival recession, periodontitis and more.[8]

As reported by one study, having good oral hygiene improves the success of the orthodontic treatment, as good oral hygiene promotes tooth movement and lowers the chances of oral diseases.[9]

Author affiliations:
1. **Noluthando L Buthelezi:** , *DipOH, AdvDipOH (Ortho), PGCHE, BEd Hons (TEPD),* Department of Orthodontics, School of Dentistry, University of Pretoria, Pretoria, South Africa.
   ORCID Number: 0000-0002-3900-7707
2. **Thomas K Madiba:** *B.Dent Ther, BDS, DHSM, MChD (Community Dentistry),* Department of Community Dentistry, School of Dentistry, University of Pretoria, Pretoria, South Africa.
   ORCID Number: 0000-0002-0171-0595

Corresponding author: Thomas K Madiba
Department of Community Dentistry, School of Dentistry, University of Pretoria, Pretoria, South Africa.
P.O. Box 21497, Valhalla, 0137.
Email: thommy.madiba@gmail.com

Author contributions:
1. **Noluthando L Buthelezi:** Principal author - 50%
2. **Thomas K Madiba:** Second author - 50%

Oral hygiene plays a very important role in orthodontics and can have a huge impact on the outcome or results of the treatment.[10] Several studies have been conducted in assessing the status of oral hygiene amongst the patients who are undergoing fixed orthodontic treatment. A study conducted at the University of Benin Teaching Hospital in Nigeria where the oral hygiene status of forty-three orthodontic patients was assessed using the Simplified Oral hygiene Index, revealed that 62.8% of the patients exhibited good oral hygiene and 37.2 % had fair oral hygiene while no patients were found with poor oral hygiene.[11] This study did not include other indices such as the gingival index, orthodontic plaque index and bleeding index. The omission of these indices could lead to incorrect diagnosis, as it can happen that a patient can present with a low plaque index but show signs of gingivitis. The latter could indicate that the patient may have brushed efficiently prior to their orthodontic appointment, which could be interpreted as the patient having knowledge of what they need to do to maintain good oral hygiene but might not be practicing good oral hygiene religiously. Using this index only therefore cannot be seen as reliable and a definitive determinant of the patient's oral hygiene status.

The Oral Hygienist plays a very important role during orthodontic treatment in ensuring that the patient has all the information they need for different phases of the orthodontic treatment.[5] Educating and motivating the patient who has orthodontic appliances to maintain good oral hygiene is necessary to decrease the risks of oral diseases.[12] The risks can be decreased if both the practitioners (Orthodontist, Dentist and Oral Hygienist) and the patients are committed. It is also the responsibility of the patient to comply to the treatment objectives and the information and preventive measures given to him/her by the practitioner.[12]

To the authors knowledge this study has never been undertaken for the institution and therefore it is important to assess the oral hygiene habits and status of orthodontic patients attending the University of Pretoria, Oral and Dental Hospital. Findings from the study will help the institution to put in measures necessary to ensure a satisfied experience of orthodontic patients.

METHODOLOGY

Ethical approval was obtained from the University of Pretoria, Faculty of Health Sciences Ethics committee (Ref 504/2015). No personal details of the patients were disclosed, and all information was strictly confidential and anonymous.

A cross-sectional descriptive study of patients undergoing fixed orthodontic treatment was conducted using a modified, validated, self-administered questionnaire[13] and clinical examination of teeth and the gingiva. The clinical examinations of patients made use of Orthodontic Plaque Index[14] (OPI), Gingival Index[15] (GI) and Bleeding Index[16] (BI) which were recorded for each patient.

The validated questionnaire was adapted from a study by Atassi and Awartani (2010). It consisted of twenty-three (23) questions that covered topics related to the knowledge and practice of patients concerning fixed orthodontic treatment. The knowledge questions consisted of sixteen (16) items that sought to determine whether patients knew the reasons for having braces, whether they knew what types of foods to avoid and whether they had been to their dentist/oral hygienist for a professional cleaning. The questions were both close ended and open ended to determine the depth of patients' knowledge.

To determine the patient's practices, seven (7) questions were asked, and they sought to determine whether patients flossed their teeth, whether they brushed their teeth and the frequency per day and whether they used mouth rinse. These questions also consisted of both closed and open-ended questions.

Clinical examination

The use of clinical examination instruments (mouth mirror, periodontal probe, tweezers, and mouth retractor) was used to assess the oral hygiene status of the participants.

The process of clinical examination was employed using the following indices:

Bleeding index

Each tooth present was gently probed with a periodontal probe at six sites (mesial, mid, and distal on both buccal and lingual surfaces).[16] Bleeding was scored as present or absent and the number of sites where bleeding was present were recorded.

The number of sites where bleeding was recorded were divided by the total number of available sites in the mouth and multiplied by 100 to express the bleeding index as a percentage.

Gingival index

The criteria used for gingival assessment was done according to the work of Löe and Silness (1963) where the marginal and interproximal tissues were assessed and scored using the scores below.[15]

0 = Normal gingiva.

1= Mild inflammation - slight change in colour and slight edema but no bleeding on probing.

2 = Moderate inflammation - redness, edema and glazing, bleeding on probing.

3 = Severe inflammation - marked redness and edema, ulceration with tendency to spontaneous bleeding.

Orthodontic plaque index

The Orthodontic Plaque Index (OPI) is a special index for patients with fixed orthodontic appliances. The OPI focuses on the tooth area in the immediate vicinity of the bracket, since additional and relatively inaccessible plaque niches arise at these sites.[14]

To record the OPI, the dentition was divided into sextants. A disclosing agent (2-Tone) was used to disclose plaque.

The plaque accumulation on each tooth surface adjacent to the bracket base was evaluated (mesial, distal, occlusal/incisal, and cervical) and recorded in the clinical data collection sheet.

0: No plaque deposits on the tooth surfaces surrounding the bracket base.

1: Plaque deposits on one tooth surface at the bracket base.

2: Plaque deposits on two tooth surfaces at the bracket base.

3: Plaque deposits on three tooth surfaces at the bracket base.

4: Plaque deposits on four tooth surfaces at the bracket base and/or gingival.

One examiner conducted the clinical examinations for all three indices. Ten subjects who volunteered to participate were examined on two occasions using the three indices (BI, GI, and OPI) to establish intra-examiner reliability.

The Kappa test was used to analyze the intra-examiner reliability and scored 71.4 percent, 79.7 percent, and 81 percent for GI, PI, and OPI respectively. All patients were seen during their regular recall appointments. The clinical assessment and the filling in of the questionnaire form took approximately twenty minutes (20 minutes) per participant.

The study was performed in the Postgraduate Clinic of the Department of Orthodontics at the Oral and Dental Hospital (University of Pretoria) and was conducted over the period of 21 weeks in 2018. The department had two full time registrars that were treating 160 patients among themselves that were undergoing fixed orthodontic treatment. With the population of 160 and a confidence interval of 95%, a minimum sample size of 47 was deemed to be sufficient. The selection criteria were:

- Treatment that consisted of full mouth fixed orthodontic appliances that had been in place for at least six months.
- No systemic diseases.
- No history of taking antibiotics for the last three months.
- No treatment by an Oral hygienist any time during the month preceding the study.

Fifty (50) patients that fitted the criteria and were able to come when the registrars had sessions which was Mondays, Tuesdays and Wednesday and agreed to take part in the study. Quota sampling was used to choose the participants. This was done through identifying fifty (50) patients who were meeting the selection criteria as stated above. The patients who met the selection criteria were then conveniently sampled as they came in.

Data was analyzed with SPSS Version 25. Descriptive and analytical statistical tests were done, and the level of confidence was set at 95%. Chi square test was used to evaluate the association between variables: Level of significance was be set at $p<0.05$.

RESULTS

The study had 50 participants with 34 (68%) of them being female and 16 (32%) of them being male. The age ranged from 10 to 28 with a mean age of 18,5.

The knowledge and practice patterns of the study participants are shown in Table 1 below.

Table 1. Knowledge and practice patterns of participants (n=50).

Knowledge	Yes (n/%)	No (n%)
Do you know why you have braces?	49 (98)	1 (2)
Where you shown how to clean your teeth after your braces were done?	45 (90)	5 (10)
Do you eat hard sticky food?	15 (30)	35 (70)
Do you know why you should avoid hard sticky foods?	48 (96)	2 (4)
Are you happy with your gums?	35 (70)	15 (30)
Practices		
Do you use interdental brushes under your braces	25 (50)	25 (50)
Do you use a mouthwash?	37 (74)	12 (24)
Have you had your teeth cleaned by a professional	40 (80)	10 (20)
Do you drink sugar containing drinks	41 (82)	7 (14)
How often do you brush your teeth (n/%)		
Once a day 3 (6)		
Twice a day 42 (84)		
Three times a day 5 (10)		
How many times do you use a mouth wash (n/%)		
Once a day 22 (44)		
Twice a day 14 (28)		
Three times a day 2 (4)		
How often do you floss (n/%)		
I don't floss 8 (16)		
Once a day 28 (56)		
Twice a week 13 (26)		
Four times a week 1 (2)		

Table 1 above indicates that most of the patients had knowledge about orthodontic treatment and were aware what food to eat and had the knowledge that sticky and sugary drinks were not good for them. However as far as the practice was concerned 82% of the patients were consuming sugar containing drinks. More than half (56%) of the patients were flossing once a day, 84% were brushing twice a day and 80% of the patients had their teeth cleaned by the professional oral health practitioner.

Table 2. Mean Gingival, Bleeding and Orthodontic indices scores of participants n=50.

	Gingival index	Bleeding index	Orthodontic index
Mean	0.1	13.3	2.6
Std deviation	0.4	15.9	0.7
Minimum	0	0	1
Maximum	3	83	4

The mean gingival index is 0.1 and it shows that most patients had normal gingiva with no inflammation. The bleeding index mean was 13.3 which indicated that most patients had bleeding with 1 patient with a very high score of 83. As far as the OPI was concerned the mean was found to be 2.6 which means that there was plaque found on two to three surfaces of the bracket bases.

When evaluating the association between two indices scores (BI and OPI) and age and gender there were no

significant differences (p>0.05). There were also no significant differences between gender and age as far as frequency of brushing, flossing, use of mouth rinse, appearance of gums and consuming sweetened drinks (p>0.05).

There was also no correlation between age and GI score (p=0.21). However, there was a significant correlation between age and GI score (p=0.02) with more than half of patients in the age category 10-19 years of age having a zero score (58%) as compared to 16% of 24-28. See Table 3. It was also interesting to realise that only 8 % had a score of 1 and 92% of the patients had a score of zero which meant that more than 90% of the patients had normal gingiva. See Table 3 below.

DISCUSSION

The study had 50 participants with 34 (68%) of them being female and 16 (32%) of them being male. This could be explained by the fact that most females are conscious of their overall appearance and the possibility that the female patients were easily and conveniently available during the period of data collection. Orthodontic treatment aims at achieving aesthetic harmony, functional efficiency, and structural balance of the dentofacial region.[17]

Females patients could be well motivated to have this procedure done on them as it could lead to improved personal appearance. The age ranged from 10-28 years with a mean age of 18.5. The latter finding could be due to many reasons why patients in younger years seek orthodontic treatment, this *inter alia* includes the desire to have better dental appearance, straight teeth, self-confidence and social acceptance.[18,19,20]

In testing the practices and the knowledge of the patients, the findings indicated that most patients were knowledgeable and well informed about diet during orthodontic treatment (see Table 1). This might be because oral health care workers in the department of orthodontics in the institution availed themselves to educate and motivate patients before and after the installation of fixed orthodontic brackets, a fact that was reported by patients.

While patients knew what food to consume and what to avoid, 82% of patients were consuming sugary containing drinks which was higher than a similar study.[13] This percentage is very high and indicates that while patients reported that they knew what foodstuffs to take and the fact that sugar containing drinks was not good for them, their practices did not reflect their knowledge. This was not surprising as literature indicate that knowledge does not always translate into changes in behaviour or attitude, but that changes in behaviour are influenced by conditions in which people live.[21]

Many health promotional activities fail because health professionals assume that by providing health education, knowledge will increase, and this would result in change of behaviour and attitudes.[21]

The high consumption of sugar sweetened beverages by most patients is a cause of concern and therefore the oral health workers treating these patients need to reinforce that aspect of knowledge.

According to the findings 56% of the patients indicated that they flossed once a day. Again, the oral health care workers in this department should enforce the importance of flossing once a day to the patients. A high percentage of patients (84%) indicated that they brushed twice a day which is what is recommended during patient education. Only 6% of the patients brushed once a day and these patients must be reminded of the significance of brushing at least twice a day.

It is equally important that patients who are on fixed orthodontic treatment should visit an oral hygienist or a dentist to have their teeth professionally cleaned and checked up to manage and eliminated the occurrence of oral diseases. The findings indicate that 80% of the patients have visited the oral hygienist or dentist to have their teeth scaled and polished. This means 20% of the subjects have not had their teeth professionally cleaned. These patients need to be booked for professional cleaning and reminded of the importance of having their teeth professionally cleaned regularly.

The study found that a high percentage (90%) of patients undergoing fixed orthodontic treatment in the department of orthodontics at the Oral and Dental Hospital had normal gingiva. This finding contrasts with a study conducted among orthodontic patients in King Saudi Hospital.[13] In this study 40% of the patients indicated to have a fair oral hygiene while 60% were indicated to have poor oral hygiene.

The higher percentage in this study could be explained by the fact that the study sample consisted of a higher percentage of female patients and females in general are known to have better hygiene standards compared to males. In the King Saudi Hospital study there was had a higher percentage of male participants (64%) and a low number of female participants (36%).

The high percentage in this study is also an indication that patients took the oral hygiene instruction that was given to them seriously and practised them. This is evidenced by the fact that 90% of the patients admitted that they were shown how to clean their teeth after the brackets were bonded and the fact that the majority of the patients brushed their teeth twice a day.

Table 3. Association between age and Gingival Index score n=50.

Age category (years)	Gingival Index score (n/%)					
	0	1	2	3	Total (n/%)	P value
10-19	29 (58)	2 (4)	0 (0)	0 (0)	31 (62)	0.02
20-23	9 (18)	2 (4)	0 (0)	0 (0)	11 (22)	
24-28	8 (16)	0 (0)	0 (0)	0 (0)	8 (16)	
Total (n/%)	46 (92)	4 (8)	0 (0)	0 (0)	50 (100)	

Even though the OPI revealed a mean of 2.6 which indicate that for most patients there were plus minus three surfaces in the vicinity of a bonded bracket that were covered by dental plaque. This can hypothetically give the impression that most patients have poor oral hygiene, hence this study combined OPI with other indices to get better understanding of the oral hygiene status of the patient.

A study by Ajayi E and Azodo C (2014) only used simplified plaque index and did not use other indices such as the gingival index, orthodontic plaque index and bleeding index.[11] This was somewhat skewed as a patient can have a 10% or less plaque index but present with signs of gingivitis which indicates that the patient may have brushed efficiently prior to their orthodontic appointment.

Using this index only therefore cannot really predict the efficacy of the patient's oral hygiene practices. The only conclusion that can be drawn from only using simplified plaque index is whether patient have knowledge on good oral hygiene regimen. The fact that patients in this study had about three surfaces covered with plaque might be an indication of the difficulty in cleaning around the brackets which is a common finding with patients undergoing Orthodontic treatment.[13,22,23] The encouraging fact is that most patients had normal gingiva which means that reinforcement of oral hygiene practices can solve the problem.

The study performed by Atassi F & Awartani F (2010) depicted that motivating patients to maintain good oral hygiene practices can improve patient homecare regimen.[13] The presence of an oral hygienist who is patient-centred in an orthodontic practice can therefore help to improve the oral hygiene status and knowledge of patients with fixed orthodontic treatment.[24]

There was a significant association between age and GI score ($p=0.02$) with more than half of patients in the age category 10-19 years of age having a zero score (58%) as compared to 16% of 24-28. The finding in this study were similar to patients that were treated at university of Benin in Nigeria that found that the subjects aged between 11-20 years old exhibited a significantly higher level of good and fair oral hygiene status.[11] One would have thought that the older ages would do better in terms of gingival health as their practices are expected to be better because it is assumed their understanding is higher.

CONCLUSIONS AND RECOMMENDATIONS

This study revealed a satisfactory oral hygiene status among this sample with 90% of the patients having normal gingiva, more than half flossing daily, used mouth wash and 84% brushing twice a day. Although this was the case patients had three surfaces on average having plaque around orthodontic brackets, a common occurrence in patients with orthodontic brackets.

There were no significant differences between gender and age as far as frequency of brushing, flossing, use of mouthwash, appearance of gums and consuming sweetened drinks. There was also no association between age and GI score However this study showed a significant association between age and GI score, with more than half of patients in the age category 10-19 years of age having a zero score (58%) as compared to 16% of 24-28 ages. Although the majority of patients in this study reported that they were told what food to eat and how to practice oral hygiene 82% were consuming sugar sweetened beverages.

The study revealed that knowledge does not translate into change of behaviour and therefore the oral health care workers should continue educating and motivating these patients to maintain their oral health and providing recommendations for oral home care aids to enhance their compliance.[25]

They should encourage the patients to gain an understanding of what their responsibilities are and to understand they are partners in their orthodontic treatment and have an opportunity to improve and then maintain good oral healthcare themselves. The staff must also understand that oral hygiene programs won't be effective unless the team accept the responsibility for motivating their patients.

Limitations

This study is limited by the cross-sectional study design, and causality cannot be inferred. Response acquiescence is common in questionnaires that tend to determine habits that are considered taboo or have negative connotations. Despite the limitations, the current study provided useful information that may inform future oral health education approaches of patients at the institution.

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Declaration

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You can run, but you can't hide
- A bitemark analysis

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L Robinson[1], H Bernitz[2]

CASE REPORT

All names and places have been changed to protect innocent victims in this case report.

A young woman was returning home after work when she was accosted by a man wielding a knife. She was dragged into a nearby bush where the suspect attempted to rape her. She put up a substantial fight and was able to flee the scene. She went directly to the nearest police station to report the case. She was asked by the police to accompany them in the hope that she might recognise the suspect at the local taxi rank, which was near the scene of the crime. She did in fact recognise the suspect who was duly arrested. He denied any knowledge of the crime for which he was being apprehended.

The victim informed the police that she had remembered biting the suspect on his right shoulder during the attack and ensuing struggle. The suspect was asked to roll up his right sleeve where a possible bitemark wound was observed. The suspect was taken into custody for further investigations.

Fortunately, the police officer in charge of the case had attended a lecture on bitemarks given by the second author some weeks before the incident and was therefore well-versed in the protocol for the collection of evidence in a bitemark case. The officer arranged that photographs and impressions of the possible bitemark were taken for forensic analysis. Unfortunately, swobs of the bitemark were not conducted, therefore DNA and ABO blood group antigen analysis could not be performed. Impressions of the victim's dentition were also taken from which plaster models were constructed.

Author affiliations:
1. **Liam Robinson:** *BChD, PDD (Maxillofacial Radiology), PDD (Forensic Odontology),* Department of Oral Pathology and Oral Biology, School of Dentistry, Faculty of Health Sciences, University of Pretoria.
   ORCID Number: 0000-0002-0549-7824
2. **Herman Bernitz:** *BChD, Dip (Odont), MSc, PhD,* Department of Oral Pathology and Oral Biology, School of Dentistry, Faculty of Health Sciences, University of Pretoria.
   ORCID Number: 0000-0003-1361-1225

Corresponding author: Herman Bernitz
Department of Oral Pathology and Oral Biology, University of Pretoria, South Africa.
Email: bernitz@iafrica.com

Author contributions:
1. **Liam Robinson:** Primary author - 50%
2. **Herman Bernitz:** Secondary author - 50%

All dental materials used in this case were mixed according to the manufacturer's instructions and were within their expiry dates.

This evidence was submitted to the forensic odontology unit at the University of Pretoria for examination and comparative analysis.

ANALYSIS OF THE BITEMARK

The following evidence was received:
1. A CD containing photographs taken of the bitemark on the right upper arm of the suspect (Figure 1).
2. Two silicone impressions of the bitemark (plaster models were subsequently constructed) (Figures 2-3).
3. Two models of the victim's dentition, one of the maxillary teeth and one of the mandibular teeth (Figure 4).

Figure 1. Photograph of the bitemark on the right upper arm of the suspect.

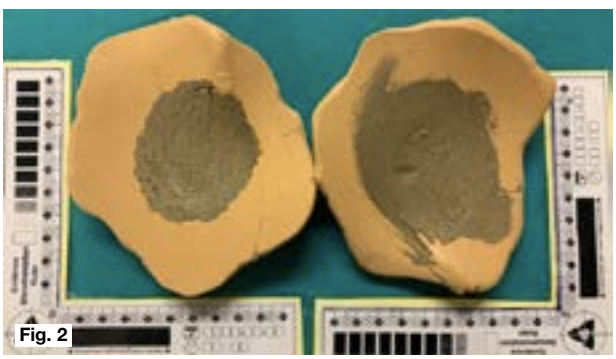

Figure 2. Two silicone impressions of the bitemark.

Figure 3. Cast model of the bitemark.
Figure 4. Maxillary and mandibular models of the victim's dentition.

The examination was performed by comparing the models of the victim's dentition with the clinical photographs and models of the bitemark present on the upper arm of the suspect. An additional pattern association comparison was performed by contrasting the bitemark on the upper arm of the suspect with simulated bitemarks obtained using the victim's dental models to bite into plasticine blocks (Figure 5). Both a macroscopic and microscopic analysis was performed in this case, according to international best practice.

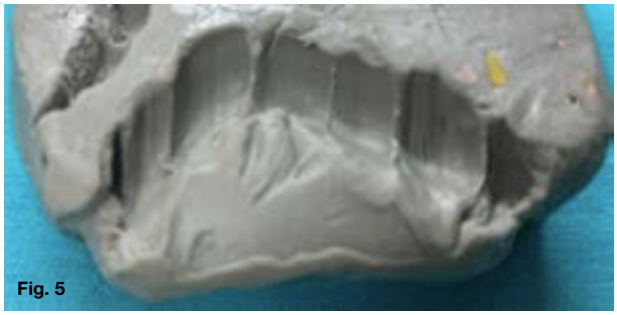

Figure 5. Simulated bitemark using the victim's maxillary dental model.

The marks present on the upper arm of the suspect were consistent with those of a human bitemark.

- The approximate widths of the maxillary teeth were within the normal range (Mean width central incisor = 8.6 mm and lateral incisor = 6.6 mm).[1]
- The shapes of the teeth within the arch were consistent with that of a human bitemark (central incisors wider than lateral incisors).
- The mandibular intercanine distance was within the normal range of a human bitemark.[2] The maxillary intercanine was not measured as both canines were not apparent in the bitemark.

It is important to emphasise the following points when analysing bitemarks:

1. Warping, shrinkage and distortion make exact measurements of teeth impossible, and that these measurements are used purely as a quality control measure.
2. Minimal amounts of warping and shrinkage will not affect the pattern association analysis of bitemarks.[3]
3. When comparing measurements/patterns of a suspect's dentition with bitemarks present on the skin of the victim, an exact match will never be found.[3]

Macroscopic examination of the victim's dental models and the models and photographs of the bitemark on the upper arm of the suspect showed several points of concordance, but lacked any unique recognisable dental features:

i. All mandibular anterior teeth, and teeth 11, 21, 22 and 23 were present in both the victim's dentition and in the bitemark observed on the upper arm of the suspect.

ii. Tooth 21 was labially positioned in relation to tooth 11 in both the victim's dentition and in the bitemark observed on the upper arm of the suspect.

iii. In the victim's dentition, tooth 21 was longer than tooth 22. This was also apparent in the bitemark observed on the upper arm of the suspect. This gave the impression of a step, rather than an even arch contour.

iv. The third quadrant of the bitemark showed a labially positioned tooth, which was also present in the mandibular arch of the victim's dentition.

v. The mandibular arch of both the bitemark observed on the upper arm of the suspect and the victim's dentition showed a similar arch shape.

Based on the macroscopic analysis alone, the following conclusions were made:

1. The victim cannot be excluded as the possible biter.
2. The pattern of the upper and lower bitemarks showed concordance with the pattern of the victim's dentition, but the lack of any unique recognisable dental feature makes any degree of individualisation unreliable.

All evidence was then transferred to the Silverton Forensic Laboratory (Pretoria, South Africa) where a microscopic analysis of the bitemark was performed. A Leica DMC comparison microscope (typically used for examination of fired bullets and other forensic evidence) was used to compare the models of the bitemark and the suspect's dentition. The microscopic comparison showed individualising features, and a conclusion of "high degree of certainty" was given.

In a court of law, the macroscopic and microscopic analysis of the bitemark is presented independently. As previously emphasised, international agreement stipulates that no skin bitemark conclusions are ever given with absolute certainty.

DISCUSSION

A bitemark represents a pattern of injury or marking produced by teeth during the biting process. Bitemarks can be present on inanimate objects found at the scene of the crime such as foodstuffs (for example cheese, chocolate or an apple), or on human skin. Bites can be inflicted by humans or animals, be self-inflicted, or inflicted by the victim on the perpetrator and/or vice versa.[4] Bitemark collection and analysis is a dynamic field of forensic odontology in which techniques, protocols and quality control measures are continuously evolving. The analysis of bitemarks is fundamentally a macroscopic and microscopic pattern association science. This involves a comparison of the patterns of teeth in the dental arch of the biter with the substance bitten, and includes:

- Gross characteristics, which determine whether or not the bite was inflicted by a human.
- Individual characteristics, including the size of teeth, rotated teeth or diastemas.
- Accidental characteristics, such as chips and imperfections caused by attrition, abrasion and trauma.[4]

Bitemark analysis methods and techniques include direct macroscopic and microscopic comparative analysis, various overlay techniques, computer-generated comparisons and 3D computer-assisted programs.[4] Individual cases in which highly scientific methods such as tissue micro-replication followed by scanning electron microscopy for determination of concordance between a suspect's dentition and a victim's bitemark have also been described.[5] Currently, acetate overlays and computer-generated comparisons are regarded as the most objective methods of bitemark analysis.[3] The author's believe that concurrent macroscopic and microscopic analysis is the most accurate and feasible technique for bitemark comparisons. Scratch or sledge marks created by the dentition in the bitten object can be accurately matched to chips and nicks present on the suspect's dentition using a DMC comparison microscope.[5]

It is important to emphasise that several parameters have a significant effect on bitemark analysis. These include the quality of patterns in the bitemark, the type and quantity of material available for analysis and the presence of recognisable dental features. The considerable variation of bitemark presentations on human skin brings its accuracy as a registration material into question. Skin is highly variable in terms of anatomical location, underlying musculature or fat, curvature and looseness or adherence to underlying structures. Also, skin is a highly visco-elastic substrate, which allows stretching and distortion to occur during the biting process or subsequently when evidence is collected.[6] Irrespective of the techniques used, the degree of warping, shrinkage and distortion in bitemark patterns remains one of the biggest stumbling blocks during analysis.[7-8] A study by Bernitz has shown that a small degree of warping or shrinkage will not affect the pattern-associated analysis of the bitemark.[3] This finding was subsequently reinforced using affine transformations to mathematically prove that minor deformations do not affect the ability to show positive concordance between the suspect's dentition and the bitemark.[7]

It is the authors' opinion that a conclusion of "absolute certainty" should never be given in skin bitemark cases. This statement would be virtually indefensible on cross-examination. Pretty and Sweet use the term "highest level of forensic significance" which does not imply absolute certainty.[6,9] In contrast, bitemarks present on inanimate objects can be matched with absolute certainty.[3]

The exact methodology when dealing with a skin bitemark is beyond the scope of this article. For a detailed synopsis, refer to the following article: *Bernitz H, Owen JH, van Heerden WFP, Solheim T. An integrated technique for the analysis of skin bite marks. J Forensic Sci. 2008; 53(1): 194-8.*

The debate regarding the uniqueness of human teeth is probably one of the fiercest in forensic odontology. Many scientists and lawyers have questioned the validity of dental uniqueness determination and its subsequent use in bitemark analysis.[6] Several scientific papers have sought to prove the uniqueness of the human dentition, however, this debate may be moot, as the real issue centres around how much detail of the dentition is transferred, or not transferred, to the bitemark.[10]

In some cases failure of the procedural compliance has led to the bitemark analysis being wrongly branded as a "pseudoscience", a point emphasised in anti-bitemark literature and more recently by organisations such as the Innocence Project (IP). Reports of errors made by forensic odontologists in bitemark cases in the 1980s and 1990s have subjected this science to aggressive and disparaging criticisms.[11-12] It is acknowledged that a wrongful conviction can have dreadful consequences, both for the convicted person and the justice system. As a result, the forensic odontologist must understand the limitations of bitemark analysis and adopt a conservative approach, including developing quality assurance procedures that limit biases and eliminate false or exaggerated conclusions.[10]

The Innocence Project reports that 351 persons have been exonerated using DNA evidence. However, only 27 of these cases included bitemark evidence (approximately 8% of the total). Not all of these cases were exonerations based on DNA analysis alone, as some were based on post-conviction work of forensic odontologists with extensive bitemark experience unrelated to IP.[13] From this, the value of forensic odontologists in the field of bitemark analysis cannot be ignored. Certainly, some form of contradiction exists as IP attorneys may criticise the evidence of bitemark analysis in some situations, yet they choose to use forensic odontologists experienced in bitemark analysis in other situations.[10]

It cannot be overstressed that the comparison of bitemarks must be regarded as a scientific analysis in which a degree of concordance is demonstrated or rejected. Only individuals experienced in bitemark analysis should analyse the relevant evidence, give an impartial scientific appraisal to the court, and leave the final verdict to the judicial system. In this way, bitemark analysis should not be considered a procedure in which a suspect is found guilty or innocent.[4]

CONCLUSION

The analysis of bitemarks found on skin or inanimate objects should only be carried out by a competent, well-trained forensic odontologist experienced in this field. Many of the cited cases where bitemark analysis decisions have been overturned are not because of a failure of the science, but rather due to poor decision-making by forensic odontologists who are not adequately trained in this field.[5]

In summary, the current authors agree with some of the comments below adapted from the final paragraph of an article published by a critic of bitemark evidence:

- Respect the bounds of actual knowledge.
- Abandon claims of uniqueness and absoluteness.
- Abandon the use of misleading terminologies such as match, identification or absolute certainty.
- Offer descriptions and opinions with clarity and candour.
- Offer conclusions with modesty.
- Resist any form of exaggeration.
- Always utilise evidence-based forensic science.[12]

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Treatment of a severe Class II malocclusion with pre-existing root resorption

- A judicious use of orthodontic appliances

SADJ April 2021, Vol. 76 No. 3 p142 - p146

I Hansa

CASE REPORT

The orthodontic treatment of patients with pre-existing root resorption (RR) is often difficult due to the increased risk of progression and often a compromised treatment outcome can be expected.[1,2]

The treatment plan in such situations should comprise of a root sparing strategy, which includes reducing the treatment duration with fixed appliances, non-extraction treatment, reducing force levels, avoiding intrusion of at-risk teeth, reducing the amount of apical movement of the affected teeth and intermittent force application where possible.[1-6]

The following case report shows the use of a root sparing strategy in the treatment of a severe Class II malocclusion with pre-existing root resorption of the 11 and 21.

DIAGNOSIS AND TREATMENT PLAN

A 13-year-old female presented with a chief complaint of protrusive upper anterior teeth (Figure 1). She exhibited a convex profile with incompetent lips, an everted lower lip, deep labio-mental sulcus and a mild mandibular deviation to the right. An Angle Class II, division 1 relationship on a Class II skeletal base was observed, with an overjet and overbite of 13mm and 10mm respectively.

The upper arch had minor crowding of 2mm, and the lower arch had moderate crowding of 5mm, in addition to a 6mm curve of Spee. The upper midline was coincident with the facial midline, and the lower midline was 4mm to the right of the facial midline.

Furthermore, there was a reverse crossbite between the 24/34 and high frenal attachments between upper and lower central incisors, with mild recession on the 31 which seemed to be caused by the aforementioned frenal attachment.[7] A periodontal evaluation was performed and the recession was to be reassessed after orthodontic treatment.

Author affiliations:
Ismaeel Hansa: *BDS, MSc,* Private Practice, Durban, South Africa.
ORCID Number: 0000-0001-6070-4534
Email: drismaeelhansa@gmail.com

The cephalometric analysis (Table 1) found a Class II anteroposterior skeletal relationship (ANB: 5.1°; Wits: 7.6 mm), and a hypodivergent pattern of growth (SN-GoGn: 25.7; Co-Go-Me: 114.7). The upper incisors were proclined (U1-PP: 127.7°), and the lowers were retroclined (L1-GoGn: 86.6°) and retruded (L1-APo: -2.1mm). The lower lip was retruded (-1.5mm).

Radiographic imaging showed a Grade 4 resorption of the 11, and a Grade 3 resorption of the 21 (Figure 1).[8]

On further investigation, the patient revealed a history of primary upper incisors avulsion due to trauma at age 6. This may have played a role in triggering the initial resorption.

The treatment objectives included preventing progression of the RR and recession, achieving a Class I molar and canine relationship, obtaining a normal overjet and overbite, resolving the crossbites, leveling, aligning, and coordinating the arches, improving the smile and soft tissue aesthetics, and retaining the results after treatment completion.

Table 1. Initial and final cephalometric analysis.

	Initial	Final	Difference	Norm
SNA	81.6°	81.4°	-0.2°	82°
SNB	76.5°	78.5°	2°	80°
ANB	5.1°	2.9°	-2.2°	2°
WITS	7.6mm	1.8mm	-5.8mm	0 mm
SN-PP	10.1°	7.8°	-2.3°	8°
SN-GoGn	25.7°	26.4°	0.7°	33°
PP-GoGn	15.6°	18.6°	3°	25°
Y axis	64.2°	64°	-0.2°	61°
U1-PP	127.7°	115.4°	-12.3°	110°
L1-GoGn	86.6°	103.0°	16.4°	94°
L1-APo	-4.4 mm	2.5mm	6.9mm	2mm
Overjet (cast)	13mm	3mm	10mm	3.5mm
Overbite (cast)	10mm	3mm	7mm	2mm
U1-L1	130.1°	123.0°	-7.1°	132°
Naso-labial angle	99.7°	102.9°	3.2°	102°
Facial convexity	16.5°	8.5°	-8°	15°
Upper lip protrusion	6.2mm	3.0mm	-3.2mm	5mm
Lower lip protrusion	-1.5mm	1.3mm	2.8mm	4mm

Figure 1. Initial records.

Figure 2. 6-month treatment progress after discontinuation of the twin block, and start of fixed appliance.

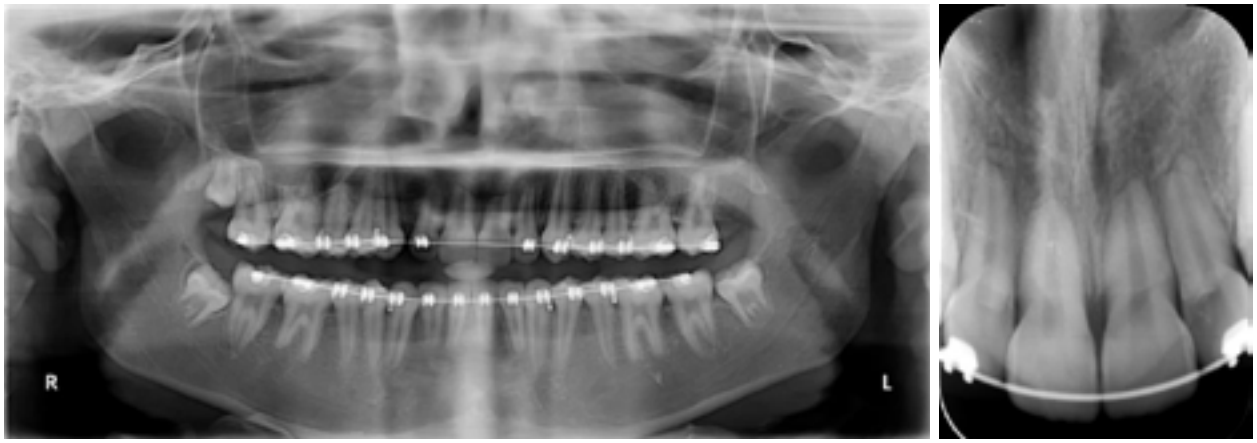

Figure 3. 13-month progress PAN and periapical.

Figure 4. 13-month progress records.

The treatment plan, which utilized a root sparing strategy, was two-phased and non-extraction.[9] A good prognosis for functional appliance treatment was expected (Co-Go-Me angle < 125.5°),[10] and both Herbst and Twin Block appliances were given as options to first correct the sagittal aspect of the malocclusion.[11] A decision was made to use the twin block as the patient was internally motivated and it seemed that compliance would not be an issue.[12] Thereafter, fixed preadjusted appliances would be used, however, the 11 and 21 would only be bonded during finishing to prevent further resorption of those teeth. The central incisors were to be monitored every 6 months with a peri-apical radiograph.

TREATMENT PROGRESS

The twin block appliance with maximum bite advancement was delivered initially with instructions for fulltime wear.[13] After 6 months, the overjet was 3mm, and the molars were in a ½ cusp Class III relationship, and the decision was made to bond the upper (with exception of the 11 and 21) and lower arches (7-7) to level the lower curve of Spee and align the teeth. (**Figure 2**) A progress PAN and peri-apical was taken after 13 months of treatment, and the 14 and 34 brackets repositioned (**Figure 3** & **4**). The lateral incisors were not repositioned due the resorption seen on the peri-apical. The 11 and 21 were bonded passively to avoid deleterious intrusive forces. Treatment was completed 4 months thereafter (**Figure 5**). A lower 3-3 fixed lingual retainer was bonded, and an upper wrap-around retainer was delivered.

TREATMENT RESULTS

The final treatment outcome achieved most of the stated objectives and attained a satisfactory result (**Figure 5**). Class I molar and canine relationships were obtained, overbite and overjet were reduced to 3 mm, and soft tissue and smile aesthetics were improved. Unfortunately, recession on the 31 increased with treatment and although periodontal treatment was advised, the patient did not

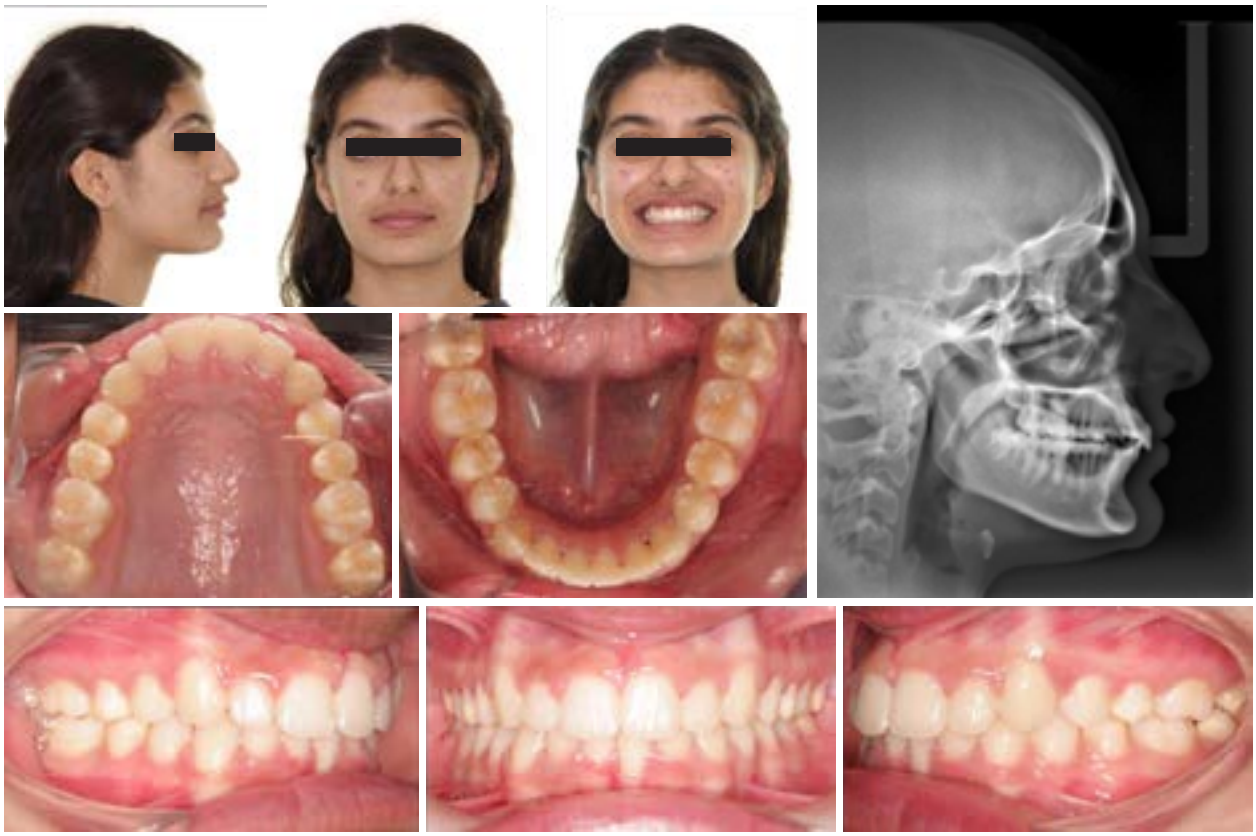

Figure 5. Final records.

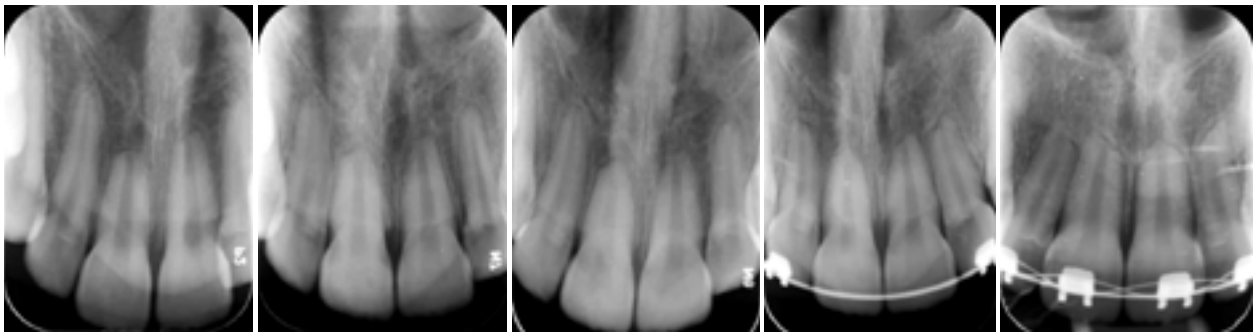

Figure 6. Progression of root resorption at the following time-points: 1) Initial; 2) After 3 months of Twin-block use; 3) After 6 months with the Twin-block and commencement of fixed appliances; 4) After 10 months of fixed appliances; 5) after 18 months of fixed appliances, and 1 month prior to debond.

want to undergo treatment. There was also mild progression of resorption of the 21 and 11 despite the delayed bonding. The upper lateral incisors also developed a Grade 3 resorption post treatment, suggesting a genetic predisposition (**Figure 6**).[14]

Post treatment cephalometric changes (**Table 1**) and superimposition (**Figure 7**) showed restraint of maxillary growth (-0.2°), and a 2° increase in SNB. WITS improved from 7.6 mm to 1.8 mm, probably due to change in occlusal plane and SN-GoGn increased by 0.7°.

The upper incisors retroclined 12.3°, and the lower incisors proclined 16.4°. Although lower incisor proclination has generally not been found to increase gingival recession,[15,16] our patient had a pre-existing gingival defect, which may have exacerbated the recession. However, adding extra labial root torque to the lower incisors to prevent proclination may well have caused further dehiscence and recession and was thus not performed.[17] In hindsight, a pretreatment gingival graft may have been indicated.[18]

Facial convexity decreased 8°, the upper lip was retruded by 3.2 mm, and the lower lip protruded 2.8 mm. Unfortunately, no retention records were able to be taken as the patient emigrated two weeks after treatment completion.

DISCUSSION

The present case shows that the treatment of patients with severe malocclusions and preexisting RR is possible by reducing and eliminating risk factors using a root sparing strategy. Initially, patient related factors should be taken into consideration, such as pre-existing RR, incisors with abnormal root morphology and previous trauma.[19] Thereafter, a root sparing strategy should be planned. This will vary depending on the malocclusion and desired tooth movement. Generally, it would involve the use of light forces, avoiding excessive movement of the tooth apex, using intermittent forces, avoiding intrusion and bodily movement and minimizing the duration in fixed appliances.[20]

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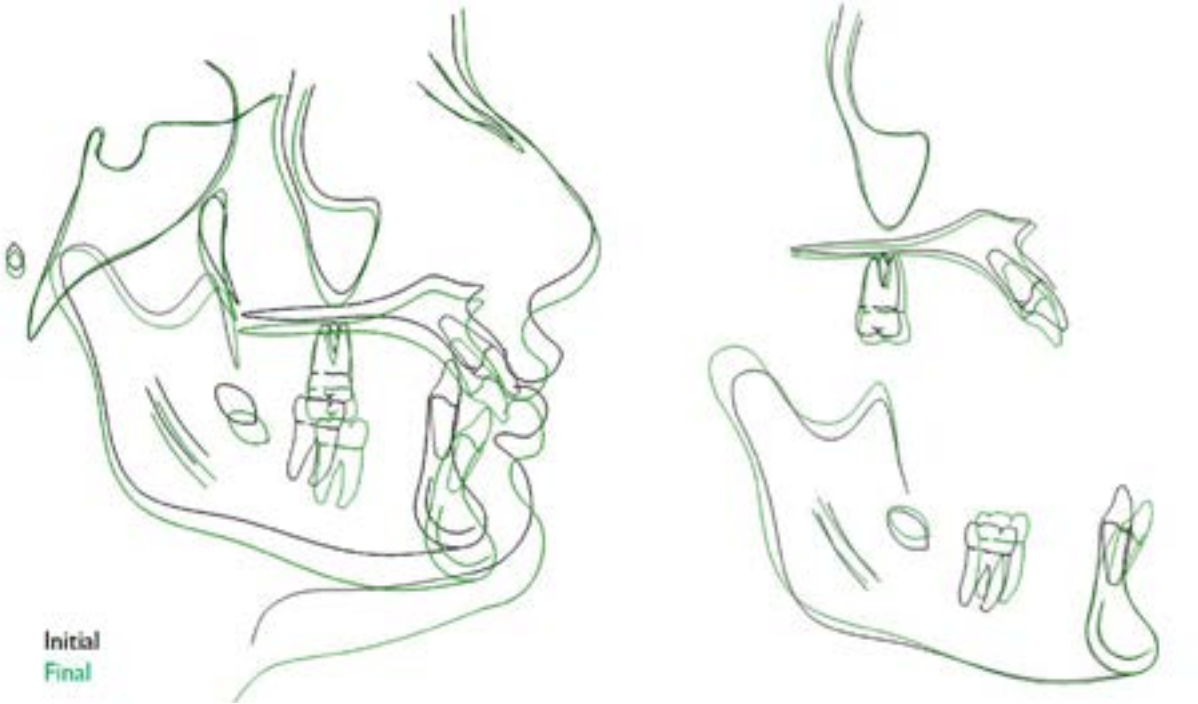

Figure 7. Cephalometric superimpositions of the initial and final cephalometric radiographs

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Evaluation of the quality of systematic reviews critiqued by clinical assistants in-training

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SB Khan[1], Q Isaacs[2]

ABSTRACT

Objective

Conduct an overview of systematic reviews (SRs) reviewed by clinical assistants (CAs) in-training.

Method

SRs relating to clinical procedures and theoretical concepts, critiqued by CAs were included. Review authors independently screened the results of the requested SRs and evaluated these using the AMSTAR-1 checklist and AMSTAR-2 tool. Differences regarding study outcomes were resolved by consultation.

Results

Articles (N=37) submitted to the researcher included 35 reviews published in accredited journals. Of the reviews, only 18 were SRs as stated in their titles and these were of mixed designs and quality; and 17 were either non-structured and biased literature or critical reviews. SR topics reviewed in-training varied; and included temporo-mandibular disorders, implants and implant-supported prosthesis. AMSTAR-1 scores were favourable; scores were low for most SRs using AMSTAR-2, including those with randomized controlled trials only, with the exception of one review that had no randomized controlled trials but fulfilled the critical domain criteria.

Conclusion

Students' misconceptions regarding what constitutes good SRs which are translatable into clinical practice are emphasized, impacting their learning. CAs lack of appraisal skills related to SRs which may influence clinical practices are highlighted.

Author affiliations:

1. **Saadika B Khan:** *BChD, PDD, MSc, PhD,* Department of Restorative Dentistry, Faculty of Dentistry, University of the Western Cape, South Africa.
   ORCID Number: 0000-0001-6017-959X
2. **Qaanita Isaacs:** *BChD, MSc,* Department of Oral Medicine and Periodontics, Faculty of Dentistry, University of the Western Cape, South Africa.

Corresponding author: Saadika B Khan
Associate Professor, Department of Restorative Dentistry,
University of the Western Cape, Private Bag X01, Tygerberg 7505.
Email: skhan@uwc.ac.za

Author contributions:

1. **Saadika B Khan:** Contributed to Protocol, Data collection and Analysis and Manuscript preparation and manuscript finalization - 60%
2. **Qaanita Isaacs:** Contributed to Data Analysis and Manuscript preparation and manuscript finalization - 40%

Keywords

Systematic reviews, AMSTAR assessment, critical appraisal skills, clinical assistants in-training.

INTRODUCTION

According to the hierarchy of evidence, systematic reviews (SR) are considered the most credible study type as it encompasses a rigorous methodology and critical appraisal of all primary research studies.[1-5] The best SRs are those which include only randomized controlled trials (RCTs) related to a specific research question.[2] Moreover, results from such rigorous research may be considered implementable and thus allows clinicians to modify, improve or even change their clinical practices.[1,6] Policy-makers consider and rely on SRs for achieving good quality evidence related to healthcare and thus use these to change policies.[1,6] Yet, in many instances translation of research clinically rarely occurs, despite the enormous costs associated with conducting rigorous clinical research.[7]

Furthermore, beside the structure of an acceptable SR being followed meticulously when being conducted, the reporting of the SR using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Meta-analysis of Observational studies in Epidemiology (MOOSE) checklists, amongst others, should be ensured.[8] Thus, by conducting a SR according to the proposed methodology, all researchers involved would ultimately be responsible for raising and maintaining the standard of this particular research design.

It has been observed in recent years that completing a SR has become the objective of established or even novel researchers and they would readily be involved with such a study. However, in their haste to complete such a study, many errors which may or may not be obvious are included whilst undertaking it. It has been observed that researchers have a tendency to omit or under report the steps taken to conduct the research including failure to record the subsequent study outcomes.[9-10]

The problems are thus two-fold: when conducting the SR using the suggested format/s, errors may be included, and when writing the SR for publication, important features may be omitted.[2,9-10] Thus, when accepting a SR for publication, journals should maintain that researchers complete and submit a PRISMA and/or MOOSE checklists with their manuscript.[8] More importantly, researchers and clinicians including CAs should be trained to recognize that

errors may exist within published SRs. All these contribute to whether the final results or outcomes of the SR may be used to change clinical practice, that is, whether the research findings and evidence are implementable in clinical practice.[6,11-14]

Tools are available to appraise these rigorous secondary research studies, such as a measurement tool to assess systematic reviews (AMSTAR-1), an 11-question checklist used to score SRs that only include randomized controlled trials (RCTs).[15] The responses to the checklist has 4 options (Yes/No/Cannot answer/Not applicable) and a score of 1 is indicated for each 'Yes' response (Table 1).[15] The ratings are grouped according to the scores obtained into high (score of 8-11), medium (score of 4-7) and low (0-3 scores) with the responses following a rigorous explanation and interpretation of what constitutes a 'Yes' answer.[15]

However, the AMSTAR tool has now also undergone an upgrade to a more comprehensive 16-item AMSTAR-2 assessment system, which allows evaluation of SRs that include randomized and non-randomized studies.[16] The AMSTAR-2 checklist includes 10 items from AMSTAR-1, with responses for all including a 'Yes' or 'No' response, and for some items a 'Partial Yes' response to identify partial adherence to the standard.[16]

The AMSTAR-2 checklist does include what is called '7 critical domains', and these are highlighted as the developers believe that these may affect the validity and conclusions of a review.[16] It is therefore important for each study to at least have a 'Yes' response for these 7 domains, so as to ensure that it is a valid and reliable review. AMSTAR-2 does not give an overall score as in AMSTAR-1, but it does give an overall rating which is an indication of the assurance of the results of the review.[16] These ratings are: high=4, moderate=3, low=2 and critically low=1; and are all dependent on the 'Yes' responses of the critical domains. A low rating means one 'critical flaw' and a critically low rating implies more than one critical flaw with or without a non-critical weakness in each SR.[16]

AMSTAR 1 or 2 scoring of SRs are crucial in thus assessing the quality of the published SRs. Developers of both AMSTAR tools, firmly endorse that AMSTAR-2 as an assessment system allows for greater clarity, better assessment, increased ability to check for bias, and to establish greater reliability of results following a more rigorous methodology.[16]

As part of their training, CA's should critique, review and discuss published literature in order to broaden their knowledge base. This forms part of their assessment portfolio where they have to review a certain number of relevant publications per year related to different topics in their respective fields provided to them which are relevant to their learning.

With the escalating amount of attention given to SRs in academic settings, these are the first choice for most of the CAs when searching for relevant publications. Being involved in postgraduate teaching and training, and especially as it relates to SRs and what teachings these convey, it is important to evaluate whether these CAs understand and are able to recognize what constitutes a good SR where the results may be clinically implementable.[6,11-14] Thus completing an appraisal of the SRs reviewed and presented by these CAs using validated tools, would be a good indicator of not just their understanding but also of postgraduate teachings and how it may be improved.[15-16]

During training and at their seminar session, CAs present the chosen articles to colleagues and here they have to contend with questions related to their choice of SR (especially the topic of interest), the guidelines used to complete article review and whether they can recommend clinical implementation of the subject matter under discussion. The work presented may also serve as a guide for clinical implementation of future patient cases presented to this forum.

The aim of this study is thus to complete an overview using validated tools of all systematic reviews critiqued by postgraduate clinical assistants as part of their training.

Objectives

1. To collate and evaluate systematic reviews (Cochrane and non-Cochrane reviews) as it relates to different concepts or topics of interest.

2. To critically appraise each systematic review using the AMSTAR-1 checklist and/ or AMSTAR-2 tool.

METHODS

Protocol development

A protocol was developed (not published) to include all aspects of an overview of SR namely: selection criteria, search strategy, selection methods using predetermined eligibility criteria, data extraction using a preformed data sheet, AMSTAR-1 and AMSTAR-2 tools to evaluate the methodological quality of each included SR, where appropriate.

Ethical clearance for the primary studies that were included in each of the SRs included had to be obtained from the respective institutions involved at that time. Written informed consent was also obtained from the participants in the primary studies according to the Declaration of Helsinki.[17]

Criteria for considering studies included for this overview

Inclusion criteria

Completed SRs related to interventions or concepts after critiquing by CAs.

Exclusion Criteria

Primary and *secondary* research studies on animals that did not meet the inclusion criteria

Types of outcome measures

Primary and secondary outcomes were pre-specified and include:

Primary outcomes

1. Steps for an acceptable systematic review included.
2. Acceptable methodological quality (high scores for each SR) according to the AMSTAR-1 and AMSTAR-2 tools.

Secondary outcomes

Procedures (clinical or laboratory), subjective or patient- or investigator-reported outcomes in patients with interventions were based on students' choice and interests in their field from a list of topics provided during training.

These were analysed and discussed with colleagues, and the relevance of implementation of outcomes related to clinical practice were identified.

Search methods for identification of studies

Electronic searches

Systematic reviews (both Cochrane and non-Cochrane reviews) obtained via computerized searches completed by CAs (both MSc and MDS students) that are relevant to their training and learning were requested from them for the period 2013 to 2018.

For this study, development of a search strategy was therefore not necessary; neither was conducting electronic searches required by the researchers as the CAs had already sourced SRs via computerized searches. The request to all CAs was to forward all their SRs presented at their seminar sessions to the main researcher (SK). As expected, only English versions of studies were included and reported.

Selection methods

An eligibility form compiled from the inclusion criteria was used by the review authors (SK and QI) to independently screen and include potentially relevant SRs requested from the CAs.[2] Studies that did not meet inclusion criteria were excluded and reasons for exclusion were reported.

Data extraction was completed by the researchers on all included SRs received from CAs on study designs included for each SR, participants, interventions, outcomes, and conclusions using a specially-designed pre-piloted data extraction form.[2]

Furthermore, the researchers independently completed the AMSTAR-1 scoring and AMSTAR-2 assessments that critically assessed the methodological quality of SRs.[15-16] Disagreements regarding data extraction were resolved by discussion between the researchers; and when agreement could not be reached a third colleague assisted with the final decision.

Table 1. AMSTAR-1 - Evaluation of included systematic reviews

	AMSTAR-1 ITEM	Al Fadda 2018	Lemos et al. 2018	Said et al. 2016	Huang et al. 2015	Leao et al. 2018	Lemos et al. 2017
1	Was an 'a priori' design provided?	Yes	Yes	Yes	Yes	Yes	Yes
2	Was there duplicate study selection and data extraction?	No	Yes	Yes	Yes	Yes	Yes
3	Was a comprehensive literature search performed?	Yes	Yes	Yes	Yes	Yes	Yes
4	Was the status of publication used as inclusion criteria?	No	Yes	No	Yes	No	No
5	Was a list of included and excluded studies provided?	Yes	No	No	No	No	Yes
6	Were the characteristics of included studies provided?	Yes	Yes	Yes	Yes	Yes	Yes
7	Was scientific quality of included studies assessed and reported?	Yes	Yes	Yes	Yes	Yes	Yes
8	Was scientific quality of studies used appropriately in formulating conclusions?	No	Yes	No	Yes	No	Yes
9	Were the methods used to combine findings appropriate?	Yes	Yes	No	No	Yes	No
10	Was the likelihood of publication bias assessed?	Yes	No	No	No	No	No
11	Was the 'conflict of interest' included?	Yes	No	No	No	Yes	Yes
	Final AMSTAR-1 Score.	8	8	5	7	7	8

Key: Yes = 1 No = 0

Table 2: AMSTAR-2 - Assessment: Critical domains of included systematic reviews

AMSTAR-2 - CRITICAL DOMAINS (7)	Lemos et al. 2018	Lemos et al. 2017	Bueno et al. 2018	Leao et al. 2018
Item 2. Registered protocol.	X	X	X	X
Item 4. Comprehensive literature search.	X	X	X	X
Item 7. Justification of excluded studies.		X	X	X
Item 9. Assessing risk of bias.	X	X	X	X
Item 11. Meta-Analysis using appropriate statistical methods combining results.	X	X	X	
Item 13. Interpretation/discussion of results must include risk of bias of studies.	X		X	X
Item 15. Investigation of publication bias.	X	X	X	

Key: Yes = X

Qualitative analysis

A qualitative discussion related to the primary and secondary outcomes stipulated for this overview is included after analysis of related topics/concepts and relevance of outcomes into clinical practice from the data extracted from each SR. In addition, the AMSTAR-1 checklist was completed to assess the quality of SRs that had included only RCTs and the scores were calculated using the online system where a 'yes' answer equalled a score of 1.15. Similarly, a qualitative discussion is included following an AMSTAR-2 rating of all SRs, those with RCTs only and those including mixed designs.

Data synthesis and management

Data synthesis and management included analysing all SRs presented at seminar sessions by CAs, and collating and reporting on the outcomes of the study and characteristics of each separately. Thus, the results include a report on the methodological quality of each included SR according to the AMSTAR-1 checklist and where applicable the AMSTAR-2 scoring system. These are summarised in the Table.

RESULTS

Summary of SRs included:

The registered CAs (N=9) submitted 37 articles following the request. Of these, 2 were primary studies, 17 were other types of reviews (including non-structured, literature or critical reviews) and 18 were SRs as stated in the titles.

SR subject matter varied, but most related to fixed prosthesis (FPDs) or resin bonded bridges (RBBs), removable prosthesis (RPDs), complete dentures (CDs), implants and implant-supported prosthesis, inlays and onlays, maxillectomy defects, retraction cord, pulp testing, tooth wear and temporo-mandibular disorders. Thus, outcomes were related to implant survival rate, prosthesis survival rate, technique accuracy and reliability, patient satisfaction, masticatory ability, treatment recommendations and (oral health related) quality of life.

For SRs including RCTs only (N=6), which form the apex of the evidence pyramid, only 3 had completed a meta-analysis.[18-23] Thus, most SRs (N=12) included study designs of a mixed nature, of which 9 focused on clinical studies, 1 on a classification system, 1 on a laboratory study and 1 was a case report.[24-35]

AMSTAR-1 results

AMSTAR-1 includes 11 questions related to the structure and methodology of a SR (Table 1). Only 6 of the included 18 SRs were appraised using AMSTAR-1 as they fit the criteria, and had a favourable score following this evaluation.[18-23] Results of the AMSTAR-1 evaluation are summarized in Table 1.

Three of the six SRs had a high score of 8, two had a medium score of 7, and one a score of 5 (Table 1). The SRs by Lemos et al., (2017 and 2018) scored 8 and Leao et al, 2018 scored 7 on AMSTAR-1 respectively, and these were the only studies who met the critical domain criteria when assessed using the AMSTAR-2 tool (Table 1, Table 2).[19-20,23]

AMSTAR-2 results

AMSTAR-1 was initially developed to appraise SRs including RCTs only, whereas AMSTAR-2 is an extension to include both RCTs and non-RCTs and assists in identifying high quality studies.[16] Table 2 highlights the 7 critical domains and the studies that met some or all of these criteria.

When comparing the SRs included for the AMSTAR-1 evaluation, 3 of these were also included in the AMSTAR-2 assessment (Table 2).[19-20,23] However, for AMSTAR-2, the 3 SRs that scored well on AMSTAR-1, did not meet all 7 criteria for the critical domains of AMSTAR-2 (Table 2).[19-20,23] These are considered as low and critically low SRs with the AMSTAR-2 assessment (Table 2).

This may be attributed to the rigor required when assessing studies following these set domains. However, the SR of mixed designs by Bueno et al, 2018, that did not meet requirements to be assessed using AMSTAR-1, fulfilled the criteria for all 7 critical domains of AMSTAR-2 and was rated high.[16,32]

DISCUSSION

SRs by its very nature are considered as the best evidence and as such have reserved the position at the apex of the hierarchical evidence pyramid and this status should be preserved at all costs.[2,4-7] However, in their haste to conduct SRs, researchers have either conducted these poorly by omitting important steps or more often than not, have inadequately reported these SRs. It may be attributed to not including, for example, PRISMA or MOOSE checklists and therefore have neglected to include important information when publishing these.[36-37] With the importance of critical appraisal of studies, including SRs, to establish the standard and rigor of the research, these flaws are highlighted.

This was evident with this study as well, where suitably conducted SRs related to important concepts and interventions fared poorly after appraisal.[2,5-7,15-16] This has a negative impact as the evidence produced should not be considered implementable to clinical practice.[11-14] Thus, the importance of conducting good quality research and more importantly, the reporting of such research cannot be over-emphasized.

CA's depend on research to implement renewed and modernized techniques and in addition, expand on their knowledge of the outcomes of these techniques. In this study, most of the concepts related to advancement of knowledge and skills with regard to dental implants and implant-supported prosthesis which created awareness amongst the CAs of the related outcome and effects.[18-29,22-28] Only 6 of the SRs could be appraised using AMSTAR 1 and only 4 qualified for appraisal using AMSTAR 2.[18-23] Once again, this highlights the significance of quality research designed for application in clinical practice.

Critical appraisal or AMSTAR scoring or assessment of SRs are crucial in determining the quality of the synthesis of research conducted.[15-16] Even though SRs appraised by AMSTAR 1 had favourable scores, it should be noted that only one third of the selected SRs by the CA's qualified for critical appraisal using AMSTAR 1, and similarly, just under a quarter of the selected SRs by the CAs qualified for critical appraisal using AMSTAR 2.[15-16,18-23] Failure to meet the criteria for AMSTAR 1 appraisal is attributable to selection of SRs by reason of included study design.[2,15] Explanations for exclusion of appraisal of SRs using AMSTAR 2 include failure to report on a registered protocol, justification of excluded studies, unsatisfactory techniques or no risk of bias assessment, no meta-analysis conducted and no investigation of publication bias.[16] These factors relate to the critical domains and ensure quality of SRs which is directly related to implementation for guiding clinical practice. Mention should be made of the SR by Bueno et al, 2018, which qualified for appraisal using AMSTAR 2 and met all the criteria stipulated for the critical domains, even though it included non-RCT studies.[16,32]

The implications of this is that a rigorous mixed design SR may be used to change clinical practice as the evidence is regarded highly, and at the same time, a good RCT could have flaws which affect implementation of the acquired evidence.[11-14] According to the developers, the change from the AMSTAR-1, (an 11-point scale) to the AMSTAR-2 (a 16-item tool) as an assessment system allowed greater clarity, better assessment, an increased ability to check for bias, and to establish greater reliability of results following a more rigorous methodology.[15-16]

Knowledge translation (KT) refers to the assessment, review and utilization of scientific research and evidence production that may change and improve the conditions of patients, where appropriate.[38-40] The KT process consists of multiple stages from design to implementation including diffusion, dissemination such as publishing and implementation of research evidence.[38-40] Evidence from SRs, that have a rigorous methodology, is considered implementable into clinical practice, and emphasizes the need for critical appraisal.[2,38-40] CAs are directed to different topics in their respective fields to expand their knowledge base. The CAs are guided by this list of topics to select articles and prepare seminars which can improve their knowledge, skills and clinical practices. Thus, it is as important and essential to appraise all SRs published to ensure the evidence may be implementable. Accordingly, from knowledge-into-action or from evidence-to-practice, entails the translation of best evidence obtained from well conducted SRs into clinical practice.[29-31]

CONCLUSIONS

Included studies per SR were mostly of mixed design types and quality, some of which reduced the value of the evidence. Students' misconceptions regarding what constitutes quality SRs and the appraisal skills required may be questioned. Choice of SRs was largely based on students' interests in the concepts or related clinical topics covered, not on the quality of the evidence needed to change or improve clinical practice.

Clinical implications

It is recommended that lectures and/or workshops focusing on SRs (methodology and interpretation) should be conducted with students and staff in the postgraduate program. The importance of using rigorous research or evidence to change clinical practice and thus the care provided to patients has also been emphasized.

The role of CAs in this regard is crucial in the program and also for their clinical practice after graduating. Moreover, the articles chosen to review should be a guided process, other than providing topics or areas of interest. The impact of these learning sessions on clinical practice has far-reaching effects and this must be highlighted.

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Data availability statement

1. The datasets generated during and/or analysed during the current study are available from the corresponding authors on reasonable request.
2. Data generated or analysed during this study are included in this published article.

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Integrating dentistry into palliative medicine - Novel insights and opportunities

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A Majeed[1], A Ahsan[2], M Vengal[3], P Sampath[4], G Vivek[5]

ABSTRACT

Palliative care is a global human right, to be provided in a systematic way. The dentist can help the patient right from the initial diagnosis of the condition up to the relief of pain in the terminal stages of the diseases. This inquiry into the oral physician's role on elderly care and special needs would be of benefit to researchers of Palliative Dentistry; particularly in multidisciplinary contexts. This text proposes to discussintegrated oral care, oral health care delivery system, and a flow of educational actions, resources, research, conceptual framework, guidelines and dissemination of newer trends in oral palliative care.

Keywords

Palliative dentistry, geriatric dentistry, mobile dentistry, portable dentistry, palliative oral care.

BACKGROUND

Oral care, in majority of terminally ill patients is often neglected. This is because patients are not always able to receive oral care in their preferred place of care, are often shuttled between sites of care and experience unnecessary hospital admissions as they near the end of life. The patient's emotional, social and economic wellbeing add to these woes. Literature has shown that oral palliative care can have a positive impact on the quality of life of patients; however, the provision of oral palliative care is often still less than optimal.[1-4] There is therefore a need to integrate dentistry to palliative care needs and to disseminate the concept of palliative care amongst oral healthcare professionals. Palliative care dentistry has been defined by Wiseman as the study and management of patients with active, progressive, far-advanced disease in whom the oral cavity has been compromised either by the disease directly or by its treatment; the focus of care is quality of life.[5]

Palliative care is a global human right, to be provided 'throughout the illness course'.[6] According to Obadan-Udoh et al. "providing care that is patient-centered is an indication of quality and that should be our ultimate goal. Dental profession has huge challenges in meeting these expectations."[7] The purpose of this article is to offer practical tips and techniques for establishing successful oral palliative care.

Palliative care in South Africa

South Africa has a population of 55 million people of which 62% constitutes the urban population. It is designated an upper middle-income country by the World Bank with $12,730 GNI per capita in 2014. Life expectancy in 2014 was 57 years.[8] In 2011, the World Bank report on human resources in health identified that there were 4.7 nurses, 0.8 doctors and 0.085 dentists per 1000 people.[8,9] The estimated need for palliative care using only mortality data is that 0.52% of the population requires palliative care in any year. There are currently eight hospital palliative care services (two dedicated children's palliative care services) and 150 hospices providing palliative care, about 40 of them also provide care for children. Funding for palliative care is a limiting factor and a number of hospices closed in the period 2011-2016 for wants of funds.[8]

The South African National Department of Health (NDoH) requires the support of all government and non-government organizations (NGOs) in their vision of a healthy life for all people of SA. The care provided by hospices takes place mainly within the patient's home. In response to this need Hospice Palliative Care Association (HPCA) adopted the Integrated Community- Based Home Care Model,[10] which was developed by the South Coast Hospice in KwaZulu-Natal (KZN). The NDoH recognized this as a best practice model and commissioned HPCA to replicate the model in urban, peri-urban, and rural communities; to determine the cost of the model and to develop a training curriculum for home-based carers.[8]

Author affiliations:
1. **Abdul Majeed:** *BDS, MDS,* Oral Medicine and Radiology, KMCT Dental College, Manassery, Kerala, India.
   ORCID Number: 0000-0001-9735-2691
2. **Auswaf Ahsan:** *BDS, MDS,* Professor and Head of the Department Oral Medicine and Radiology, KMCT Dental College, Manassery, Kerala, India.
   ORCID Number: 0000-0002-4629-2999
3. **Manoj Vengal:** *BDS, MDS,* Professor, Oral Medicine and Radiology, KMCT Dental College, Manassery, Kerala, India.
   ORCID Number: 0000-0001-8977-2901
4. **Prejith Sampath:** *BDS, MDS,* Oral Medicine and Radiology, KMCT Dental College, Manassery, Kerala, India.
   ORCID Number: 0000-0002-3339-0565
5. **G Vivek:** *BDS, MDS,* Consultant Dentist (Oral Medicine and Radiology), Dentigo, Iqraa International Hospital, Calicut, Kerala, India.
   ORCID Number: 0000-0001-9231-3909

Corresponding author: Abdul Majeed
Oral Medicine and Radiology, KMCT Dental College, Manassery, Kerala, India.
Email: mazid1987@gmail.com

Author contributions:
1. **Abdul Majeed:** Primary author - 20%
2. **Auswaf Ahsan:** Second author - 20%
3. **Manoj Vengal:** Third author - 20%
4. **Prejith Sampath:** Fourth author - 20%
5. **G Vivek:** Fifth author - 20%

The first hospital-based palliative care team in SA was established in Charlotte Maxeke Johannesburg Academic Hospital in 2001.[11] Other important service providers are Wits Palliative Care, Gauteng Centre of Excellence for Palliative Care, and Chris Hani Baragwanath Hospital in Soweto. Of particular note is a program developed from a hospital-based palliative care team established in 1999, which ran the N'Doro project funded by Irish Aid for 3 years (2003 - 2006). They provided specialist palliative care services, outreach visits to the Soweto community, consultations for patients in Chris Hani Baragwanath Hospital, as well as training of healthcare professionals, conducting research and undertaking advocacy activities for palliative care.[12]

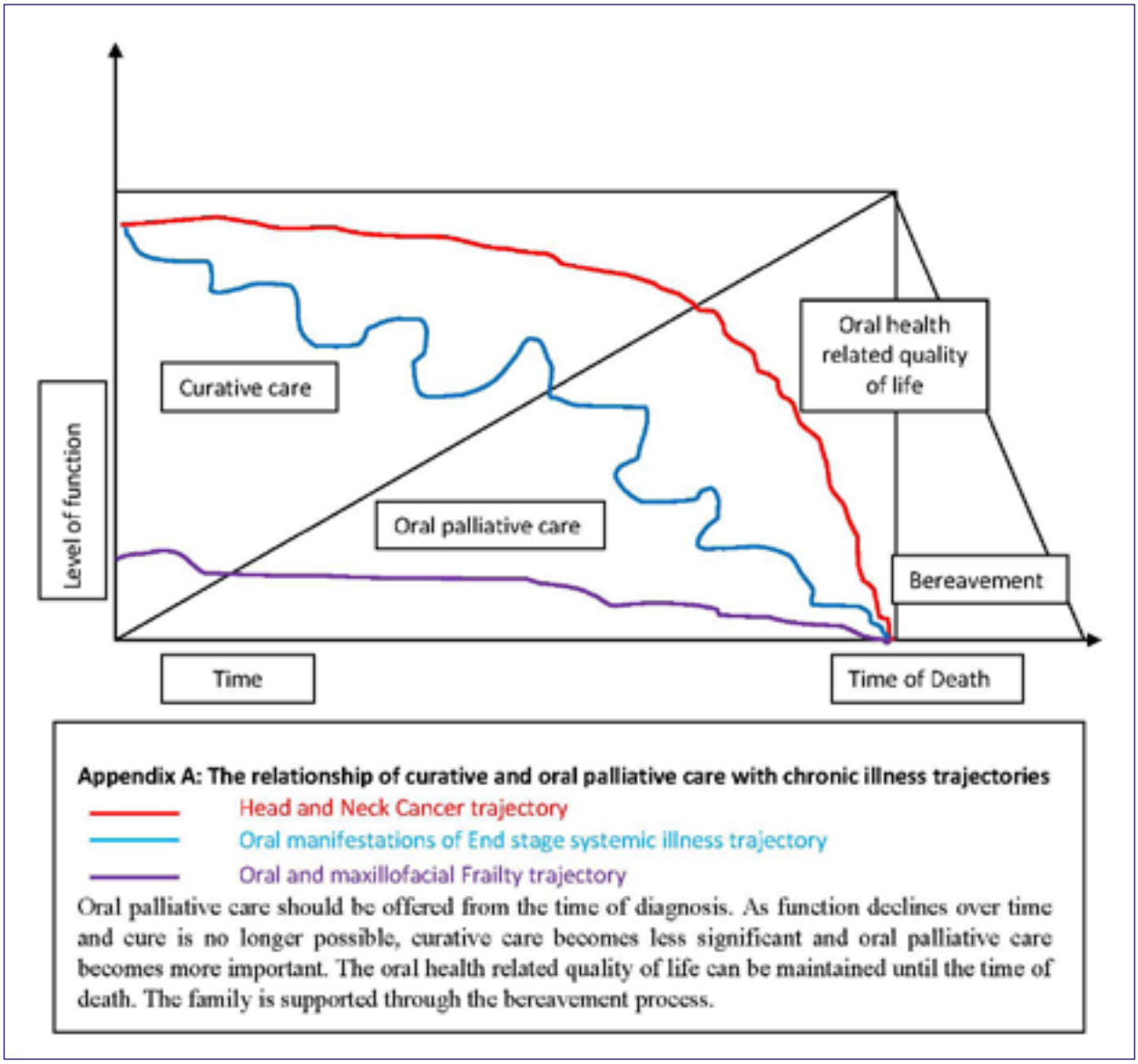
Despite South Africa having launched the National Policy Framework and Strategy for Palliative Care 2017–2022,[13] integrating palliative care into existing public health care is still in its infancy. In 2018, with district wide institutional managerial support, a South African palliative care model for rural areas was initiated in the Western Cape. The process involved setting up hospital- and community-based multi-professional palliative care teams, initiating weekly palliative care ward rounds, training champions in palliative care and raising awareness of palliative care.[14]

Palliative care in India

In India, organizations like NNPC and Pallium India are making enormous contribution in the field of Palliative care.[15] Kerala, one of the southern states of India, has managed to develop an integrated health service delivery model with community participation in palliative care.[16]

Institute of Palliative Medicine has been playing a major role in shaping up this model. The evolving palliative care system in Kerala tries to address the problems of the incurably ill, bedridden and dying patients irrespective of the diagnosis, age or social class.

The program in Kerala is also expanding to areas like community psychiatry and social rehabilitation of the chronically ill. Palliative care has been declared by the Government of Kerala as part of primary health care. The 'Quality of Death' study by Economist Intelligence Unit (2010) states that "Amid the lamentably poor ac-



Appendix A. The relationship of curative and oral palliative care with chronic illness trajectories.

cess to palliative care across India, the southern state of Kerala stands out as a beacon of hope.

While India ranks at the bottom of the Index in overall score, and performs badly on many indicators, Kerala, if measured on the same points, would buck the trend. With only 3% of India's population, the tiny state provides two thirds of India's palliative care services. In April 2008, Kerala became the first state in India to announce a palliative care policy. The Calicut model has also become a WHO demonstration project as an example of high quality, flexible, and low-cost palliative care delivery in the developing world and illustrating sound principles of cooperation between government and NGOs.[17]

Oral palliative care

Oral palliative care includes access to oral care, regular oral screening, imaging, diagnosing and treating oral diseases like salivary gland disorders, xerostomia, head and neck cancer, temporomandibular joint disorders, myofacial pain, oral psychosomatic disorders, oral mucocutaneous disorders, auto immune disorders, oral and maxillofacial frailty, odontogenic and non-odontogenic infection of the jaws, oral manifestations associated with systemic diseases, edentulism, caries and periodontal diseases. They may result from ageing, poor oral intake, drug treatments, local irradiation, oral tumors or chemotherapy. Oral symptoms may significantly affect the person's quality of life, causing eating, drinking, and communication problems, and oral discomfort and pain.[15]

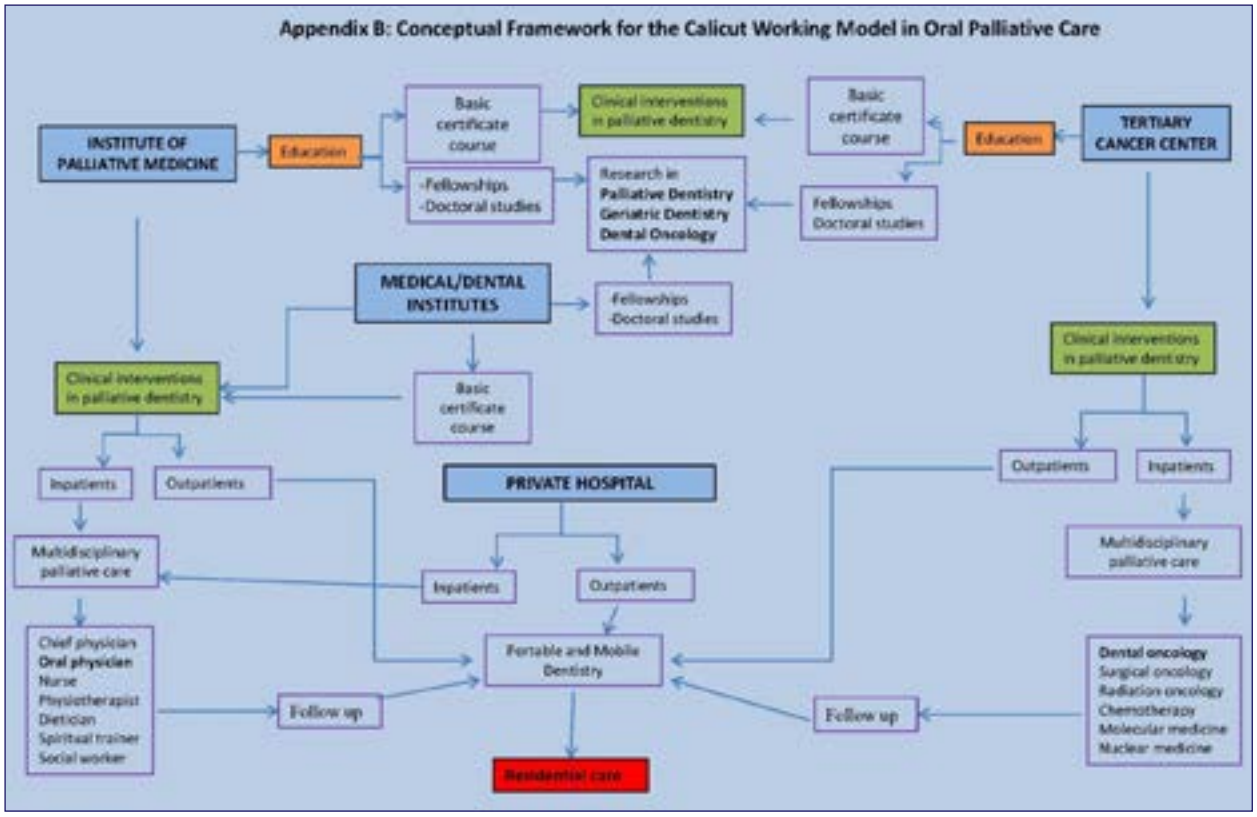
Geriatric Dentistry is therefore obviously an integral part of palliative medicine which covers all aspects of oral and maxillofacial dysfunctions. Nam et al., in 2017, considered oral and maxillofacial dysfunctions like xerostomia, burning mouth syndrome, taste disorders, swallowing disorders and oromandibular dyskinesia or dystonia as 'oral and maxillofacial frailty' which literally means reduced physiologic functions of oral and maxillofacial region.[18] Prevention of these oral complications, early recognition, diagnosis, and management often requries the bridging of expertise between both medical and dental care.[19]

Why oral palliative care so important?

Appendix A depicts the trajectories of oral and maxillofacial disorders which most likely would benefit from oral palliative care. A disease trajectory describes a patient's health status or function over time and may be affected by the availability of health services and treatments.

While head and neck cancer follows a fairly predictable course, oral manifestations as a result of a chronic systemic illness often has periods of acute decline followed by recovery, although the overall function declines over time. Patients with oral and maxillofacial frailty often follow a slow but inexorable decline in function, and care for these patients are often neglected due to improper knowledge on oral palliative care.[20]

Dentists can help the patient right from the initial diagnosis of the condition up to the relief of pain in the terminal stages of the diseases. But many a times the general dentist is unaware of his responsibilities toward a terminally ill patient. The community is also unaware of the role that a nearby dentist can play.[3] It is therefore necessary to sensitize authorities to ensure that the expertise of a dentist is available for palliative care needs.



Appendix B. Conceptual framework for the Calicut working model in oral palliative care.

Access to oral care

The need for an integrated model of oral palliative care has prompted the authors to describe a Calicut working model (Appendix B). This is an effective and efficient collaboration between Institute of Palliative Medicine, regional tertiary Cancer Research Centre, Medical/Dental institutions and an NGO palliative care team in a private hospital. It aims to address the oral health problems of institutionalized cancer patients, terminally ill and geriatric patients, especially the frail, special care needs and homebound individuals. Since most of the patients prefer to be at home in the last phase of their life, it is ideal if oral palliative care services are available to them at their residence. Oftentimes, the organizers ensure that the patients are treated on site with minimal interruption of their day or without the complex logistical issues surrounding transportation (Figure 1 and 2). Despite the increased focus on clinical care in the recent decade, oral health professionals have turned to the area of research in palliative dentistry, especially in geriatric dentistry and dental oncology. This has been made possible through basic certificate courses, fellowships and doctoral studies in oral palliative care available in universities across the district.

Figure 1. Mobile dental van.

Figure 2. Dental chair inside the van.

As the patient's end stage disease progresses, the need for oral palliative care will increase with a concomitant decrease in the level of curative treatment. It is often very difficult to recognize the oral problems, especially for a patient who has an unpredictable disease trajectory.

For this purpose, a simple assessment tool has been developed by a private dental institution (Appendix C) in order to identify patients who have unmet oral palliative care, regardless of prognosis. As with any tool, this would need to be validated for use in all settings. Patients who are identified to be in need of oral care interventions can then be further assessed by the appropriate dentist.

Oral health care delivery system

Historically, Portable and Mobile Dentistry (PMD) has been valuable to those for whom transport can be a challenge, like children and the elderly.[21] It is very significant to differentiate portable dentistry from mobile dentistry. Portable dentistry entails treating patients at locations such as nursing homes, private homes, and institutions, by transporting dental supplies and equipment from the office to the location. Mobile dentistry on the other hand, involves a dental clinic on wheels in which the patient can be treated within the vehicle.[22]

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Appendix C: Calicut model Oral Palliative Care Assessment Tool (COPCAT)

Step 1. Does the patient have any of the following illnesses?

- HIV and/or TB
- Cancer
- Kidney Failure/Disease
- Liver Failure/Disease
- Heart Failure/Disease
- Respiratory Disease/Respiratory Failure
- Stroke/Cerebovascular Accident
- Neurological Disease such as Motor Neuron Disease/ Multiple Sclerosis/Parkinson's Disease
- Dementia/Alzheimer's/Other causes
- Uncontrolled Diabetes Mellitus
- Frailty with multiple comorbidities
- History of serious fall
- Decreasing activities of daily living
  - In bed for >50% of the day
  - Increasingly relying on others for self-care (bathing/dressing/brushing/eating)

If yes or no, move to step 2.

Step 2. Does the patient have any of the following oral problems? (examine the patient)

1. Calculus/plaque/poor oral hygiene
2. Halitosis
3. Root caries and periodontal disease
4. Edentulism
5. Candidiasis
6. Ulcers
7. Orofacial pain
8. Oral and maxillofacial frailty
   a. Xerostomia
   b. Burning mouth
   c. Altered taste sensation
   d. Swallowing disorders
   e. Speaking difficulties
   f. Difficulties in facial expressions
   g. Oromandibular dystonia/dyskinesia
9. Para functional habits/bruxism/sleep apnea
10. Maxillofacial trauma

If the patient is with or without any of the illness in step 1 + Any of the first 5 criteria in step 2	Basic general oral palliative care
If the patient is with or without any of the illness in step 1 + Any of the remaining criteria (6-10) in step 2	Advanced specialist oral palliative care

Appendix C. Calicut model Oral Palliative Care Assessment Tool (COPCAT).

Molete et al, in 2014, conducted a cross-sectional study in retirement villages in six district regions in Johannesburg. The aim of the study was to investigate barriers to accessing oral health care amongst an elderly sample residing in government-subsidized retirement villages.

The barriers most frequently reported included the belief that they were not able to afford dental treatment and the lack of transport availability.[4] in 2016, another study demonstrated the costs of providing oral health care for school children in a mobile dental unit. The author stated that, it would be possible to expand the service provision to a wider population, particularly in the South African government's plans to integrate school health programs in the primary healthcare re-engineering programme.[23]

Thema and Singh in 2017, conducted a cross-sectional, explorative and descriptive study using a combination of qualitative and quantitative data to assess oral health service delivery in the public sector in Limpopo Province.

Themes arising from data analysis included lack of policy support; no dedicated funding; and poor oral health representation within different levels of the health system. It has been suggested that, there was an urgent need for re-orientation of oral health services towards prevention and promotion.[24]

By projecting population data beginning from 1955, Jim Chung, an independent scholar, determined that over the next twenty years, Canada is expected to double her population of people over the age of 65 to ten million.[25] This will represent less than 20% of Canada's projected population, and the situation is similar for the US.[26]

In Western Europe that population will represent over 25% of its total population, and in Japan that number is approaching 40% of its respective population.[25] This poses a number of fundamental challenges to the traditional model of delivering dentistry.

In Canada, there is typically too much competition amongst dentists in the big cities, and a shortage of dentists in the rural regions. Jim chung has suggested that, rather than joining a less than busy practice or starting a new practice with zero patients and poor prospects, a new practice model could be a mobile clinic servicing a dozen retirement homes that one could visit twice a month in rotation. Retirement homes are becoming large retirement centres in response to the growing demographic. The retirement homes are privately operated, for-profit businesses and charge their residents a premium for their services.[25]

Guidelines for oral palliative care in South Africa

The following guidelines constitute an attempt to progressively establish oral palliative care in South Africa.

1. The right to health

Access to oral palliative services over the course of an illness to alleviate unnecessary pain and suffering is a basic human right. The nation's obligation to respect, protect and fulfill this right should be expressed as "A healthy life for all South Africans."

2. Equitable access

All South African citizens should have access to the essentials of oral palliative care, both in the public and private health sectors and across all service levels. Patients should have access throughout the continuum of care, from diagnosis through treatment, and over the course of their life.

3. Evidence-based research

Oral health care providers should be guided by evidence based practice and locally developed guidelines. On-going research, monitoring and evaluation are required to assess and refine quality standards and management guidelines.

4. Patient-centered and ethical care

The provision of oral palliative care must adhere to the principles of medical ethics. It should be an absolute requirement in ensuring oral health related quality of life and dignity of patients from the time of diagnosis until death. Oral palliative care should be accessible and available in facilities for people with disabilities and in care homes for the elderly.

5. Legal and regulatory framework

In order to meet the needs of patients requiring oral palliative care, a national policy framework and strategy in line are required. Such a policy framework and strategy must address the structural challenge, oral health related quality of life and social determinants of health.

6. Social determinants of health

It is difficult to evaluate South Africa's morbidity and mortality without consideration of the social determinants of health. Lack of access to water, sanitation, education and employment all impact the health of the population. It is impossible to have optimal health in South Africa for all, until these social determinants of health are addressed.[13] The abovementioned factors also have an impact on the provision of oral palliative care.

7. Governance and financing

Oral palliative care as a health service module has not been determined and therefore adequate funding has not been allocated for the delivery of care. At the organisational level, the National Oral Health Service is dysfunctional. Currently, there is no costing model for oral palliative care in South Africa.[27]

8. Health resources

A major challenge in providing oral palliative care in South Africa includes a lack of recognized and qualified dentists.[9] There is also an absence of curricula, limited formal training and resources, and no clear definition of roles and responsibilities of dentists in the palliative care team. Nurses and other health care workers within the multi-disciplinary team receive minimal training to enable them to recognize the needs of individuals seeking assistance for oral palliative care. Given the relative scarcity of dentists in South Africa (0.085 per 1000 population),[9] it has been argued that a health workforce should be developed for the provision of oral palliative care services.

By establishing a rotating internship program for Under

Graduate and Post Graduate dental students at the Institute of Palliative Medicine, day care, long term care facilities, tertiary cancer centres or centre for special needs, the availability of dental practitioners can be increased.

9. Service delivery

There is a severe lack of effective communication and appropriately defined care pathways between service providers, resulting in large gaps in the continuum of oral palliative care. Persons in need of oral palliative care should be identified early and should be put onto a specific care pathway with clear referral processes to ensure continuity of oral care throughout the course of the illness. Early identification can be achieved through the use of a clinical assessment tool, which assists health care providers in identifying patients with oral palliative care needs, regardless of prognosis. It is also noteworthy to ensure the availability of PMD in all health sectors.

10. Inter-professional collaboration

Oral palliative care should be developed and maintained through collaboration between relevant national departments through a productive memorandum of understanding (for example, medical/dental institutions, tertiary cancer centers and palliative care centres). There should also be collaboration between government and non-governmental organizations, charitable trusts and religious organizations.

11. Centres of excellence

As the need for oral palliative care is addressed, it will be necessary to establish academic curriculum at the medical/dental institutions, tertiary cancer centers and institute of palliative medicine. The dentist at these centers will be involved in teaching, research, advocacy and service delivery, as in the case of any other academic department. Whilst oral palliative care is currently not recognized as a specialty, the dentist would hold at least a master's degree in Dentistry and a suitable fellowship in palliative care.

12. Information and research

Government/non-governmental sources of oral palliative care information is scarce, making it difficult to access information with regards to the delivery of oral palliative care services. The University of Cape Town and University of the Witwatersrand (Wits Centre for Palliative Care) both have a robust palliative care curriculum embedded within the undergraduate and post graduate medical curricula.[13] These institutions are best positioned to initiate clinical and interventional research related to PMD and integrated oral palliative care.

13. Dissemination of newer trends

Publishing the scientific works related to oral palliative care will help identify numerous challenges and barriers that have precluded continuing care to oral palliative care needs. Organizing national or international conferences to congregate the entire perspectives of palliative medicine and dentistry is another way to meet the needs.

14. Dental oncology

A fellowship in dental oncology should be started in tertiary cancer centers. The dental oncologist can play an integral role before, during, and after anti-neoplastic therapies, in order to provide the maximum possibility of functional and aesthetic outcomes. Dental oncologists should be recognized as key members of the multidisciplinary cancer-treatment team.

15. PMD

As Jim Chung suggested;[25] the dental practitioners should be encouraged to undergo a paradigm shift from the traditional model of dental care and move towards a model that includes portable and mobile dentistry (PMD).

CONCLUSION

Taken together, the perspective of integrating dentistry into palliative medicine is deeply rooted with the principles of human dignity and appreciation of life, while further reinforced by numerous spiritual values. This will go yet a step further in evoking the moral values and norms of the dentist with respect to enhancement of collaborative opportunities; definitely stating "existence of any matter depends on the priorities."

Such a perspective is however not static, but rather dynamic while nurturing solidarity and support to palliative care needs. Further research on service integration to palliative medicine on the various issues of palliative care needs is nonetheless required to bring about a better understanding of oral health related quality of life.

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Declaration

The authors declare no conflict of interest.

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Do the CPD questionnaire on page 168

The Continuous 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.

Online CPD in 6 Easy Steps

1 Go to the SADA website www.sada.co.za.
2 Log into the 'member only' section with your unique SADA username and password.
3 Select the CPD navigation tab.
4 Select the questionnaire that you wish to complete.
5 Enter your multiple choice answers. Please note that you have two attempts to obtain at least 70%.
6 View and print your CPD certificate.

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What's new for the clinician?
- Excerpts from and summaries of recently published papers

SADJ April 2021, Vol. 76 No. 3 p160 - p163

Compiled and edited by V Yengopal

1. Online follow-up improves the quality of life of patients who undergo extraction of impacted mandibular third molars - A randomized controlled trial

X Zheng, J Zhao, Z Wang, et al. Postoperative online follow-up improves the quality of life of patients who undergo extraction of impacted mandibular third molars: a randomized controlled trial. Clin Oral Invest. 2021; 25: 993-9.

INTRODUCTION

Surgical removal of impacted 3rd molars is a common surgical procedure carried out by both general and specialist oral health professionals. This procedure is often associated with postoperative pain, swelling and bleeding which affects the patients eating and speaking and oral health related quality of life.

Very little published studies have investigated the effect of postoperative follow-up on the quality of life of affected patients. Traditional postoperative follow-up via telephone has proven to be effective and it has effects such as reducing the cost of consultation compared with conventional on-site follow-up. However, in clinical practice, telephone follow-up was found to greatly increase the time consumption of doctors and nurses, as they have to repeat the same instructions or guidelines, and patients often reject the calls, as they think that these unknown incoming calls are harassing calls.

The increase in online medical care facilitates patients' access to medical services and also enables doctors to manage their cases more efficiently and follow up with their registered patients quickly and accurately to obtain important clinical data. Zheng and colleagues form China (2021) used the Good Doctor Online mobile app to follow up registered patients after tooth extraction. The primary aim of their study was to evaluate the effectiveness of postoperative online follow-up on patients' quality of life following impacted mandibular third molar removal. A further objective was to investigate the application value of online medical care in the field of oral therapy.

Veerasamy Yengopal: *BChD, BScHons, MChD, PhD*, Community Dentistry Department, School of Oral Health Sciences, University of Witwatersrand, Medical School, no. 7 York Road, Parktown 2193, South Africa.
ORCID Number: 0000-0003-4284-3367
Email: veerasamy.yengopal@wits.ac.za

MATERIALS AND METHODS

The study was a prospective, randomized, double-blind clinical trial. Healthy patients with no history of major systemic disease, aged 18-45 years old, with impacted mandibular third molars indicated for surgical removal were included in this study. Smokers, those with poor oral hygiene, and/or severe periodontitis, pregnant patients or those with systemic disease were excluded from this study.

This study tested the null hypothesis that there were no differences in the clinical outcomes of patients without online follow-up vs. those with online follow-up, against the alternative hypothesis of a difference. All measurements were taken by independent blinded assessors.

A standardized procedure was performed for the surgery. A cone beam CT (CBCT) was taken before the operation and the position of the 3rd molar was recorded using the Pell and Gregory classification.

Patients were assigned to one of two groups: one group recei-ved follow-up the other did not. The PoSSe scale which is a questionnaire with good reliability and validity, was used to evaluate the quality of life of patients after operation.

Postoperatively, patients were placed on antibiotics (amoxicillin 750 mg p.o. three times a day for 3 days; patients with a history of allergy to penicillin were prescribed clindamycin 300 mg p.o. four times a day for 3 days), a NSAID (ibuprofen 600 mg p.o. at least 12h apart when

necessary), and a mouthrinse (0.12% chlorhexidine mouthwash twice a day for 7 days).

Patients in the test group were asked to download the Good Doctor Online mobile app on their mobile phones and register their personal information. The surgeon used the mobile app to group and actively follow up with the patients on the first, third, and fifth days after surgery to monitor their postoperative response, reemphasize the postoperative instructions, and answer the patients' questions.

Patients in the control group did not receive a postoperative online follow-up. Patients in both groups were followed up with in the hospital for suture removal and completion of the PoSSe scale 7 days after the surgery. The PoSSe scale was used as a measure to effectively evaluate the quality of life of the patients, including their eating, talking, feeling, appearance, pain scale, nausea, and other daily life activities.

Patients with poor compliance, patients without follow-up, and patients whose operation time was too long (>45 min) were excluded from the final analysis of the data.

The approval rate of an online follow-up after tooth extraction by 20 senior doctors (≥40 years old) and 20 young doctors (<40 years old) was also recorded. A visual analogue scale (VAS) was used for the analysis, in which a score of 0 represented lack of approval and a score of 10 represented high approval. None of the 40 doctors participated in the clinical trial, and they did not know the results of the clinical trial.

RESULTS

In this study, 145 patients were enrolled, and 12 patients were excluded. The remaining 133 patients were randomly divided into the test group (68 cases) and control group (65 cases). Thirteen patients did not come to the on-site follow-up, and 122 patients were finally analysed, including 62 in the test group and 60 in the control group.

There was no significant difference in age, operation time, sex, Pell and Gregory classification, Winter classification, relationship with inferior alveolar nerve canal, osteotomy, crown cutting, or root splitting between the two groups ($P>0.05$).

All patients successfully underwent tooth extraction. In the test group, in addition to our active follow-ups, 18 patients still actively asked questions through the app. There was 1 case of postoperative haemorrhage and 1 case of postoperative swelling that failed to improve on their own under the online guidance of the doctor and needed to be followed up with in the hospital. The remaining cases were provided nursing advice and did not need to come to the hospital, which minimized the burden of patient visits. In the control group, 9 patients returned to the hospital for follow-up treatment, including 2 cases of postoperative haemorrhage, 3 cases of discomfort due to swelling, and 4 cases of foreign body sensation in the wound. Among these 9 patients, only 1 case of postoperative haemorrhage required postoperative wound re-suturing after examination by the doctor, and the remaining cases were provided explanation and given comforting treatment. Thirty-two patients in the control group said they had questions during the whole healing process, but because they could not get the doctor's response in time, they could only query the Internet or ask friends who had had their teeth removed. In the on-site follow-up 7 days after surgery, the scores of the other PoSSe scale items were significantly lower in the test group than in the control group. Higher scores on the PoSSe scale represent more severe symptoms and worse quality of life of patients.

The VAS scores of young doctors and senior doctors for the approval of an online follow-up after tooth extraction were 8.05 ± 1.46 and 4.45 ± 2.21, respectively, indicating that the young doctors' approval of a postoperative online follow-up was significantly higher than that of senior doctors ($P<0.05$).

CONCLUSIONS

The researchers concluded that postoperative online follow-up effectively improved the quality of life of patients who underwent extraction of impacted mandibular third molars. Young doctors (<40 years old) were more likely to approve the online follow-up after tooth extraction than senior doctors (>40 years old).

Implications of practice

The COVID pandemic has forced clinicians to minimize any unnecessary face to face consultations. The use of mobile apps was found to be effective for follow-up and patient monitoring in this study.

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1. Zheng X, Zhao J, Wang Z, et al. Postoperative online follow-up improves the quality of life of patients who undergo extraction of impacted mandibular third molars: a randomized controlled trial. Clin Oral Invest. 2021; 25: 993-9.

2. Working length accuracy in endodontics - Electronic versus visual methods

AA Klemz, ATG Cruz, L Piasecki, E Carneiro, VPD Westphalen, UX da Silva Neto. Accuracy of electronic apical functions of a new integrated motor compared to the visual control of the working length - an *ex vivo* study. Clinical Oral Investigations. 2021; 25: 231-6.

INTRODUCTION

The determination of the proper working length is an important factor for successful root canal treatment. This is variously expressed either as an extension to the apical constriction or 0.5-2 mm short of the radiographic apex (RA) or as an extension to the cementodentinal junction (CDJ). However, this is not always feasible in clinical practice. Therefore, all working length (WL) assessment methods aim to determine the optimal approach of this anatomical structure, which may considerably vary from one tooth, root or wall to the other.

There are many different ways to determine the working length, for example by use of anatomic averages and knowledge of apical anatomy, tactile sensation, presence of moisture on paper points, radiographs and electronic apex locators (EALs). Also, given that the CDJ cannot be precisely located on radiographs, there are arguments supporting the termination of preparation in necrotic cases at 0.5 to 1 mm short of the radiographic apex and at 1 to 2 mm short in cases involving irreversible pulpitis.

Electronic apex locators (EALs) are currently the most reliable method for determining the working length (WL) for endodontic procedures.[1] Compared to the traditional radiographic method, the use of Electronic apex locators (EALs) is faster, does not require radiation exposure, and is more accurate for detecting the canal terminus under different conditions.[1]

Tri Auto ZX2 is a new version of the cordless electric endodontic motor with a built-in apex locator. In addition to a continuous rotation, the Tri Auto ZX2 is capable of two new motions, the optimum torque reverse (OTR) and optimum glide path (OGP). The OTR allows continuous clockwise rotation of the instrument under minimal intracanal stress and then switches to a 180° clockwise and a 90° counter-clockwise reciprocation if the pre-set torque value is reached.

The apical functions of most integrated motors control the apical limit by either stopping or reversing the motion when the instrument tip reaches the pre-set apical point. 1 Tri Auto ZX2 also features a new apical function named Optimal Apical Stop (OAS), which slightly reverses the instrument (one half to one full rotation) prior to stopping the motion.

Klemz et al. (2021) reported on a trial that sought to evaluate the accuracy of the new Tri Auto ZX2 endodontic motor in maintaining the WL while shaping canals using the apical functions auto apical reverse (AAR) and Optimal Apical Stop (OAS) in combination with the continuous rotation (CR) or optimum glide path (OTR) motion, compared to the conventional visual control using rubber stoppers. The null hypothesis is that the different combinations of motions and electronic apical controls would result in the apical limit of preparation similar to the conventional visual control.

MATERIALS AND METHODS

One-hundred ten human, single-rooted, mandibular premolars were selected from a pool of extracted teeth stored in a 0.1% thymol solution. The teeth were evaluated under an operating microscope at ×10 magnification to exclude roots presenting with cracks, calcified canals, immature apices, resorptive defects, caries, or lateral foramina.

The teeth were scanned by means of cone-beam computed tomography (CBCT) to evaluate and standardize the anatomical parameters. Eighty standardized teeth characterized by Vertucci's Type I configuration, apical curvature less than 10°, and apical diameters up to 0.25 mm were selected. The teeth were washed in saline, and dental crowns were cut with a diamond disk to obtain a plain surface and a root length of approximately 18 mm. Endodontic access was performed using round burs. A manual size 15 K-file was used to confirm the presence of a single canal and a patent major apical foramen.

The coronal thirds of the root canals were pre-flared using a nickel-titanium (NiTi) SX rotary instrument using 2.5% sodium hypochlorite as the irrigating solution. Visual measurements were performed under ×10 magnification using a size 15 K-file introduced into the root canal until the tip became visible at the most coronal border of the apical foramen (AF) opening. At that point, the rubber stop was carefully adjusted to the coronal flat reference point. The distance between the file tip and the rubber stop was measured in triplicate using a digital calliper with 0.01 mm precision. The mean length was defined as the pre-operative actual root canal length (AL).

The teeth were randomly divided into five groups ($n = 16$). To prevent movement of the teeth during the root canal preparations, they were fixed to an acrylic platform: a customized rectangular small acrylic box containing a lid with five rounded orifices. Four teeth at a time were fixed at the CEJ level to the orifices using auto-polymerizing acrylic resin, and the fifth orifice was used to connect the contrary electrode of the motor. Before placing the lid containing the teeth, the acrylic box was filled with freshly mixed alginate. The canals were irrigated with 2.5% sodium hypochlorite.

The canal measurement function of TriAuto ZX2 set at the 0.5 mark was used to determine the electronic work-

ing length of the teeth to be prepared with conventional visual control. The length obtained was measured using the digital calliper to a 0.01-mm precision and approximated to the nearest half millimeter. For the conventional visual control (CVC) group, the rubber stoppers were carefully adjusted using the pre-calibrated lengths of an endodontic ruler.

The files were activated using the continuous rotation (CR) motion of TriAuto ZX2 motor, set at 300 rpm, 2.5 N·cm, and no apical control function. Then, the operator slowly advanced the calibrated proTaper instruments into the canal, and visually controlled their insertion according to the coronal flat reference point.

For each of the four experimental groups, it was assigned a combination of one of the tested motions (continuous rotation (CR) or optimum glide path (OTR) motion) and one of the apical action functions (auto apical reverse (AAR) and Optimal Apical Stop (OAS). For both motions, the speed was adjusted to 300 rpm, with "auto start" set to "on" and "auto stop" set to "off." For the continuous rotation (CR) motion, the torque was adjusted to 2.5 N·cm, and the options "apical slow down," "torque slow down," and "apical torque down" were set to "off."

For the OTR motion, the 180° rotation angle was selected, and the trigger torque was set to 0.2 N·cm. For both apical actions, the "0.5" position was selected in the meter's display. The Tri Auto ZX2 motor was turned on, and the contrary electrode (lip clip) was placed inside the alginate. The NiTi instrument was inserted into the contra angle, which contains a built-in electrode designed to close the electric circuit. Thus, when the NiTi instrument was placed inside the wet canal, the motor automatically started the rotation. In these four groups, all the rubber stoppers were removed, and the ProTaper instruments were slowly advanced inside the canal until the apical action of the motor reversed (AAR) or stopped (OAS) the motion.

The canals in all groups were shaped using the ProTaper Universal rotary NiTi instruments up to an F3 size. The chemical-mechanical preparation was performed by a single operator trained to use the new motor. After each NiTi instrument used, irrigation was performed with 2 mL of 2.5% sodium hypochlorite, and patency was checked. Final irrigation was performed using 17% EDTA.

The last ProTaper instrument used (F3) was introduced manually into the full extent of the prepared root canal, and the rubber stop was adjusted to the reference point. The distance between the instrument tip and the rubber stop was measured using a digital calliper and recorded as the WL. The teeth were removed from the alginate, washed in saline, and then visualized under ×10 magnification. A size 15 K-file was inserted up to the Apical Foramen to measure the actual length after preparation. All visual measurements were performed by a single operator who was blinded to the groups.

RESULTS

The mean pre-operative actual root canal length (AL) was 18.3 mm (SD ± 0.38), the mean length after preparation (AL2) was 18.27 mm (SD ± 0.36), and the mean WL was 17.75 (SD ± 0.42). A *t* test revealed no difference ($P>0.05$) between AL and AL2 measurements, but WL measurements were significantly different from those for AL2 ($P<0.05$).

The multiple comparisons revealed a statistically significant difference only between conventional visual control (CVC) and the combination of Continuous rotation (CR) motion and Optimal Apical Stop (OAS).

There was no significant differences between the groups when mean length after preparation (AL2) and WL measurements were obtained using the different motions and apical controls ($P>0.05$).

CONCLUSIONS

Within the limitations of this in-vitro study, the tested combinations of motions and apical controls for the Tri Auto ZX2 motor were able to provide an adequate apical limit for the mechanical preparation of root canals, similar to conventional visual control using rubber stoppers. There was no significant difference between the motorised and manual processed used to determine working length.

Implications for practice

The Tri Auto ZX2 cordless electric endodontic motor with a built-in apex locator is effective for use in determining working length for teeth with single root canals.

Reference

1. Klemz AA, Cruz ATG, Piasecki L, Carneiro E, Westphalen VPD, da Silva NetoUX. Accuracy of electronic apical functions of a new integrated motor compared to the visual control of the working length - an *ex vivo* study. Clinical Oral Investigations. 2021; 25: 231-6.

http://dx.doi.org/10.17159/2519-0105/2021/v76no3a8

Maxillofacial Radiology 189

SADJ April 2021, Vol. 76 No. 3 p164

CJ Nortjé[1], J Walters[2]

This 10-year-old boy presented with a main complaint of a carious painful primary molar in the third quadrant. A pantomograph revealed an incidental mass in the right posterior maxilla (Figure 1). No other symptoms were reported. What are the most important radiological features and what is your provisional diagnosis?

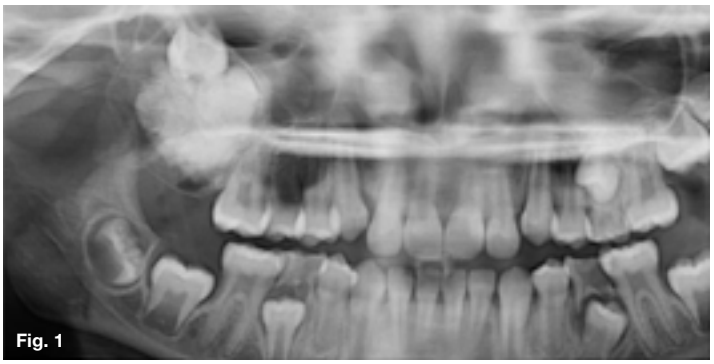
Fig. 1


Fig. 2

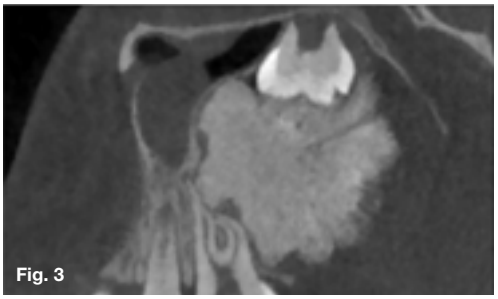
Fig. 3

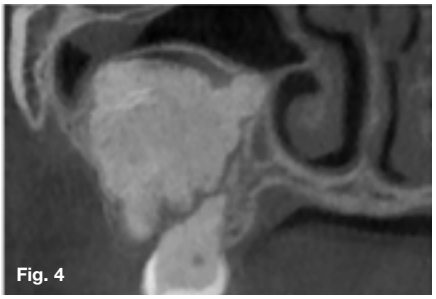
Fig. 4

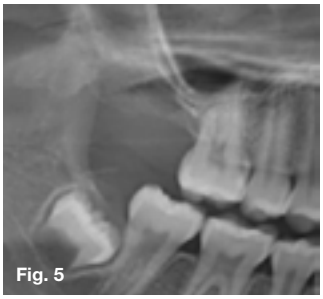
Fig. 5

INTERPRETATION

Appearing as a solitary radiopaque mass encompassed within a well-defined corticated cystic-like capsule and inclusion of the third molar. Expansion, thinning, and interruption of the cortex with protrusion into the maxillary sinus was discernible. Root resorption at the 16 with impaction and displacement of the third molar was apparent. 3D volume rendering (Figure 2) demonstrate the extensions. Sagittal (Figure 3) and coronal (Figure 4) CBCT slices depict a lobulated mass appearing as a tooth-like predominantly intermediate-density accompanied with specs of high-densities throughout and a missing second molar. Histopathological confirmation of an ameloblastic fibro-odontoma (AFO) was made. A follow-up cropped pantomograph (Figure 5) indicated no recurrence. A member of the mixed odontogenic tumours, demonstrating features of an ameloblastic fibroma and an odontoma. The WHO notes it to be an immature representation of the latter. It is a benign neoplasm consisting of odontogenic epithelium, ectomesenchyme and dental hard tissue formation. Compared to the ameloblastic fibroma and ameloblastic fibrodentinoma. The AFO's inductive changes are more advanced with enamel and dentine present. Frequency ranges from 0.3% to 3.7%. With 98.9% of cases observed before the age of twenty and a mean of 9-years-old. Similarly, odontomas also develop during the tooth-forming years. Therefore, meticulous radiographic interpretation can facilitate provisional diagnosis. Radiographically lesions appear unilocular or multilocular with internal content ranging from multiple specs of calcifications to solid odontoma-like masses. Diagnostic features include a fine cortical outline, a thick lucent rim, and the ability to cause significant tooth displacement when compared to similar appearing lesions of the same size. There is a slight male predominance with a ratio of 1.4:1. Predilection has been shown for the posterior mandible, though all regions of the jaws can be affected. Usually asymptomatic, slow-growing, and deemed solely as a central intraosseous lesion. Most are associated with an unerupted or impacted tooth where investigation leads to initial discovery. Treatment consists of surgical enucleation.

Author affiliations:
1. **Christoffel J Nortjé:** *BChD, PhD, ABOMR, DSc.* Faculty of Dentistry, University of the Western Cape.
   ORCID Number: 0000-0002-9717-5514
2. **Jaco Walters:** *BChD PDD (MFR) PGD (OS) MSc (MFR),* Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, University of the Western Cape, Tygerberg Oral Health Centre, South Africa.
   ORCID Number: 0000-0002-0593-6890

Corresponding author: Jaco Walters
Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, University of the Western Cape, Tygerberg Oral Health Centre, South Africa.
Email: jawalters@uwc.ac.za

Author contributions:
1. **Christoffel J Nortjé:** Principal author - 50%
2. **Jaco Walters:** Second author - 50%

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The “contagious” clinician

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LM Sykes[1], GP Babiolakis[2], B Boers[3]

ABSTRACT

The many new airborne viral pathogens such as coronavirus (Covid-19), the novel variant (SARS-CoV-2), acute respiratory distress syndrome (ARDS), severe acute respiratory syndrome (SARS), and Middle East respiratory distress syndrome (MERS), have brought about a whole new avalanche of problems.

These airborne pathogens are all highly contagious and transmissible, especially in the dental setting where the procedures and machinery used may generate enormous amounts of aerosol spray. This is an ideal vector for air/droplet spread.

Most dentists have implemented screening procedures to determine if their patients are well enough to be treated, and have begun wearing a full gamut of personal protective clothing (PPE). Nonetheless, a concern that has received limited attention in the literature is the “contagious clinician” who continues to work and who may pose a risk of infecting their patients.

This paper explores both the patient’s rights to quality care in a safe and healthy environment, as well as the clinician’s rights to determine for themselves if they are mentally and physically competent to practice. It also poses questions about whether health care practitioners can be mandated to be inoculated against potentially life-threatening and highly infectious agents.

INTRODUCTION

In the early eighties when the world first heard about HIV/AIDS, there was a frenzy that occurred throughout the medical and dental professions. Some of the concerns related to fear of patient-to-patient, and patient-to-dentist transmission.

Author affiliations:

1. **Leanne M Sykes:** *BSc, BBDS, MDent, Dip Research Ethics (IRENSA); Dip ESMEA (Univ Dundee), DipOdont (Forensic Odontology),* Department of Prosthodontics, School of Dentistry, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa. ORCID Number: 0000-0002-2002-6238
2. **George P Babiolakis:** *BBDS, MSc Dent, PGDip Dent,* Part-time Lecturer, Department of Prosthodontics, University of Pretoria, Pretoria, South Africa.
3. **Bernice Boers:** Final year dental student, Department of Prosthodontics, University of Pretoria, Pretoria, South Africa.

Corresponding author: Leanne M Sykes
Department of Prosthodontics, School of Dentistry, Faculty of Health Sciences, University of Pretoria, South Africa.
Email: leanne.sykes@up.ac.za

Author contributions:

1. **Leanne M Sykes:** Primary author - 60%
2. **George P Babiolakis:** Second author - 20%
3. **Bernice Boers:** Third author - 20%

This brought about new surgical disinfection and sterilization protocols that needed to be adhered to, to prevent cross-contamination. The reported incidences of dentist to patient infection were rare and usually occurred as a result of poor adherence to disinfection and sterilization protocols.

At this time, it became the norm for dentists to start wearing surgical gloves - something that had rarely been done for general dental work, except during surgical procedures. Many also started to wear facemasks and protective goggles to protect themselves from the aerosol back spray.

Fear of infection from the HIV virus also led to several position papers and publications on both practical and ethical principles related to HIV. The Health Professions Council of South Africa (HPCSA) published guidelines to clinicians on the management of patients with HIV infection or AIDS.[1]

These regulations explored issues such as whether dentists could insist on patients being tested and declaring their status before being treated; if they could refuse to treat HIV positive patients; if and when confidentiality about a patient’s HIV status could/or should be breached; and whether they were obliged to inform other health care practitioners or family members of a patient’s status.

Due to the sensitivities and stigmas associated with HIV infection at that time, it was regulated that clinicians could not insist on patients being tested or declaring their positive status before treatment.

As such, it became the practice to consider “all patients as possibly positive” and to adhere to the strictest disinfection and sterilization protocols recommended for the various categories of dental instruments and surgery areas, as well as the necessary personal protective protocols to adopt for themselves, their staff and their patients.[1]

Booklet 6 also documents comprehensive guidelines on the necessary steps that all practitioners are expected to take to prevent or minimise the risks of transmission of any infectious agents from one person to another, including disposal of biohazardous and biological waste.[1]

The "new enemies"

Acute respiratory distress syndrome (ARDS), severe acute respiratory syndrome (SARS), Middle-East respiratory syndrome (MERS), Coronavirus (Covid-19), the novel variant (SARS-CoV-2), and other airborne viral pathogens have brought about a whole new avalanche of problems.[2]

These viral pathogens are all highly contagious and transmissible, especially in the dental setting where the procedures and machinery used in the surgeries and laboratories generate enormous amounts of aerosol spray which is an ideal vector for air/droplet spread.

Dentists who are concerned about their health and safety have implemented basic screening procedures for their patients and have begun wearing a full gamut of personal protective clothing (PPE). They are also at liberty to refuse to treat a visibly ill, or Covid infected patient unless the condition is life-threatening (which is rare in dentistry).

They can usually provide temporary relief for a patient with antibiotics, analgesics or anti-inflammatory drugs until they are well enough to be treated. Also, presumably, a sick patient would cancel or postpone treatment until they feel better. The greater risks are the contagious, but asymptomatic patients.

A "concerned clinician" ought to take every possible precaution to protect themselves, their patients, and their staff. But what about the "contagious clinician" who continues to work? They may not be that ill as to warrant staying away from their surgery; may not want to risk the loss of income or inconvenience of cancelling patients and having to fit them in later; not want to pay staff to come to work and do nothing, and have high overhead costs to worry about.

These individuals may insist on working despite being ill and potentially contagious. They may wear full PPE, or generally at least will don gloves and masks when operating. However, in between patients they should dispose of these garments and put on a new clean set.

During this time, they may walk from room to room without either any of the PPE apparel and can potentially be spreading viruses particles throughout their surgeries. If they have air conditioners this will allow atmospheric spread as well, which is even faster and more dispersed.

Another concern is that when Covid-19 first surfaced, people were advised to cough into a handkerchief or their sleeve. Imagine then, a sick dentist coughing into their sleeve, or using their arms to wipe their nose or brow, and then leaning over an open-mouthed patient while working. This will result in a direct avenue for the virus to be inhaled through the nose or mouth of the unsuspecting patient, and a very high risk of them becoming infected.

Ethical issues

1. Patient-related issues

The Department of Health is committed to providing all patients with "caring and effective services".[3] To this end, they have drawn up a set of guidelines known as The Patients' Rights Charter.[3] The very first one states, "Every patient has a right to a healthy and safe environment".

At the same time, patients have a responsibility to "provide health care workers with relevant and accurate information for diagnostic, treatment, rehabilitation or counselling services". If this is the case, then surely, patients also have a right to expect the provision of, and compliance with, the same from their treating clinicians.

Patients have confidence and trust that their doctors will act professionally and in their best interest at all times. The clinician may feel that despite being ill themselves, they pose no risk of harming their patients. In their minds, the treatment will thus be both beneficial (doing good), to the patient and non-maleficent (not harmful). However, they need to also consider the other ethical principles outlined by Beauchamp and Childress,[4] especially that of patient autonomy.

This encompasses the patient's right to choose for themselves what they wish to have done to their bodies and depends on the clinician's duty to truth-telling and communication.[5] An honest clinician would inform their patients they are ill and could be contagious and allow the patient to autonomously decide if they wish to proceed with the scheduled treatment. Ideally, this should be conveyed to them before they spent time and money getting to the surgery.

The fourth principle relates to justice (fairness and fair treatment), and includes legal justice (the respect for morally acceptable laws), distributive justice (fair distribution of limited resources) and rights-based justice (respect for people's rights).[5] These issues will not be discussed further in this paper as they are not directly related to the topic being explored.

2. Clinician–related issues

The clinician may feel and argue that they have the right to work and earn a living, and to judge for themselves if they are mentally and physically competent enough to do so. However, could they be considered negligent or even found guilty of malpractice if they knowingly work when they are ill and inadvertently infect a patient?.

Based on the four principles of biomedical ethics, such clinicians may be acting with beneficence with regards to alleviating patient pain and addressing their dental needs. However if they have not disclosed their impediments to their patients they have denied the patients their right to autonomy.

At the same time if the person being treated suffers in any way as a direct consequence of the dental treatment, the clinician would also be guilty of acting with maleficence.

A further and future issue relates to vaccination. There are people who for various personal reasons object to taking vaccinations. If and when a vaccine becomes available for Covid-19, every person (and clinician) will have the right to choose whether they wish to be vaccinated and if they are prepared to accept any possible side effects that may be associated with the immunization. They may not fully trust the research or elect to wait and see how well the inoculation works before being vaccinated themselves.

This is a personal choice and needs to be respected. However, if they have not yet had Covid-19, they will be potential carriers and spreaders of the infection if they catch it at a later stage. Once again this poses a threat of them infecting their patients, especially if they are asymptomatic and continue to work. Would they still be considered negligently in this situation? Their intention was never to cause harm, and they were fully justified to choose whether or not to be vaccinated. In this case patients were not denied autonomy and the clinician did not intentionally act with maleficence.

The same practitioners may feel they are doing more good (being beneficent) by treating patients who may be in pain, than staying home if they are not ill. If they intended to provide a service, and were truly unaware of their impairments, they cannot be held accountable if they inadvertently infect their patients. They may feel that their actions were fully justified and would argue this point if it went to a court of law. At the same time, it would be very difficult for the patient to prove conclusively that their dentist infected them.

CONCLUSION

Given the many factors and concerns raised in the above scenarios, there are no simple or fully "right or wrong" answers to most of the questions posed. In the authors' opinion, it all depends on "intent" and whether their actions were motivated to benefit the patient or their pocket.[6] As such, it remains the duty of the dentist to act responsibly and professionally, and at all times to adhere to the core ethical principles.

This will include their behaviour within their practice, as well as regarding their personal mental and physical health and well-being. They must ensure strict adherence to correct disinfection and sterilization protocols, wearing of the requisite PPE by themselves and their staff in all surgical areas, never placing patients or staff members at risk of being infected with a contagious agent or harmed in any way due to their negligence, and acting professionally at all times.

This encompasses far more than merely following the adage of "First do no harm". It includes weighing up risks versus benefits in every situation, making it more subjective and less straightforward.[7]

A far better guide is another affirmation from the Hippocratic Oath that states, "I will follow that system of regimen which, according to my ability and judgment, consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous".[8]

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CPD questionnaire

This edition is accredited for a total of 3 CEUs: 1 ethical plus 2 general CEUs

GENERAL

Evaluation of radiation awareness among oral health care providers in South Africa

1. Select the CORRECT answer.
   Performing dental radiographic examinations in pregnant women in South Africa is:
   A. absolutely contraindicated
   B. only allowed in 3rd trimester
   C. not contraindicated, but risks and benefits must be evaluated.
   D. only allowed in the 1st trimester
   E. unsure

2. Choose the CORRECT answer.
   Which one of the following measure/s will have the greatest dose reduction effect during intra-oral radiographic examinations?
   A. Rounded collimator with filter
   B. Rectangular collimator with filter
   C. Lead apron
   D. Using D-speed film
   E. Using a short cone/aiming tube

Oral hygiene habits and status of orthodontic patients attending the University of Pretoria, Oral and Dental Hospital

3. Choose the CORRECT answer. Who has the main responsibility to comply to the orthodontic treatment?
   A. Orthodontist
   B. Oral hygienist
   C. Patient
   D. Dentist

4. Select the CORRECT answer. Which selection criteria did the study use to select participants?
   A. Patients between the ages of 15-25
   B. Patients with systemic diseases
   C. Patients who had just seen an oral hygienist for professional cleaning
   D. Patients who were not taking antibiotics for the last 3 months

5. What is the CORRECT answer.
   What is the mean age of participants in this study?
   A. 12.5
   B. 14
   C. 18.5
   D. 20.5

6. Select the CORRECT answer. What type of study design was employed for this study?
   A. Cohort
   B. Case Control
   C. Longitudinal
   D. Cross-sectional
   E. Eight

7. Choose the CORRECT answer.
   According to this study what is the percentage of patients with good oral hygiene?
   A. 90%
   B. 65%
   C. 40%
   D. 85%

You can run, but you can't hide - A bitemark analysis

8. Choose the CORRECT answer.
   Bitemarks may be:
   A. inflicted by humans
   B. inflicted by animals
   C. self-inflicted
   D. inflicted by the victim on the perpetrator and/or vice versa
   E. All of the above

9. Choose the CORRECT answer.
   Bitemark analysis techniques include:
   A. macroscopic and microscopic comparative analysis
   B. overlay techniques
   C. computer-assisted programs
   D. All of the above

Evaluation of the quality of systematic reviews critiqued by clinical assistants in-training

10. Select the CORRECT option.
    The most reliable type of research that forms the apex of the evidence pyramid is a:
    A. systematic review
    B. randomized controlled trial
    C. systematic review with meta-analysis
    D. overview of systematic reviews
    E. umbrella review

11. Choose the CORRECT answer.
    The advantages of AMSTAR 2 compared to AMSTAR 1 are:
    A. Allowed greater clarity
    B. Better assessment
    C. Increased ability to check for bias
    D. Establish greater reliability
    E. All of the above

12. Which of the following options is CORRECT.
    Systematic Review types include:
    A. randomized controlled trials only
    B. clinical trials only
    C. mixed design types
    D. qualitative type of studies only
    E. All of the above

Clinical Window: What's new for the clinician?

13. Select the CORRECT statement.
In the Zheng et al. trial, follow up was done on which of the following days?
A. Days 2, 4, 6, 7
B. Days 1, 3, 5,
C. Days 1. 3. 5. 7
D. Day 7

14. Which of the following is CORRECT.
In the Zheng et al. trial, in instrument used to measure quality of life was:
A. Direct observation
B. The amount of NSAIDs used
C. The Oral Health Impact Profile
D. The PoSSe scale

15. Select the CORRECT answer.
The Drop-out rate in the Zheng trail was:
A. 12
B. 13
C. 122
D. 62

16. Select the CORRECT option.
The Klemz et al. study is an example of an:
A. ex-vivo study meaning it occurred in the mouth
B. an *in-vitro* or *ex-vivo* study meaning that it occurred outside the mouth in a laboratory
C. an *in-vitro* or *ex-vivo* study meaning that it occurred inside the mouth and also in a laboratory
D. ex-vivo study meaning that live patients were included

17. Which of the following options is CORRECT.
In the Klemz et al. study, the use of conventional isual control or an electric endodontic motor for determination of working length was found to:
A. favour the use of conventional visual control
B. favour the use of an electric endodontic motor
C. both methods produced similar results
D. favour none of the above

Maxillofacial Radiology 189

18. Select the CORRECT answer.
Histopathological features of the ameloblastic fibro-odontoma demonstrate:
A. features of a complex and/or compound odontoma
B. epithelial and mesenchymal features such as in an ameloblastic fibroma
C. inductive changes that include dentine and enamel formation
D. All the above

19. Which of the following is CORRECT.
Characteristically the ameloblastic fibro-odontomas' radiographic features may include:
A. a significant radiolucent component such as a cystic-like capsule
B. root resorption, tooth displacement, and impactions
C. internal radiodensities of a consistent nature
D. predominantly radiopaque masses like a complex odontoma

20. Select the CORRECT statement.
Considering the presented case:
A. radiographic interpretation may be challenging due to the similarities to an odontoma
B. the patients' demographical information coincides with the literature
C. clinical presentation and incidence are character istic of the AFO
D. All the above

ETHICS

The "contagious" clinician

21. Choose the CORRECT option.
The Patients' Rights Charter states that:
A. every patient has a right to a healthy and safe environment
B. every patient should take care of their own health records
C. every patient has a right to confidentiality and privacy
D. All of the above are correct
E. Only A and C above are correct

22. Select the CORRECT answer.
The ethical principle of autonomy includes:
A. the patient's rights to choose for themselves
B. the clinician's duty to truth telling
C. the clinician's duty to act in a non-maleficent manner
D. All of the above are correct
E. Only A and B above are correct

23. Select the CORRECT statement.
The ethical practitioner should:
A. only obtain consent prior to embarking on complex treatment
B. help patients make important decisions
C. only tell patients as much as they think the patient needs to know
D. only treat patients who agree with their proposed treatment plans
E. take over treatment if patients come to them for a second opinion

24. Which is the CORRECT statement?
In the Hippocratic oath clinicians swear to:
A. protect patient's privacy and confidentiality
B. abstain from any act of corruption and mischief
C. impart knowledge of their art to others
D. All of the above
E. Only A and B above

25. Select the CORRECT answer.
Practitioners must disinfect all instruments after use, however only need to sterilize them if:
A. the patient is known to be contagious
B. the patient is known to have HIV/AIDS
C. the patient bleeds during a procedure
D. they have opened them at all during the consultation
E. the patient has not yet had Covid-19 or the immunization for it

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