RESEARCH
402 Oral health amongst male inmates in Saudi prisons compared with that of a sample of the general male population.

CLINICAL REVIEW
414 Apexification of immature teeth using an apical matrix and MTA barrier material: Report of two cases.
424 Dental implications of bisphosphonate therapy in osteogenesis imperfecta.

The black mamba: Dendroaspis polylepis has a fearsome reputation, the most venomous (and the longest poisonous) snake in Africa. Mature specimens are usually over two metres. Dentition is highly proteroglyphous, with 6.5 mm fangs attached to the front of the maxilla (that is what proteroglyphous means!). Beware the black mouth of the mamba.
October appears a most popular month for HEALTH AWARENESS ...there is scarcely a day which is not allocated to the recognition of a particular project, illness or community challenge.

October
1 International Day for Older Persons
1 National Inherited Disorder Day
9 International Day for Natural Disaster Reduction
9-15 National Nutrition Week
10 World Mental Health Day
12 World Sight Day
10 World Hospice and Palliative Care Day
11-17 Case Manager Week
12 World Arthritis Day
12-20 World Bone and Joint Week
15 National Foetal Alcohol Syndrome Day
15-19 National Obesity Week
16 World Food Day
16 World Spine Day
17 World Trauma Day
17 International Day for the Eradication of Poverty
20 National Down Syndrome Day
20 World Osteoporosis Day
20-26 International Lead Poisoning Prevention Week
23 National Iodine Deficiency Disorder Day
24 World Polio Day
25 World Spina Bifida and Hydrocephalus Day
28-3Nov World Stroke Week
29 World Stroke Day

Wikipedia defines a National or International Day or observance as: “a date usually set by a major organisation or Government to commemorate a public health or ethical cause of importance on a national or international level.” Bearing that concept in mind, it is perhaps salutary to again consider the breadth of health problems we are asked to observe, commemorate, and, hopefully, manage – all in one month! Ranging from problems affecting the infant to a recognition of the “older person,” from joints and bones through to toxic substances and overeating... and, National Obesity Week is juxtaposed with World Food Day! The profusion is confusing. The question has to be posed; just how effective are all these well intentioned endeavours? The Association commits to a time of frenzied activity during the National Oral Health Month in September... four weeks out of 52. Yet the message is widely broadcast, the community made aware and at least some of the information must have lasting impact. And we
can do it all over again next year to remind and reinforce. On balance it must be recognised that it is a privilege that for a full month the focus of the nation is on the central objective of the profession, PREVENTION. The Association was fully committed in September. Oral Health is indeed possible for all. Constant awareness is the solution, stimulated annually.

Intrigued by the plethora of Awareness Days and Months, and suspecting that establishing such a dedicated calendar slot would surely involve much paperwork and foot slogging, I sought guidance from the Web. And indeed did find a reference to Senate having giving approval for one such project... BUT no more guidance came to light. There was indeed much comment on those Awareness endeavours which are already there but no advice on the method of creating that special slot on the National calendar. Elsewhere, however, came an entry which intriguingly, provides eight steps to follow when creating your own Awareness Day:

1. Choose the right date.
2. Make it interesting.
3. Promote in the right places.
4. Make use of the Internet.
5. Hire a PR Agency.
6. Have a celebrity on board.

(At a glance through that list it may occur to the reader that the Journal actually meets many of those guidelines... even to having a celebrity on board, for every author is an aspiring celebrity! And yes, we make use of the Internet, even though the change has not been that popular!)

Those guidelines may sound rather intensive and demanding lots of commitment. A far more practical way is to simply take a determined decision to have your own Journal Awareness Day (Days, Week, etc).

On that day there will be an acute awareness of the papers published in the Journal of your choice. Read, digest and apply. What better use of an Awareness Day! On just such a Journal Awareness Day will this issue of the SADJ hold the attention of those brave enough to attempt endodontics on a tooth with an open apex, of those who know that the essence of epidemiology is to have control over the sample (prison inmates meet that criterion, even when all signed Informed Consent!), of those seeking development of diagnostic prowess in Oral Medicine and in Maxillo-facial radiology. The discipline of allocating and reserving a special time for your journal reading will confer so many advantages.

Perhaps in these times of political uncertainty, of petrol price increases, of looming NHI challenges, of enhanced central control over dental practice, there may be some sense in creating a Day of Unrestricted Joy and Happiness. Or should we call it a Day of Unequivocal Escapism?
The Editor
South African Dental Journal

Dear Sir,

Dr S Singh is to be congratulated for publishing a paper in the July edition of the SADJ entitled “Localised vertical relapse following orthodontic correction in young growing patients with cleft lip/palate: Case studies potentially leading to a revision of the retention protocol.”1 It is unusual to report on a problem rather than a success.

With the understanding that Dr Singh has identified a difficulty, I would like to suggest a protocol that may help the retention process in patients who have had bone grafting in the line of the cleft with subsequent orthodontic alignment of incisor teeth into or adjacent to the graft.

Kaare Reitan2 beautifully described the histology of orthodontic tooth movement, a work which included recognition of the simultaneous stretching of the dento-gingival and trans-septal fibres which occurs in the direction of the de-rotation of malpositioned teeth. Later, Edwards3 demonstrated that a circumferential dento-gingival and trans-septal fibre cut of 3mm into the periodontal ligament space greatly enhanced rotational stability. This very minor surgery reduces the tension in the stretched supra-alveolar collagen and elastic fibres which subsequently re-attach to the tooth in a normal relaxed state within a few days. This principle could be applied in Dr Singh’s patients where orthodontically aligned teeth associated with bone grafting become unstable due to the increased network of collagen and oxytalan fibres associated with the healing process.

The steps to be taken include orthodontic alignment during which the affected teeth should be extruded a little further (0.5mm - slight over treatment) than the planned final positions to stretch the supra-alveolar fibres. The case is stabilised for four weeks, and then the circumferential fibre cuts are conducted. The teeth will become mobile which is a sign that the dento-gingival and scar tissue fibres have been successfully severed. The teeth should then be rigidly tied to a finishing wire for at least 6-8 weeks, although the mobility returns to normal levels within a day or two. The free gingival fibres readjust and heal in unstressed positions. In order to test the rotational stability of the de-rotated teeth the finishing wire is released from the teeth for a further 6-8 weeks. If the teeth relapse (an outcome which is usually minimal if anything), should relapse be evident, then consideration can be given to repeating the process.

This technique has been successfully used to prevent palatal relapse when severely palatally impacted canine teeth were surgically exposed and orthodontically aligned. Circumferential dento-gingival fibre cuts as described by Edwards3 may be helpful in preventing the vertical relapse which is described in Dr Singh’s paper, thereby reducing the necessity for lifelong retention.

Yours sincerely,

Prof A McCollum
mccollumtony@mweb.co.za

References
RARE IS REWARDING

Muhammad Ali’s 1971 boxing gloves. A truly incomparable piece of history. As rare as graduate professionals. Which is why PPS, with our rare insight into the graduate professional world, acknowledges and rewards the achievement of being one. As a PPS member, you benefit not only from financial services exclusively available to graduate professionals, but also from our unique PPS Profit-Share Account. Rare achievements deserve reward.

PPS offers financial solutions to select graduate professionals. PPS is an authorised Financial Services Provider. Image for illustrative purposes only.
Oral health amongst male inmates in Saudi prisons compared with that of a sample of the general male population

SADJ October 2017, Vol 72 no 9 p402 - p407

RMF Bukhari1, AMH Al-Sulaimi2, AH Fadaak3, AA Balhaddad4, AMA AlKhalfan5, MMA El Tantawi6, AA Al-Ansari7

ABSTRACT

Objectives: A survey compared dental caries experience, perceived problems, treatment needs and exposure to risk factors in a group of prisoners in two Saudi prisons with those of a group from the general population.

Methods: The study included male prisoners (n =82) in Dammam and Khobar prisons (October 2014- January 2015) An age, gender and education-matched control group (n=79) was selected from literacy schools and an elderly care home using a stratified sampling method. Data was collected on an interview questionnaire. Caries experience was assessed using World Health Organization criteria.

Results: Of the prisoners, 75.6%, and, of the subjects in the control group, 47.4%, reported smoking cigarettes daily, 95.1% and 70.9% reported having oral health problems such as dental pain or bleeding on brushing whilst 97.6% and 70.9% reported treatment need, with caries incidence being around 90.2% and 57%. Being a prisoner increased the odds of having dental problems affecting daily activities (odds ratio= 7.37), and having decayed teeth (odds ratio= 6.99).

Conclusions: Male inmates in the two Saudi prisons had higher odds of dental problems than did subjects from the general population. Governmental action and volunteering initiatives are needed to reduce oral health inequalities between prisoners and the general population.

INTRODUCTION

Prisoners have high rates of chronic and blood-borne diseases, mental and psychological illnesses and dental diseases.1 They usually come from disadvantaged groups with less education, higher unemployment rates and lower chances of adopting healthy practices and having access to and seeking health care to them. Further, their disease risk increases because of health damaging practices such as the use of tobacco, alcohol and substance abuse.2 At the time of their admission to prison, convicts usually already present with a considerable amount of unmet dental treatment needs 2,3 which are unlikely to receive the required attention. This latter situation could be attributed to a lack of resources for dental treatment in the prison health care system or perhaps, to an unwillingness on the part of dentists to deal with the high security constraints in the prison environment. In addition, dentists are usually attracted to the more financially rewarding private practice environment.3,4

Several countries have instituted programs to manage the oral health of prisoners.5,6 Around the world, studies have been conducted to assess the oral health status and needs presented by prisoners, and to facilitate planning for the required manpower to provide the required services. Examples include the United States,9,10 Australia,11 Europe,4,12 China13 and South Africa.14 In Saudi Arabia, the General Directorate of Prisons supervises 116 prisons and reformatories with a population estimated to include 47,000 prisoners, of whom 72% are foreigners (www.prisonstudies.org/country/saudi-arabia). There are inadequate data about the oral health status and needs of prisoners in the Middle East, including the Kingdom of Saudi Arabia (KSA). If the oral health situation of the general population in other Middle Eastern countries were to be extrapolated for the purpose of comparison to the situation of inmates in Saudi prisons, differences in health care systems, cultural norms and ethnic
backgrounds would limit the usefulness of that endeavour. The present study assessed dental caries experience, exposure to risk factors and access to care among a group of prisoners in two prisons in the Eastern Province of KSA; Dammam and Khobar, and compared that data with matching information from a general population group. The comparison may assist in the determination of the resources required to attend to the oral health needs of prisoners.

**METHODS**

A study of cross sectional design compared data representing a group of male prisoners to matching data from a selected group representing the general population. Sample size was estimated using the following assumptions: 5% type I error, 20% type II error, 80% prevalence of dental pain among prisoners and 60% among the group representing the general population. Calculations (MedCalc software, MariaKerke, Belgium) estimated that 78 subjects would be needed per group with a total of 156 to validate the study.

**Recruitment**

**Study Group:** Prisoners were recruited from Dammam and Khobar, two prisons in the Eastern Province having a capacity of approximately 3,350 inmates. Khobar prison has recently been renovated to only a male section whereas Dammam prison included both male and female sections. Following cultural norms, the male examiners were allowed to examine male prisoners only and female prisoners were not included in the study. To maintain the confidentiality of the prisoners, the prison authorities, not the investigators, selected a convenience sample. Hence, a true random sampling strategy was not possible. Subjects were included from all sections and wards except the quarantine. Informed consent was obtained from all participants. Study data were collected from the prisoners and preliminary analysis was conducted to provide descriptive information.

**Control Group:** A comparable group was selected from the general population to match the mean age, gender and distribution of educational levels of prisoners (group-matching). Subjects for the comparison group were selected from amongst the communities of three schools of literacy and of a home for the care of the elderly, in Dammam and Khobar. The managers invited subjects who were free and/ or willing to participate in the study. Subjects were informed that the participation in this study was optional and each had the right to withdraw at any time. Thus, subjects in the comparison group were self-selected volunteers. Data was collected from October 2014 to January 2015.

**Ethical Approval**

Institutional Review Board approval was obtained (IRB/2015/02/016). The study was conducted according to the Principles of the Helsinki declaration. A letter explaining the purpose of the study and requesting permission to proceed was sent to the prisons authorities and to the managers of the schools of literacy and the care facility.

**Background**

Both prisons have dental clinics, that at the Khobar prison clinic being recently installed. A dentist from the Ministry of Interior visited the Dammam Prison clinic weekly with a total of 0.2 full-time equivalent (FTE) dentists for both prisons. No dentist had yet visited Khobar prison. The study procedures were performed in the respective clinics. The managers of the Schools of Literacy and the Elderly Care Facility provided accommodation, such as a classroom or any open space, for the study team to conduct the examination.

Members of the study team explained the purpose of the study and submitted the official request to the facility’s authorities/ managers, with whom the flow of subjects was planned. Participants were brought into the designated area in groups of two to four. Each subject was introduced to the study, signed the consent form, was interviewed, and clinically examined.

**Questionnaire**

An interview-based questionnaire was used to minimize the potential effect of illiteracy or language barriers. Collected were background information (age, education and time since imprisonment), exposure to risk factors (frequency of tooth brushing, use of fluoridated toothpaste, number of cigarettes smoked daily and use of chewing tobacco) and accessibility to care, in addition to self-reported oral health problems (oral problems in general, dental pain and bleeding on brushing) and perceived need for care. The same questionnaire was used for the comparison group after removing the question about duration of imprisonment.

**Clinical Examination**

Disposable mirrors and probes were used for the examination which was conducted under head light. Training and calibration for caries assessment was done to ensure reliability among examiners. Clinical examination assessed caries at the cavitation level using the World Health Organization (WHO) criteria and the DMFT was recorded. Kappa statistic for reliability between the two examiners (R.B and A.S) was 0.7. The other three investigators recorded the results of clinical examinations, interviewed the participants using the questionnaire, managed the flow of subjects and performed the infection control procedures. The inter-examiner agreement for identification of gingivitis and suspicious oral lesions produced kappa values of 0.35 and 0.27 respectively. These values are quite low and these data were omitted from the examination to ensure validity.

After data were collected, subjects were made aware of their treatment needs. Volunteering dentists from the College arranged a subsequent visit, which was not a part of this study, to respond to the treatment needs. This was not an incentive to influence the participation in the study as the treatment was arranged after the study had been conducted.

**Data Analysis**

Using Chi square, the two groups were compared regarding background variables (age and education), frequency of daily brushing, use of fluoridated tooth paste, daily cigarette smoking, use of chewing tobacco, caries experience, dental pain, problems affecting daily activities, perceived need for treatment, bleeding on brushing, having decayed, missing, filled teeth. Comparisons regarding the number of cigarettes smoked daily, time since last dental visit, number of decayed, missing or filled teeth was done using the Mann Whitney U test. Correlation between time since imprisonment and the number of decayed, missing or filled teeth as well as
time since last dental visit was assessed using Spearman rho. Binary logistic regression analysis assessed the effect of various independent variables on two dependent variables (having dental problem affecting daily activities and having decayed teeth). Factors with significant effect in univariate regression were entered into multivariate logistic regression and the odds ratio and confidence intervals were calculated. Significance level was set at 5%. Statistical analysis was done using SPSS version 17.0.

RESULTS

Questionnaire and clinical examination data were available for 161 subjects (82 prisoners and 79 subjects in the comparison group). These represented 98.8% and 100% of those initially consenting to participate as one prisoner left the study. Some prisoners refused to complete some items in the questionnaire. These unanswered items were dropped during data analysis. The two groups were similar in age, gender and education (p=0.10 and 0.35 respectively, Figure 1). The median duration since imprisonment was 27 months (ranging from 2 to 360 months).

Oral Hygiene Practice

The two groups had similar oral hygiene practices including brushing frequency and use of fluoridated toothpaste (P= 0.14 and 0.68, Table 1). Daily smoking of cigarettes was higher in prisoners’ group with a greater median number of cigarettes (75.6% and 47.4%, median= 20 and 0, P<0.0001 and 0.004, Table 1). The frequency of using chewing tobacco in the two groups was similarly low (Table 1). Prisoners reported a much longer period since the last dental visit than did subjects in the comparison group (median= 24 and 12, P<0.0001). Time since last dental visit was significantly, moderately and positively correlated with length of imprisonment (rho= 0.41, P= 0.001). Prisoners reported a greater frequency of having oral health problems, dental pain, dental problems affecting daily activities and need for treatment than those in the comparison group (Table 2). There was no statistically significant difference between the two groups in reporting bleeding on brushing (p = 0.98, Table 2).

Caries Experience

Table 3 shows the comparison between the two study groups in caries experience. The percentage of prisoners with decayed or missing teeth was significantly higher than the comparison group. A significantly higher median number of teeth with caries experience was found in prisoners compared with the control group (median= 8 and 5, P= 0.001), although the percentage of subjects with caries experience in the two groups was similar (P= 0.27). Correlation between time in months since imprisonment and number of decayed and missing teeth was not statistically significant but was weakly positive (rho= 0.11 and 0.15, P= 0.32 and 0.17). Correlation with number of filled teeth was not statistically significant and weakly negative (rho= -0.02, P= 0.84).

Dental Problem in Relation to Daily Activities

“Having a dental problem affecting daily activities” was significantly related to the prisoners group, education, the number of cigarettes smoked daily and having decayed teeth. In addition, “having decayed teeth” was significantly associated with prisoners (Table 4). In multivariate logistic regression analysis, when all four significant factors related to having a dental problem affecting daily activities were considered, the only factor with a significant effect was being a prisoner (odds ratio= 7.37, confidence interval= 2.97, 16.43). Being a prisoner also increased the odds of having decayed teeth seven - times (odds ratio = 6.99, confidence interval = 2.97, 16.43).

DISCUSSION

One of the strengths of the present study is that it compares the findings among prisoners to a concurrent, age-, gender- and education- matched comparison group representing the general population. Endeavours were made to control the confounding effect of education (as an indicator of socio-economic status) on oral health problems/caries. This was done partly during study design (matching) and partly through analysis (multivariate regression). In their 2008 review, Walsh et al indicated that most studies

Table 1: Comparison between the two study groups as with regards regard to exposure to factors affecting risk for oral diseases

<table>
<thead>
<tr>
<th>Variables</th>
<th>Prisoners (N= 82)</th>
<th>Comparison group (N= 79)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brushing frequency Daily</td>
<td>Daily: n (%)</td>
<td></td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>Less frequently: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not know: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using fluoridated toothpaste</td>
<td>Daily: n (%)</td>
<td></td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>Less frequently: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do not know: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking cigarettes daily</td>
<td>Daily: n (%)</td>
<td></td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td></td>
<td>Less frequently: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of cigarettes smoked daily</td>
<td>Min – max: n (%)</td>
<td></td>
<td>0.004*</td>
</tr>
<tr>
<td></td>
<td>Median: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using chewing tobacco</td>
<td>Daily: n (%)</td>
<td></td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Less frequently: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No: n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time in months since last visit to dentist</td>
<td>Min – max: n (%)</td>
<td></td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td></td>
<td>Median: n (%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Statistically significant at P ≤ 0.05
assessing oral health among prisoners used samples from previous national surveys as comparison groups. In other studies, comparison groups already existed or were matched by age or ethnic group. Less frequently, some studies assessed the effect of socio-economic conditions on oral health status among prisoners.4,9,16

Prisoners were included in the study using a convenience sample since the study team did not have the relevant comprehensive administrative information, which made random sampling difficult. The same limitation related to unavailability of data was cited in another study assessing oral health status among English prisoners.3 The convenience sampling in the present study may have limited the extent to which the sample represents prisoners in Saudi prisons and, consequently, generalizability. However, consider that in most prisons, essentially the same exposure to risk factors prevails among inmates after admission. Higher odds of oral diseases compared with the general population are expected to occur in various prisons in KSA. Variations in the magnitude of these odds may, however, exist among the different locations. Thus, although generalization may suffer due to the non-statistical nature of the samples included in the study, the conclusions would logically apply in various locations unless mitigating factors intervene. Another limitation that may be related to convenience sampling is the potential for overestimation of perceived and/or actual needs if the prisoners selected by the prisons’ authorities actually volunteered to join the study, seeking diagnosis and hoping for treatment. However, this would have been balanced to some extent by the percentage of prisoners with actual needs who refused to participate when they knew that only examination and no actual treatment would be provided during the study period. This latter situation was also reported in studies among English prisoners.3,17

The 2010 official Saudi census indicated that expatriates represent 31% of the total population in KSA.18 The actual percentage of expatriates in the prisoners’ sample is not known since no data could be obtained regarding their nationality. On the other hand, the comparison group representing the general population contained only Saudis. It is not known what proportion of the higher odds of oral health problems among prisoners may be attributed to their nationality/ethnic background and how much is related to factors associated with their imprisonment. The aim of the study was to provide information about the oral health status of prisoners in KSA. Comparing prisoners with another group could be beneficial to investigate any factors that might affect the oral health status of prisoners. Also, this comparison might be helpful to influence health care policy planners responsible for prison health programs. What

<table>
<thead>
<tr>
<th>Table 2: Comparison between the two study groups as with regards to self-reported oral health problems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
</tr>
<tr>
<td>Oral health problems</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Dental pain</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Dental problem affecting daily activities</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Perceived need for treatment</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Bleeding on brushing</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*: Statistically significant at P ≤ 0.05

<table>
<thead>
<tr>
<th>Table 3: Comparison between the two study groups as with regards to caries experience measured by DMFT and its components.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DMFT and its components</strong></td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>DMF</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*: Statistically significant at P ≤ 0.05

<table>
<thead>
<tr>
<th>Table 4: Univariate logistic regression analysis for having dental problem affecting daily activities and having decayed teeth in the group of prisoners.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Group</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Brushing daily</td>
</tr>
<tr>
<td>Using fluoridated tooth paste</td>
</tr>
<tr>
<td>Number of cigarettes smoked daily</td>
</tr>
<tr>
<td>Using chewing tobacco</td>
</tr>
<tr>
<td>Bleeding on brushing</td>
</tr>
<tr>
<td>Having decayed teeth</td>
</tr>
<tr>
<td>Having missing teeth</td>
</tr>
<tr>
<td>Having filled teeth</td>
</tr>
</tbody>
</table>

*: Statistically significant at P ≤ 0.05
the findings of the study show is that prisoners, regardless of their nationalities and ethnic backgrounds, have higher odds of oral health problems than does the general Saudi population who has reasonable access to care. Providing health care to this high risk group in a defined and limited setting such as the prison potentially decreases inequalities in access to care.

In the present study, self-reporting was exclusively used to assess exposure to risk factors and perceived oral health problems while clinical examination was used to assess caries status. It is agreed that self-reporting can be used to identify high-risk groups with health needs. However, this may potentially introduce the risk of over-estimation since prisoners may exaggerate the extent of their suffering to gain attention and priority over their colleagues for treatment. No other means of collecting information about exposure to risk factors was feasible for the study purposes. In addition, the validity of self-reporting by prisoners was confirmed by the clinical assessment of caries by the examiners which increases the credibility of the obtained data. Other oral health conditions (gingival and periodontal status as well as oral mucosal lesions) were not assessed because of logistic constraints related to the limited time allowed by the prison authorities for the visit and examination. In addition, kappa values were not satisfactory for the data reflecting gingivitis and suspicious oral lesions. It would be useful to include an assessment of these aspects of oral health in future studies.

The percentage of daily tooth brushing in the two groups was generally lower than that reported in another study of Saudis from the general population, although the authors in that study presented their results categorized by educational levels with no overall figures reported for the group as a whole, which makes direct comparison difficult. It was, however, higher than that reported among a convenience sample of male and female Saudis, also representing the general population in another study, where 46% were tooth brush users. Similar levels of brushing were reported among prisoners in other studies.

The median percentage of cigarette smoking among prisoners and subjects in the comparison group was higher than that stated in Bassiony’s review. Moreover, the WHO reported that the percentage of tobacco use in KSA is 35%, which is less than that found in this study (75%). On the other hand, smokeless tobacco use among prisoners in the current study was lower than that among the comparison group. The figures related to smokeless tobacco in the present study may reflect the actual situation or may be due to under-reporting to avoid penalties imposed by the prison authorities which ban smokeless tobacco but not cigarettes. The latter interpretation may be supported by the fact that the examiners noticed traces of the effects of smokeless tobacco in some inmates during caries examination although they denied using it in the interview. The high levels of smoking reported in the present study is similar to other studies conducted among prisoners. This situation calls for interventions aiming at cessation of tobacco habits to control deleterious effects on oral and general health. These interventions should be part of the plans of the prison authorities and should be implemented on an ongoing basis.

The median time since last dental visit among prisoners was two years, and it was also the median time since imprisonment. This is to be expected since only 0.2 FTE dentists were assigned to provide care to 3,350 prisoners. Consequently, almost all prisoners reported they needed dental treatment. Other studies reported high dental treatment needs among prisoners (the level in the present study is much higher). At an Iowa correctional facility that housed 8,700 prisoners, it was estimated that 14 FTE dental staff (dentists and others) would be needed to address the dental needs of the prisoners. Dentist-to-inmates ratio in various states in the US ranged from 1:1,397 to 1:1,031.6 These figures represent systems where dental needs can be met to a greater extent than the situation reported in the current study. On the other hand, inadequacy of a supply of dentists to meet the needs of prisoners was reported in other settings with different health care systems such as among Indian prisoners. It is understandable that dental services can be made available to prisoners to an extent less than to the general population, due to issues of logistics, high mobility of subjects and manpower shortage. Acknowledging these constraints, the amount of unmet treatment needs reported among prisoners in the present study is still markedly greater relative to the comparison group so that being a prisoner was associated with a sevenfold odds of having problems affecting daily activities and having caries.

Almost nine out of ten prisoners reported having dental pain. In another study, high level of reported pain among prisoners was considered untrue since some subjects may try to gain access to care. Alternatively, it is possible that the reported level of dental pain reflects an actual state of greater dental disease which may be supported by the high level of caries detected by clinical examination.

In the present study, the prevalence and severity of decayed and missing teeth in prisoners was higher than that in subjects from the general population. Filled teeth, on the other hand, had lower prevalence and intensity. This situation is similar to that reported by most studies assessing the oral health of prisoners. DMFT was not significantly affected by the duration of imprisonment which supports the concept that imprisonment itself is not the cause of worse oral health status among prisoners, but rather the accumulated effect of their previous lifestyle, exacerbated by inadequate oral health care in prison. This finding is similar to those of a study conducted among Italian prisoners. In another study, however, DMFT increased as the term of imprisonment increased except for the number of decayed teeth. The authors attributed this to worse detention conditions among prisoners with long term or life imprisonment which further impacts their sociological and psychological problems. In contradiction, another study reported a positive relation between time since imprisonment and caries experience, with a longer stay in prison associated with better oral health. This may be expected when there are established oral health care systems that prisoners can increasingly use as more time passes in prison. Better access to care and reduced exposure to harmful practices and risk factors inside the prison would decrease the incidence of disease.

The oral health needs of prisoners should be assessed by a qualified dental team. Bose and Jenner stated that oral health care of prisoners could be maintained by...
providing free fluoride supplements, information about dental service, reducing cariogenic food inside prisons, training prison staff in health promotion, addressing problems of smoking, alcohol and drugs misuse. The inadequate numbers of dentists available to provide care for prisoners calls for a greater government support for oral health care services in prisons to alleviate the disease burden among this at-risk group. Ensuring regular access to care decreases human suffering, cost of treatment and inequalities in oral health. Innovative solutions may include the collaboration of non-governmental organizations with the academic sector to offer volunteer services and extend to extra-mural training opportunities for students in the clinics of the prisons.

CONCLUSION

The results of this study indicated that the prisoners surveyed were more likely to have dental problems than individuals from the general population. The administrators of prisons should have a qualified dental team who is able to provide an optimum dental treatment to prisoners to maintain their oral health. Further studies are required to address the limitations of this study, to specifically investigate the range of individual risk factors affecting inmates, and to formulate preventive and interceptive plans to ensure the oral wellbeing of this group.

References

A morphological study of the lingula in South Africans in relation to sagittal split osteotomy.

SADJ October 2017, Vol 72 no 9 p408 - p412
RE Rikhotso¹, C Munsamy²

ABSTRACT

Purpose: To establish the position and shape of the lingula of the mandible in relation to the surrounding anatomical landmarks, data requisite for inferior alveolar nerve blocks and mandibular osteotomies.

Methods: Measurements were carried out on 201 sides from 113 adult dry mandibles.

Results: The most common shape of the lingula was truncated, found in 38.8% of cases, followed by the triangular (30.8%), nodular (21.4%) and assimilated (8.9%) types. The average distances of the tip of the lingula from the anterior border, posterior border and sigmoid notch of the ramus of the mandible were 20.15mm, 16.77mm and 16.3mm respectively, and, from the mandibular second molar tooth, 33.3mm. The lingula was above the level of the occlusal plane in 63.7% of cases, by an average of 6.5mm.

Conclusion: The position of the lingula has been shown to be related to adjacent anatomical landmarks which may provide useful clinical references. In Lingula is above the level of the occlusal plane by an average distance of 6.5mm. Truncated type is the most common shape of the lingula A higher position of the lingula may be anticipated in both Class II and III malocclusions.

Keywords: lingula, mandibular foramen, sagittal split osteotomy

INTRODUCTION

The lingula is defined as a tongue-shaped bony projection on the medial surface of the ramus close to posterior margin of the mandibular foramen. It was first described by Johannes Baptist Spix in 1815, and following his description it was referred to as ‘Spix’s osseicle or spine’. It lies in close proximity to the mandibular foramen.

The Sagittal Split Ramus Osteotomy (SSRO) involves a horizontal osteotomy on the medial surface of the mandibular ramus, a sagittal osteotomy along the anterior border of the mandibular ramus, and an internal oblique line and a vertical body osteotomy. An important clinical landmark for performing the horizontal ramus osteotomy is the lingula, the cut being made just above it and extending posteriorly in order to minimize damage to the inferior alveolar nerve.

Failure to accurately identify the lingula intra-operatively when performing a sagittal split ramus osteotomy can result in a number of complications such as an unfavourable split and transection of the inferior alveolar bundle which results in haemorrhage and damage to the nerves.

Both the shape and the position of the lingula on the medial aspect of the ramus of the mandible are highly variable. An accurate knowledge of the anatomy of the medial aspect of the ramus of the mandible is imperative in order to prevent complications associated with sagittal split ramus osteotomies.

In South Africa, no study has been conducted on dry mandibles to evaluate the position of the lingula in relation to surrounding anatomical structures and the lower molar teeth. This study was therefore undertaken to provide clinicians with reliable clinical landmarks when performing surgery on the mandibular ramus as well as to provide insights on the position of the inferior alveolar nerve (IAN), useful when delivering local anaesthesia for various dental procedures.

ETHICAL CONSIDERATIONS

Approval for the use of the human dry mandibles for research purposes was first obtained from the Department of Anatomy, University of the Witwatersrand and from the Human Research Ethics Committee of South Africa. Ethics reference number: W-CJ-101109-1.

MATERIALS AND METHODS

A total of 113 adult human dry mandibles were selected from the Raymond Arthur Dart Collection at the Department of Anatomy, University of the Witwatersrand.

Inclusion Criteria

- Mandibles that were dentate, with dentition up to and including the mandibular second molar tooth.
mandibles for which the age, sex and race were known (identified according to the archives of the collection).

**Exclusion Criteria**
- mandibles that were edentulous or that exhibited the presence of a bony defect, deformity or evident pathology.
- The jaws of those cases which were included were placed in full occlusion and a record was made of the Angle Classification, namely, Class 1, Class II or Class III.
- Both the right and the left sides were examined, and from the 113 specimens which were accepted, 201 sets of records were taken. In 25 cases, only one side was included, due to the omitted side not meeting the inclusion criteria.

**DATA COLLECTION**
A digital sliding calliper was used to obtain linear measurements of the specimens (Mitutoyo R, Japan, capable of measuring to the nearest 0.01mm). All measurements were carried out by the same investigator.

The mandibles were measured according to predetermined points. All measurements were determined to the tip of the lingula (defined as the highest point of the lingula). The following data were obtained:
- **Shape of the lingula**, defined as truncated, triangular, nodular or assimilated.
- **Position of the lingula in relation to ramal landmarks** (Figure 1):
  - A line was drawn from the deepest point of the sigmoid notch to the tip of the lingula ("vertical" line). A line perpendicular to the first line was drawn from the anterior border of the mandible ("horizontal" line).
  - The distance of the lingula from the sigmoid notch was determined by measuring the length of the "vertical" line (figure 1, line c).
  - The distance of the lingula from anterior border of the ramus of the mandible was measured along that segment of the "horizontal" line (figure 1, line a). The distance of the lingula from the posterior border of the ramus of the mandible was measured along that segment of the "horizontal line" (figure 1, line b).
- **Position of the lingula in relation to the mandibular second molar**
  - The distance was measured from the tip of the distobuccal cusp of the mandibular second molar tooth to the tip of the lingula.
- **Position of the lingula in relation to the occlusal plane**
  - A wooden spatula was used to determine the level of the occlusal plane

- The lingula was defined as being:
  - At the level of the occlusal plane
  - Above the occlusal plane
  - Below the occlusal plane

The measurements and observations were repeated by the investigator and by an independent observer to enable both intra-observer and inter-observer error tests.

**RESULTS**
Of the 113 mandibles, 77 (68%) were from male individuals and 36 (32%) were from females. The age at death distribution of the specimens ranged from 20 to 50 years, with a mean of 40.2 years (See Figure 2).

**Shape of the lingula**

- The most common shape of the lingula noted was the truncated type which was found in 38.8% of cases, followed by the triangular, nodular and assimilated types which comprised 30.8%, 21.4% and 8.9% respectively (see Figures 3 and 4). In 26.4% of cases, there was a difference between the right and left sides of the mandible with respect to lingula shape. The incidence of the truncated and assimilated types in the male and female mandibles was almost equal (see Figure 5). However, the triangular variant was more commonly noted in females, found in 35% of the cases examined, as compared with 26.4% in
males. The nodular variant was noted more commonly in males (23.5%) than in females (16.9%). The assimilated type was only marginally more common in females with an incidence of 9.2% as compared with the 8.8% noted in male mandibles.

Location of the lingula in relation to ramal landmarks and the mandibular 2nd molar tooth
The position of the lingula in relation to mandibular ramal landmarks is shown in Table 1. There were no statistically significant differences in position of the lingula between the right and left sides of the mandible in terms of the distances from the anterior border, posterior border and sigmoid notch of the ramus of the mandible, with p= 0.18, 0.83 and 0.2 respectively. Measurements indicated that the average horizontal distance of the lingula from the anterior border of the ramus of the mandible was 20.42mm (right) and 19.88mm (left), the average horizontal distance from the posterior border of the ramus was 16.77mm (right) and 16.84mm (left) whilst the average vertical distance of the lingula from the sigmoid notch was 16.53mm (right) and 16.1mm (left).

The horizontal distance from the tip of the disto-buccal cusp of the mandibular second molar tooth to the tip of the lingula was found to be on average 33.8mm (right) and 32.9mm (left) (Table 1). This implies that the average distance from the second molar to the posterior border of the ramus of the mandible is approximately 48mm. There were no statistical differences between the measurements from the right and left sides of the mandible.

The relationship of the lingula to the occlusal plane
The relationship between the lingula and the occlusal plane, as found in this study, is depicted in Table 2. No statistically significant difference was observed between the right and left sides of the mandible. In 36.3% of cases, the lingula was found to be at the level of the occlusal plane. The lingula was above the level of the occlusal plane in 63.7% of cases, by an average distance of 6.5mm (SD +/- 2.42mm) on both the left and right sides of the mandible.

The position of the lingula in relation to the type of occlusion
The lingula was found to be located above the level of the occlusal plane in 70% of Class 1 occlusions, 65% of Class 11 occlusions and 58% of Class III occlusal relationships, with an average distance of 6.1mm (SD +/- 3.46) 7.1mm (SD +/- 4.09) and 6.5mm (SD +/- 3.2) respectively. The lingula was not seen on any specimen to be below the occlusal plane.

DISCUSSION
The lingula, as its name implies, is a tongue shaped projection found on the medial aspect of the ramus of the mandible. It overlies the mandibular foramen, where the inferior alveolar vessels and nerve enter into the mandibular canal, and has become an important clinical landmark to surgeons as well as dental practitioners. The lingula is a reliable and useful anatomical landmark in determining the position of the mandibular foramen when performing medial ramus osteotomy. Knowledge of its shape and position is thus invaluable in minimising complications associated with this procedure.

However, there is a paucity of data regarding the shape of the lingula. Nicholson13 and Dubrul14 acknowledged that various shapes may be present, but failed to describe the variety. Currently, four different shapes are recognised, namely the triangular, truncated, nodular and the assimilated.15-18 This study found that the truncated type was the predominant lingula shape noted in 38.8% of cases, with the triangular type only marginally less common (30.8%), followed by the nodular (21.4%) and assimilated (8.9%) variants. These results are similar to those of studies conducted by Kositbowornchai et al.19 and Jansisyanont et al.10 who reported the truncated variant to be the most common type, comprising 47% and 46% of the specimens respectively. Hossain et al.20 only noted three variants of the lingula in his study of 208 Bangladeshi mandibles i.e. triangular, truncated and assimilated comprising 70.2%, 20.2% and 9.6% respectively. The reason for the variation in shape is unknown. Tuli et
al. suggested that the lingula is considered a vestigial structure, serving as a point of attachment for the sphenomandibular ligament (which is considered an accessory ligament of the temporomandibular joint), and that no lengthening or tension is produced on the ligament in all movements of the jaw. It is therefore doubtful as to whether the lingula is disappearing as a process of evolution such as could be suggested in the cases of the nodular and assimilated types. It has been postulated that the lingula, together with other non-metric measurements of the skull, could be used as an anthropological marker to assess different populations and races. However, further investigations need to be carried out to confirm this hypothesis.

Results from this study have indicated that the lingula is on average 20.15mm (20.42mm [right], 19.88mm [left]) from the anterior border of the ramus of the mandible, 16.8mm (16.77mm [right], 16.84mm [left]) from the posterior border of the ramus of the mandible and 16.3mm from the sigmoid notch (16.53mm [right], 16.1mm [left]). These results varied only marginally from those reported by Jansisyanont et al but exhibited a large discrepancy from the values obtained by Kim et al. A possible explanation for the variation in results could be due to different methodology employed by the different investigators. The methodology employed in this study proved to be most reliable and reproducible in determining points of reference for the anatomical location of the lingula, with correlation coefficients of > 95% in both intra-observer and inter-observer error tests. In addition, it is a simple method that can be used intraoperatively to gauge the probable anatomical position of the lingula.

This study found that the horizontal distance from the tip of the disto-buccal cusp of the mandibular second molar to the tip of the lingula was on average 33mm (SD +/- 3.3mm). There was no statistically significant difference in this measurement between the left and the right sides of the mandible. Kim et al. in a similar study on Korean mandibles found that the average horizontal distance from the distal side of the mandibular second molar to the lingula tip measured 28.7mm (SD +/- 2.87mm). Jansisyanont et al. in a study conducted on Thai mandibles, found the distance from the lingula tip to the disto-buccal aspect of the second molar tooth to be approximately 29.7mm (SD +/- 4.4mm). These studies have shown that a possible difference exists between the anatomical locations of the lingulae amongst different population groups in relation to surrounding landmarks. This may be due to variation in the size of the rami of mandibles, as noted in a study by Lee, who found that Korean mandibular rami were the largest among Asians, but were smaller than those of Caucasians.

There are few studies in which the position of the lingula was evaluated with respect to the level of the occlusal plane, having reported rather on the position of the mandibular foramen in relation to the occlusal plane. Whilst anatomical relationships and measurements of the mandibular foramen are invaluable, it is often not easily visualised intraoperatively, and is therefore less likely to be considered a clinical landmark. However, it can be readily visualised intraoperatively, given that the operator has a good understanding of its anatomical location, and therefore is regarded as a better clinical landmark. In this study, results indicated that the lingula was most commonly located above the level of the occlusal plane (83.7% of cases), which is a finding similar to those reported in several other studies. Although there were no statistically significant differences in the data between the right and the left sides of the mandible, it is important to note that, in some instances, the level of the lingula in relation to the occlusal plane differed from side to side within the same mandible. The average distance above the level of the occlusal plane was 6.5mm (SD +/- 2.42mm), which is higher than that reported by Jansisyanont et al, who found this measurement to be on average 4.5mm (SD +/- 2.6mm) above the level of the occlusal plane. The results from a study conducted in Thailand found that in 80% of cases, the lingula was located above the level of the occlusal plane, while in 20% of cases it was located below, and in no incidences was the lingula found to be at the level of the occlusal plane. In this study, there were no incidences in which the lingula was located below the level of the occlusal plane.

An attempt was also made to identify possible discrepancies in the anatomical position of the lingula that may be related to the type of occlusion. Results indicated that in 70% of class 1 occlusions, 65% of class II occlusions and 58% of class III occlusal relationships, the lingula was found to be above the level of the occlusal plane, with average distances of 6.1mm, 7.1mm and 6.5mm respectively. Thus the highest average position of the lingula was noted in Class II followed by Class III malocclusions. This suggests that a higher position of the lingula should be anticipated in both Class II and Class III malocclusions.

Several studies have found that if the lingula is situated high on the mandibular ramus, the medial horizontal osteotomy is made higher on the mandibular ramus in a thin region where there is little or no cancellous bone. According to Cillo and Stella, the lingula was found in Class III malocclusions to be higher than in Class I and Class II malocclusions, the ramus of the mandible exhibited

<table>
<thead>
<tr>
<th>Table 2: The relationship of the lingula to the occlusal plane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occusal plane</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>At Level</td>
</tr>
<tr>
<td>Above Level</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3: The position of the lingula in relation to the type of malocclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Class 1</td>
</tr>
<tr>
<td>Class 11</td>
</tr>
<tr>
<td>Class 111</td>
</tr>
</tbody>
</table>
limited marrow and the inferior alveolar nerve was found to be near the inferior border of the mandible. All these factors increase the risk of occurrence of an unfavourable fracture and IAN injury. Class III malocclusions are therefore regarded as having the greatest risk of acquiring an unfavourable fracture, due to the high lingula.29

In many measurements a considerable range was recorded. This possible variation should be borne in mind when applying the average data of the position of the lingula.

CONCLUSIONS

This study has attempted to describe the position and relation of the lingula to adjacent anatomical landmarks. This information could be useful when performing mandibular osteotomies or anaesthetic infiltration in this area. To this end, a simple set of guidelines may be suggested, using a 3-2-1-1 x 16mm rule to help describe the position of the lingula in relation to the surrounding structures:

- **3 X 16mm** = the approximate distance from the second molar tooth to the posterior border of the mandible (48mm)
- **2 X 16mm** = the approximate distance from the second molar to the lingula (32mm)
- **1 X 16mm** = the approximate distance from the sigmoid notch to the tip of the lingula (16mm)
- **1 X 16mm** = the approximate distance from the lingula to the posterior border of the mandible (16mm)

These standard references may help in the more proficient intraoperative location of the lingula.

References

Live MOUTH SMART

Be Confident through life

Good oral hygiene habits, avoiding risk factors and having a regular dental check-up from early in life can help maintain optimal oral health into old age.

www.sada.co.za  #SADA  #LiveMouthSmart
Apexification of immature teeth using an apical matrix and MTA barrier material: Report of two cases.

CH Jonker1, PJ van der Vyver2

ABSTRACT
Apexification is defined as a method to induce a calcified barrier at the root tip of a tooth with an open apex or to encourage the continued apical development of an incomplete root in teeth with necrotic pulps. Two case reports are presented in which teeth with large open apices and immature roots were clinically managed by placing demineralised freeze-dried bone allograft (DFDBA) as a matrix before placement of Mineral Trioxide Aggregate (MTA) as an apical barrier. The indications for and advantages of using DFDBA and MTA are discussed.

INTRODUCTION
The field of endodontics poses numerous challenges, amongst which is the management of the immature tooth with incomplete root development.1,2 In these situations, the absence of a natural constriction at the end of the root canal makes control of obturation materials difficult.3 Root canal rehabilitation is a significant challenge, because of the size of the canal, the thin and fragile dentine walls and the large open apex. Other challenges include instrumentation techniques, correct length determination and adequate irrigation. There is also a high risk of root fracture and it has traditionally been considered that teeth with incomplete root development and wide open apices have poorer prognoses and even the best endodontic treatments have a high possibility of failure.1,3,4

Apexification is a method aimed at inducing a calcified barrier at the root tip of a tooth with an open apex or encouraging the continued apical development of an incomplete root in a tooth with a necrotic pulp.5 Apart from allowing compaction of the obturation material, the goal of this treatment includes obtaining an apical barrier to prevent the extrusion of toxins and bacteria into the periapical tissues from the root canal. The procedure of chemically or mechanically creating an apical barrier is therefore defined as “apexification”.6

Several materials – including calcium hydroxide paste, calcium hydroxide powder and other alternatives – have been used in the past in an effort to create the apical barrier.7–15 Attempts have also previously been made to utilize a mixture of materials and chemicals in an effort to stimulate apexification and natural root closure.16 Ham et al. (1972) treated immature pulpless teeth in monkeys by cleaning and shaping with endodontic instruments beyond the root apex in an effort to induce bleeding to allow the formation of a blood clot in the hope of stimulating natural root closure.17 Traditionally, the material of choice

ACRONYMS
DFDBA: demineralised freeze-dried bone allograft
DMBM: demineralised bone matrix
DOM: dental operating microscope
MAP: Micro-Apical Placement System
MTA: Mineral Trioxide Aggregate

1. Casper H Jonker: BChD, Dip.Odont, Msc. (Pret.). Division of Endodontics, Department of Operative Dentistry, School of Oral Health Sciences, Sefako Makgatho Health Sciences University, Gauteng, South Africa.

Corresponding author
Casper H Jonker:
Division of Endodontics, Department of Operative Dentistry, School of Oral Health Sciences, Sefako Makgatho Health Sciences University, Gauteng, South Africa. E-mail: casper.jonker@smu.ac.za
REPAIR
& PROTECT
POWERED BY NOVAMIN

Nº1 DENTIST RECOMMENDED BRAND FOR SENSITIVE TEETH*

*Project Touchstone December 2016. For any product safety issues, contact GSK on +27 11 745 6001 or 0800 118 274
has been calcium hydroxide to stimulate the formation of the apical barrier, but the procedure involves numerous appointments and the treatment phase regularly extends over six months. Major disadvantages of prolonged contact with calcium hydroxide is that a significant decrease occurs in the intrinsic properties of exposed dentine and that immature roots become more susceptible to vertical root fractures.

The development of MTA provided a breakthrough in the field of endodontics and offered a most acceptable substitute for calcium hydroxide in the creation of an apical barrier. This material has advantages which include reduced chair time, a favourable outcome in the healing of periapical lesions and resolution of clinical symptoms.

In certain scenarios, an apical matrix is needed to provide sufficient resistance for the apical compaction of MTA and to avoid extensive overfill of the material. Bio-resorbable demineralised bone matrix (DMBM) is the protein component of bone and can be considered as a viable material from which to create the apical plug. DMBM has been widely used in other disciplines of dentistry in the treatment of periodontal and maxillofacial bone defects. Histological studies have shown favourable healing of bone and neighbouring periodontium when demineralised bone was used in the treatment of periodontal defects. The osteo-conductive potential of this material makes it suitable for the creation of the apical barrier before MTA placement.

This article presents two detailed case reports on the use of a novel matrix such as DFDBA prior to placement of MTA as an apical barrier.

**CASE REPORT 1**

A 21-year-old male complaining of discomfort on his upper-right central incisor received emergency root canal treatment at a Dental Clinic and was then referred to the Department of Operative Dentistry at Sefako Makgatho Oral Health Centre, Ga-Rankuwa, South Africa. The patient presented with an uncomplicated medical history. A history of dental trauma was noted but the exact date was unknown. On examination discoloration of the upper right central incisor was noted and a draining fistula was observed on the buccal mucosa in the region of the apex of the tooth. Slight tenderness was elicited on palpation around the apical region. On thermal stimulation, no response was recorded. The tooth was diagnosed as presenting with a necrotic pulp and a periapical chronic abscess. The pre-operative radiograph revealed an incomplete root closure, open apex and a large periapical lesion (Figure 1).

Two treatment possibilities were offered to the patient: the revascularisation procedure or non-surgical endodontics with an apexitication using MTA (ProRoot MTA, Dentsply Sirona, Switzerland) and DMBM. Consent was obtained for the latter option after a detailed discussion with the patient, and based on the predictability of the procedure. A rubber dam was placed and an access cavity was prepared. Once the canal was opened, no drainage could be observed, but a pervasive necrotic odour was noted. Length determination was accomplished using Machtoo pluggers (Dentsply Sirona) and estimated at 19.5 mm with the incisal edge as a reference point (Figure 2).

The root canal was chemically disinfected with 3.5% sodium hypochlorite, excess fluids from the root canal were removed with paper points and an intracanal medicament of calcium hydroxide paste was placed (Calasept Plus, Nordiska Dental, Sweden) (Figure 3).

The tooth was sealed with Ketac Molar (3M ESPE) as a temporary restoration and post-operative instructions were provided. The patient was scheduled for his next appointment four weeks later.

- On the second visit, it was noted that the draining fistula had disappeared. The patient reported no symptoms. No drainage from the canal was visible and the intracanal medicament was removed by irrigation with 3.5% sodium hypochlorite. Chemicals and excess fluids were removed from the root canal with paper points. A mixture of DFDBA (Osseograft TM, Advanced Biotech Products) (Figure 4) and sterile water was prepared. The mixture was placed in the coronal portion of the root canal and manipulated apically and beyond the apex with the Machtoo pluggers, ensuring that an apical plug was established at the working length with...
Visual accuracy was enhanced by the use of the Dental Operating Microscope (DOM). A small quantity of white MTA (Dentsply Sirona) was placed in the canal and moved apically with the use of large paper points and Machtou pluggers (Denstply Sirona). The decision was then made to fill the complete root canal space with MTA (Figures 5a and b).

At a follow-up consultation and evaluation four weeks later, it was observed that there was no visible swelling, there were no clinical symptoms on percussion and palpation of the tooth, and no mobility could be demonstrated. The patient was re-scheduled for an eight-month follow-up at which time notable bone healing with a reduction in diameter of the periapical lesion was seen (Figure 6). On a 12-month post-operative follow-up visit, examination of a periapical radiograph confirmed clear signs of bone healing and reduction of the large apical radiolucency (Figure 7).

**CASE REPORT 2**

A 17-year-old male presented in private practice with a history of previous dental trauma to his maxillary right central incisor about nine years previously. A pre-operative periapical radiograph revealed incomplete root closure associated with a wide-open apex and a large periapical lesion (Figure 8). After placement of a rubber dam an access cavity was prepared. Length determination was accomplished using Machtoo pluggers (Densply Sirona) and an electronic apex locator (Pixie Electronic Apex Locator, Dentsply Sirona). The working length was confirmed radiographically (Figure 9).

Remnants of the root canal contents were removed with Profile 04/90 instrument (Dentsply Sirona) before the canal was chemically disinfected with pre-heated (approximately 55 degrees Celsius) 3.5 % sodium hypochlorite for five minutes. Calcium hydroxide paste was placed (Ultracal, Ultradent, Utah, USA) as an intra-canal medicament.

At the second visit, two weeks later, the medicament was removed by activating 3.5 % sodium hypochlorite with an Endo-Activator (Dentsply Sirona). Excess fluids were removed from the root canal using ISO size 100 paper points under DOM magnification. A mixture of DFDBA (Osseograft TM, Advanced Biotech Products) (Figure 4) and sterile water was prepared at the chairside. The mixture was placed in the coronal portion of the root canal and then manipulated apically and beyond the apex with the Machtou pluggers under the DOM, until resistance was felt at the point of the predetermined working length. White MTA (Dentsply Sirona) was then mixed according to the manufacturer’s instructions and dispensed into the canal with the use of the Micro-Apical Placement System (MAP) system (Dentsply Maillefer). The dispensed MTA was moved apically against the apical matrix using the Machtoo pluggers. A plug of approximately 3mm was created against the matrix in the apical part of the root canal and...
placement was checked radiographically (Figure 10). Another 2mm of additional MTA was packed in to create a 5mm apical plug before the canal was obturated with Pulp Canal Sealer (Kerr Corporation, Orange, Ca, USA) and warm gutta-percha dispensed from an Obtura II unit (Obtura Spartan, IL, USA)(Figure 11).

The patient attended an eight-month follow-up visit when the tooth was permanently restored. A peri-apical radiograph showed complete apical healing (Figure 12).

DISCUSSION

In both cases, calcium hydroxide was used as an intra-canal medicament to achieve sterility in the root canal systems. It appears that a maximum period of up to four weeks is clinically acceptable before structural changes can be seen in the root dentine, which could lead to an increased susceptibility to fractures of the prepared roots.\(^1^{8,26}\) It has been shown that time is needed for hydroxyl ions to diffuse from the inner- to the outer dentine surface in order to reach an appropriate pH level.\(^27\) A risk of root fracture does, therefore, exist with longer periods of calcium hydroxide as an intra-canal anti-bacterial medium.\(^18\)

In the past, DFDBA material formed a decisive part of treatment approaches when an endodontist was confronted with periodontal bone defects. This approach has resulted in a proven reduction of clinically unacceptable periodontal pocket depths, with accompanying increased stability of the tooth and enhanced health of clinical attachment and the neighbouring periodontium.\(^18,23\) These studies further reported that radiographs taken at follow-up consultations demonstrated healing in the affected areas with the periapical pathology showing signs of resolution. An additional benefit of using freeze-dried demineralised bone is that it serves as an osteoconductor and even has the potential to induce bone formation.\(^25,36\) It could be speculated, but not yet proven, that it might have played a role in stimulating bone healing in our case but its primary use was to form a mechanical barrier for the placement and condensation of MTA. In the treatment option adopted in this case, the DFDBA provided sufficient resistance to withstand vertical compaction of MTA without accidental overfill of MTA into the periapical area. The decision was made to avoid further extrusion of bone particles once adequate resistance was encountered rather than forcing more particles beyond the apex and risking damage to the root canal walls.

The use of MTA in the apexification procedure provides an excellent treatment option in the management of teeth that present with incomplete root and apex formation and has the advantage of reduced chair time. Calcium hydroxide, by comparison, requires a number of appointments to stimulate barrier formation.\(^18,19,19\) Apatite-like interfacial deposits can be observed in the maturation phase of MTA, a biologically acceptable seal and reduced cytotoxicity compared with alternative materials used in the treatment of the pulp.\(^32\) It has been advocated that a minimum barrier of approximately 5mm MTA is needed to guarantee strength and reduce micro-leakage. It could be argued that the affected tooth in case report One above could then have been treated with an apical MTA barrier of 5mm and standard obturation with gutta-percha in the remaining coronal part of the root canal. It has been shown that obturation with gutta-percha does not increase resistance to root fractures, which may occur even with low forces.\(^33\)

A review study conducted by Bogen and Kuttler in 2009 concluded that the use of MTA to obturate the complete root canal system might ultimately increase the long-term prognosis and retention of the tooth compared with the use of conventional obturation methods in conventional and complex therapies.\(^34\)

The numerous additional advantages offered by MTA include superb biocompatibility, very similar to a primary mono-block. The deposits fill any possible voids encountered during the setting/shrinkage phase and also increase the frictional resistance between MTA and the root canal walls. It can be speculated that the formation of these apatite deposits is responsible for the superior seal created by MTA when it is used as a regular obturation material during standard root canal treatment and for the repair of root canal perforations.\(^31\)

The results obtained in these clinical case reports suggest that there are clear advantages in the single-visit apexification procedure in the management of large open apices in trauma-affected teeth.
References


ABSTRACT
Background: Rhinosporidiosis is a rare chronic granulomatous infection presenting primarily on the mucous membrane of nasal cavities, nasopharynx and oral cavity. *Rhinosporidium seeberi* has been identified as the causative agent; however recent studies have implicated a waterborne organism, the cyanobacterium *Microcystis aeruginosa*, as the cause. It is endemic in India and Sri Lanka where 90% of all infections occur. The aim of this paper is to review literature on rhinosporidiosis and to report on one of the sporadic cases encountered in South Africa, Gauteng province.

Case presentation: A 17 year old black male patient presented with a pedunculated nasal mass causing nasal obstruction. Microscopical examination showed a polypoid mass with numerous thick walled sporangia in a background of fibrovascular connective tissue stroma with granulomatous inflammation. Fluorescent microscopy was effective in identifying the walls of the sporangia in the granulomas. A final diagnosis of nasal rhinosporidiosis was made.

Conclusion: Rhinosporidiosis, a rare condition in our environment, has the potential to disseminate to other parts of the body. It is therefore critical for the clinicians to always consider rhinosporidiosis as a differential diagnosis when assessing patients presenting with nasal polyps.

Keywords: Nasal polyp; *Rhinosporidium seeberi*; Sporangia with endospores; *Microcystis aeruginosa*; Rhinosporidiosis in South Africa.

BACKGROUND
Rhinosporidiosis is a rare chronic granulomatous infection that presents as sessile or pedunculated polypoid lesion, primarily affecting the mucous membrane of nasal cavities, nasopharynx and oral cavity. Whilst extranasal involvement is rare, skin, eyes and bone, amongst other sites, may also be affected and it can occasionally present as disseminated disease. The condition is believed to be caused by *Rhinosporidium seeberi* but recent studies have implicated a waterborne organism, the cyanobacterium *Microcystis aeruginosa*. A molecular study on the polyps of rhinosporidiosis detected 16S rRNA gene in round bodies. This confirmed *Microcystis aeruginosa* as a causative agent. The presumed mode of infection is through traumatised epithelium, most commonly in nasal sites. The spread could be auto-inoculation, or haematogenous or lymphatic spread. It may occur anywhere but is endemic in India and Sri Lanka where 90% of all infections are recorded. Microscopically, rhinosporidiosis is characterized by hyperplastic respiratory or squamous epithelium, accompanied by prominent subepithelial chronic granulomatous inflammation. The connective tissue stroma contains numerous thick walled, 100 to 300 microns sporangia that are in different stages of maturity. Within the sporangia are numerous endospores with a characteristic arrangement of immature and mature forms. The condition is rare in African continent and to date only 14 cases have been reported from South Africa.

CASE REPORT
A 17 year old male patient presented with a pedunculated polypoid mass attached to the anterior part of the nasal septum, causing nasal obstruction. The lesion was clinically suspected to be an allergic polyp. Excisional biopsy was done and the specimen was submitted for histological examination. Microscopy revealed a polypoid mass covered by respiratory epithelium with areas of squamous metaplasia. The core of the lesion showed numerous thick walled sporangia in different stages of maturity within the background of a fibrovascular connective tissue stroma with dense granulomatous inflammation (Figure 1). Evidence of fusion of some sporangia between the overlying epithelium and ductal lining, with a resultant rupture and release of the endospores onto the overlying surface epithelium and into...
Live MOUTH SMART

Taste through life

Good oral hygiene habits, avoiding risk factors and having a regular dental check-up from early in life can help maintain optimal oral health into old age.

www.sada.co.za  #SADA  #LiveMouthSmart
the ductal lumen respectively, was also demonstrated. There were foci of foreign body giant cell reactions that were probably a reaction to the endospores released from ruptured sporangia. Mucicarmine stained the inner walls of the capsules of the sporangia and the endospores (Figure 2). The fluorescent microscope demonstrated autofluorescence of the capsules of the sporangia and endospores (Figure 3).

DISCUSSION

Rhinosporidiosis is a rare condition in the African continent with only a few sporadic cases having been reported in the literature. The condition has the highest incidence in India and Sri Lanka. Although to date only 14 cases have been recorded from South Africa, others have been reported in Burundi, Zaire, Rwanda, Tanzania, Chad, Malawi, Kenya, Uganda, Congo and Egypt. Almost all the South African cases were ocular rhinosporidiosis and were encountered in patients younger than 15 years of age. This is the first case to be reported in Gauteng province and it is also that of a younger patient. The case was diagnosed in the Department of Oral Pathology of Medunsa Oral Health Centre, Sefako Makgatho Health Sciences University. The biopsy was submitted by the Department of Otorhinolaryngology, Dr George Mukhari Academic Hospital.

It is believed that stagnant ground water is the natural habitat of the causative agent. Accordingly it will be important to determine the chemical and physical characteristics of those waters where it is likely that these South African individuals were infected. Host predisposing factors such as blood group and genotype HLA types, should also be investigated as there could be many people who are bathing in ponds and lakes; yet the incidence of this disease is still low in the country. The incidence of rhinosporidiosis has been reported to be the highest in individuals of blood Group O followed by Group AB. Recurrences and dissemination of the disease should also be investigated and documented.

The clinical presentation of rhinosporidiosis can mimic other non-infectious nasal polyps. It is therefore critical to take a biopsy for histological examination of the lesion to confirm a definitive diagnosis. The organisms can be identified easily on sections stained by hematoxylin and eosin. Other histochemical stains such as Periodic Acid Schiff and mucicarmine can also be used to establish the correct diagnosis of rhinosporidiosis. The autofluorescence demonstrated by the capsules of the sporangia and endospores revealed distinctly the capsule of a ruptured sporangium with release of endospores and resultant foreign body giant cell reaction. The property of autofluorescence was also observed by other authors.

It is important that the incisional or excisional biopsy is taken with caution to avoid spillage of endospores from the polyp. Spillage is usually followed by autoinoculation through the adjacent epithelium and this tends to serve as a base for increased recurrences in rhinosporidiosis. Hence the recommended treatment is a combination of surgical excision and electrocoagulation.

Just as the clinical presentation can mimic certain conditions so may to the histological features and the following differential diagnoses need to be considered: Coccidioides immitis, oncocytic Schneiderian papilloma and Myosporulosis.

Coccidioides immitis also evoke a granulomatous foreign body giant cell reaction with a dense chronic inflammatory infiltrate. However; the spherules of Coccidioides immitis measure approximately 30 – 80μ as compared with those of Rhinosporidiosis seeberi which measure 100 -350μ. The endospores are small and numerous measuring 2-5μ whereas those of Rhinosporidiosis seeberi measure 5-10μ. The capsule of Rhinosporidiosis seeberi has a thicker, distinctly bilaminated capsule that stains with mucicarmine whereas the capsule of Coccidioides immitis does not. Also this type of infection is not common in the nasal cavity.

In oncocytic Schneiderian papilloma, the epithelial lining has scattered mucous cells with intraepithelial microcysts that contain mucin and polymorphonuclear cells. The surface epithelium in rhinosporidiosis lacks oncocyes and there is no endophytic growth. The microcysts do not have a thick capsule and there are no contained endospores.

Myosporulosis is a rare iatrogenic pseudomycotic lesion characterized by prominent fibrous and chronic inflammation with foreign body-type giant cells surrounding pseudocystic spaces. The spaces contain saclike structures with a thick dark wall, referred to as parent bodies with enclosed “fungus-like” spherules. These spherules are simply red blood cells that have been altered by the medication. This is actually a result of a tissue interaction...
with petroleum base and an antibiotic. The spherules do not stain with mucicarmine.

Surgical resection is the primary treatment for rhinosporidiosis and this may be combined with electrocoagulation. If the lesions are not treated early, dissemination to distant areas, usually attributed to haematogenous spread, may occur. There has been a report of a case where a single patient had simultaneous involvement of the skin, subcutaneous tissue, muscle, bone, penis, urethra and nasal cavity. One case was reported of a patient with nasal rhinosporidiosis with dissemination to a finger, necessitating amputation.

CONCLUSION

Rhinosporidiosis is a rare condition in our region. The disease has the potential to disseminate to other parts of the body. Clinicians should always consider rhinosporidiosis as a differential diagnosis when assessing patients presenting with nasal polyps.

Recommendation: It is important for all health care institutions in Africa to report this rare disease, so that definitive reference data can be accumulated on the geographic and demographic distribution of rhinosporidiosis. Further investigations should be undertaken to establish those host factors that render patients susceptible to this infection.

Consent: Written informed consent was obtained from the patient for publication of this Case report and any accompanying images.

Ethics: Approval to report the case was obtained from the Research Ethics Committee of the Sefako Makgatho Health Sciences University. The reference number is SMUREC/D/160/2015: IR

Conflict of interest: None declared

References

Dental implications of bisphosphonate therapy in osteogenesis imperfecta.

ABSTRACT
Bisphosphonate therapy, which is effective in reducing the rate of fracturing, represents a significant advance in the medical management of Osteogenesis imperfecta (OI). When administered to affected persons, bisphosphonate therapy is relevant in their dental and craniofacial management. A particular concern is bisphosphonate-induced osteonecrosis of the jaws, a rare but potentially devastating problem.

Osteogenesis imperfecta type III (OI III) is relatively common amongst the indigenous Black African population of South Africa. With the co-operation of medical colleagues 64 Black South African individuals with OI III, between the ages of three months and 18 years, were identified and were dentally assessed. Fifty-five of these individuals had received or were receiving bisphosphonate therapy. This impacted on dental treatment planning and delivery since there is a risk of the complication of bisphosphonate induced osteonecrosis of the jaws.

There is a paucity of information regarding the dental management of persons with OI who are receiving bisphosphonate therapy. In particular, orthodontists and maxillofacial surgeons have expressed concern regarding the advisability of orthodontic extractions, tooth movement when faced with the potential for developing osteonecrosis of the jaws.

In view of these uncertainties, the dental implications of bisphosphonate therapy have been reviewed and discussed in this article.

INTRODUCTION
Bisphosphonates are synthetic analogs of pyrophosphates, which, being deposited on the bone surface, inhibit bone resorption. They are then ingested by osteoclasts with consequent apoptosis of these cells. Bisphosphonates also demonstrate anti-angiogenic activity by inhibiting vascular endothelial growth factor and the formation of new blood vessels.1 Bisphosphonate therapy is used for several conditions notably osteoporosis, Paget’s disease, metastatic bone malignancies and Osteogenesis imperfecta (OI). Although impressive radiological and clinical improvements following bisphosphonate therapy have been observed and are well documented in persons with different forms of OI, nevertheless bisphosphonate-induced osteonecrosis of the jaw (ONJ) remains a rare but potentially devastating problem.

In South Africa, there is a need to record clinical experiences and to devise and develop a clinical management protocol and guidelines for optimizing dental therapy in persons affected with OI who have received bisphosphonate therapy.

PATIENTS AND METHODS
All investigations were undertaken in complete accordance with the Declaration of Helsinki, the Hippocratic Oath and the Singapore Statement on Research Integrity. Formal ethical approval (HREC reference number: 203/2013) was obtained from the Ethics Committee, University of Cape Town. Informed signed consent was obtained from parents, or from guardians of affected children where appropriate.
Severe autosomal recessive (AR) Osteogenesis imperfecta type III (OI III) is relatively common amongst the indigenous Black African population of South Africa. With the co-operation of medical colleagues, 64 Black African individuals with OI III in South Africa, between the ages of 3 months and 19 years, were identified and dentally assessed. Fifty-five of these individuals had received or were receiving bisphosphonate therapy and a detailed account of this aspect of management of OI III on 26 of these persons has recently been documented.²

An extensive appraisal of the literature in terms of dental management in conjunction with bisphosphonate therapy in OI has been undertaken and the findings and conclusions form the subject of this paper.

DISCUSSION

Pamidronate is a bisphosphonate frequently used in children. A study which included 26 Black African patients with OI III in South Africa who had received Pamidronate therapy, concluded that this treatment was well tolerated. The affected persons ranged in age from 1.5 years to 24 years and the majority reported a reduction in symptoms and an increased sense of well-being.² No reported instances of Pamidronate being associated with osteonecrosis of the jaws in OI could be found in the literature. In circumstances where affected persons did not respond optimally to Pamidronate, Zoledronic acid has been used. It may be relevant that Zoledronic acid has frequently been used in South African patients. Although concern exists that this form of therapy has been associated with aseptic necrosis of the jaw in adult persons, none of the South African patients presented with any symptoms of ONJ.²

Bisphosphonate Therapy and Dentistry

The jaws are susceptible to osteonecrosis due to several anatomical and physiological factors. Bisphosphonates tend to accumulate in the bones of the jaws due to the high vascularity and turnover rate. The forces of mastication and consequent tension on the periodontal ligament ensure a high turnover rate of alveolar bone and the thin oral mucosa can easily be traumatized during dental procedures, allowing oral microbes to track into the mucoperiosteal region of the jaws.³ The pathophysiology of ONJ is multifactorial, involving factors such as marked suppression of angiogenesis, altered functioning of oral mucosal cells, modification of the oral microbial flora, an anti-inflammatory effect and a genetic predisposition.⁴ It is relevant that bisphosphonate uptake results in decreased remodeling of the alveolar bone and a sclerotic lamina dura.⁵

A search of the literature suggests that various clinical settings in dentistry may potentially be involved if an individual has a history of or is currently receiving bisphosphonate therapy.⁵-⁰¹ Several case reports and cohort studies have linked bisphosphonate therapy and osteonecrosis of the jaw (ONJ) in adults in different disorders.¹³,¹⁸-²⁸ Reports of three hundred and sixty-eight cases of ONJ have been published in a systematic review, the majority occurring in elderly persons with malignancies. However, to date, there have been no published data of the frequency of ONJ in children. The only dental report which was found pertaining to children, referred to a 1.67-year delay in tooth eruption in 33 persons with OI who received bisphosphonate therapy.¹⁰

A retrospective Swedish¹¹ survey, identified a large series of persons with various forms of OI, between the ages of 2 months and 20 years, who had received or were on bisphosphonate therapy, many of whom had had dental surgical procedures. No evidence of ONJ were identified in any of these patients at their eight-year follow-up.

There were no reports or history of ONJ subsequent to dental therapy amongst the 55 persons in the current South African series who were affected with OI III and who had received or were receiving bisphosphonate therapy.

1. Dental Implants

Persons with OI have an increased risk of early loss of teeth and, hence, rehabilitation using dental implants may be a management option. Although bone graft surgery and dental implants are considered potential risk factors for the development of ONJ in individuals receiving bisphosphonate therapy, studies of this possibility have reported no incidences of ONJ in persons with OI.¹²

2. Periodontics

The potential beneficial effects of bisphosphonates on periodontal disease have been explored, for the density of alveolar bone is increased, a favourable outcome, but, paradoxically, there an increased risk of ONJ.⁵,¹³ A reported incidence of the development of osteochonemocrosis in a patient who received non-surgical periodontal treatment highlights the importance of practitioners being cognizant of this possible debilitating consequence, even when non-surgical therapy is performed. Since ONJ is difficult to predict and prevent the avoidance of surgery has been advised.¹⁴

In OI affected individuals, the lamina dura is absent, suggesting decreased mineralization of the alveolar bone (Figure 1). This factor places these persons at risk for the development of periodontal disease and consequent alveolar bone loss. The presence of periodontal disease may necessitate invasive periodontal procedures or dental extraction, which will increase the risk of ONJ.

Figure 1: Panorex radiograph of a 19 year old boy with OI. The lamina dura is absent and several radiographic features of Dentinogenesis Imperfecta are evident in all his teeth.

There is cervical constriction of the molars (1). The pulp chambers are partially or completely obliterated in almost all of his teeth (2). The roots are thin and short (3).
For this reason, impeccable oral hygiene practices are encouraged in persons with OI who are receiving bisphosphonate therapy.

Despite a vigorous literature search, no published reports were found which documented persons with OI and ONJ consequent to periodontal therapy.

3. Orthodontics
Bisphosphonates are effective in the medical management of children with OI. No instances of ONJ have been reported and the extraction of teeth is not contraindicated in these children.15,16 The current authors suggest that a young age may be a protective factor.

Increasingly, adults with OI with bisphosphonate exposure are now seeking orthodontic care. Nevertheless, a literature search has not revealed any case reports of ONJ developing during orthodontic management. Bisphosphonates may compromise orthodontic treatment in that tooth movement involves bone resorption and deposition. It has been shown that bisphosphonates can reduce the rate of orthodontic tooth movement due to their inhibition of bone resorption by osteoclast apoptosis and reduced bone vasculature. Inhibition of orthodontic tooth movement has been documented in four cases with a history of bisphosphonate exposure.17,18 No studies have specifically implicated orthodontic management as a factor in increased ONJ risk, but there is evidence that prolonged orthodontic treatment in patients suffering OI may intensify the potential for ONJ.19

4. Endodontics
In persons with OI and a history of bisphosphonate therapy, endodontic treatment is preferred over extraction in order to minimize the risk of ONJ.20

5. Oral Surgery
A report documents several middle aged to elderly medically compromised patients on bisphosphonate therapy who presented with unusual non-healing extraction wounds. In this clinical setting, namely, bisphosphonate therapy in medically compromised individuals, it is imperative that a detailed medical history is obtained, in particular information on bisphosphonate usage and that proper procedure is followed in order to avoid the onset of ONJ.21 Dental extractions and surgical procedures need to be as atraumatic as possible and good oral hygiene is crucial in order to ensure optimal healing. These constraints are especially relevant in a bisphosphonate induced environment of reduced blood supply, sclerotic bone and reduced bone turnover.15,22

6. Cranial Base Abnormalities
Pathology of the cranio-cervical and base of skull region in OI can be divided into platybasia, basilar invagination and basilar impression and it is suggested that these complications can occur separately or concurrently.23-25 Cranial base anomalies impact on dental therapy and caution is warranted when a patient’s head is manipulated in order to avoid atlanto-axial subluxation and spinal cord compression. In cephalometric analyses of dentofacial morphology, details on the cranial base constitute important reference points. This situation necessitates awareness by the dental clinician in order to enable the distinction between pathology and normal developmental patterns.

A research report documented the natural progression of cranial base anomalies in 150 persons with OI, aged between 0 - 39 years and recorded that 37% had abnormalities.23 The authors subsequently recommended a radiological surveillance strategy with regular follow-up. In this cohort of patients, the number of individuals on bisphosphonate therapy was low; hence, a further study was undertaken in order to resolve the issue of the effect of bisphosphonates on the development of cranial base abnormalities.24 The conclusion was that although the early initiation of bisphosphonate treatment may defer the development of cranial base pathology, abnormalities may still arise despite this therapy.

7. Antibiotic Prophylaxis
A survey of dental specialists and dentists in the UK revealed that their approaches to the management of paediatric patients on bisphosphonates ranged from no precautions against ONJ, to antibiotic prophylaxis. It also highlighted the fact that OI centres in the UK frequently received calls from dental practitioners requesting management advice for this group of individuals and it is evident that guidance in this regard is necessary.26 The question of antibiotic prophylaxis during dental intervention arose in the context of South African patients with OI III had orthopedic roots. There is a paucity of published information pertaining to this situation. A few reports have suggested that antibiotic prophylaxis for ONJ is not required when dental treatment is undertaken.27 The instance of a boy aged 10 years with OI who had dental surgery with no administration of antibiotics and without the suspension of bisphosphonate therapy has been reported.28 Eighteen months later at his follow-up appointment, he showed no signs of ONJ.

8. Reported Dental Management Protocol
Currently, no established protocols or guidelines have been formulated for the dental management of persons with OI who are on bisphosphonate therapy. The perception that dental extractions and other oral surgical procedures in children should be carried out only when necessary is based upon experience with adult individuals receiving bisphosphonate therapy. Delaying or avoiding the extraction of severely carious teeth may result in infection and chronic pain which can have serious consequences. Similarly, a delay or failure to manage an evolving malocclusion may deny paediatric patients a functional occlusion.

A suggested management approach is to discontinue bisphosphonate therapy 8 - 15 days prior to simple procedures such as a dental extraction and four months prior to invasive surgery such as an osteotomy. In both circumstances, antibacterial prophylaxis is recommended.26,29 It has also been documented that although bisphosphonate therapy withdrawal may not interfere with the bisphosphonate previously assimilated into the bone, withdrawal of therapy may expedite the healing process of the injured tissues by averting the anti-angiogenic effect of bisphosphonates.30

Referring to patients in whom bisphosphonate therapy has already been initiated, the American Association
of Oral and Maxillofacial Surgeons\textsuperscript{23} and the Japanese ‘Allied Task Force Committee of Bisphosphonate-Related Osteonecrosis of the Jaw’ suggest that dental procedures be performed prior to the bisphosphonate dose reaching a high level.\textsuperscript{31} It is recommended that, prior to the commencement and during the administration of bisphosphonate therapy in this group of patients, they be referred to a dental clinician for examination, for the identification of any risk factors for ONJ, and for the development of an appropriate treatment plan and frequent follow-up.\textsuperscript{31}

In the South African situation, the authors advocate that, in order to obtain baseline information of the relation between dental and craniofacial manifestations and bisphosphonate therapy, cephalometric radiographs of affected persons who have not received bisphosphonate infusions should be compared with those of OI affected persons who have received bisphosphonate therapy. In this way, the effect of bisphosphonate therapy on the dental and craniofacial structures may be identified.

\section*{CONCLUDING COMMENTS}

Most reported cases of ONJ related to bisphosphonate therapy have been in patients older than 60 years and often associated with malignancies. Osteonecrosis of the jaws has also been seen in children and adolescents with a history of malignancies who were treated with bisphosphonates.\textsuperscript{8}

Several reports have suggested that there is little risk of ONJ in paediatric OI dental patients receiving bisphosphonate therapy.\textsuperscript{15,16,22} The reasons for this reduced risk are unclear. When dental treatment is vital in this group of children on bisphosphonate therapy, communication with the child’s medical team is essential. Patients and their parents or caregivers should be informed of the importance of maintaining good oral hygiene and having regular dental evaluations in order to prevent dental disease.

It should also be considered that as bisphosphonates are retained in bone for many years, any dental intervention in this period may, in theory, result in ONJ.

The Canadian Association of Oral and Maxillofacial Surgeons established a multidisciplinary task force that reviewed all relevant research and current literature related to ONJ.\textsuperscript{7} These authors concluded that although ONJ was identified as a risk factor in oncology patients receiving high dose intravenous bisphosphonates, low dose bisphosphonate use in patients, especially children, with OI, did not pose a risk for the development of ONJ and no causal link was established.\textsuperscript{8}

A review of the literature suggests that the risk of bisphosphonate-associated ONJ in persons with OI is considered to be extremely low and that persons requiring dental management should not be deprived of treatment. Prior to any dental procedures, dental practitioners should inform patients of the potential risk of ONJ and thereby receive informed consent. Follow-up appointments are obligatory so that healing is closely monitored. If the patient develops symptoms of ONJ, referral for secondary care is mandatory.

\section*{SUGGESTIONS FOR FUTURE RESEARCH IN SOUTH AFRICA}

A prevalence study and the frequency of persons with OI receiving bisphosphonate treatment who have developed ONJ consequent to dental intervention in South African clinics is necessary. Postoperative follow-up of persons with OI who have received bisphosphonate therapy is important as well as documentation of the antibiotic regimen and the type of bisphosphonate used.

Osteonecrosis of the jaws is a serious clinical problem and, therefore, in order to obtain data in the South African context and to create a greater awareness of this potentially devastating concern, longitudinal studies, such as those mentioned, are necessary.

\section*{References}


Maxillo-facial radiology case 155

CJ Nortje

Below are clinical pictures and images of the most common malignancy which may present in the oral cavity. Describe the clinical and most obvious radiological features. What is your diagnosis?

INTERPRETATION

Figs. 1 & 2 show an ulcerative lesion of the alveolar bone with destruction of the bone adjacent to the intra-oral lesion. There is marked bone loss leading to “floating” teeth. A cropped pantomograph of another patient (Fig. 3) demonstrating a “floating” tooth and the presence of a pathologic fracture (red arrow) of the mandible. Figs. 4 & 5 show the presence of a swelling with a draining sinus with extensive local involvement of the left mandible. Note the pathologic fracture in Fig. 5 (yellow arrow). Fig. 6 is a T2-weighted MRI image from the same patient. Note invasion of the lesion to the floor of mouth and destruction of both buccal and lingual cortical plates of the left mandible. The most obvious diagnosis of the above is primary carcinoma of the oral cavity and jaws. Carcinoma is the most common malignancy of the oral cavity. Certain geographic areas of the world have a high frequencies of oral cancer. For example, India has a high rate of oral squamous cell carcinoma. In the United States, squamous cell carcinoma makes up 4% of all carcinomas in men and 2% in women. Invasion of the jawbones by continuity is a frequent occurrence in carcinomas originating in the alveolar ridge and the gingiva. Less frequent are osseous complications in carcinomas arising from the maxillary sinus, the hard palate, the buccal mucosa or the floor of the mouth. A comparison between the frequency of mandibular and maxillary osseous involvement in cases of oral mucosal carcinoma has shown a higher degree of invasion of the maxilla. Radiographic examination is important to determine whether the jawbone is involved in a soft tissue-originated carcinoma. In the mandible, the osseous involvement begins in most cases on top of the alveolar ridge, causing destruction of the underlying bone, in a U-shaped form. The edges may be distinct, ill-defined, or at times, slightly ragged and the lamina dura is totally destroyed (Fig. 2). There is no evidence of bone production within the excavation and no normal bone structures are recognizable in the affected area. A periosteal reaction is seldom seen. The bone is being destroyed through osteoclastic activity, and the marrow spaces are replaced by connective tissue which is the site of chronic inflammation. The spread of the carcinoma often occurs along the inferior dental neurovascular bundle.

Reference

INTRODUCTION

Negligence refers to the breach of a duty of care which results in damage. It occurs when a person’s conduct falls below the standards of behaviour established by law for the protection of others against unreasonable risk of harm. A person has acted negligently if he or she has departed from the conduct expected of a reasonably prudent person acting under similar circumstances. In a legal situation, in order to establish negligence it must be proven that the defendant had a duty to the claimant, the defendant breached that duty by failing to conform to the required standard of conduct, the defendant’s negligent conduct was the cause of the harm incurred by the claimant, and the latter was, in fact, harmed or damaged.1

LITERATURE REVIEW

1. Negligence

Historically, English Common Law imposed liability for all wrongful acts. However, the concept of negligence only emerged as an independent entity in the eighteenth century, when the concept of legal liability for a “failure to act” emerged. This was originally imposed on those who undertook to perform a service, but failed to exercise care or skill in carrying out that service. This breach of promise to exercise care, whether overt or implied, formed the origins of the concept of “duty”.1 These ideas spread and today negligence is one of the most wide-ranging misdemeanors, encompassing most forms of unintentional or wrongful conduct where others are injured. While the actual laws pertaining to negligence may differ throughout the world, the basic notions and values remain the same. One of the most important arguments used in negligence law is that of the “reasonable person,” which provides the standard by which their conduct is judged.1

1.1 The “Reasonable Man Rule”

By definition, “a person has acted negligently if they have departed from the conduct expected of a reasonably prudent person acting under similar circumstances. The hypothetical reasonable person provides an objective by which the conduct of others is judged”.1 This helps distinguish negligence from intentional wrongdoing such as assault and battery where the actions were deliberate and intended to cause harm. A negligence suit, however, seeks to establish that failure of the defendant to act as a reasonable person caused the plaintiff’s injury. It considers many factors including the person’s knowledge, experience, and perceptions, the activity they are engaging in, and the circumstances surrounding their actions.1

In the medical / dental context, when a clinician engages in an activity requiring special skills, education, training, or experience, the standard by which their conduct is measured is the conduct of a reasonably skilled, competent, and experienced person who is a qualified member of the group authorized to engage in that activity. They cannot deny personal knowledge of basic aspects of the profession that are commonly known and practiced by their peers. The law does not make a special allowance for beginners with regard to special skills, and holds everyone to the standard of conduct of persons who are reasonably skilled and experienced in the activity.1 In addition, a person’s physical characteristics or impairments and mental capacity does not excuse them from acting according to the reasonable person standard. Similarly, voluntary intoxication will not excuse conduct that is otherwise negligent.1

In the case of emergencies, the law recognizes that “even a reasonable person can make errors in judgment in such situations, and their conduct will be evaluated in light of whether it was a reasonable response under the circumstances, even though, in hindsight, another course of action might have avoided the injury”.1 In other circumstances failure to anticipate the emergency could constitute negligence, as a reasonable person would have anticipated, and taken precautions against, the foreseeable emergency.1 A further issue that is seldom considered is that a clinician could be held negligent by virtue of the patient’s conduct. The law may consider that a trained professional should have taken into account the possible conduct of their patient, and regulated their own conduct accordingly. For example administering a double mandibular block to a child without anticipating that...
they would not understand the implications and damage they may inflict on themselves if they chewed while their mouths were still anaesthetized is negligent. Even adults given bilateral inferior alveolar nerve blocks experience loss of control of the tongue, collection of fluid in the oral cavity, weak bolus propulsion during swallowing and possible aspiration. A reasonable person must foresee the negligent conduct of others if the situation warrants.

1.2 Proof of Negligence
Proof of negligence is based on comparing the actions with those that a reasonable clinician, under the same circumstances, would have performed. This expert witnesses (colleagues) are often called upon to provide information beyond the common knowledge of the legal representatives, such as scientific evidence, interpretation of special investigations and test results, diagnosis, clinical procedures performed. They will also be asked to ascertain whether the accepted standard of care was given. To do this they may need to evaluate the conditions and circumstances, examine the patient if possible, and deliver a professional opinion. Note: it is easy to become emotional and accusatory when called upon to comment on the wrongdoings of others. However, one needs to remember that no third party can ever really know the full circumstances and details of what transpired during a clinical appointment. As such, findings should be presented in a clearly written document that reports on the current situation as observed clinically and radiographically. It should include a detailed description of the entire oral cavity, the tooth number, type of restorations present, and acceptability or problems associated with these, and may offer advice on possible solutions, including time and financial implications. Unless the expert witness has access to pre-operative records it will be impossible for he/she to report on the extent of damage caused by the accused colleague. As such the report should not include personal allegations accusations or assertions of guilt. Bear in mind that this document could be presented in a court of law, and all observations, opinions and deductions should be defensible and justifiable. Also consider that one never knows the exact circumstances, or issues that may have been beyond the clinician’s control which could account for their actions. Circusstrial evidence is very difficult to prove and when used in medical situations, the principle of Res Ipsa Loquitur (the thing speaks for itself) is invoked. Res Ipsa loquitur argues that the injury could not have occurred in the absence of the clinician’s negligence, was due to instrumentation or management that was exclusively under their control and that the injury would not have occurred if the clinician had acted with reasonable care.

1.3 Negligence and Duty
Negligence on the grounds of duty refers to those situations where a pre-existing relationship creates an obligation to exercise care and to protect another person from harm. “While a person generally has a duty to not endanger the safety of others, they don’t have a duty to render aid or prevent harm if it is from some other independent cause”. A doctor who witnesses an accident has no duty to offer emergency medical assistance to the accident victims. However they can voluntarily decide to help, but are then obliged to exercise reasonable care in rendering that aid. This has resulted in doctors who have given medical assistance to accident victims being sued for negligence, and led to the so-called “good Samaritan” rule to relieve them from negligence liability.

1.4 Patient Negligence
There are times when the patient could have acted negligently and thus adding to their own injury. This is called “contributory negligence” and often results in their being unable to claim for the damages caused by the clinician. To compensate for this they may seek restitution based on “comparative negligence” in which their own negligence will not completely bar them from claiming damages, however their damages will be reduced by whatever percentage their own fault contributed to the injury. The clinician and patient may also have contradictory accounts as to the mechanism and extent of injury, based on their subjective recollection and interpretation of the events.

1.5 Assumption of Risk
This rule would allow a clinician to avoid liability for his/her negligence by proving that the patient voluntarily consented to the procedure knowing its potential dangers and / or the dentist’s limited capabilities. It is almost never used in a medical context.

2. Malpractice
Reputation is a reflection of actions rather than words.

Malpractice is a legal term with a very specific definition. However in dentistry it can be defined as treatment provided by a dental care professional that is deemed to be below the acceptable standard of care expected from a dentist, that results in serious personal injuries to the patient. If a patient feels he/she have been injured by a dentist and wished to claim for malpractice there are four issues that need to be proven in the court of law: that the dentist was licensed, as this establishes that he/she had a duty to his/her patients to be professional and take care of them; that the dentist failed that duty through mistakes and poor treatment; that the mistake caused an injury; and that the injury resulted in damages. The damage may be physical harm such as scarring, injury to teeth or oral structures, or permanent loss of teeth, but could also include other costs such as lost time and wages, psychological trauma, incapacity, or extra medical or dental expenses. In a 12 year medico-legal survey of the most common dental malpractice claims in the USA, approximately one-quarter involved complications arising from extractions, including infections, sinus perforation and nerve damage. Twenty percent of claims resulted from endodontic procedures. Surgical errors included instruments left behind, air embolisms and nerve damage. Another quarter of the complaints involved injuries, fractures and infections resulting from implants, crowns and bridges. The rest of the cases included drug and anesthesia reactions, root resorption and other complications from orthodontics and braces, severe infections and failure to diagnose diseases. [This reference was purposefully inserted as an example to internet users to be wary and question information in web posts. In a follow up e-mail correspondence with the lawyer who published these results, it was established that the research had been conducted 20 years ago! Undoubtedly with the implant explosion, the figures would be different in 2017 than they were in the late nineties].

Disgruntled patients often present to a different practitioner when they feel they have been mistreated.
This puts the second person in a difficult position of trying to establish whether the actions were negligent or severe enough to constitute malpractice? The authors propose using a three-pronged approach to evaluate the situation. This entails consideration of the: Magnitude, Frequency, and Intent.

To paraphrase Charles Babbage: The fatigue produced on human muscles does not only depend on the magnitude of the force employed in each effort, but also on the frequency with which it is exerted, and the individual's motivations (Leanne Sykes).

2.1 Magnitude
There is a common misconception that the magnitude scale is itself some kind of instrument or apparatus. Visitors will frequently ask to 'see the scale.' Charles Francis Richter.

This quotation with reference to earthquakes could quite easily also be applied to the difficulty one has determining the magnitude of a misdemeanor in the clinical context. A minor injury may be considered an adverse event in situations that were out of the clinician’s hands, where a well justified decision turned out badly, where there may not be a universal agreement as to the best treatment option that should have been chose, or where the dentist displayed an isolated case of poor judgement or skills. These instances may be condoned if isolated, and are very often overlooked by the patients, whose memories fade as they heal or adapt. However more destructive damage that is detrimental to their oral health, function, appearance, psycho-social wellbeing, or puts their lives at risk could constitute negligence or malpractice. Very often the deciding factor between an adverse event, negligence and malpractice is determined by the magnitude.

Note: Informed consent is no protection against malpractice.

2.2 Frequency
Oscar Wilde said that “To err once is human, twice is careless.”

In dentistry, an isolated adverse occurrence could be due to patient factors, the clinical situation, unavoidable damage or human error and negligence. However repeated injurious incidents, no matter how minor, may constitute carelessness at best and malpractice at worst. Arguably, if the latter is an isolated incident it should still only be considered negligent. However the practitioner should communicate with the patient immediately after the adverse event and offer to carry out all possible corrective measures or agree to some form of restitution.

2.3 Intent
“We judge others by their behaviour. We judge ourselves by our intentions” (Ian Percy).

Intention can be defined as: an act or instance of determining mentally upon some action or result; the end or object intended; purpose or attitude toward the effect of one’s actions or conduct.

In legal terms (and alphabetically it seems) it refers to the aim, ambition, consilium, design, desire, destination, determination, direction, earnestness, end view, end intended, fixed direction, fixed purpose, goal, institutum, mark, object, objective, plan, proposittum, purpose, resolution, resolve, set purpose, settled determination, target, ultimate purpose (Burton, 2010 #96). Any dental intervention carries with it a risk of error or failure. Complications can and do occur. It’s impossible to save every tooth, to fully restore every mouth to optimal health or to satisfy every patient’s oral needs. However, in determining negligence or malpractice, one would need to analyze the dentist’s intention in terms of whether the action was beneficent or not. Questions to ask include: was the aim to provide a therapeutic benefit, to protect the patient, to prevent harm, to remove conditions that could lead to future harm, and was the therapy aimed at promoting the patient’s best interests?11

CONCLUSION
In light of the above arguments, it is proposed that a transgression in any one of the three points be considered negligence, while liability in two or all three aspects could constitute malpractice. However all detected incidents of negligence should still be reported, documented and followed by a warning. Repeated offenses could signify a trend which would warrant Council investigation and intervention in order to protect future patients. At the same time, in order to protect clinicians against malpractice suites, there needs to be a stronger emphasis on teaching and practicing “evidence-based” rather than “experience-based” dentistry. To this end the dental profession need to collectively develop more extensive best practice guidelines.

References
Direct pulp capping is a method designed to preserve pulp vitality through hard tissue repair of the open exposure, and studies have shown it to be superior to root canal treatment in the long run, provided the patient is a young adult and there is no proximal exposure. For many decades, calcium hydroxide has been the standard material for maintaining pulp vitality. Both clinically and histologically it has been found to produce satisfactory results in indirect and direct pulp capping, because it is capable of stimulating the formation of tertiary dentin by the pulp. In contact with vital pulp tissue it contributes to the formation of reparative dentin, a special variant of tertiary dentin, which seals exposures by newly formed hard tissue. Nevertheless, calcium hydroxide has some drawbacks. Poor bonding to dentin, material resorption and mechanical instability are among them. As a result, calcium hydroxide does not prevent microleakage in the long run. The porosities ("tunnel defects") of the newly formed hard tissue may act as a portal of entry for microorganisms. These may cause secondary inflammation of the pulp tissue and are thought to be responsible for failed maintenance of tooth vitality. In addition, the high pH (12.5) of calcium hydroxide suspensions causes liquefaction necrosis at the surface of the pulp tissue.

MTA is an endodontic cement that is extremely biocompatible, capable of stimulating healing and osteogenesis, and is hydrophilic. MTA is a powder that consists of fine trioxides (tricalcium oxide, silicate oxide, bismuth oxide) and other hydrophilic particles (tricalcium silicate and tricalcium aluminate, responsible for the chemical and physical properties of this aggregate), which set in the presence of moisture. Hydration of the powder results in formation of a colloidal gel with a pH of 12.5. The gel solidifies to a hard solid in approximately 3 to 4 hours. This cement is different from other materials currently in use because of its biocompatibility, antibacterial properties, marginal adaptation and sealing properties, and its hydrophilic nature.

Kundzina and colleagues from Norway (2017) reported on a multicentre, parallel-group RCT that sought to compare the effectiveness of MTA and calcium hydroxide as a direct pulp capping (DPC) material in adult molars with carious pulp exposure.

MATERIALS AND METHODS

This study was a randomized, controlled, parallel, patient-blinded, two-arm superiority trial with a 1:1 allocation ratio. The inclusion criteria were applied as follows: age 18–55 years; first or second permanent molar with a proximal carious lesion (primary or secondary caries); no history of pain or the presence of pain indicating, at most, reversible pulpitis; positive response to a cold test or to electric pulp testing according to the routine choice of each clinic, bitewing radiograph showing a carious lesion in at least the inner 1/3 of the dentine; periapical radiograph showing closed apex and normal periapex (with no radiolucency or widening of the periodontal ligament space); attachment loss not exceeding 4 mm; noncontributory medical history (including pregnancy); and no use of medication (no antibiotics during the previous month). Only one pulp cap was to be included per subject. In cases where a subject had several eligible molars, the one with the deepest lesion was chosen. Exclusion criteria included a lack of pulpal exposure after complete removal of the caries and failure to control the bleeding in exposed pulp within 10 min.

The clinical procedures were standardized. Briefly, the tooth was anaesthetized and isolated with a rubber dam, and the caries was removed using a complete excavation strategy. The cavity outline (Class II) was cut down to sound enamel using a high-speed bur and water cooling. With a round bur at low speed, the carious dentine was then completely removed from the non-pulpal walls of the...
cavity until the dentine was found to be hard when checked with a sharp probe and all cavity margins were inside the sound tooth structure. To ensure good prerequisites for the sealability of the margins of the cavity, a caries detector dye was applied. On the pulpal wall(s), only a hand excavator was used to remove the caries until no or little dye staining was present. In cases of pulpal exposure, the bleeding was controlled within 10 min using cotton pellets soaked in buffered 0.5% NaOCl.

Patients were randomized using the envelope method, with block sizes 4-6-4-6, with each study clinic acting as a separate allocation unit. Envelopes were sent to the study clinics in batches of 20. The envelope revealed the treatment group to which the subject was allocated and was opened only after bleeding of the pulp was successfully controlled. Patients were not informed of their allocation group.

In the Calcium hydroxide (CH) group, a thin layer of a commercial liner (Dycal®) was applied to the pulpal exposure and left to set. In the MTA group, white ProRoot® powder was mixed according to the manufacturer’s instructions and a 2-mm-thick layer was placed directly over the pulpal exposure and the surrounding dentine, leaving at least 2 mm of dentine and enamel available circumferentially for the bonded composite restoration. After placement of the MTA, a flat, water-moistened cotton pellet was placed directly over the material. As the setting of the MTA needed to be checked after 1 week, the cavities in both groups then received a temporary filling (Fuji IX glass–ionomer cement). After 1 week, the entire temporary filling was removed for patients in the MTA group, and the hardness of the MTA was verified with a dental probe. In the CH group, part of the temporary filling was left under the permanent filling. Any postoperative pain was recorded, pulpal status was checked applying a cold or electric pulp testing, and if there were no symptoms, the cavity was permanently restored with a composite resin material used at the study clinic.

The primary outcome was the survival of capped pulps. Survival was defined as a non-symptomatic tooth that responded to sensibility testing and did not exhibit any periradicular changes radiographically. Follow-up included pulpal testing and periapical radiograph at six, 12, 24 and 36 months. The secondary outcome measure was postoperative pain one week after treatment. The patients were asked whether they had any pain or had experienced it during the first three days.

RESULTS

Eighty patients were recruited into this trial. Ten subjects were excluded due to a lack of pulpal exposure after the complete removal of caries. Consequently, 70 subjects were randomly allocated to either the CH group (n = 37; mean age 30.9 years SD: 9.9) or the MTA group (n = 33; mean age 30.2 SD 9.7). The study was closed when all patients had received at least 36 months of follow-up, had the capped pulp fail or had been lost to follow-up.

The Kaplan–Meier survival analysis showed an 85% cumulative survival rate of pulps in the MTA group and 52% in the CH group. This difference was significant (P = 0.006) according to the log-rank test. The effect size was 0.25, and the number needed to treat was three (NNT = 3).

Almost half of the subjects (34/70) had experienced preoperative pain at baseline that was not more severe than reversible pulpitis; these subjects were equally distributed between the two material groups. Only 18 of the 70 subjects reported postoperative pain at 1 week. Regardless of the presence of preoperative pain, there were no significant associations between the material and postoperative pain, although postoperative pain was observed slightly more often (10/33) in the MTA group than in the CH group (8/37). No adverse effects were reported in either group.

CONCLUSION

The authors concluded that Mineral trioxide aggregate (MTA) was more effective than conventional CH dressing as a direct pulp capping material in molars with carious pulpal exposure in adult patients.

IMPLICATIONS FOR PRACTICE

The superior material properties and clinical performance of MTA makes it an ideal choice for use in endodontics.

Reference
2. Evaluation of pit-and-fissure sealants placed with four different bonding protocols: a randomized clinical trial


The use of pit and fissure sealants has become accepted as an effective intervention for the prevention of occlusal caries in the molar teeth of young children. The evidence for the clinical efficacy and cost-effectiveness of sealants in reducing occlusal caries in molars has been highlighted in recent papers. 1 Resin-based sealant materials are most commonly used and are regarded as the ‘gold standard’ for sealing pits and fissures. Their caries-preventive effect relies on the sealing of pits and fissures through micro-retention, created through tags after acid etching of enamel. However, these are easily destroyed by saliva contamination, reducing micro-retention and consequently, the caries-preventive effect. 1 Moreover, the preventive benefits and resin-based sealant retention are gained and maintained only as long as the sealants remain completely intact and bonded in place.

The application of adhesive during sealant placement which allows optimal infiltration and encapsulation of inter- and intra-prismatic boundaries of etched enamel and the formation of long adhesive tags has been studied. The dehydrating activity of solvents in the adhesive such as acetone or ethanol displaces water from the deep fissure walls and allows deeper penetration of adhesive and sealant resin. This has been shown to increase bond strength, reduce micro-leakage, and improve short-term clinical success. Both etch-and-rinse (total etch) type and self-etch type of bonding agents have been studied. Multimode one-bottle universal adhesives have been developed recently to make the clinical procedure more user-friendly. These new adhesives can be used as self-etch or as etch-and-rinse adhesives. This enables the clinician to selectively acid etch enamel and bond to enamel in etch-and-rinse mode and dentin in self-etch mode with the additional advantage of chemical bonding to enamel and dentin. Khare and colleagues from India reported on a RCT that sought to evaluate the effectiveness of pit-and-fissure sealants applied to teeth using etch-and-rinse, self-etch, and multimode adhesives during bonding of pit-and-fissure sealants.

The null hypothesis stated was that there is no difference in sealant retention, fissure caries incidence, and marginal discoloration after use of self-etch or etch-and-rinse or multimode adhesive in the bonding protocol compared with conventional bonding protocol of pit-and-fissure sealant.

MATERIALS AND METHODS

This was a split mouth, randomized, double-blinded clinical trial. Children aged 6-10 years with all four erupted, non-caries first permanent molars which were completely erupted through the gingiva, with deep pits and fissures and DMFT/deft 1 or more with satisfactory cooperative behaviour (Frankl score 3 or 4) and oral hygiene (OHI-S ≤ 3) were selected. Patients with history of any medical disease or long-term medication that might interfere with the study were excluded. Patients with history of abnormal parafunctional activity, under fluoride application regimen, restorations on first permanent molars, and history of allergies to resins were also excluded from the study.

Finally, 52 patients with a total of 208 first permanent molars, four in each patient, were included in the study. They were randomly assigned into four groups using block allocation (block size 4) by an operator not involved in other aspects of the study. Randomization was performed using a random table of numbers. Details of the allocated group were recorded on cards contained in sequentially numbered, opaque, sealed envelopes.

Sealants were placed according to one of the following bonding protocols:

- Group 1: Conventional acid etching without adhesive (control group)
- Group 2: Etch-and-rinse adhesive (Adper Single Bond2)
- Group 3: Multimode universal adhesive (Scotch-bond Universal Adhesive) used in etch-and-rinse mode
- Group 4: Self-etch adhesive (G-BOND) used after acid etching

Clinical sealing protocol

For the sealant placement, all procedures were standardized. Moisture control was maintained by cotton rolls and saliva ejector. All applications were carried out by a single operator. The sealants were placed in the grooves of occlusal surfaces of permanent first molars (including the buccal groove of lower molars and palatal groove of upper molars). Sealants were applied on the permanent molars with one of the bonding protocols:

- Conventional acid etching without adhesive. Etchant was applied using a micro-applicator brush, left for 15 seconds, and then washed with water spray for 10 seconds. The tooth surface was dried by cotton blotting.
- Etch-and-rinse adhesive (Adper Single Bond2). Etchant was applied using a micro-applicator brush, left for 15 seconds, and was thereafter washed with water spray for 10 s. The tooth surface was dried by cotton blotting. The bonding agent was applied using the micro-applicator for 15 seconds and spread evenly using air spray for 5 seconds. The bonding agent was then light cured for 10 seconds.
- Multimode universal adhesive used in etch-and-rinse mode (Scotch-bond Universal Adhesive). Etchant was applied using a micro-applicator and left for 15 seconds and was thereafter washed with water spray for 10 seconds. The tooth surface was dried by cotton blotting. The bonding agent was applied using the micro-applicator and rubbed for 20 seconds and then air-dried for 5 seconds. The bonding agent was then light cured for 10 seconds.
- Self-etch adhesive used after acid etching (G-BOND). Etchant was applied using a micro-applicator and left for 15 seconds and was thereafter washed with water
喷洒10秒。牙釉质的表面被干燥。粘结剂被应用于切割刻痕和未被干扰的刻痕中，并且用探针检查。然后，应用此粘结剂的刻痕被聚合，同时使用探针进行处理。所有应用粘结剂的刻痕被抛光，探针和咬合镜被分别交叉检查。

临床窗口

After the respective adhesive application, the resin sealant (Clinpro™Sealant) was applied to the pits and fissures and gently teased through the fissure using the tip of a periodontal probe to prevent voids and air entrapment. Then, the applied fissure sealants were polymerized using a LED curing light for 20 seconds. The cured sealant was checked for voids using an explorer, which were re-filled. All the sealant applications were cross-checked using mouth mirror and explorer by an experienced examiner. The occlusion was checked with articulation paper. Finishing and polishing was performed using one-step composite polishers (Shofu) at low speed. The participants were unaware of the type of bonding protocol selected for each tooth.

RESULTS

The study sample consisted of 32 males and 20 females. The mean age of the participants was 8.69 ± 0.98 years. The age distribution of the sample was as follows: 6 years old (3.8%), 7 years old (3.8%), 8 years old (32.7%), 9 years old (38.5%), and 10 years old (21.2%). Of 52 participants, three participants did not report for follow-up due to illness at 6-month follow-up and one participant did not report at 12-month follow-up due to migration to another city. This amounted to a drop-out rate of 7.69%. For the final analysis of the data, the dropouts and teeth with partial/complete loss of sealants were eliminated and the rest of the data was considered.

At the end of three months, the number of teeth with completely retained sealants was highest in Group 2 followed by Group 3, Group 4, and Group 1. After one year, complete retention was highest in Group 2 and 3 followed by Group 4 and Group 1. Most of the sealant loss was of partial type with only five teeth showing complete loss. Etch-and-rinse group showed the least partial loss followed by universal and self-etch groups. Caries was observed only in one tooth which belonged to Group 3 at three months.

A nonparametric Friedman analysis was carried out for intragroup (within group) comparison of sealant retention rate at three, six, and 12 months, which revealed statistical significant difference over time in etch-and-rinse group (P = 0.018). There was no statistical difference in sealant retention rate among other groups with time (P = 0.368 for Group 1; P = 0.135 for both Group 3 and Group 4). Group 2 had the highest complete sealant retention at three months (92.3%) which decreased to 91.8% at six months. But by 12 months, only 77.1% of sealants had been retained with greatest loss occurring in the six to 12-month period. Kruskal–Wallis test was used for intergroup (between group) comparison of sealant retention at three, six and 12 months. At the three-month follow-up, the difference between the groups was found to be statistically significant (P = 0.002) but was not significant at both six-month and 12-month follow-up (P = 0.119 and 0.952, respectively). Mann–Whitney U-test after Bonferroni correction revealed that there was a statistically significant difference between Group 1 (conventional acid etch) and Group 2 (etch and rinse) at three-month follow-up.

The pattern of marginal discoloration, an early indicator of loss of marginal integrity, showed similar trends as sealant retention. Intergroup comparison of marginal discoloration using chi-square test revealed statistically significant difference at three months but no significant difference at six months and 12 months. Intragroup comparisons over time at three, six and 12-month follow-up using chi-square test revealed significant difference in the etch-and-rinse group (P = 0.02) but not in other groups (P > 0.05). Pearson’s correlation revealed that there was no statistically significant relation between OHIS as well as DMFT/deft scores with sealant retention rate thus confirming that the level of oral hygiene and dental caries of the participants did not affect the sealant retention rate. Sealant retention was higher in maxillary molars as compared with mandibular molars at all follow-up visits, but the difference was not statistically significant (P = 0.31).

CONCLUSIONS

Under the conditions of this study, the authors found that the use of self-etch or etch-and-rinse or multimode adhesive during pit-and-fissure sealant application does not significantly enhance sealant retention nor decrease marginal discoloration at 12-month follow-up. Etch-and-rinse adhesive is advantageous only at short-term three-month follow-up.

IMPLICATIONS FOR PRACTICE

This trial found that the retention of sealants did not significantly increase with use of adhesives. Hence, it may not be necessary to routinely use dental adhesives for bonding pit-and-fissure sealants, taking into consideration the increase in complexity and cost of the procedure.

Reference

Live MOUTH SMART

Express Yourself through life

Good oral hygiene habits, avoiding risk factors and having a regular dental check-up from early in life can help maintain optimal oral health into old age.

www.sada.co.za  #SADA  #LiveMouthSmart
Dental implications of bisphosphonate therapy in osteogenesis imperfecta. (p 424)

1. Bisphosphonates are prescribed in osteoporosis and in Paget’s disease because they demonstrate the potential to activate vascular endothelial growth factor.
   a. True
   b. False

2. Oral hygiene practices in patients with Osteogenesis imperfecta who are receiving bisphosphonate therapy must be:
   a. Reasonable
   b. Performed only every third day
   c. Impeccable
   d. Performed only with a finger to avoid unintentional loss of teeth.

3. Bisphosphonates may slow orthodontic tooth movement by:
   a. Inhibiting bone resorption by osteoclast apoptosis and reduced bone vasculature.
   b. Escalating painful reactions leading to loss of patient cooperation
   c. Inducing an acid reaction in the mouth, destroying the elasticity of intraoral elastic traction.
   d. Stimulating sclerotic, avascular bone deposition in the lamina dura.

4. Elderly medically compromised patients on bisphosphonate therapy may present with unusual non-healing extraction wounds.
   a. True
   b. False

Apexification of Immature Teeth Using an Apical Matrix and MTA Barrier Material: Report of Two Cases. (p 414)

5. The intent of apexification is to:
   a. Allow compaction of root filling material and to prevent reamers from penetrating beyond the apex.
   b. Prevent extrusion of toxins and bacteria and encourage revascularisation of the canal.
   c. Allow compaction of the root filling material when preparing for a post crown.
   d. Allow compaction of root filling material and to prevent extrusion of toxins and bacteria.
   e. Alter the above

6. Prolonged contact with calcium hydroxide will increase the resistance of immature roots to vertical fractures.
   a. True
   b. False

7. Mineral Trioxide Aggregate is the material of choice in apexification because it forms a biologically acceptable seal and is biocompatible with an enhanced cytotoxicity.
   a. True
   b. False

8. The protein component of bone (demineralized bone matrix - DMBM) can be considered as a viable material to create the apical plug in apexification procedures.
   a. True
   b. False

Oral health amongst male inmates in Saudi prisons compared with that of a sample of the general male population. (p 402)

9. Stratified sampling method is:
   a. A random sampling technique where subjects are chosen randomly.
   b. Arranging the target subjects according to some ordering scheme and then selecting elements at regular intervals through that ordered list.
   c. Subjects with number of distinct categories are organized into separate strata. Then, each stratum is sampled as an independent sub-group, out of which individual elements can be randomly selected.
   d. Subjects are divided into clusters of homogeneous units, usually based on geographical contiguity.

10. This study indicated that:
    a. Prisoners had a higher frequency of carious lesions than the control group.
    b. Prisoners and control were missing teeth to the same extent.
    c. Prisoners were more likely to develop periodontal diseases.
    d. Prisoners presented with severe malocclusions.

11. The oral health cares of prisoners could be maintained by:
    a. Providing free fluoride supplements
    b. Reducing cariogenic food inside prisons
    c. Training prison staff in health promotion
    d. Addressing problems of smoking, alcohol and drugs misuse
    e. All the above
Nasal Rhinosporidiosis in South Africa: Review of literature and report of a case. (p 420)

12. Rhinosporidiosis is a rare chronic granulomatous infection in which both *Rhinosporidium seeberi* and *Microcystis aeruginosa* have been implicated as causative agents.
   a. True
   b. False

13. Although excision of the polyp in Nasal Rhinosporidiosis is recommended, care must be taken not to allow spillage of the endospores which would lead to autoinoculation.
   a. True
   b. False

14. A definitive diagnosis of Rhinosporidiosis is confirmed by histological examination using histochemical stains including hematoxylin and eosin, Periodic Acid Schiff and mucicarmine and a demonstration of autofluorescence.
   a. True
   b. False

MaxilloFacial and Oral Radiology case 155 (p 429)

15. Carcinoma is the second most common malignancy of the oral cavity.
   a. True
   b. False

16. In carcinoma of the jaws the lamina dura of the involved teeth is totally destroyed.
   a. True
   b. False

Clinical windows (p 433)

17. In the Kundzina et al trial, MTA showed superior survival rates when compared with calcium hydroxide.
   a. True
   b. False

18. In the Kundzina et al trial, postoperative pain was significantly greater in the MTA group than in the CH group.
   a. True
   b. False

19. Preventive benefits and resin-based sealant retention are gained and maintained only as long as the sealants remain completely intact and bonded in place.
   a. True
   b. False

20. In the Khare et al trial, intergroup (between groups) comparison of sealant retention at 3, 6 and 12 months was significant at all time points.
   a. True
   b. False

ETHICAL

Part 14. Negligence vs Malpractice (p 430)

21. The law does NOT distinguish between: Assault, Negligence, Battery and Libel.
   a. True
   b. False

22. The conduct of a patient may lead to a practitioner being held negligent.
   a. True
   b. False

23. *Res ipsa loquitur* (the thing speaks for itself) is a principle in law that implies that negligence of a clinician was an essential element leading to damage suffered by the patient.
   a. True
   b. False

24. Under conditions known as “Contributory negligence” even aggrieved patients may not be able to legally claim professional negligence.
   a. True
   b. False

25. In a malpractice suite, the damage suffered by a patient may be physical, psychological, financial or loss of work time.
   a. True
   b. False

Readers will note that we have reduced the number of General Questions to twenty whilst retaining five Ethics based questions. Our allocation of CPD points remains unchanged. There is optimism that this section will continue to provide members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure Continuing Education. Please note that SADA is no longer offering the ‘CPD via SMS’ service.

Contact Ann Bayman at SADA, Tel: 011 484 5288, for any enquiries and assistance.

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.
Cornelius Niemann
Andolex Product Manager
Tel: 011 021 4155
E-mail: c.niemann@inovapharma.co.za

Alisha Poolingam
Tel: 011 745 6000
E-mail: Alisha.a.poolingam@gsk.com

Adriaan Buys
Tel: 011 898 2429
E-mail: adriaan_buys@colpal.com
Website: www.colgateprofessional.co.za

Alida Thomson
Tel: 0800 22 86 87
Cell: 084 402 7746
Fax: 021 531 1792
E-mail: alida@ekonodent.co.za

Sharon Fisher
Tel: 011 477 0878
E-mail: sharon.fisher@dentsply.com

Georgina Harpur
Tel: 011 253 4274
E-mail: Georgina.harpur@kraftfoods.com
Orders: 0860 456 123
E-mail: info@ivodent.co.za
Website: www.ivodent.co.za

Barbara van Wyk
Tel: 021 710 4111
E-mail: bvanwyk@tsj.jn.com
Website: www.listerine.co.za

The only recommended cleaner for your Valplast® partials and appliances! Suitable for acrylic dentures and soft-line material.
Nova Dental are your exclusive stockists of Val-Clean Concentrated Denture Cleaner.

Tel: 011 2100 400
Fax: 011 433 3581
Email: sales@novadental.co.za

SA’s leading Health Information Exchange

medi|switch
the trusted claim in healthcare 0800 111 703 | www.mediswitch.co.za

Barbara van Wyk
Tel: 021 710 4111
E-mail: bvanwyk@tsj.jn.com
Website: www.listerine.co.za

The only recommended cleaner for your Valplast® partials and appliances! Suitable for acrylic dentures and soft-line material.
Nova Dental are your exclusive stockists of Val-Clean Concentrated Denture Cleaner.

Tel: 011 2100 400
Fax: 011 433 3581
Email: sales@novadental.co.za

SA’s leading Health Information Exchange

medi|switch
the trusted claim in healthcare 0800 111 703 | www.mediswitch.co.za

Barbara van Wyk
Tel: 021 710 4111
E-mail: bvanwyk@tsj.jn.com
Website: www.listerine.co.za

The only recommended cleaner for your Valplast® partials and appliances! Suitable for acrylic dentures and soft-line material.
Nova Dental are your exclusive stockists of Val-Clean Concentrated Denture Cleaner.

Tel: 011 2100 400
Fax: 011 433 3581
Email: sales@novadental.co.za

SA’s leading Health Information Exchange

medi|switch
the trusted claim in healthcare 0800 111 703 | www.mediswitch.co.za

Barbara van Wyk
Tel: 021 710 4111
E-mail: bvanwyk@tsj.jn.com
Website: www.listerine.co.za

The only recommended cleaner for your Valplast® partials and appliances! Suitable for acrylic dentures and soft-line material.
Nova Dental are your exclusive stockists of Val-Clean Concentrated Denture Cleaner.

Tel: 011 2100 400
Fax: 011 433 3581
Email: sales@novadental.co.za

SA’s leading Health Information Exchange

medi|switch
the trusted claim in healthcare 0800 111 703 | www.mediswitch.co.za

Barbara van Wyk
Tel: 021 710 4111
E-mail: bvanwyk@tsj.jn.com
Website: www.listerine.co.za

The only recommended cleaner for your Valplast® partials and appliances! Suitable for acrylic dentures and soft-line material.
Nova Dental are your exclusive stockists of Val-Clean Concentrated Denture Cleaner.

Tel: 011 2100 400
Fax: 011 433 3581
Email: sales@novadental.co.za

SA’s leading Health Information Exchange

medi|switch
the trusted claim in healthcare 0800 111 703 | www.mediswitch.co.za

Barbara van Wyk
Tel: 021 710 4111
E-mail: bvanwyk@tsj.jn.com
Website: www.listerine.co.za

The only recommended cleaner for your Valplast® partials and appliances! Suitable for acrylic dentures and soft-line material.
Nova Dental are your exclusive stockists of Val-Clean Concentrated Denture Cleaner.

Tel: 011 2100 400
Fax: 011 433 3581
Email: sales@novadental.co.za
Thank you for considering the submission of your work to the Journal for possible publication. We welcome papers which may be Original Research, Clinical Review, Case Reports, Letters or Notes.

We shall be obliged if your submission is prepared respecting all the details listed in these Instructions. This facilitates our process and ensures more rapid responses to you. The Journal is published ten times each year in electronic format. Hard copy is available by arrangement.

Address for submission of articles
The Editorial Assistant, Mr Noko Reagan Mojela, South African Dental Journal, South African Dental Association [SADA], Private Bag 1, Houghton 2041, South Africa. Electronic addresses: NMojela@sada.co.za and bill.evans@wits.ac.za.

Language
All articles must be submitted in English. Spelling should be in accord with the Shorter Oxford English Dictionary.

Title
To be kept as brief, clear and unambiguous as possible.

Summary
The summary shall consist of not more than 200 words. This applies to both research and review articles. For research articles, the summary should be structured under the following headings: introduction, aims and objectives, search articles, the summary should be structured under these headings.

Text
- Please submit the paper in electronic format to NMojela@sada.co.za and to bill.evans@wits.ac.za, accompanied by a covering letter signed by the author(s). The paper should be submitted in a single file including all Tables and Figures and their accompanying Legends.
- Articles should be clear and concise.
- Text should be typed in Times New Roman font, size 11; double-spaced with a 3 cm margin on sides, top and bottom. Each page must be clearly numbered.
- Tables should clearly identified, using Arabic numerals i.e. Table 1, Table 2 etc.
- The front page of the manuscript should list the title of the article, the author’s(s’) name(s), qualification(s), affiliations and positions held, telephone and fax numbers and address(es), including e-mail address(es) if available. It is especially important that details of the Corresponding Author should be clearly stated.
- Please submit on the front page a list of up to eight Key Words.
- In the case of multiple authors, the role played and the respective contribution made by each should be recorded. For example "principal researcher, writing article, tissue analysis, microscopic examination etc.
- Authors are requested to note and adhere to the current style of the Journal particularly with respect to paragraph settings and headings.

Length of the article
In general, papers should be between 4000 and 5000 words, although this is flexible. The Editor reserves the right to edit the length of an article in conjunction with the author(s) and SADJ reserves the right to charge for excess/additional pages. The first four pages of original research papers published in the SADJ will be free of charge after which a charge of R500 per page or part thereof will be levied.

Illustrations/graphics/photographs
- Illustrations/graphics/photographs must be appropriate to the content of the manuscript. Digital images with a DPI of at least 300 should be supplied. Photographs and pdf files of photographs are not acceptable. Please note the request that Figures be included in the text AND sent separately in jpg format.
- The Figure number must be in Arabic style and clearly identified for each illustration, graphic or photograph. Remember also to record Figure numbers in the text.
- Permission: Where any text, tables or illustrations are used from previously published work, permission must first be obtained from the holder of copyright and a copy of the agreement must be submitted with the article. Suitable acknowledgement must be recorded in the article.

Continuing Professional Development
Please supply 5-8 questions related to your article, at least three of which should be in the multiple choice format. Answers must be either True or False or, if multiple choice, have only one correct answer. Please provide answers to the questions.

References
References should be set out in the Vancouver style and only approved abbreviations of journal titles should be used (consult the List of Journals Indexed in Index Medicus for these details at: http://www.nlm.nih.gov/tsd/serials/lji.html).
- References should be inserted seriatim in the text using superscript numbers and should be listed at the end of the article in numerical order. Do not list them alphabetically.
- It is the author’s responsibility to verify each reference from its original source. Please note that an article may be rejected if the referencing is inaccurate.
- Names and initials of all authors should be given unless there are more than six, in which case the first three names should be given, followed by ‘et al’. First and last page numbers should be given. Where it is applicable the page numbers should be abbreviated by omitting redundant numbers eg pages 456 to 478 is recorded as 456-78, and 456 to 459 as 456-9, but 398 to 401 is recorded as 398-401.
- Notice that volume numbers are not given in bold, authors are not linked by ‘and’ or ‘&’, and the date of publication appears after the name of the journal. No item should appear in italics except for foreign terms,
eg et al, in vivo.

**Journal references should appear thus:**

**Book references should be set out as follows:**
- ‘Unpublished observations’ and ‘personal communications’ may be cited in the text but not in the reference list.
- Manuscripts accepted but not yet published may be included as references followed by the words ‘in press’.

**Galley Proofs**
Changes/corrections to the proofs supplied to authors must be submitted to the publishers by e-mail or be fax and not over the telephone. Galley proofs must please be returned to the publishers within four days after receipt thereof.

**Declaration**
All sources of funding, possible financial interest/s or incentives in products or services mentioned in the article must be disclosed. Authors are kindly requested to read and sign the attached declaration.

No articles that have been published previously, or that are currently being considered for publication elsewhere, will be accepted. Authors are kindly requested to verify that their article complies with this condition. Where relevant, authors should indicate whether their research has been approved by the Ethics Committee of their Institution or by other research ethics committees.

**Copyright**
All articles submitted to the journal and accepted for publication automatically become the copyright property of the South African Dental Journal [SADJ]. The Managing Editor reserves the right to decline articles, photographs or illustrations where products or services are mentioned that are not appropriate.

**Personal details**
The Corresponding Author is kindly requested to identify himself/herself (on the title page) and to supply his/her postal address, telephone numbers (home, office, cell), fax number and e-mail address. All authors are to supply details of qualifications and position(s) currently held.

**Young author:** Please consider identifying any first author who is under the age of 35, as the Association makes an annual award to the best paper published by a young researcher.

**Enquiries** regarding Journal matters can be directed to Mr Noko Mojela, Editorial Assistant, at SADA headquarters on tel (011) 484 5288, fax (011) 642 5718, Shared Line 0860 110 725 or e-mail: NMojela@sada.co.za.

---

**DECLARATION BY AUTHOR/S:**

Title: __________________________________________

Author/s: ______________________________________

I/we, the undersigned confirm and declare that:
1. This manuscript is my/our original work and I am/we are the owner/s of this manuscript and possess rights of copyright.
2. I/we confirm that this manuscript has not been published previously and it is not currently considered for publication elsewhere. Has this article been submitted to any other journal and if so, has it been rejected?
   YES ☐ NO ☐
3. For no consideration or royalty, I/we hereby assign, transfer and make over to SADA all the rights of copyright, which have or will come into existence in relation to this manuscript.
4. I/we waive in favour of SADA or any successors in title any moral rights which may be vested in me/us.
5. The manuscript does not constitute an infringement of any copyright and I/we indemnify SADA against all loss or damage, from any cause arising which SADA may sustain as a result of having been granted copyrights to the manuscript.
6. The research has been approved by the Ethics Committee of my/our institution/s or the Ethics Committee/s of other accredited research facilities.
7. I/we have disclosed in my/our Acknowledgments all sources of funding, possible financial interest/s or incentives in products or services mentioned in the paper.

Initial(s) and Surname Signature Date

Initial(s) and Surname Signature Date

Initial(s) and Surname Signature Date

Initial(s) and Surname Signature Date

Initial(s) and Surname Signature Date
Smalls Advertising Placement Procedure and Rules

- All smalls advertisements are restricted to a maximum 100 words per advertisement.
- All advertisement requests are required in writing, submit to ABayman@sada.co.za, with full contact details of the advertiser which should include:
  » the wording of the advertisement as you require it to be published;
  » the members professional number; (will not be published);
  » the members contact details (will not be published).
- Advertisement lifespan is two weeks from the date of upload.
- Advertisements to be repeated follow the same process as the original placement request.
- All advertisements which exceed a word count of 100 words will be forwarded to our publishers E-Doc for further processing as a potential advertisement to be placed in the SADJ electronically or as website advertising. E-Doc will contact you thereafter regarding your requirements.
- SADA Members may place advertisements at no cost providing their annual membership fees are either paid in full at the time of their request of a debit order request has been lodged.
- Non-SADA Member advertisers will be charged R25 per word for placement of their advertisements.
- Advertisement must be paid in full prior to uploading on the web platform.
- Invoice may be settled telephonically with the use of a credit card to prevent delay of placement.
- Telephonically processed payments will result in uploading of advertisement within 24 hours of settlement.
- Advertiser remains liable for placement costs should payment be dishonoured and invoice remains unpaid.

Contact details:
Ann Bayman
South African Dental Association
Tel: 011 484 5288
E-mail: ABayman@sada.co.za
Live MOUTH SMART
Chew through life

Good oral hygiene habits, avoiding risk factors and having a regular dental check-up from early in life can help maintain optimal oral health into old age.

www.sada.co.za    #SADA    #LiveMouthSmart
Live MOUTH SMART

Feel attractive through life

Good oral hygiene habits, avoiding risk factors and having a regular dental check-up from early in life can help maintain optimal oral health into old age.

www.sada.co.za  #SADA  #LiveMouthSmart