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We progress a little further in each tick of the clock. Ronnie Cornelisz… Philosopher and Jehovah’s Witness. Never send to know for whom the bell tolls… it tolls for thee. John Donne, 1624.

Two diametrically opposed thoughts, both so relevant to our brief sojourn here. And perhaps it is fortuitous that our stay is relatively short, when I last checked the World Population Meter, the total number of folk had reached seven and a half billion .. at that time, and to be precise… 7,427,593,441! Forecasts indicate a world population of 10 billion by 2083!

There had been 261,000 births that day alone, when I checked the meter, and 110,000 deaths, giving a growth of 151,000 in that one day. Over the year to date, the population had grown by 36 million people.

Do we dare to translate those terrifyingly high numbers into our dental responsibilities… just how many teeth are being formed right now, how many teeth are carious right now, how many malocclusions are developing … right now!! But we know the profession is facing an escalating problem in the endeavour to maintain oral health for our populations. No need to paint a picture of a dental tsunami!

We do however have a serious additional responsibility which may also be escalating with the expansion of population. We are, as has often been stated, frequently the first professional health care personnel who have the opportunity to recognise the early signs of drug addiction in our patients. It is true that in the world stakes on estimated frequency of drug abuse, South Africa does not in fact feature prominently. We are not in the top ten when numbers of users of amphetamine –type stimulants, like Ecstasy, are considered, whilst Australia and New Zealand hold second and third places respectively (2.7% and 2.3% of population), with El Salvador leading the list (3.28%). It is Spain which records the highest numbers of cocaine users, at 2.7% But, Scotland comes in as dual first, also with 2.7%. Of course our favourite drug in South Africa is cannabis.. and how frequently is a stand of dagga found growing surreptitiously in the garden! We are listed as having a 3.65% cannabis users in the population.. a figure hotly disputed by … guess … cannabis users who suggest a much higher figure! In terms of world usage, South Africa is rated in the 100th place. Other common drugs in use in South Africa include cocaine, where we are ranked 32nd in the world with only a 1.02% local usage, amphetamines, at 27th, also with 1.02% of population using the drug.

These figures may be low by comparison with elsewhere… Iceland is rated as having a population of whom no less than 18.3% are identified as cannabis users. It is without doubt the most commonly used drug, with Australia registering a 10.6% usage at rank number 10 worldwide. We shall not engage in the heated argument as to whether cannabis should be unbanned… suffice to record a comment “There is no scientific reason for the criminal prohibition of cannabis if alcohol and tobacco are legal and regulated and STILL cause thousands of deaths every year. Remember that no one has ever died of a cannabis overdose… EVER.” Each to his or her own.

Whether harmful or not, whether widespread or not, drugs do affect our patients and it is pertinent that the early warning signs are in the forefront of our minds as we observe patients in our care. Look out for: Bloodshot eyes - Aggressive behaviour - Inability to sit still - Anorexia - Weight loss

And there are the dental and oral problems with which we must contend and which are explicitly detailed in a paper in this issue from the University of Western Cape. That deals with “Meth mouth” and demonstrates just how devastating an effect the drug may have on oral health.

Progress may be being made every day, a little at a time… but drugs may just be the braking force delaying that advance… and tugging on the bell rope to warn us. … it tolls for us.

WG Evans: Managing editor, E-mail:bill.evans@wits.ac.za
It's no coincidence that the PPS Profit-Share Account grows substantially each new year. Especially when our tailor-made financial solutions have been developed and refined over 75 years through the power of professional thinking.

For 2015, we allocated all R2.2 billion in profits to our members’ PPS Profit-Share Accounts and paid R2.2 billion in benefits. PPS also accumulated a total of R29.5 billion in PPS Group assets*. This proves that the power of professional thinking can make all the difference, especially when it's been crafted over decades.

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*Excluding assets in unit trusts for third parties.
The structure and organisational hierarchy of the Association have been carefully assembled to produce an efficient and progressive team to direct the affairs of our profession. Paramount amongst that architecture is the recognition of the dual imperatives of the Executive... but also indeed of all the Committees and substructures. The ultimate success of the organisation depends upon harnessing the wisdom of the experienced member with the enthusiasm and energy of the younger... that is the dual nature which combines to produce innovation but also the start of tradition. Membership of the Association committees is therefore a signal honour... but is also a challenging burden. The objectives may be clear but the way through may be tortuous indeed. It has been with those realities in mind that the tenure of membership on any of the committees has been formulated to allow for the stamina of experience and to allow for the impetuosity of youth.

When members are invited to nominate colleagues to any of these positions, that invitation accords a privilege and a responsibility. It is a privilege for individual members to express their preferences, and a simultaneous responsibility, for those preferences will be based on careful assessment of the abilities of the candidate. Whilst these considerations may be claimed to affect any organisation, they are especially pertinent to the Association because of the impact of the new structures which recognise that the Association has matured into an institution run on business lines. settling into that role has demanded time and cogitation.

When nominations are called for members to fill positions on the SADA Board, it is precisely the factors described above which will influence the decisions and the selections. It is instructive to also recognise that despite the undoubted qualifications such erudite nominees may have, there remains a need for a period of induction and, perhaps surprisingly, a period of actual training. Association Members may not be aware of just how seriously is considered the question of ensuring competent direction of the affairs of the Association. New non-Executive members of the Board will have a period of some several months to receive such training before finally assuming the offices to which they have been elected. Indeed a basic selection consideration may be whether a candidate is willing to undergo time consuming and challenging instruction in the workings and promotion of SADA. These are rather special, dedicated people.

It may be just imagination but there may be some relevance in the current Front Cover images of the Journal... the teeth of denizens of the deep. Think of the mussel cracker and then focus on the need for Committee members to be able to break down the hard crust of problems facing the Association so a thorough chewing-over of all considerations is possible. Then picture the baleen of the mighty whale... sifting out the essentials, carefully retaining the best for intake. May our Committee members bring that same meticulous combing out of the dilemmas facing the profession, simplifying and refining to render problems digestible?? But what about sharp teeth?? There are those aplenty amongst fish. And yes of course we need Committee members whose sharp intellect and perception will analyse problems rapidly by stripping off the obfuscating verbiage.

Revisit the Front Covers ... do you recognise the characteristics? Remember them as the criteria which single out the leaders in our profession... enriching and energising.
SADA Congress - a quick peep

Mehroon Khan (Coding and Nomenclature Manager), promoting Oral Health. Mehroon has recently left to pursue other goals. We wish her every success.

Marilize van der Linde (Manager, Events and Public Relations) and Punkaj Govender (Head, Legal and Corporate Services) debating a serious issue.

Tea break and a time to compare notes with fellow delegates.

Some of the trade exhibitors.

The South African Dental Association presents:

SADA 2016
Gallagher Convention Centre
Congress & Exhibition
19 March - 21 March 2016
Methamphetamine abuse: Oral symptoms and dental treatment needs

ABSTRACT

Background: Methamphetamine: a highly addictive drug commonly used in South Africa. Users often present with poor oral hygiene, grossly decayed teeth and complain of a dry mouth. The prevalence of dental caries among users is high.

Methods: A cross-sectional study design was used with a convenience sample of 308 self-reported methamphetamine users who were part of an in- or out-patient rehabilitation programme at one of 22 specialised substance addiction treatment centres in the Western Cape.

Results: The majority were in their late twenties, unemployed and not satisfied with the appearance of their teeth. A dry mouth and a bad taste were the most common symptoms reported. More than three quarters reported ‘stiff’ facial muscles and more than half grinding of their teeth. The most common reason for the last dental visit was toothache and the most common treatment at that visit was dental extraction.

Conclusion: Lower levels of education were associated with increased numbers of extractions and a higher probability of poor oral health. Xerostomia, a bad taste and ‘stiff’ facial muscles were the most common symptoms reported.

Practical Implications: A thorough intra-oral examination together with comprehensive note taking is crucial for the management of patients abusing methamphetamine.

Key words: Methamphetamine, xerostomia, dental caries.

BACKGROUND

The United Nations Office of Drugs and Crimes (UNODC) have estimated that about 33.8 million of the global population aged between 15 – 64 years use amphetamine-type stimulants (ATS).1 In 2011, 71% of all ATS-related seizures occurring globally involved methamphetamine. This is a highly addictive drug, commonly used in South Africa.2 The South African Community Epidemiology on Drug Use (SACEDU) is a sentinel surveillance project active in all nine provinces and is monitoring alcohol and drug use on a six-monthly basis. In the Western Cape, a third of all patients in treatment rehabilitation centres reported using methamphetamine as the primary substance of abuse.3

Users present with a classical caries pattern termed “Meth Mouth” that often involves the interproximal and buccal smooth surfaces of anterior teeth.4 Rampant cavities are often observed at the cemento-enamel junction (CEJ) and the buccal half of posterior mandibular teeth.5 Destruction of tooth structure progresses with time and eventually leads to coronal involvement, tooth loss and edentulism.6 The prevalence of dental caries among methamphetamine users is higher when compared with non-users7 and poor oral health often leads to a diminished oral health quality of life.

INTRODUCTION

Methamphetamine can be smoked, swallowed, snorted and injected during drug use. It is a potent central nervous system stimulant.4,8 The South African National HIV Prevalence, Incidence, Behaviour and Communication Survey (NCS) in 2008 reported that the overall number of treatment admissions for methamphetamine-related abuse significantly increased between 1996 and 2005. However, the prevalence of drug abuse in South Africa is low when compared with that of the United States and Australia.8

Methamphetamine is highly addictive, cheap and readily available when compared with other illicit drugs. It causes a combination of adverse physiological, behavioural and...
psychological effects that need to be taken into consideration when treating chronic methamphetamine users.

The general effects of the drug on the user include increased energy levels, a sense of enhanced physical prowess, mental alertness, euphoria and mood elevation which may last for days. An elevated metabolism and increased physical activity often lead to dehydration whilst the drug also acts as an appetite suppressor.4

**Physiological effects**

Methamphetamine stimulates the central nervous system by causing the release of neurotransmitters into the synaptic cleft. It has a similar chemical structure to that of dopamine and norepinephrine4,6 and it's duration of action is usually 8-12 hours but this can extend up to 24 hours if associated with intoxication. In addition, there is an increase in sympathetic activity causing the stimulation of inhibitory alpha-2 receptors and resulting in vasoconstriction of the capillaries of the salivary glands, leading to a reduction of salivary secretion and consequently a dry mouth.6

Lung disorders, kidney damage, hyperthermia, stroke and cardiac arrest are some of the consequences that may follow drug abuse.6 Skin lesions, unexplained motor activity,10 as well as an anorexic effect are common associated afflictions.4,6

**Behavioural effects**

Users are often paranoid and display violent or aggressive behaviour during times of usage4,10 and they neglect their personal hygiene.6 Methamphetamine users also have a tendency to consume large amounts of alcohol and cigarettes when compared with non-users.11

**Effects on the oral cavity**

Methamphetamine users have higher DMFT scores with significantly more decayed and missing teeth compared with non-users.11 In most cases, users present with poor oral hygiene, grossly decayed teeth and complain of a dry mouth. The destruction of hard tissues can be explained by an increased intake of sweetened, carbonated drinks and foods containing high levels of sugar. Unhealthy diet preferences combined with a chronic dry mouth result in catastrophic effects on oral health due to the absence of protective saliva.4,6,7,12

Bruxism during drug use as a result of hyperactive facial muscles leads to accelerated tooth wear6 and other symptoms such as temporomandibular joint (TMJ) disorders, myofacial pain and trismus.13

The classical caries pattern observed in methamphetamine users is referred to as “Meth Mouth” and it affects the interproximal and buccal smooth surfaces of teeth. Teeth are often darkly stained and have a crumbling appearance.13 Demineralisation of tooth structure usually starts at the CEJ since cementum is less resistant than enamel. Initially the cavities are V-shaped13 at the cervical area of the teeth and eventually progress to frank coronal involvement.6

**Methamphetamine mouth symptoms**

The most common oral symptom experienced by methamphetamine users is xerostomia.4,6,14 The decreased salivary secretion is caused by vasoconstriction of the blood vessels in salivary glands6 and results in an increased risk for dental caries.13 A dry mouth contributes further to difficulties in speaking, swallowing, unpleasant taste sensations and burning mouth symptoms.16 It also leads to a sore mouth that makes food intake difficult.15 In addition, xerostomia may contribute to the inflammation of soft tissues and other fungal infections such as candidiasis, cheilitis and glossitis.13

Prolonged neglect of oral hygiene causes gross accumulation of plaque which is colonised by acidogenic bacteria that continue to metabolize the sugar into acids leading to low pH levels in the mouth.15 The cariogenic properties of soft drinks can be explained by the high levels of sugar which are broken down by bacteria and cause demineralisation.6 During periods of high intake of soft drinks and sweet foods, the oral pH level drops below the critical oral pH point and erosion and decay of tooth structure usually follows.20

This paper reports on the oral and dental symptoms as well as the dental treatment needs of methamphetamine users.

**MATERIAL AND METHODS**

A cross-sectional study design was used with a convenience sample of 308 self-reported methamphetamine users who were attending in- or out-patient rehabilitation programmes at one of 22 specialised substance addiction treatment centres in the Western Cape. Most of the sites were located in the City of Cape Town, a health district within the Western Cape Province. The area is bordered by Atlantis, Worcester, Helderberg and the Cape Point sub-districts.

Ethical approval was obtained from the Senate Research Ethics Committee of the University of the Western Cape on the 23rd of July 2010 (ID number: 10/05/17), the Department of Social Development on the 30th November 2012 (ID number: 9/2/114/3/2/4) and the City of Cape Town on the 12th of December 2012 (ID number: 10331). Participation was anonymous and voluntary. After informed consent was obtained, researcher-administered questionnaires were used to collect oral health status data. If photographs were taken, a separate consent form was completed. An oral examination was performed to measure DMFT and to determine dental needs. The WHO Oral Health Survey guidelines and criteria for determining DMFT were used.7 The oral examination was carried out using a plane mirror and dental curved probe, and no radiographic examinations were performed. All oral examinations and interviews were conducted by the calibrated principal investigator (inter-examiner = 0.873). Data was captured on Microsoft Excel 2010® and statistical analysis was completed using Epi Info™ 7 and R®.

**RESULTS**

Twenty two substance abuse treatment centres were visited and 308 participants who were using methamphetamine were included in the study. The majority (69%) of participants were male and almost three quarters (72%) were unemployed. The mean age was 28 years and half were aged between 21-25 years. Most of the participants resided in Cape Town. Slightly more than a quarter (27.27%) reported visiting a dentist in the last six months and about 40% mentioned that their last visit had been in the past twelve months (Table 1). The majority (56.17%), however, recorded that their last dental appointment was more than a year ago. Eleven patients indicated that they had never been to a dentist. The most common reason for going to the dentist was a toothache (67.5%). Other reasons for
The last dental treatment received was also investigated. The most common treatment received during their last dental visit was a tooth extraction (72.47%). Other procedures such as restorations (fillings) (9.76%) and cleaning (8.71%) were much less common. Only 5.95% indicated that a check-up was the only treatment they received at their last visit (Figure 1). More patients received fillings (9.76%) compared with the proportion that initially visited for fillings (7.58%). Almost double the number who attended for a cleaning (4.33%) actually received a cleaning (8.01%). These contrasts indicated that participants had a skewed perception of their own oral health status.

Almost two thirds (63.31%) were not satisfied with the appearance of their teeth and 73.31% indicated that their teeth had changed since they have started using methamphetamine. More than half (53.57%) of the sample was satisfied with the functioning of their teeth at the time of the interview.

**Oral health symptoms experienced while using methamphetamine**

A dry mouth (93.51%) and a bad taste (91.23%) were the most common symptoms experienced during times of methamphetamine use (Figure 2). Almost three quarter (73.98%) reported stiff facial muscles and more than half (59.74%) were grinding their teeth during usage. There was an association between grinding teeth and stiff facial muscles ($p = 0.00024$; OR$=2.6$; 95% CI: $1.54 – 4.36$). Those who experienced grinding were 2.6 times more likely to experience stiff facial muscles compared to those who were not grinding their teeth.

Almost two thirds (60%) were not satisfied with the appearance of their teeth and 73% indicated that their teeth had changed since they have started using methamphetamine. More than half (53.57%) of the sample was satisfied with the functioning of their teeth at the time of the interview.

**Other symptoms that were less common included sore gums (33.44%) and a “burning” sensation in the mouth (21.1%). There was an association between gender and sore gums ($p = 0.013$; RR$=1.5$; 95% CI: 1.09 – 2.04). Women were 1.5 times as likely to have sore gums when compared with men. Only 47 (15.26%) of participants indicated that they had suffered toothache when using the drug. The majority (80.2%) reported a poor /very poor appetite when using methamphetamine; however there was no significant influence found when the daily amount of drug used was considered. Only seventeen per cent reported their appetite was normal during drug use (Table 2).

The majority (93.52%) indicated that the duration from the time they started using methamphetamine until they experienced a dry mouth was less than an hour (Figure 3). Almost a third reported that their mouth was dry within five minutes. Some participants reported that a dry mouth was an indication that they had reached the point of “being high”.

The duration of time that occurred for the mouth to return to ‘normal’ was also determined and three quarters
of the respondents indicated that recovery of the mouth required between one and 24 hours after the last usage of methamphetamine (Table 3). About 15% indicated that their mouth remained dry for more than a day.

**Perception on aesthetic appearance and functionality of teeth**

The majority (82.74%) of the participants indicated that their teeth had changed in some way since the start of their drug addiction. Nearly a third (30.80%) reported that their teeth had ‘broken down’ and 17.54% said: “their teeth had become rotten”. A few users reported that their teeth had become ‘weaker’ (3.79%) or/and chipped (3.79%). Almost a third (29.38%) reported a change in tooth colour. Actual discolouration of teeth was reported by slightly more than a quarter (26.83%), two thirds of whom (67.44%) considered that their teeth had stained yellow and 13.95% identified a brown discolouration. Other colours of discoloration which were less common were black, blue, off-white and white spots.

**Dental treatment required after clinical examination**

The most common dental treatment required was dental extractions. One fifth of the sample required at least one extraction while 13% required at least two. The mean number of extractions required per user was two teeth. One participant, who had been using methamphetamine for 13 years, had multiple severely carious teeth. He required 19 extractions.

The highest levels of education received by participants were categorised into primary school, high school and tertiary institution. Those who attended tertiary education were categorised into primary school, high school and tertiary institution. Those who attended tertiary education were black, blue, off-white and white spots.

<table>
<thead>
<tr>
<th>Time until normal</th>
<th>All participants</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ≤ 60 min</td>
<td>6.14%</td>
<td>10.87%</td>
<td>3.98%</td>
</tr>
<tr>
<td>1 ≤ 24hrs</td>
<td>77.82%</td>
<td>75.00%</td>
<td>79.10%</td>
</tr>
<tr>
<td>1 ≤ 7 days</td>
<td>14.33%</td>
<td>11.96%</td>
<td>15.42%</td>
</tr>
<tr>
<td>&gt; week</td>
<td>1.71%</td>
<td>2.17%</td>
<td>1.49%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Table 3: Time from last methamphetamine usage until experiencing normally salivated mouth**

The data fitted the line of regression ($R^2 = 0.9987$).

**DISCUSSION**

The demographic information of participants reflected similar results reported by SACENDU for 2013 in that the majority of users are male and in the age group 25-29 years.

A dry mouth makes speaking, swallowing and eating very difficult and results in users consuming large amounts of carbonated sugary drinks to quench their thirst. A dry mouth was the most common symptom experienced by users and this concurs with the literature. The most likely cause of a dry mouth is the activation of alpha-adrenergic receptors which lead to vasoconstriction of the vasculature of salivary glands and a decreased saliva secretion. Other contributing factors can be an increased metabolism and physical activity.

There is strong documented evidence to support the association between saliva and the risk for dental caries due to a decreased buffering effect. Users often present with high caries experience and excessive tooth wear that worsened with the increasing duration of addiction. The severe destruction of dentine and enamel can be explained by a chronic dry mouth, constant grinding of teeth and an increased consumption of sweetened, carbonated soft drinks, snacks containing high levels of sugar and a poor appetite.

A dry mouth and a bad taste were the most common symptoms and, together with other symptoms such as the grinding of teeth, this finding is consistent with other studies reported in the literature. It was interesting to note that participants regarded a dry mouth as an indication of having reached a “high”. Most users reported that the time that elapsed from the last use of the drug until experiencing a ‘normal’ mouth was about 24 hours.

The classical “meth mouth” caries pattern on buccal smooth surfaces and interproximal areas of anterior teeth can be explained by the chronic dry mouth. This caries pattern is similar to that described in Sjögren’s syndrome and irregular periods of oral hygiene are common among methamphetamine users.

Lower levels of education were associated with increased numbers of extractions and a higher probability of poor oral health.

Users often presented for dental care with advanced stages of tooth decay and severe dental pain. This was the reason that extractions were the most common treatment provided. Complex restorative and surgical management was mostly required to ensure complete oral rehabilitation after prolonged periods of substance abuse.

Methamphetamine users are difficult to manage, the challenge being how to reduce the consumption of carbonated drinks and high sugar diet. Furthermore, users often have financial constraints making it difficult to afford the complex dental treatment that may be required.
treatment, oral health promotion and education initiatives. Psychosis and paranoia are adverse effects of chronic methamphetamine abuse that can last for years even after the drug abuse habit has been overcome.27

Although dental pain was not always prominent during times of methamphetamine usage, participants did indicate they often had episodes of tooth ache during abstinence. Very severe pain resulted in a relapse to drug dependence when the patient used methamphetamine to bring pain relief.

CONCLUSION

Methamphetamine abuse remains a serious public health problem in South Africa and in the rest of the world. It causes numerous dental problems and reduces the oral health quality of life. Dental caries is very common among users but in many cases the seeking of dental treatment is delayed for a year or even longer due to a number of reasons. Xerostomia and other symptoms such as a bad taste, grinding of teeth and stiff facial muscles are the most common symptoms experienced. A chronic dry mouth combined with high-sugar and carbonated drinks intake causes rampant caries that has a classical pattern known as “Meth Mouth”.

A dental extraction is still the most common treatment option for methamphetamine users. However, consideration should be given to a more preventive approach that includes oral health instructions, education on good dietary and brushing habits while users are in treatment programmes. It is recommended that there should be more public awareness of the deleterious effects of sugar and carbonated sugar-sweetened drinks and the destructive nature of methamphetamine abuse on oral health.

A thorough intra-oral examination together with comprehensive record keeping is crucial when attending to dental patients who are methamphetamine users. The likelihood of detecting a patient with a drug addiction habit will be increased if dentists are better informed on the signs and symptoms of substance abuse. The rationale for increased professional and public awareness will lead to early detection which will facilitate appropriate management.

References

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Parental perspectives on self-care practices and dental sealants as preventive measures for dental caries.

BG Nair1, S Singh2

ABSTRACT
The oral health behaviour of children is increasingly seen to be driven and shaped by parental influences.

Aim and Objectives: The study set out to explore parental understanding of dental caries, self-care practices, and dental sealants as preventive strategies for dental caries.

Methods: This was an explorative and cross-sectional study. The participants were parents/care-givers (n=295) of grade one learners. Twelve schools were selected from the Chatsworth Circuit, KwaZulu-Natal, using a systematic sampling technique. Information was obtained through the use of a self-administered questionnaire and focus group discussions.

Results: Seventy-four percent of respondents reported that unhealthy deciduous teeth can lead to problems when permanent teeth develop (p<0.001). Although the majority of respondents understood the role of diet and self-care practices, almost 80% of these respondents did not floss and 70% did not use a mouth rinse. Sixty-five percent were aware of dental sealants and these parents were twice as likely to be willing to have sealant placements performed on their children than those parents who were unaware of the procedure (OR 2.32, p<0.001).

Conclusion: Parental knowledge and awareness of oral health self-care practices does appear to translate into support for dental sealants as a preventive strategy for dental caries.

Keywords: parental knowledge and attitudes; oral health; dental sealants; dental caries; South Africa

INTRODUCTION
Dental caries is a preventable disease but remains poorly researched in developing countries, particularly sub-Saharan Africa.1-3 While not life-threatening, the impact of caries on the quality of life is profound, including pain, impaired functional capacity and a negative influence on the child's growth rate and body weight.4 When the disease has an early onset with rampant clinical progression, dental caries becomes a serious public health problem, a challenge which is further compounded by the high cost of treatment.1,4 While the causes of dental caries are known and the disease can be prevented, its high prevalence amongst South African children suggests that the benefits of prevention are not reaching this population group.5,6

Eating and tooth-brushing behaviour are learned in early childhood and the home environment exerts substantial influence on the development of these behaviours.7,8 Maternal or caregivers’ knowledge of nutrition, the impact of parental feeding practices, television viewing and peer pressure all play a role in influencing the child's eating behaviour.6 Several studies have examined the influence of parental knowledge, attitudes and perceptions (KAP) on oral health self-care practices in the family.9-11 Parental oral hygiene self-care practices such as tooth-brushing routines, knowledge of fluoride, healthy diet and perceptions of the importance of good oral health care, have been found to have an impact on the oral health behaviour of their children.9-11

LITERATURE REVIEW
Very few national surveys on dental caries rates have been conducted in South Africa. The National Children Oral Health Survey of 1999/2002 indicated that children living in urban areas have significantly higher rates of dental caries than do children in rural areas, and that oral health need varied widely from province to province.8 The survey
also described the percentage of children in South Africa who required treatment for dental caries as ranging from 45%-60%, with the mean number of teeth needing care ranging between two to three per child.6 The greatest need was recorded in the Western Cape, (almost 80% in need), while the lowest need for dental caries care was recorded in Limpopo Province.6 In KwaZulu-Natal, the prevalence of dental caries in six-year-olds with primary dentition was recorded as 64.8%. Oral health unmet need varied widely with the four to five and the six-year old age groups requiring more emergency relief of pain and conservative care in comparison with the older groups.6

Dental caries preventive strategies include educational and oral health awareness programmes; additional fluoride uptake and sealant placement programmes.12,13,14 A critical review of current dental public health preventive strategies at national, provincial and local levels in South Africa reveals that oral health promotion programmes are poorly implemented, inconsistent, fragmented and not evaluated at design, implementation, and post-implementation levels.12

Dental sealants
Epidemiological studies have found strong evidence of the effectiveness of dental sealants on sound posterior teeth in children and adolescents.1,16-18 The occurrence of dental caries in the pits and fissures of posterior teeth may be reduced by 60% in the period of two to five years after placement with a reduction of 78% in the first year and of 59% over four years or more.1,17 A study by Weintraub et al. (2001) assessed the dental experience of 15438 children over a seven-year period and concluded that dental sealant placement was associated with savings in expenditure.18

These studies generally agree that dental sealants should be part of an overall prevention strategy which should include caries risk assessment. The delivery platforms could include clinics, mobile units or school settings.12 One limitation of this caries preventive strategy is the need for skilled oral health personnel, hence increasing the potential cost of the programme.16,17,20 A second limitation is that the application and the successful retention of dental sealants are technique-sensitive, dependent on a number of factors including clinical competency and the type of material used.16,17,20

This study set out to explore parental understanding of dental caries, oral health self-care practices, and the use of dental sealants as caries-preventive strategies for children residing in the Chatsworth Circuit of the uMlazi District, KwaZulu-Natal. This province accounts for approximately 7.6% of South Africa’s land surface with a population of 10 449 300.21 The study null-hypothesis was that parents of Grade 1 learners in the identified region will not have a basic understanding of dental caries, of oral health self-care practices, and of the role of dental sealants in caries prevention.

METHODS
The study design was explorative and cross-sectional using a combination of probability and non-probability sampling, and quantitative and qualitative data. From a total sample of 50 schools (representing 5832 Grade 1 learners) in the district, twelve were selected using a systematic sampling technique (with a confidence level of 95%). The names of schools were placed into an alphabetically ordered list. The total sample of 50 was divided by the desired sample number, 12, leading to the outcome of 4.2. Hence every fourth school was selected from the ordered list. If a selected school declined participation in the study, a substitute school was selected using the same sampling technique.

Information was obtained in two phases. Phase One made use of a self-administered questionnaire that sought information on demographic data, oral health behaviour and knowledge patterns, income and education status, and knowledge of oral health practice programmes. Questionnaires were sent out to about 800 parents via the learners. The inclusion criteria were that the potential participant should be 18 years or older, be a biological parent, care-giver, grand-parent or guardian and be residing in the geographical region of the uMlazi school district. Three hundred and thirteen (313) questionnaires were returned, representing a response rate of 40%. From these were excluded 18 returned questionnaires that had incomplete responses. The final study sample therefore had 295 participants (n=295).

The questionnaire was a modified version of the Child Oral-Health-Related Quality of Life (COHQoL) questionnaire.22 The scales for measurement comprised of the Child Perceptions Questionnaire (CPQ); the Parental-Carer Perceptions Questionnaire (P-CPQ) and the Family Impact Scale (FIS). The reliability, validity and responsiveness in longitudinal research of the P-CPQ component and the FIS have been confirmed by Thomson et al. (2013) and by Kramer et al. (2013)22,23. The questionnaire was organised into four sections: Section A focused on parental biographical data such as age, gender and education, income, number of people in each household and medical insurance ownership. Section B included information on knowledge of dental caries. Sections C, D and E had questions related to perceptions and attitudes of dental caries and preventive care, for example, “Problems with baby/milk teeth could affect adult teeth” and “Have you heard about dental sealants?” The questionnaire comprised of both open ended and closed ended responses. The questionnaire was pre-tested in a pilot study conducted among ten parents whose children attended a primary school that was not on the identified sample list.

Data for Phase Two was obtained through focus group semi-structured interviews with parents who had completed the questionnaire, at five conveniently selected schools with 10 participants in each group. The purpose of the focus group discussion was to explore parental understanding of dental sealants as a component of preventive care. The focus group discussion consisted of open-ended statements and questions, and a visual aid (a photograph of a dental sealant being placed onto a tooth) to elicit the understanding of participants of dental sealants. The focus group discussion was audio-recorded. Consent was obtained for each phase of data collection. Ethical approval was obtained from the Humanities and Social Sciences Research Ethics Committee at the University of KwaZulu-Natal (Reference: HSS/0327/013M) and gatekeeper permission was obtained from the Department of Education and the Department of Health in the eThekwini District, KwaZulu-Natal.

All quantitative responses were collated and entered into a computer database using Microsoft Excel® and examined statistically using the statistical software package for social sciences IBM SPSS Statistics® version 21. Statistics
were generated for biographic and demographic characteristics, and for parental knowledge, attitudes and perceptions of preventive strategies against early childhood caries. The responses to the open-ended questions were scrutinised for key concepts and themes and then thematically grouped after identifying a common link. Statements expressing similar sentiments were grouped into themes that represented the main messages conveyed by the data and then analysed using the software package NVivo® 10. Univariate descriptive statistics such as frequency and mean distribution were conducted for all variables. The Pearson chi-squared test was conducted to assess possible relationship between the independent variables (income, education and age) and the dependent variables (oral health knowledge, attitudes and behaviours). A level of p<0.05 was established as being significant. The data on the educational levels of participants were further categorised into higher (high school level and tertiary education) and low education (no formal education and primary school education). Binary logistic regression analysis and Odds Ratios (ORs) with 95% confidence levels (CI) were also calculated.

Data collected from the focus group discussions were analysed using the open coding method of thematic analysis and the software package NVivo® 10. Each of the five focus group transcripts was scrutinised for key concepts and themes. To minimise bias all interviews were additionally scrutinised by another independent researcher and consensus was reached in the allocation of codes and themes. Member verification was conducted on the transcripts from the focus group discussions. This ensured credibility in the data collected.

RESULTS
The study sample comprised of 295 participants, nearly three quarters of whom were female (72%). Half of the study population was in the 30-49 years age group (n=152, 51.7%). More than two-thirds of the participants (75%) had at least a high school or tertiary education (Table 1). Despite the majority of the participants being of higher educational level (75%), the results showed that 55.7% of the study population earned less than R6000 per month and that 42.7% received their monthly income in the form of social grants, donations or pensions. Although the results revealed that majority of the primary caregivers were female, no significant statistical association could be established between gender and any of the variables such as oral health practices or visits to the dentist.

Table 1: Socio-demographic characteristics of respondents

<table>
<thead>
<tr>
<th>Variables</th>
<th>Identifiers</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male (n= )</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Female (n= )</td>
<td>72</td>
</tr>
<tr>
<td>Age</td>
<td>&lt; 20-29 years (n=38)</td>
<td>12.8</td>
</tr>
<tr>
<td></td>
<td>30-39 years (n=83)</td>
<td>28.3</td>
</tr>
<tr>
<td></td>
<td>40-49 years (n=69)</td>
<td>23.4</td>
</tr>
<tr>
<td></td>
<td>40-59 years (n=56)</td>
<td>18.9</td>
</tr>
<tr>
<td></td>
<td>≥ 60 years (n=49)</td>
<td>16.6</td>
</tr>
<tr>
<td>Relationship to the child#</td>
<td>Mother (n= )</td>
<td>65.5</td>
</tr>
<tr>
<td></td>
<td>Father (n=)</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>Other (n= )</td>
<td>11.2</td>
</tr>
<tr>
<td>Educational level#</td>
<td>Low education* (n=79)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>Primary School</td>
<td>22.3</td>
</tr>
<tr>
<td></td>
<td>Higher Education* (n=212)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary School</td>
<td>50.5</td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td>24.4</td>
</tr>
<tr>
<td>Household income</td>
<td>Low income (&lt; R6 000 per month)</td>
<td>55.7</td>
</tr>
<tr>
<td></td>
<td>Moderate income (≥ R 6 000 per month)</td>
<td>44.3</td>
</tr>
<tr>
<td>Number of people in a household</td>
<td>2-3 people</td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td>4-5 people</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>&gt; 5 people</td>
<td>37.3</td>
</tr>
</tbody>
</table>

*The term low and higher education was used to categorise the parental educational attainment. # Significant at p<0.001
Support for dental sealants

The study results also indicated that the majority of respondents (65%) were aware of dental sealants. However only 67% of participants were willing to have sealant placements performed on their children (Figure 2). Thirty-two percent (32%) of respondents were hesitant or unwilling to have this procedure done. Parents who were aware of dental sealants were twice as likely to be willing to have sealant placements performed on their children than parents who were unaware of the process (OR 2.32, p<0.001). Additionally a participant in focus group “D” stated that she was concerned about the “side effects of dental sealants”.

DISCUSSION

The results of this study reveal gaps in parental knowledge, attitudes and perceptions about dental caries, oral hygiene practices, diet and nutrition, and dental sealants. Only 67.1% of respondents indicated their use of toothbrush and toothpaste for self-care practices. The respondents also recorded that only 68.1% of children brushed their teeth. The majority of respondents did not floss (79.7%) or use a mouthwash (70.8%). According to de Castilho et al (2013), the key elements shown to impact on oral health behaviour of children include parental oral health attitudes, general knowledge and oral health status.24 These authors further add that children's oral health behaviours are more closely related to parental oral health behaviours.24 an opinion similar to the findings of this study. Although knowledge and attitudes towards oral health self-care practices are important considerations, examples set by parents in their oral health behaviours are seen to have a greater influence on those of their children.

Saldanha et al (2014) pointed out that parental education and socio-economic status appear to influence the implementation of dental caries prevention in children.13 Higher parental education is associated with more favourable oral health outcomes in children.25 The literature further indicates that cultural norms and social factors such as values, beliefs and customs are also seen to influence oral health.26 It is therefore imperative that oral health promotion programmes and interventions include mother and child/family involvement in addressing early childhood caries.25 27 More research and advocacy needs to be conducted to identify strategies to improve parental involvement in oral health promotion decision making, specifically in the area of children’s oral health care. The contextual influences (such as income, living conditions, nutritional intake and access to oral health care services) on a family’s capacity to maintain optimal oral health status must also be considered and addressed when designing and implementing these programmes and interventions.

Two-thirds of the study participants were able to identify sealants as a mechanism to help prevent dental caries but 32% of respondents did not support this procedure. Although this issue was further explored in the focus group discussions, participants provided weak reasons for not supporting dental sealants, such as concerns about the ‘side effects of fissure sealants’. Bonetti et al (2010) reported in their study that the main problem may be a lack of understanding of the mechanism by which the sealant works.28 The themes arising from qualitative analysis suggested a poor understanding of common oral diseases and oral health priorities, coupled with the perception that low oral health status could be inherited. The study results imply an acceptance that oral health status is very much beyond the individual's control and that oral health intervention should only occur when the condition becomes symptomatic. Conversely, past dental experiences, limited access to care, or impact of time away from work could also contribute to inconsistent perceptions of dental sealant uptake.

Potential bias could also have resulted in parents over-reporting their knowledge of dental sealants. Contrary to the findings in this study, the literature does however suggest that knowledge of dental sealants does not necessarily translate into a behavioural change.29 Given that 32% of respondents did not support dental sealants, more research needs to be conducted to unravel the reasons for parents not wanting to have sealant placements done on their children despite their having a knowledge of its proven benefits. Bonetti et al (2010) suggest that psychological theories such as the Theory of Planned Behaviour (TPB), the Social Cognitive Theory (SCT) and the Operant Learning Theory (OLT) could be utilised in efforts to ensure that parental knowledge, attitudes and perceptions toward dental sealants and preventive care, are increased.29 On the other hand, parents could have positive attitudes towards preventive care, including dental sealants but this is of little value if there are obstacles to accessing these inventions. Further research is also required to explore the availability and support for oral health promotion activities, specifically from a public oral health service delivery perspective.

The World Health Organisation advocates that comprehensive strategies to prevent caries in children cannot be conducted in isolation but should be part of a collaborative health promotion effort between the following role-players: health care professionals, educators and health care providers; caregivers; and
the child. A framework for any oral health promotion programme should include the following five approaches: intervention, behaviour change, education, client-centred approach and societal change. Thus an oral health promotion programme aimed at reducing the rate of dental caries and improving oral health outcomes in children should consider the multifactorial influences on this process and ensure strategic engagement with the relevant stakeholders at all levels of programme planning and implementation.

A limitation of this study is that the research findings cannot be generalized. Despite this, the results provide insight into parental practice, knowledge and perceptions towards oral health care for their children/guardians. The study provides useful data that could be used to re-orientate planning towards improved oral health promotion, especially among identified high-risk groups from lower-socio-economic groups. These data could also be integrated into programmes aimed at addressing non-communicable diseases that affect South Africa and other countries of similar economic and social development.

CONCLUSION

The study concludes that parental knowledge and awareness of oral health self-care practices does appear to translate into support for dental sealants as a preventive strategy for dental caries. The alternate hypothesis for this study is thus supported. More research needs to be conducted to further investigate strategies to improve parental involvement in oral health promotion decision-making, specifically in the area of children’s oral health care.

Acknowledgement:
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References
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Salivary cortisol level and severity of xerostomia in patients who stutter

ABSTRACT

Background: Stuttering is associated with high levels of anxiety. Salivary cortisol is used as a biomarker to assess stress level. Dry mouth is one of the symptoms of anxiety. The aim of this study was to evaluate salivary cortisol levels and severity of xerostomia in men with and without stuttering.

Methods: In a case-control study, 19 patients with stuttering (PWS) and 19 control individuals were recruited to the investigation. The xerostomia inventory (XI) score was used as an index of the severity of xerostomia. The salivary cortisol concentration was measured by an enzyme immunoassay kit (ELISA). Student’s t-test was used in the statistical analysis.

Results: The mean unstimulated saliva flow rate was lower (P=0.045), and the mean unstimulated saliva concentration of cortisol (P=0.017) and XI score (P= 0.044) were significantly higher in the PWS than in control individuals.

Conclusion: It can be concluded that saliva levels of cortisol and severity of xerostomia are high in stutterers and these patients suffer xerostomia.

Keywords: Cortisol, Saliva, Xerostomia, Stutter

INTRODUCTION

Stuttering is defined as a disturbance in the rhythm of speech (fluency disorder). The patients with stuttering (PWS) know what they want to say but often are unable to put the words together. They suffer from involuntary disruptions of speech, including syllable repetitions, prolongations, blocking of sounds, substitutions, as well as involuntary pauses. Given the involuntary nature of stuttering and the fact that it is socially evident, the affliction has a potentially negative impact on mental and emotional health and quality of life of the patient. Consequently, stuttering is associated with high levels of social anxiety. PWS expect to experience speech difficulties in many social situations, based on associated previous negative experiences, resulting in anxiety. In addition, anxiety leads to psychophysiological and autonomic reactions follow such as a freezing response, the fight or flight response or the alarm or stress response. Typical physiological changes occur in anxiety states such as increased heart rate, elevated pulse volume, enhanced tonic and phasic skin conductance, a galvanic skin response, or the stimulation of production of different hormones like catecholamine, adrenocorticotropin, cortisol, prolactin, and thyroxin. Physiological and psychological responses to stress are mediated by the hypothalamic-pituitary-adrenal (HPA) axis, the sympathoadrenal system, and brain monoaminergic systems such as locus coeruleus (noradrenalin production).

Cortisol is released after stressful emotional situations and has effects on energy level, learning, memory, neural plasticity, immunity and on behaviour such as sleep patterns, mood and the reception of sensory input. Salivary cortisol measurements provide a reliable indicator of the functional status of the hypothalamus-hypophysis-adrenal axis and has been used in studies on stress evaluation, depression, and anxiety. Saliva secretion is essential for the health of oral cavity tissues and has been used as a non-invasive source for medical investigations. Whilst cortisol levels may be assessed in serum, the measurement in saliva offers several advantages, such as being stress-free, painless, non-invasive, allowing for frequent and rapid sampling in different situations, with no need for trained staff. It has been shown that cortisol injected intravenously appears in saliva within less than a minute and reaches a peak concentration within 2-3 minutes while at the same time similar concentrations are achieved in the plasma.

ACRONYMS

HPA: hypothalamic-pituitary-adrenal
PWS: patients with stuttering
TUMS: Tehran University of Medical Sciences
XI: xerostomia inventory score

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Anxiety is one of the causes of a feeling of a dry mouth. Dehydration and a lack of oral lubrication impacts on functions, and sufferers of dry mouth encounter difficulties with speaking, eating and swallowing. Although there are some reports of cortisol levels being raised with selected stressors, research on salivary cortisol from PWS are rare and obscure. These patients suffer stress and anxiety coupled with reduced salivary flow. This study undertook measurements of salivary cortisol and salivary flow rates in an Iranian male cohort of stutterers.

METHODS AND MATERIALS

Subjects
The Ethics Committee of Tehran University of Medical Sciences (TUMS), Iran, approved the study protocol (1708742). Informed consent was obtained from all participants.

A total of 38 men were asked to participate in a case/control study. Nineteen patients with stuttering (PWS), with ages 32.2 ± 5.9 years, were recruited from amongst the patients attending the laboratory of physiology of the Rehabilitation Science School, TUMS. A matched sample of 19 individuals with no documented stuttering (aged 36.2 ± 7.3 years) were included as controls. Smokers, obese patients (body mass index ≥ 30 kg/m²), patients taking xerogenic medical agents, patients with certain systemic diseases (including patients with diabetes, Sjogren’s syndrome, etc.), oral candidiasis or unfavourable oral health conditions such as poor oral hygiene and periodontal diseases (pocket depth more than 3 mm) and patients who used antidepressant or antianxiety drugs were excluded.

All subjects completed questionnaires about the status of their xerostomia (Table 1). A Xerostomia inventory (XI) score was then determined as the severity of dry mouth feeling (xerostomia) for each subject. The scores of these responses were added to the questionnaire score, to provide a Total XI score for each individual (the minimum possible score was 11 and the maximum possible score was 55).

Sample collection
Unstimulated whole saliva was collected under resting conditions in a quiet room between 8:30 am and 10:30 am and at least 90 min after the last intake of food or drink. The duration of saliva sample collecting was recorded with a stopwatch. At the start, the participants were asked to swallow any saliva pooled in their mouths, after which unstimulated whole saliva was collected from the individuals by having them expectorate their fresh saliva, into dry, de-ionized, sterile plastic tubes, this process being timed

Table 1: The xerostomia inventory (XI)

<table>
<thead>
<tr>
<th>Comment</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I sip liquids to help swallow food</td>
<td>1</td>
</tr>
<tr>
<td>My mouth feels dry when eating a meal</td>
<td>2</td>
</tr>
<tr>
<td>I get up at night to drink</td>
<td>3</td>
</tr>
<tr>
<td>My mouth feels dry</td>
<td>4</td>
</tr>
<tr>
<td>I have difficulty in eating dry foods</td>
<td>5</td>
</tr>
<tr>
<td>I suck sweets or cough lozenges to relieve dry mouth</td>
<td>1</td>
</tr>
<tr>
<td>I have difficulty swallowing certain foods</td>
<td>2</td>
</tr>
<tr>
<td>The skin of my face feels dry</td>
<td>3</td>
</tr>
<tr>
<td>My eyes feel dry</td>
<td>4</td>
</tr>
<tr>
<td>My lips feel dry</td>
<td>5</td>
</tr>
<tr>
<td>The inside of my nose feels dry</td>
<td></td>
</tr>
</tbody>
</table>

Response options: Never (scoring 1), hardly (2), occasionally (3), fairly often (4) and very often (5).

Figures:

Figure 1: Unstimulated saliva flow rate (A) and cortisol concentration (B), and xerostomia inventory score (C) in patients with stutter (PWS) and persons who non-stutter (control). *P< 0.05. Data are presented as means ± SEM.
and the volume being recorded. The salivary flow rate was calculated by dividing the volume of saliva by the duration of saliva sample collection. The samples were clarified by centrifugation (2500g, 10 minutes), and immediately stored at −20°C for later determination of cortisol.

**Cortisol Assays**
The salivary cortisol concentration was analyzed by ELISA technology using commercially available kits (DRG Instruments GmbH, Mar Burg, Germany).

**Statistical Analysis**
For statistical analysis, the data are presented as a mean ± standard error of mean (SEM). The two-tailed Student’s unpaired t-test was used to compare salivary cortisol levels between experimental and control groups. P < 0.05 was considered statistically significant.

**RESULTS**
Student’s t-test showed that there was a significant drop \(p<0.05\) in mean unstimulated saliva flow rate in the PWS group compared with the control (Figure 1A). The concentration of cortisol was significantly higher in the mean unstimulated saliva of the PWS group \(p<0.05\) (Figure 1B).

The Xerostomia inventory score, an index of xerostomia severity, was significantly higher \(p<0.05\) (Student-t) in the PWS sample than in the controls (Figure 1C).

**DISCUSSION**
High levels of anxiety may be experienced by people who stutter, resulting in a dry mouth and raised levels of salivary cortisol, a biomarker used to assess stress level. This study has shown a significantly higher cortisol concentration in unstimulated saliva and a severity of xerostomia which is also significantly higher \(p<0.05\) (Student-t) in PWS than in control individuals. Salivary flow rates were found to be significantly lower in the PWS group.

Bio-behavioural research uses salivary levels of cortisol as a reliable non-invasive technique for measuring the concentration of this hormone, producing a consistent, comparable measure which accords with levels of free cortisol in plasma.\(^6\)\(^,\)\(^7\)\(^,\)\(^8\)\(^,\)\(^9\)\(^,\)\(^10\)\(^,\)\(^11\)\(^,\)\(^12\)\(^,\)\(^13\) Public speaking increases salivary cortisol in men and, considering the results of this study, it is evident that the levels of this hormone are also higher in PWS.\(^9\)\(^,\)\(^10\)\(^,\)\(^11\)\(^,\)\(^12\)\(^,\)\(^13\) A previous study based on samples of 11 PWS and 11 controls and testing low and high levels of stress found that there was no significant difference in salivary cortisol hormone between the two low stress groups.\(^1\)\(^,\)\(^2\)\(^,\)\(^3\)\(^,\)\(^4\)\(^,\)\(^5\)\(^,\)\(^6\)\(^,\)\(^7\)\(^,\)\(^8\)\(^,\)\(^9\)\(^,\)\(^10\)\(^,\)\(^11\)\(^,\)\(^12\)\(^,\)\(^13\) (Days without any stress were considered as low stress, and for those days when routine tasks were not right or “everything was going wrong”; these dysfunctional days were considered as high stress.). Saliva had been collected in that study between 3:30 pm and 6:00 pm when cortisol levels are low. To better highlight demonstrable variations in salivary cortisol output, it is advisable to collect saliva in the morning, when blood cortisol levels are high.\(^5\)

A subsequent study based on morning sampling found that cortisol levels were higher with stress than without stress.\(^10\)\(^,\)\(^11\)\(^,\)\(^12\)\(^,\)\(^13\) However, the results showed no significant difference between PWS and controls after laboratory stress, even though cortisol levels increased.\(^1^4\)

The current study reflects data procured in mid-morning in a relaxed environment for all volunteers, allowing ameliorated adaptation (Figures 1A, 1B and 1C). Essentially the research evaluated the resting levels of cortisol in PWS and in a control group and found significantly raised levels in the PWS group which also experienced relatively severe levels of xerostomia. The research focus group was well matched with the controls relative to age, gender, socio-economic status, cultural and geographic concordance. Hence it is clear that even in a non-stressed situation, the PWS have higher levels of the stress hormone, cortisol.

Statements of PWSs and review of psychophysiological studies indicate that anxiety levels amongst PWSs are related to speaking situations such as talking on the telephone, talking with people, or introducing themselves.\(^1\)\(^,\)\(^4\) Conversely, observing and listening to stuttered speech has been shown to induce physiological and emotional reactions in listeners.\(^2\)\(^1\) Further research is needed to evaluate the effects of viewing and experiencing stuttered speech on salivary cortisol levels.

The Saliva flow index is a parameter which may be used for classification of saliva flow as normal, low, or very low. In adults, unstimulated saliva flow is considered as low if it ranges between 0.1 and 0.25 mL/min and if it is less than 0.1 mL/min then the flow is considered very low or as hypposalivation.\(^2\)\(^2\) One of the side effects of drugs which are used in the treatment of stuttering (such as paroxetine or sertraline) is dry mouth.\(^2\)\(^3\)\(^,\)\(^2\)\(^4\) In this study, patients who had used drugs for at least two months prior to sampling were excluded. However, unstimulated saliva flow rate was less than 0.1 mL/min in none of control and case groups; but it was significantly higher \(p<0.05\) Student-t in control group than amongst the PWS. In addition, this study showed that xerostomia inventory score was significantly high in PWS. It showed dry mouth or xerostomia is a subjective issue, characterized by an unpleasant feeling in the mouth and throat, and does not necessarily relate to hypo salivaization in up to one third of cases.\(^1\)\(^5\)\(^,\)\(^2\)\(^5\)

**CONCLUSION**
The present study shows salivary levels of cortisol and severity of xerostomia are higher and the salivary flow rate is lower in Iranian male PWS, when compared with non-stutterers. This implies PWS have a more marked stress reaction than non-PWS. The stutterers had higher subjective feelings of dry mouth. Accordingly, it is suggested further research be conducted with larger research cohorts, to not only assess stress hormonal output and fluctuations of saliva in PWS, but also the effect their speech may have on other aspects of metabolism, the quality of life of PWS’s and the possible effects upon their social contacts.

**Acknowledgement**
We would like to thank all volunteers for their helpful participation. The Rehabilitation Research Center of Tehran University of Medical Sciences provided financial support for this project.

**References**

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Incidence and predisposing factors for dry socket following extraction of permanent teeth at a regional hospital in Kwa-Zulu Natal

ABSTRACT

Introduction: Dry socket is one of the complications which may follow dental extractions. Whilst the exact pathogenesis is unknown, blood clot disintegration as a result of fibrinolysis remains the most acknowledged theory.

Aims and Objectives: To determine the incidence, distribution by tooth type and location and predisposing factors for dry socket in a public health facility.

Methods: A retrospective review of the register and the records of patients who presented with dry socket at the facility were reviewed for the first quarter of 2015 (January-March). The following data were recorded: total number of patients their demographics, total number of permanent teeth extracted, number of dry sockets encountered and associated risk factors such as smoking, contraception and systemic illnesses.

Results: 2214 patients were reviewed from whom a total of 2281 permanent teeth had been extracted. The overall incidence of dry socket was 1.8%, being more prevalent in females, in the second and third decades of life, and in mandibular teeth, more specifically in molars.

Conclusion: Dry socket occurrence is a painful but infrequent complication of tooth extraction and most commonly affects the mandibular sockets. Oral contraception and smoking independently or in combination with a traumatic extraction were the most prevalent predisposing factors.

INTRODUCTION

Dry socket, also known as alveolar osteitis, is a commonly encountered complication following dental extractions. The condition can be defined as: “postoperative pain in and around the extraction site, which increases in severity any time between one and three days after extraction, accompanied by a partially or totally disintegrated blood clot within the alveolar socket, with or without halitosis”. The prevalence of dry socket has been reported to be as high as 35% in some cases. The most prominent characteristic of dry socket is debilitating pain, which responds poorly to narcotic and over-the-counter analgesics, generally leading to loss of productivity. It often requires a few postoperative visits to the dental practice to manage the pain, making it costly to both the patient and society.

While the exact pathogenesis of dry socket is not entirely known, it is thought that dry socket occurs from increased fibrinolysis resulting in blood clot disintegration. The aetiology of dry socket is also not exactly understood but seems to be multifactorial - such factors include age, sex, use of oral contraceptives, smoking, extraction site, trauma from difficult extractions, poor oral hygiene, and vasoconstriction of local anaesthetics used.

Various approaches have been advocated to decrease the occurrence of dry socket; including antibiotics, antibacterial mouthwashes, steroids, clotting agents, and medications. Chlorhexidine rinses and antibiotics appear to be the methods of choice. Despite the lack of understanding of the aetiology, the management of this painful condition nevertheless appears to be relatively simple and effective, involving cleaning and irrigating the affected socket followed by insertion of medicament such as Alvogyl whilst simultaneously reassuring the patient.

Although dry socket is a relatively common oral health condition-affecting patients, there have been few studies conducted in South Africa that have looked specifically at prevalence and predisposing factors for the condition.

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The aim of this study, therefore, was to determine the incidence and predisposing factors for dry socket cases in a public health facility that performs a high volume of extractions, as well as to describe the distribution of dry socket by tooth type and location.

METHODS

Study setting and design
This study was conducted at a regional public health facility with an outpatient dental headcount of approximately 14,000 patients per year. The study was a retrospective cross-sectional study.

Study population
The study population included all patients who had undergone dental extractions of permanent teeth between the 1st of January and 31st March 2015.

Data sources and collection
The dental clinic register was used to identify the number of permanent teeth extracted, the number of dry socket cases encountered and the socio-demographic details (age and sex) of the participants in the study.

A retrospective review was conducted of the clinical records of all patients who had been diagnosed with dry socket following permanent tooth extraction. The following variables were recorded: type and location of the tooth/teeth extracted, reason for extraction(s) and relevant findings of the clinician who performed the extraction(s), social habits and medical history.

Data management and analysis
The collected data was entered into an electronic database and analysed descriptively.

Ethics
Anonymity of the patients was maintained as no identifiable information was recorded. The study obtained ethical approval from the Bio-Medical Research and Ethics Committee (BREC) at the University of Kwa-Zulu Natal (BE 252/15). Permission to conduct this study was also obtained from the facility as well as from the Provincial Department of Health.

RESULTS
A total of 2214 patients had attended the dental clinic for tooth extraction between the 1st of January and 31st of March 2015, and a total of 2281 permanent teeth had been extracted. Sixty percent (1204) of patients were between the ages of 21 and 40, whilst 18% (402) were less than 20 years old. A total of 42 extractions were complicated by dry socket in the first quarter of 2015 resulting in an incidence of 1.8%.8 However, the findings presented are higher than the findings of a Nigerian study that showed an incidence of 1.4%.9 However, the findings presented are consistent with other studies that show an incidence of between 1% and 4%.10 The variability in the incidence of dry socket could possibly be attributed to the different assessment methods and the variations in diagnostic criteria.

Distribution of dry socket by tooth type
Dry sockets occurred most frequently in the mandibular arch (62%). In terms of individual teeth, mandibular third molars accounted for the highest percentage of affected sockets (26%) followed by mandibular first molars (19%) and mandibular second molars (17%) (Figure 1).

Risk factors for dry socket
Nineteen of the twenty eight females (67%) who developed dry socket were on some sort of oral contraception, with this being the only predisposing factor for 14 (50%) of the group. Smoking was the most common predisposing factor in males with 72% (10/14) of those who developed dry socket having a history of smoking. Traumatic extractions was the only factor in six (14%) of the cases, but when in combination with oral contraception and smoking was identified in 34% (14) of the cases. Six (14%) of the patients with dry socket were HIV positive, whilst one patient had diabetes mellitus.

DISCUSSION
Dry socket is a painful condition that may occur after a dental extraction and is often distressing to the patient. Although the exact pathogenesis of dry socket is not fully understood, it is thought to occur from increased fibrinolytic activity resulting in blood clot disintegration.7 In this study, the incidence of dry socket was 1.8%, which is slightly higher than the findings of a Nigerian study that showed an incidence of 1.4%.9 However, the findings presented are consistent with other studies that show an incidence of between 1% and 4%.10 The variability in the incidence of dry socket could possibly be attributed to the different assessment methods and the variations in diagnostic criteria.

| Table 1: Frequency table of age distribution of patients with dry socket complications |
|---------------------------------|----------|
| Age category | Males | Females |
| ≤20 | 4 (10%) | 3 (7%) |
| 21-30 | 5 (12%) | 10(24%) |
| 31-40 | 4 (10%) | 11(26%) |
| 41-50 | 1(2%) | 2(4.5%) |
| 51-60 | 0(0%) | 2(4.5%) |
| Total | 14 (34%) | 28(66%) |

| Table 2: Frequency Table of predisposing factors for dry socket |
|----------------|----------------|
| Predisposing factors | Number | Frequency |
| Oral contraception (no other risk factor) | 14 | 34% |
| Smoking only | 7 | 17% |
| Traumatic extraction (no other risk factor) | 6 | 14% |
| HIV | 6 | 14% |
| Trauma plus contraception | 5 | 12% |
| Trauma plus smoking | 3 | 7% |
| Diabetes | 1 | 2% |
| Total | 42 | 100% |
The incidence of dry socket was highest in the third and fourth decades of life, in strong agreement with other studies. Why this should be is still not known but it has been postulated that the presence of well-developed alveolar bone and the relative infrequency of periodontal diseases in this age group make tooth extraction more difficult. Seven patients in this study were below 20 years of age, contrary to the perception that dry socket does not occur below 18 years of age.

A female predominance (2:1) was noted. This finding is similar to a study conducted in Palestine which confirmed a higher incidence of dry socket in females. Two reasons have been suggested to explain the female predominance; namely, better health-seeking behaviour of females and the use of oral contraceptive pills which increase fibrinolytic activity in blood and saliva during the menstrual phase, affecting the stability of the blood clot. In the current study, 71.4% of females who developed dry socket were using oral contraceptives.

Regarding anatomical site, mandibular teeth, more specifically molars, were more affected than maxillary teeth, consistent with a study conducted in Sri Lanka. In addition, dry socket was more common in mandibular third molars, followed by mandibular first molars and mandibular second molars; consistent with the findings of other studies. The specificity of these sites may be related to the decreased vascularity, greater bone density and a diminished capacity in forming granulation tissue. It has also been suggested that difficulty of traumatic extractions may be a cause. It is thought that trauma results in compression of the alveolar bone, reduction in blood perfusion and thrombosis of underlying blood vessels leading to increased fibrinolytic activity.

Numerous studies have demonstrated the link between dry socket and smoking, with some studies pointing towards a dose dependent relationship. The risk of developing dry socket is reported to be significantly greater in smokers than non-smokers. It was found that 31% of the patients in the current study that developed dry socket were smokers, all of whom were male. Although smoking has been associated with an increased incidence of dry socket, it is unclear of the exact causal mechanism. It is possible that the increased risk associated with smoking is related to substances in tobacco and its smoke, particularly nicotine, cotinine, carbon monoxide, and hydrogen cyanide which are cytotoxic to the cells involved in wound healing. Nicotine increases platelet adhesiveness, raising the risk of microvascular occlusion, and tissue ischemia. It has also been postulated that smoking is associated with the release of catecholamines, resulting in vasoconstriction and decreased tissue perfusion. Other authors have suggested that the heat from the burning tobacco, along with its byproducts, could contaminate the surgical site. This, together with the suction applied to the cigarette could dislodge the clot from the alveolus and interrupt healing.

In this study, seven patients who developed dry socket had underlying medical conditions; however, current opinion reflected in the literature indicates that systemic conditions do not play a role in the occurrence of dry socket. All extractions performed during this study were under local anesthesia containing a vasoconstrictor. Other studies indicate that the resulting local ischemia has no implication in the pathogenesis of dry socket. Further, dry sockets have been known to occur in patients who underwent general anaesthesia for the extractions.

Study limitations
This study was conducted in a single regional hospital and was dependent on the accuracy and completeness of the clinical records. Therefore, detailed information regarding the duration of a smoking habit and the quantity of cigarettes smoked, the use of oral contraceptives, oral hygiene status and the degree of difficulty in extractions were not adequately recorded for all patients. The study was a descriptive cross sectional study and did not allow for detailed statistical analysis to determine associations.

CONCLUSION
Dry socket occurrence is a painful but infrequent complication of tooth extraction and most commonly affects the mandibular teeth. Oral contraception and smoking independently or in combination with a traumatic extraction were the most prevalent predisposing factors for dry socket in our study.

It is important that these underlying predisposing factors (smoking and oral contraceptive use) are recognized and that patients are appropriately counselled.

References
INTRODUCTION

The University of Pretoria Oral Health Centre (UPOHC) houses the School of Dentistry where dental, oral hygiene and post graduate students are trained. Dentists employed at the School of Dentistry generally do not complete root canal treatments (RCTs) due to their academic and research commitments but mainly perform emergency dental procedures such as pulpectomies for the relief of acute pain. The pulpectomy procedure includes the extirpation of the necrotic or inflamed pulp, minimal shaping of the canal and irrigating with sodium hypochlorite. This is followed by placing a medicament with an anti-inflammatory action such as Ledermyx® or calcium hydroxide and sealing the tooth with a temporary restoration. The patient is then placed on a waiting list (approximately 18 months) for completion of the RCT by students in their fourth and fifth year of study. Dentists complete RCTs mainly in cases where previous attempts made to locate the canals were not successful or where files have fractured in the canals or when retreatment is indicated.

The students complete a limited number of RCTs due to the time-consuming nature of the procedure and their relative lack of skill and experience.1 During the fourth year of study the students are required to complete five RCTs on teeth with one and two canals. The clinical quota for the students in the fifth year of study is five RCTs on teeth that have three or four canals.2

Several studies3-7 have been conducted on the acceptability of root canal obturations with regard to the technical quality as viewed on post-operative radiographs. The studies in question reported an acceptable technical quality of 47.4%, 84.1%, 61.35%, 57% and 44% respectively.3-7 In four of these, the RCTs assessed were completed by undergraduate students. Root fillings between 0.5mm to 2mm from the radiographic apex, consistent density and uniform taper were the criteria used to categorize the RCT as acceptable. Peak et al. also included the absence of apical pathology in the criteria.6

To date no research has been conducted on the technical quality of root canal fillings at tertiary institutions in South Africa.

METHODS

Study design

The design was an observational retrospective record based study.

A random sample of 500 from amongst 1050 teeth that had received an emergency pulpectomy between 1 July 2012 and 30 June 2013 was selected. A total of 224 of these 500 teeth had reached the obturation phase of the RCT by 30 June 2014. The maximum period before root canals were completed was thus 24 months. Four of the cases had no post-operative radiographs, although it was recorded on the file that radiographs had been taken. The clinician had failed to successfully capture the digital x-ray image on the Kodak software program. A sample size of 220 therefore remained.

The electronic and paper records of the 220 teeth on which a RCT had been completed by either a dentist or student were analysed at the UPOHC.

Technical quality assessment

The post-operative intraoral periapical radiographs were accessed on the Kodak software program (version 6.12). In the cases where the RCT had reached the obturation phase, a decision was made as to whether the RCT was completed adequately or inadequately, based on technical quality as viewed on the post-operative radiographs. The investigator who examined the radiographs is a full-time dentist with 14 years’ experience as a clinician.

ACRONYMS

RCTs: root canal treatments
UPOHC: University of Pretoria Oral Health Centre

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had supervised dental students at the UPOHC during endodontic clinical sessions for six years and had obtained a Diploma in Endodontology and a Master’s degree in Radiology. Where examination of the radiograph resulted in a categorisation of the RCT as inadequate, the reasons for that assessment were recorded. The criteria used were those proposed by Román-Richon et al.7 and others. 4, 8-11 These are displayed in Table 1.

Ethical considerations
All necessary ethical approval to access patient files and digital radiographic material was obtained from the relevant authority at the University of Pretoria, Faculty of Health Sciences. Complete anonymity of the sample was ensured.

RESULTS
The results of the treatment outcomes as obtained from the patient files and digital records are displayed in Table 2.

Table 2: Frequency table for distribution of completed root canal treatments

<table>
<thead>
<tr>
<th>Treatment procedure (x)</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT was adequately completed</td>
<td>126</td>
<td>57.27</td>
</tr>
<tr>
<td>RCT was inadequately completed</td>
<td>94</td>
<td>42.73</td>
</tr>
<tr>
<td>RCT was completed by a dental student</td>
<td>120</td>
<td>53.57</td>
</tr>
<tr>
<td>RCT was completed by a qualified dentist</td>
<td>104</td>
<td>46.43</td>
</tr>
</tbody>
</table>

A total of 126 (57.27%) root fillings were adequate and 94 (42.73%) were deemed as inadequate.

In addition, a differentiation was made between RCTs completed by dentists and those completed by students. The calculation of data showed that the fourth and fifth year dental students completed 120 (54%) of the 224 RCTs and the qualified dentists completed 104 (46%) RCTs (Table 2).

Table 3, below, displays the result of the technical quality of the obturation differentiating between clinical provider type (student or dentist).

The data showed (Table 3) that the dental students completed 59.66% of their RCTs adequately and 40.34% inadequately. The dentists, on the other hand, completed 54.46% adequately and 45.54% inadequately. These differences were not statistically significant (Chi² test).

Table 4: Frequency and reasons for inadequately obturated canals

<table>
<thead>
<tr>
<th>Treatment procedure (x)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT underfilled (short of radiological apex) (Figure 1)</td>
<td>57</td>
</tr>
<tr>
<td>RCT overfilled (past the radiological apex) (Figure 2)</td>
<td>11</td>
</tr>
<tr>
<td>Voids in the obturation (Figure 3)</td>
<td>16</td>
</tr>
<tr>
<td>Missed canal(s) (Figure 4)</td>
<td>11</td>
</tr>
<tr>
<td>Fractured file (Figure 5)</td>
<td>5</td>
</tr>
<tr>
<td>Loss of coronal seal (Figure 6)</td>
<td>5</td>
</tr>
<tr>
<td>Root perforated (Figure 7)</td>
<td>2</td>
</tr>
<tr>
<td>Teeth that have two reasons for inadequacy of RCT</td>
<td>13</td>
</tr>
</tbody>
</table>

The RCTs that were inadequately completed by either qualified dentists or dental students were classified according to the evaluation of the postoperative radiographs (Table 4). The percentage could not be calculated as some teeth had two or more reasons for inadequacy. The obturated root canals of 57 teeth were under-filled and 11 over-filled. Sixteen teeth had voids in the obturation and in 11 teeth a missed canal was detected. An endodontic instrument was fractured off in five of the obturated teeth and five teeth lacked a proper coronal seal after the obturation. Radiographs revealed that in two teeth the root had been perforated. Figures 1-7 illustrate some digital radiographic examples, of the underfilled and
overfilled canals (Figures 1 and 2 respectively), voids in the obturation (Figure 3), missed canals (Figure 4), fractured files (Figure 5), loss of coronal seal (Figure 6) and a root perforation (Figure 7).

DISCUSSION
Most root canal treatment failures develop when initial treatment procedures, mainly technical in nature, have not succeeded to thoroughly eliminate pathogenic factors. Dammaschke et al. concluded that root canal therapy can be a durable way of preserving teeth even when the RCT is carried out by students.\textsuperscript{13}

Assessment of the technical quality of the RCT’s in this study showed that 57.27% of completed cases were of acceptable quality (using the criteria described in Table 1). This percentage appears to be lower than those found in other studies which focused on the quality of the root canal fillings done by undergraduate students.\textsuperscript{4,14} In a study by Lynch et al. in 2006, 70% of the RCTs performed had acceptable

Figure 2: Exhibits canals filled past radiographic apex (overfilled).
2a: Shows over extension of gutta-percha done probably due to over-preparation.
2b: Shows an overfil of obturation material in the distal root canal system.

Figure 3: Exhibits voids (density inadequate) in the obturation.
3a & b: Shows inadequate root canal obturation. Note the poor condensation of the gutta-percha and voids in the obturation material. This is probably due to using a poor lateral condensation technique and the canal not being flared (shaped) correctly.

Figure 4: Exhibits missed canals.
4a: Shows the mesial canal missed in a mandibular first premolar.
4b: Shows a mesial canal that was missed when preparing and obturating the canals of the 17.

Figure 5: Exhibits fractured instruments.
5a: Shows a fractured instrument in the apical curvature of the distal canal of the 36. The mesial canal is obturated short of the working length.
5b: Shows fractured instruments in the apical areas of both mesial and distal root canal systems. There is also loss of coronal seal at the distal interproximal area of the crown (46) in b.

Figure 6: Exhibits loss of coronal seal.
6a: The arrow indicates loss of coronal seal. The canal is also underfilled.
6b: The arrow indicates loss of coronal seal at the distal interproximal area of the crown.
root fillings using the same criteria as those used in this research. A similar study, conducted by Chakravarthy and Moorthy found that 61.35% of the RCTs completed by undergraduate students in the Department of Conservative Dentistry and Endodontics, Penang International Dental College, Malaysia were adequate. This rating is 4% higher than the results for acceptable technical quality achieved by dentists and students in the current study.

Rafeek et al. stated that no curriculum can remain stagnant and that quality control auditing is imperative for ongoing improvement. Chakravarthy & Moorthy deduced from their study that auditing the root canal fillings plays a crucial role in quality assurance in dental schools. The authors offer valuable insights such as the need for frequent auditing of the endodontic curriculum, to lengthen the time allocated to preclinical and clinical training, to raise the staff-student supervision ratio and to include student self-assessment activities. Similar observations were reported in another study by Hayes et al. where a mere 13% of RCTs were adequately obturated, judged using the same criteria used in the current study.

This study reported that the poor results mirror the lack of experience of dental students at University of Wales College of Medicine as well as questioning the supervision and assessment methods. These opinions are confirmed by Lynch & Burke who state that teaching of undergraduate students should be conducted by specialist endodontists rather than by academic consultants who have an interest in endodontics. It is therefore recommended that dentists supervising the endodontic clinical student sessions at the UPOHC should preferably have postgraduate qualifications in the endodontic field of study. Seminars which increase skills and knowledge should be presented to supervisors who do not have postgraduate qualifications. This approach could contribute to the Continuing Professional Development (CPD) points required by the Health Professions Council of South Africa. Increasing the supervisor-student ratio for endodontic sessions should be considered as is also recommended in Chakravarthy and Moorthy’s study.

Endodontics is indeed a difficult skill and the clinician’s competency is the predominant factor determining the success of the outcome of root canal treated teeth. Duvivier et al. emphasized the need for purposeful repetition of practical tasks in order to gain the necessary clinical skills. As part of the current curriculum at the UPOHC, the dental students in their third year of study practice RCT on extracted teeth in the laboratory. They are allowed to treat endodontic patients in their fourth year of study only once they have passed the preclinical practical exam. Although these students start at an early stage in their studies to identify the root canal system, more extensive training could be considered for incorporation into the curriculum. Scaffolding is an approach to enhance a student’s self-governed learning skills. At every level of study the students should have adequate assistance in the initial phases of endodontic training and then be gradually weaned off instruction as they master the endodontic milestones independently. This means gradually reducing the support and progressively expanding the student’s responsibility.

In view of the findings of this study it is recommended that an increase in student clinical quotas for endodontics be considered at the UPOHC. Endodontics could be introduced more extensively at an early stage, in the preclinical third year of study. Practical application of modern technology such as the rotary instrumentation and the electronic determination of working lengths should be incorporated in this preclinical year. The technique for obturation of root canal treated teeth currently being taught to undergraduate dental students at the University of Pretoria is cold lateral condensation. Use is made of gutta-percha which Hammad et al. documented as showing the minimum amount of voids during root section. The final year students are however, additionally taught to use the ProTaper Universal (Dentsply Maillefer) system which consists of rotary nickel-titanium files. An earlier introduction of the use of rotary instruments (particularly the use of rotary instruments on extracted teeth in the laboratory) may improve the acceptable outcome of completed RCTs. However, use of rotary instruments in clinical wards must be preceded by thorough practice on extracted teeth.

Productive use of students’ clinical time is another factor to be investigated. At the UPOHC, much time is spent by students preparing/disinfesting the surgery (cubicle) for their patients as well as on collecting materials needed for the clinical session. The output of these students could certainly be increased if they could be provided with dental assistants. Possible solutions may include the training of junior dental students to assist during clinical teaching and learning. Greater collaboration between tertiary institutions is necessary for dental assistant (dental nursing) students to be placed in the wards during the student clinical sessions so that productivity can be enhanced. If more qualified chair side assistants could be employed then these personnel could help the dental students to prepare their surgeries before and after treatments. Dental assistants could help ensure that infection control protocols are in place, gather and prepare dental materials to be used during the session, and process instruments once the treatment has been carried out. Such measures will not only increase the productivity of the students, but may even provide both the dental and dental assistant students with improved teamwork skills and competencies, which may have an additional educational benefit. A similar recommendation was made in the United Kingdom where the General Dental Council recommended that for all dental procedures students work with a dental nurse. Installation of additional periapical x-ray machines in the endodontic clinical wards could decrease the time students spend waiting to take radiographs. There are currently only two machines per group (varying between 10 and 20 students) during one endodontic clinical session. Another option is to utilize other wards with more periapical x-ray machines for endodontic sessions.
The results from Table 3 indicate that the outcomes of RCT’s completed by qualified dentists and by undergraduate students differ by only five percent, whether judged adequate or inadequate. It may be expected that qualified dentists should have a higher success rate compared with students. However, the staff at the UPOHC, working under severe time constraints, do the retreatments and difficult cases students could not manage, which may challenge and influence the quality of the clinical work. In a study at a German dental school, Stoll et al. attributed the 74% survival rate of endodontically treated teeth to the fact that at a training hospital the difficult root canal treatment cases are delegated to the dentists. Certain root canal failures such as broken file segments are sometimes impossible to reverse and as Souter & Messer suggested, should not be attempted routinely. A valuable insight by Hayes et al. stated that focus should be on the quality of treatment rather than quantity. Dentists at the UPOHC ideally should allocate more time to properly complete RCTs rather than perhaps aiming for quantity and compromising on quality. Proper selection of teeth for RCT, especially teeth that require retreatment, should be considered. A good coronal restoration can diminish the risk of failure of root canal treated teeth. The traditional method of restoring endodontically-treated teeth is the placement of full crown coverage. Nagasiri and Chitmongkolsuk investigated the survival of endodontically treated teeth which had no coronal coverage. A mere 54% of teeth survived after 5 years, showing that a proper coronal restoration like a crown is essential for root canal treated teeth. However, according to latest research which is based on laboratory studies, root canal treated premolars and molars with limited destruction of hard tissue can be restored with composite without the use of posts. Post placement is beneficial however, when there is no cusp protection such as broken file segments are sometimes impossible to reverse and as Souter & Messer suggested, should not be attempted routinely. A valuable insight by Hayes et al. stated that focus should be on the quality of treatment rather than quantity. Dentists at the UPOHC ideally should allocate more time to properly complete RCTs rather than perhaps aiming for quantity and compromising on quality. Proper selection of teeth for RCT, especially teeth that require retreatment, should be considered. A good coronal restoration can diminish the risk of failure of root canal treated teeth. The traditional method of restoring endodontically-treated teeth is the placement of full crown coverage. Nagasiri and Chitmongkolsuk investigated the survival of endodontically treated teeth which had no coronal coverage. A mere 54% of teeth survived after 5 years, showing that a proper coronal restoration like a crown is essential for root canal treated teeth. However, according to latest research which is based on laboratory studies, root canal treated premolars and molars with limited destruction of hard tissue can be restored with composite without the use of posts. Post placement is beneficial however, when there is no cusp protection particularly left in premolars. Mannocci & Cowie stated that the conservation of tooth structure is crucial to the longevity of a root canal treated tooth. The preservation rather than removal of dentine is made possible with composite restorations using adhesive techniques rather than expanded mechanical retentions. 

Limitations

Two-dimensional radiographs (conventional digital intra oral) were used to assess the technical quality of the completed root treatment. Three-dimensional radiography (a CBCT scan/cone beam) may have yielded more precise assessments. A single clinician retrospectively examined the radiographs with no repeatability assessment. It is financially costly to perform a CBCT scan on every endodontic patient and the high radiation dosage produced with the CBCT imaging makes it unethical to perform routine scans.

As with most retrospective studies, the quality of the data depended largely on the quality of the documentation of existing records including the legibility of handwriting on the hospital files. Sometimes students or dentists failed to record the entire treatment visit or omitted the tooth number on which the treatment procedure was carried out. 

CONCLUSION

The assessment of 42.73% of a random sample of RCT’s as inadequate raises a number of concerns. Auditing of root canal fillings is an important contributing factor for this provides the basis of long term survival of teeth treated endodontically by undergraduate students. Members of staff involved in clinical supervision of endodontics should be equipped with sufficient knowledge and clinical experience to evaluate and sign off RCTs which display adequately filled canals to proper working length. Shortcomings in the proper evaluation of obturated RCTs will almost certainly result in failure of the treatment. 

2. There may be a need to:
   2.1 Increase student-supervisor ratio;
   2.2 Allocate more time to clinical and preclinical endodontic training in order to raise student clinical quotas
   2.3 Re-organise the dental treatment facilities to enhance efficiency in endodontic clinical sessions;
   2.4 Ensure dentists dedicate more time to complete the more difficult RCTs and properly select the cases that can be successfully treated by students.

2.5 Recall patients with unsatisfactory RCTs for retreatment by experienced dentists. This can be used as a teaching tool during student endodontic tutorials.

2.6 Properly plan clinical time during student endodontic sessions to allow sufficient time to complete lengthy procedures and avoid unnecessary mistakes due to a rushed effort.

3. This study was undertaken at a particular Dental School. It may be instructive to repeat the study at other Schools.

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- Supports good gingival health*4,5
NEW SENSODYNE® COMPLETE PROTECTION PROVIDES ALL-ROUND CARE FOR YOUR PATIENTS WITH DENTIN HYPERSENSITIVITY*1-5

Stannous fluoride forms a robust layer over the exposed dentin and within the exposed dentin tubules. This layer starts to build from first use and continues to build with twice-daily brushing1,6

Clinically proven relief from dentin hypersensitivity pain2,3

Helps control dental plaque4,5

Supports good gingival health4,5

Clinically proven relief from dentin hypersensitivity pain2,3

Helps control dental plaque4,5

Supports good gingival health4,5

Up to 66% reduction in dentin hypersensitivity from baseline after 8 weeks*1,2

20% reduction in plaque build-up after 24 weeks compared to regular fluoride toothpaste*5

29% improvement in gingival inflammation after 24 weeks compared to regular fluoride toothpaste*6

For any product safety issues, contact GSK on +27 745 6001 or 0800 118 274


Now available in store
Introduction to Dental Lasers

It was Albert Einstein who in 1917 defined the theory of the Stimulated Emission of Radiation, developing and expanding on the work of Niels Bohr, who in 1913 had formulated the Spontaneous Emission theory. Einstein described the electrons of molecules being excited by a source of energy, usually heat, and directed in a specific way. The excited electron releases a spontaneously emitted photon which interacts with a molecule of the active medium, causing those electrons to move to a less stable, higher energy state and producing further photons. This process exponentially increases the number of identical photons which are focused by mirrors at either end of the laser tube and emitted into the delivery system. The acronym “LASER” represents “light amplification by stimulated emission of radiation.”

Theodore Maiman (1960) developed the first working laser. The active mediums contain a homogenous population of atoms that characterize each type of laser, allowing photons to be produced and absorb energy of certain wavelengths. The active mediums can be a gas such as carbon dioxide (CO2), or solid crystal such as yttrium-aluminium garnet (YAG) or a neodymium-doped yttrium aluminium garnet (Nd) YAG. Diode lasers are solid state semi-conductors. In dentistry lasers can be classified according to their active mediums which determine the wavelengths of the laser and which in turn, dictate the tissue interaction, intra-oral uses and the scope of practice (Table 1).

A synopsis of lasers in use in Dentistry
The Carbon Dioxide Laser (CO2) provides rapid soft tissue removal and haemostasis with a very shallow depth of penetration. It provides a very dry operating field with reduced swelling of soft tissue. The main chromophore target for this wavelength (10,600 nm) is water. The exposed tissue undergoes a rapid evaporation of both intracellular and extracellular fluids and the photo-destruction of the rest of the cell.

The Neodymium (Nd) Yttrium Aluminum Garnet Laser: YAG wavelength (1,064 nm) is highly absorbed by haemoglobin and melanin. The energy emitted from this laser is predominantly diffused in the targeted tissues in the form of heat, making it a very effective surgical laser for cutting and coagulating dental soft tissues, with good haemostasis. In addition to its surgical applications, there has been research on using the Nd:YAG laser and various diode lasers for non-surgical sulcular debridement in periodontal disease control and the Laser Assisted New Attachment Procedure (LANAP).

ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KTP</td>
<td>potassium titanyl phosphate</td>
</tr>
<tr>
<td>Nd:YAG</td>
<td>neodinium-doped yttrium aluminium garnet</td>
</tr>
<tr>
<td>Nd:YAP</td>
<td>neodinium-doped yttrium aluminium perovskite</td>
</tr>
<tr>
<td>CO2</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>Er,Cr:YSGG</td>
<td>erbium-chromium-doped yttrium scandium gallium garnet</td>
</tr>
</tbody>
</table>

Table 1: Classification of dental lasers in accordance with dental use.

<table>
<thead>
<tr>
<th>Laser Type</th>
<th>Wavelengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft tissue lasers</td>
<td>Argon 514 nm</td>
</tr>
<tr>
<td></td>
<td>KTP 532 nm</td>
</tr>
<tr>
<td></td>
<td>Diode 803, 810, 940, 980, 1064 nm</td>
</tr>
<tr>
<td>Hard and soft tissue lasers</td>
<td>Nd:YAG 1064 nm</td>
</tr>
<tr>
<td></td>
<td>Nd:YAP 1340 nm</td>
</tr>
<tr>
<td></td>
<td>CO2 10600 nm</td>
</tr>
<tr>
<td>Low-level lasers</td>
<td>Helium neon 635 nm</td>
</tr>
<tr>
<td></td>
<td>Diode 635, 810, 980 nm</td>
</tr>
<tr>
<td>Photopolymerization lasers</td>
<td>Argon 488 nm</td>
</tr>
<tr>
<td></td>
<td>Tooth whitening lasers</td>
</tr>
<tr>
<td></td>
<td>KTP 532 nm</td>
</tr>
<tr>
<td></td>
<td>Diode 803, 810-980 nm</td>
</tr>
<tr>
<td>Caries detection lasers</td>
<td>Diode 655 nm</td>
</tr>
<tr>
<td>Dentine desensitization</td>
<td>Er:YAG 2940nm</td>
</tr>
<tr>
<td></td>
<td>Er,Cr:YSGG 2780 nm</td>
</tr>
</tbody>
</table>

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Erbium Laser: There are two distinct wavelengths, namely the Er,Cr:YSGG lasers (2780nm) and Er:YAG lasers (2940nm). The erbium wavelengths have a high affinity for hydroxyapatite and the highest absorption of water of any laser wavelengths. Consequently, it is the laser of choice for treatment of dental hard tissues in operative dentistry. It has been shown that there is a 3°C rise in pulpal temperatures during cavity preparation on extracted teeth with the Er:YAG laser, well below the 5.5°C that is deemed safe to prevent an acute pulpitis. In addition to hard tissue procedures, an erbium laser can also be used for soft tissue ablation due to its high affinity for water.

Diode Laser: The diode laser is a solid state semiconductor that can be made of aluminum, gallium, arsenide and occasionally indium. All diode laser wavelengths (903 to 1.063nm) are absorbed primarily by tissue pigment (melanin) and haemoglobin. The emitted laser energy is scattered in the target tissues and later converted to heat. Conversely, the energy is poorly absorbed by the hydroxyapatite and by water present in the enamel. Specific procedures appropriate to their use include aesthetic gingival re-contouring, soft tissue crown lengthening, and removal of inflamed and hypertrophic tissue. The diode laser has become popular for use in frenectomies and for photostimulation of apthous/herpetic lesions.

Lasers offer a wide application in Dentistry with considerable benefits and advantages. However, there is a basic requirement that clinicians and associated staff ensure that laser use is carried out in a safe environment and with consent from the patient. Lasers can damage oral tissue, the skin, and eyes. Safety considerations are proportional to established and recognized risk. Safety glasses must be worn by the dental team and the patient at all times. The operator must have a thorough understanding of laser physics and of the device being used. Strict adherence to national and international regulations for dental lasers is essential.

References

Evidence based clinical efficacy of glass -ionomers as tooth restorations and fissure sealants

Published by The University of the Witwatersrand, Johannesburg, 2016. ISBN number 978-0-620-68083-7
Authors: S Mickenautsch and V Yengopal.
Seven Chapters and 211 pages.

This is an innovative book, intriguing in concept and challenging in content. The authors have assembled nine of their papers into a coherent presentation which comprehensively explores the clinical efficacy of glass ionomer restorations. The papers reflect the most thorough analysis of the literature dealing with glass ionomer as a restorative material in comparison with the traditional amalgam and gold standards.

The papers emanate from a unit based in the Department of Community Dentistry of the University of the Witwatersrand, Johannesburg. The System Initiative is the shortened version of the complete title of the unit..... Systematic Review Initiative for Evidence-based Minimum Intervention in Dentistry. The three main objectives are:

• To develop the basis for evidence-based teaching concerning Minimum Intervention-related topics
• To generate evidence-based practice guidelines for clinical service delivery
• To provide recommendations for further research.

SYSTEM has adopted the use of systematic reviews in seeking to achieve these objectives.

The collection of essays reflects that approach, for the papers are based on meta analyses of the related and cogent literature.

Comprehensive and meticulous literature searches characterise the determination and selection of those publications which meet the criteria and robust statistical methods are applied to extract the most reliable evidence on which clinical decisions may be based. The search conducted for one paper involved an original data base of 1359 articles. The stringency of selection may be gauged when only 20 trials were accepted for further review and data extraction.

And the evidence of the analyses challenges the widely held concepts of the relative clinical inferiority of high viscosity glass ionomers in comparison with the current gold standard of amalgam. Further that the efficacy of glass ionomers as pit and fissure sealants has not been shown to be inferior to other methods.

The nine papers are organised into sections useful to the reader who may seek information in a particular topic. The two main divisions present papers on Glass Ionomers as Tooth Restorations and Glass Ionomers as Fissure Sealants. Included in the first are papers dealing with:

A critique of the laboratory evidence
A critique of the evidence from uncontrolled clinical trials
Evidence from controlled clinical trials
Evidence synthesis.
A profession has been defined as an occupation that involves a long and specialized training at a level of higher education and one that is governed by a special code of ethics. A profession has an important and exclusive expertise; possesses an internal and external structure, including experts that mutually recognize each other's expertise, has autonomy in practice of the profession, and is largely self-regulating. Members of the profession accept a set of norms of professional practice or professional obligations. A dental professional as a member of a profession should have respect for human beings, be competent, have integrity and the primary concern should be doing good and acting in the patient's best interests, not for prestige or profit.1

Professionalism is a broad term used to include the conduct, aims, and qualities that characterize a professional or a profession and relates to the behavior expected of one in a learned profession. It embodies positive habits of conduct, judgement, and perception on the part of both individual professionals and professional organizations. Professionalism has been viewed as that quality of conduct and character that accompanies the use of superior knowledge, skill, and judgment, to the benefit of another, prior to any consideration of self-interest.1 There has been much published on professionalism in the past decade, however, it is not a new concept and different disciplines and diverse opinions have been shaping the concept of professionalism and expanding the term to cover a broad set of ideas. Three broad domains have been categorized by Huber (2002) who defined them as habits of practice, habits of group maintenance, and habits of mind.2

Habits of practice or activity include the attributes of cleanliness and personal hygiene, appropriate dress and appearance, decorum, and etiquette. In addition, a dental professional will be honest, decent, fair, trustworthy, law-abiding and of good character.3 These are the ways in which physicians behave toward members of the public, patients and their professional colleagues. Habits of practice involve “behaving like a doctor,” and can be taught by the Aristotelian example “teach virtue by being virtuous”, since an internalization of reasons and justifications is unnecessary, but this does not diminish their importance.3

Habits of group maintenance are activities and values that work toward maintaining the highly respected position, trust, and the many privileges of the social status of the dental profession. These powers are informed by an elusive and tacit social contract between dental professionals and the general public, and include among others, self-regulation, exclusivity of practice and financial compensation. The presumption on the part of the patient that they will benefit from, rather than be harmed, by the care provided for them is natural. The comfort and security derived from dealing with dental professionals stems from a confidence that commitments and undertakings will be honoured. Patients, the general public and third parties all place their trust in professional people, and their expectation is that this trust is well founded.4 A professional person will take pride in the profession and pay attention to detail; will seek to improve and develop skills; will not be satisfied with substandard work and will seek to do good; will be prepared to acknowledge mistakes, learn from them and take appropriate steps to prevent it from happening again and finally will show respect for those who consult him/her in his/her professional capacity.4

Dental professionals are expected to demonstrate high regard for the welfare of the public and some of their social responsibilities are derived from the social contract, or serve to maintain it. Charity, care, public health and hygiene, health education, and political action are examples of habits of group maintenance. Dental alliances at local, national, subspecialty and hospital levels have allowed responsibility for some of these habits to become institutionalized or spread over a collective group of practitioners. Maintaining the social power of the profession is an important endeavor as social prestige, financial reward, professional autonomy, and public legitimacy once lost, are not easily regained.2

Habits of mind are the reflective, cognitive, and philosophical frameworks that inform dental practice and dental behavior. They are characteristic patterns of thinking that help dentists move from clinical information to clinical decision making and allow others to distinguish a professional from a quack.2 Self-care strategies that enhance the habits of mind are critical to dental practice and include the cultivating of clinical mindfulness, reflection in daily practice, education and teaching and emotional intelligence. Studies have found a relationship between connection between effective practitioner–patient communication and patient outcomes.
(i.e., emotional health, symptom resolution, functional status, and pain control). However, for optimal practitioner–patient communication, practitioners must be “mindful” of themselves, the patient, and the context in which they work. 

In both ethics and professionalism, it is not enough to use intuition alone when taking and making decisions for one’s actions. The traditional standards, values, and goals of the profession must be taken into account. Habits of mind can be taught only by practice but may not be immediately recognisable because they may be subtly employed or seamlessly integrated into a dentist’s behaviour.

Professionalism can be viewed as an activity and not purely a set of rules and as such the use of ethical principles and values to meet today’s challenges is a necessarily dynamic process. It requires a reflective equilibrium between principles and dynamic action. Professionalism is a vibrant and a daily part of dental practice. Personal virtue is often cited as being key to professionalism. However, contemporary professionalism in a culturally diverse society has moved beyond personal virtue to a collective commitment to patients, the public, and their health. Contemporary professionalism is a group activity, one practiced in the company of others. It is about demonstrating the values of the profession. A professional person must have a sense of responsibility and a degree of self-control regarding personal behaviour. Doing what is right — when the law requires it, as well as for ethical or moral reasons — should be a matter of personal pride for the professional person.

CONCLUDING REMARKS

Professionalism includes practice, education, reflective and applied ethics and demonstrating the values of the profession in all healthcare relationships. Professionalism is a trait that drives dental practitioners to deliver high standards of care and preserve the relationship of trust that exists between patients and the dental team. Excellence in the profession cannot be driven only by following guidelines, standards and rules. Self-regulation and mindfulness, where individual dentists develop and internalise their own guiding principles and values, is essential. True self-regulation occurs at a personal level where dentists take responsibility for their own performance and the performance of their colleagues.

References

Evidence based clinical efficacy of glass -ionomers as tooth restorations and fissure sealants

The second division includes:
- Retention rate, an invalid predictor for dental caries.
- Retention rate, an invalid surrogate for dental caries
- Glass ionomers as fissure sealants, systematic review evidence.

There are key statements which provide the lead to the conclusions which the systematic reviews generate.

“"The results of SYSTEM's meta-epidemiological study show that statements concerning glass ionomer’s inferiority to amalgam and other types of materials are based on incorrect statistical comparison methods."" 

“The conclusion of the new findings suggest the need for adopting clinical outcomes, such as caries occurrence rate in formerly sealed teeth as the ruling quality criterion for pit and fissure sealants, instead of sealant material retention”.

“There is a danger in the dental community that invalid criteria may lead to an unjust rejection of valid sealant materials”

A most useful feature is the inclusion of an Executive Summary as a prologue to each paper. These provide the reader with a succinct overview of the material and facilitate the plunge into the detailed statistics which dissect the evidence. Indeed, the statistical analyses are at first daunting in their complexities.. but the text is explicit and apposite and the reader has the opportunity to evaluate that evidence to his or her own satisfaction.

This is a book for the specialist which should also be explored by all who place restorations and sealants… contained is a wealth of relevant knowledge which will affect their clinical decisions.

All the papers originally appeared in open access Journals… their collection into one volume makes a powerful statement.

The authors have been meticulous in research, convincing in presentation and clearly impartial in assessment of the evidence.
Maxillo-facial radiology case 140

This 22 year old male patient (Figs.1&2) presented with a slow growing swelling in the left mandibular molar region. Figures 3,4,5 & 6 are images of three other patients with the same condition. Discuss the radiological features and what is your diagnosis?

**INTERPRETATION**

Fig1&2: the large lesion of left mandible shows a honeycomb-like distribution of calcifications. The borders are corticated. The tumour has displaced the mandibular molar tooth. A histological diagnosis of calcifying epithelial odontogenic tumour (Pindborg Tumour) was made. Fig.3 shows a Pindborg tumour distal to left second premolar associated with displacement of the first molar tooth. Fig.4 shows a similar tumour with mixed lucency-opacity between right premolar and molar teeth. Figs 5&6 show coronal and axial CT views of a large Pindborg tumour affecting the right maxilla. Note the marked expansion and cortical destruction. Calcifying epithelial odontogenic tumour is a rare benign neoplasm, accounting for less than 1% of all odontogenic tumours. The average age at diagnosis is 40 years; however, the tumour can occur at any age. It occurs equally in males and females. Approximately two thirds of cases are reported to occur in the mandible. Most cases occur in the premolar-molar area and are commonly associated with an unerupted tooth. The tumour is a painless, slowly enlarging mass. Histologically the tumour has a very characteristic appearance. Sheets of polyhedral cells with well-defined eosinophilic cytoplasm and hyperchromatic nuclei are featured. Amyloid and ringlike calcification may also be present. The tumour may be irregular or, in some cases, the cystic lesions may be well defined and corticated, whereas others appear ill defined. Small unilocular lesions may have a completely radiolucent centre (Fig.3). Others may have variable amounts of small flecks of calcifications scattered throughout. Larger lesions have a multilocular or honeycomb appearance. The tumour can displace and often prevent the eruption of teeth. Radiologically the tumour may be very similar to the calcifying odontogenic cyst, adenomatoid odontogenic tumour and ameloblastic fibro-odontoma.

**Reference**

What’s new for the clinician?
Summaries of and excerpts from recently published papers

1. Pulpectomies in primary mandibular molars: a comparison of outcomes using three root filling materials


Pulpectomies for the management of irreversible pulpitis in primary teeth remain controversial for several reasons, including the complex root canal morphology of primary molars, the inherent risk of physiologic root resorption, the close proximity of deciduous teeth to the permanent successors, the difficulty in obtaining good radiographic views of the apices of primary teeth, complex diagnosis due to the patient’s immaturity, need for behavioural guidance of paediatric patients and choice of technique and root filling materials. An ideal root filling material for primary teeth should be easily placed and removed, should resorb at a rate similar to that of the primary root, should not set to a hard mass that could deflect an erupting permanent tooth, should be radiopaque and not discolour the tooth, should adhere to the walls, should not shrink and should possess antiseptic properties as well as be harmless to the periapical tissues and permanent tooth germ.

The most commonly used root filling materials for primary teeth include zinc oxide–eugenol (ZOE), iodoform-based pastes and calcium hydroxide. None of these currently available materials meet all these criteria. Pramila and colleagues (2016) reported on a prospective, double-blind, randomized controlled trial that sought to evaluate the success of the currently used root filling materials for pulpectomy in primary teeth. The trial aimed to investigate the clinical and radiographic success of three materials – RC Fill, Vitapex and Pulpdent root canal sealer – used for primary molar teeth with necrotic pulps and irreversible pulps in patients aged 6, 12 and 30 months.

MATERIALS AND METHODS
This single-centre, double-blind, randomized controlled trial conducted in India included 129 teeth in 88 children (40 girls and 48 boys aged between 4 and 9 years). Teeth with one or more of the following criteria were included for pulpectomy: (1) Caries-affected teeth with intra-oral and/or extra-oral swelling or draining sinus tract; (2) Teeth with deep caries lesions and associated inter-radicular and/or periapical radiolucencies; (3) Caries-affected teeth with abnormal mobility due to periapical pathosis, and not associated with normal exfoliation; (4) History of spontaneous pain in caries-affected teeth; and, (4) Caries-affected teeth with internal root resorption involving the cervical 1/3 of the root or external resorption (not physiologic resorption) involving less than 1/3 of the root length.

Children with systemic pathosis (any medically compromising conditions) or allergies to any of the materials used were excluded from this trial.

Patients were randomly assigned by a block randomization method with random table numbers of blocks 10 and 9. Allocation concealment was performed with sequentially numbered, opaque and sealed envelopes. The participants and outcome assessors were blinded about the filling materials used.

The selected participants were randomly divided into 3 groups:
- Group I (GI) – RC Fill (ZOE with iodoform),
- Group II (GII) – Vitapex (calcium hydroxide with iodoform) and
- Group III (GIII) – Pulpdent root canal sealer – used for primary molar teeth with necrotic pulps and irreversible pulps in patients aged 6, 12 and 30 months.

A standardised approach to the pulpectomy procedure was used in all three groups.

Calcium hydroxide with iodoform (Vitapex) was available in pre-loaded syringes. The syringe was inserted into the canal near the apex. The paste was extruded into the canal, and the syringe was then slowly withdrawn as the paste filled the entire canal. The RC Fill and Pulpdent root canal sealer were available in powder and liquid form.
They were mixed to the desired consistency according to the manufacturer’s instructions. A lentulo spiral was used to place the RC Fill, and an Endodontic Pressure Syringe (EPS) was used to place the Pulpdent root canal sealer. The pulp chamber was also filled with the filling material, Type IX GIC was placed as a core, and an immediate postoperative radiograph was taken. The teeth were then restored with stainless steel crowns (3M) at the same appointment immediately following canal filling.

The outcome measures were evaluated both clinically and radiographically at 6, 12 and 30 months.

RESULTS
In total, ninety teeth (90) were followed up at 30 months (12% attrition of sample). All three materials were associated with 100% clinical success at 6, 12 and 30 months. Regeneration and reduction in the size of furcation and periapical radiolucencies were observed, and none of the teeth had developed new lesions at the follow-up. However, in a few cases furcation radiolucency and external root resorption increased, and there was thickening of the lamina dura and widening of periodontal ligament space, which were considered as failures. Hence, overall success was determined by the radiographic evidence which showed success rates of the three materials at 30 months of 94%, 90% and 97% for RC Fill, Vitapex and Pulpdent, respectively. The differences in the success rates amongst the materials were not significant (P > 0.05). An intention-to-treat strategy was used, and the results were analysed according to the assigned treatment groups. Based on this, the results were observed to be similar to the pre-protocol results of the study with respect to all clinical and radiographic parameters.

CONCLUSION
All three materials. RC Fill, Vitapex and Pulpdent, were shown to be equally effective root filling materials at 30 months post-operatively for primary molars with necrotic pulps and irreversible pulps.

IMPLICATIONS FOR PRACTICE
The results of the trial suggest that dentist preference for the material of their choice should not affect the outcome as all three materials showed equivalent clinical performance.

Reference


Mepivacaine is an amide-type anaesthetic that is recommended for cases in which systemic conditions restrict the use of other anaesthetics.1 Tramadol hydrochloride is a centrally acting drug with a mechanism that is not fully understood. Tramadol hydrochloride is used for the management of acute and chronic pain, and it is effective in moderate-to-severe pain with low addiction incidence.2

In the last decade, it has been proposed that the use of other drugs, such as nonsteroidal anti-inflammatory drugs (NSAIDs), opioids and tramadol, could be used as adjuncts to anaesthetics to obtain a higher success rate and longer duration of the anaesthetic effect under the concept of multimodal analgesic or pharmacological synergism1 However, oral administration of drugs can cause adverse systemic effects and that is why local application is an alternative that increases the concentration on the damaged tissue locally, reducing the possibility of interactions with other drugs and their adverse effects1.

The inferior alveolar nerve block (IANB) is the most common anaesthetic technique used on mandibular teeth during root canal treatment. Several studies have reported a 30–80% failure rate for IANBs in patients with symptomatic irreversible pulpitis (SIP).3 Rodríguez-Wong and colleagues (2016)1 undertook a randomized double-blinded trial to compare the success of an inferior alveolar nerve block after applying a combination of mepivacaine and tramadol or mepivacaine alone in patients with symptomatic irreversible pulpitis in mandibular permanent molars. The null hypothesis was that the combination of mepivacaine–tramadol will not increase the success of the IANB in patients with SIP.

MATERIALS AND METHODS
This Mexican study was a double-blind, randomized clinical trial. Seventy-four patients were pre-selected to participate according to a preoperative pain scale and preliminary clinical evaluation following the guidelines suggested by the CONSORT group for planning and reporting clinical trials; 56 patients were included and 18 were excluded. Inclusion criteria were as follows: age 18 years or older, acute moderate-to-severe preoperative pain in the posterior mandibular region, SIP in a first or second mandibular molar, no intake of analgesics for 12 h prior to the treatment and acceptance and signing of the consent form. The exclusion criteria were as follows: pregnancy, allergy to tramadol or mepivacaine, poor tooth integrity for restoration, periodontal disease, root resorption, root fracture, systemic diseases such as diabetes and uncontrolled hypertension, intake of drugs or narcotics and patients with sensory impairment or paraesthesia. The elimination criteria were teeth with necrotic pulps found
after diagnosis and during endodontic access (partial necrosis), intraoperative accidents such as perforations or crown fractures and patients who decided to withdraw from the study.

Initially, preoperative pain was scored using a modified Heft-Parker VAS of 100mm with 11 measurement points for determining the intensity of pain, where the endpoints were the extremes of no pain and the worst pain (0–10, respectively). A previously calibrated independent clinician performed the initial diagnosis. Diagnostic tests were performed by applying thermal cold testing with a cold spray (Endo-Ice) on a cotton pellet in the middle third of the buccal surface of the tooth until the patient responded (maximum 7). The patient was asked to indicate the intensity and the duration of the thermal sharp sensation once identified. Equivocal or confusing responses to cold test were recorded, and these patients were excluded from the study. SIP was diagnosed if there was a prolonged response to the cold test, when compared to the control contralateral tooth. In addition, the diagnosis was complemented with the absence of radiographic evidence of periapical pathosis.

Patients were assigned sequential numbers in the order of enrolment and received their allocated treatment according to a computer-generated randomization schedule prepared before the start of the study. Patients were randomized using the block randomization method to obtain equal sample sizes in each group. This method keeps a balance in number of subjects in each group across the study. The block size was determined as four.

The control group (mepivacaine) received the IANB using 1.8mL of mepivacaine 2% 1:100 000 epinephrine, and the experimental group received 1.3mL of mepivacaine 2% 1:100 000 epinephrine mixed with 0.5mL of tramadol 50mg mL−1. The anaesthetic was injected with a metallic syringe with a 27-gauge 1.25-inch needle. All of the anaesthetic cartridges had the same appearance to blind both operator and patients.

The same operator carried out all the anaesthetic blocks by a direct (Halsted) approach, and an independent investigator carried out the evaluation of the treatment.

After 15 min, a progressive four-step examination was performed to analyse the success of the IANB in both groups as follows: lip numbness was determined and compared with the contralateral lip. Isolation of the target tooth was carried out, and a second cold test was performed to determine the presence or absence of a painful response. Then, endodontic access cavities were prepared to confirm a painful response in hard tissues (enamel, dentine or restorations). Finally, canal negotiation was performed to confirm profound anaesthesia in the pulpal tissues. If the patient reported any pain or discomfort during any evaluation, the anaesthetic blockade was categorized as a failure, and the patient received a second cartridge of mepivacaine as a repetition of the IANB or the intrapulpal technique. Only patients with no response advanced to the next examination test, and anaesthetic success was defined as no response during the whole diagnostic process. Only those patients with no response (or a zero value on VAS) in all of the sequential four-step examinations were considered as an anaesthetic success.

Patients were monitored 24 h after the procedure to assess the duration of the anaesthetic effect, the consumption of postoperative analgesics and side effects. The patient received three tablets of ibuprofen 600 mg and one tablet of sublingual ketorolac 30 mg for emergency and rescue medication, respectively, in case they experienced pain after treatment.

RESULTS

Of the 74 patients who were evaluated, 56 patients were included and 18 excluded. No significant differences between the experimental and control groups were found for gender (P > 0.05), age (P > 0.05), duration of treatment (P > 0.05), intensity of preoperative pain (P > 0.05) and pain produced by the injection (P > 0.05). Therefore, the groups were considered homogeneous. After administration of the inferior alveolar nerve block (IANB), all of the patients reported lip numbness, except one patient in the control group. The anaesthetic success was 57.1% for the experimental group and 46.4% for the control group with no significant difference (P = 0.05). There was a significant difference (P < 0.05) in the duration of the anaesthetic effect, with higher values in the experimental group (142 min). No patient in either group reported adverse effect.

CONCLUSION

The combination mepivacaine–tramadol solution achieved similar success rates for the inferior alveolar nerve block (IANB) when compared with mepivacaine 2% epinephrine 1 : 100 000. There was no significant difference in the anaesthetic efficacy between the control and experimental solutions, and none of the solutions tested were completely successful.

IMPLICATIONS FOR PRACTICE

The addition of a pain control medication in the local anaesthetic did not improve the performance of the local anaesthetic in patients who were undergoing root can treatment for symptomatic irreversible pulpitis (SIP).

Reference

CPD Questionnaire

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

GENERAL

Methamphetamine abuse: Oral symptoms and dental treatment needs. (p 150)
1. Meth Mouth is characterised by:
   a. Caries on palatal surface of anterior teeth and the buccal surfaces of posterior teeth.
   b. Caries on smooth labial surfaces of anterior teeth and occlusal surfaces of posterior teeth.
   c. Caries at interproximal areas of anterior teeth and lingual surfaces of posterior teeth.
   d. Caries at smooth labial surfaces of anterior teeth and at the CEJ and buccal half of posterior teeth.

2. Xerostomia in “meth mouth” is associated with the stimulation of inhibitory alpha-2 receptors.
   a. True
   b. False

Parental perspectives on self-care practices and dental sealants as preventive measures for dental caries. (p 156)
3. Of the study sample, 45% did not support the use of sealants as a preventive measure against caries.
   a. True
   b. False

4. 68% of children in the sample brushed teeth and 80% did not floss.
   a. True
   b. False

5. Dental caries in the pits and fissures of posterior teeth may be reduced by 60% in the period of two to five years after placement.
   a. True
   b. False

Salivary cortisol level and severity of xerostomia in patients who stutter. (p 162)
   a. True
   b. False

7. Patients who stutter suffer stress and anxiety coupled with reduced salivary flow.
   a. True
   b. False

8. Salivary levels of cortisol and severity of xerostomia were higher in this study in patients with stuttering than in non-stutterers.
   a. True
   b. False

Introduction to Dental Lasers. (p 178)
9. The active mediums which determine the wavelengths of the laser are determined by:
   a. the length of the tube
   b. the amperage of the input current
   c. the material comprising the active medium
   d. the time of exposure

10. The Neodymium (Nd) Yttrium Aluminum Garnet Laser: YAG is a very effective surgical laser for cutting and coagulating soft tissues.
   a. True
   b. False

11. Temperature rises within the pulp of teeth during tooth preparation below 5.5°C lead to pulpitis.
   a. True
   b. False

Incidence and predisposing factors for dry socket following extraction of permanent teeth at a regional hospital in Kwa-Zulu Natal. (p 166)
12. Oral contraception was shown to be a predisposing factor for the occurrence of dry sockets in females.
   a. True
   b. False

13. The incidence of dry socket was highest in the fifth and sixth decades of life.
   a. True
   b. False

An audit of root canal treatments completed by students and dentists at an academic hospital. (p 170)
14. Dental students at the University of Pretoria Oral Health Centre are expected to do in their 4th and 5th years of study a total number of root treatments of:
   a. twelve
   b. ten
   c. eight
   d. fifteen
15. How many of the 220 teeth which were obturated during the period studied were classified as having inadequate root fillings?
   a. 26  
   b. 98  
   c. 56  
   d. 94

16. Which authors suggested broken endodontic file segments are sometimes impossible to reverse and should not be attempted routinely.
   a. Souter & Messer  
   b. Lynch, Burke F  
   c. Chakravarthy P, Moorthy J.  
   d. Elemam RF, Pretty I.

Maxillo-Facial Radiology case 140 (p 182)

17. The Pindborg tumour is the most common odontogenic tumour.
   a. True  
   b. False

18. Large tumours may have a honeycomb appearance.
   a. True  
   b. False

Clinical Windows (p 183)

19. The results of the Pramila et al trial suggest that material choice should be a dentist-preferred choice.
   a. True  
   b. False

20. In the Rodríguez-Wong et al trial, pre-operative pain was assessed using objective and subjective measures.
   a. True  
   b. False

ETHICAL
Professionalism (p 180)

21. A profession is an occupation that involves a long and specialized training at a level of higher education and one that is governed by a special code of ethics.
   a. True  
   b. False

22. All dentists have the responsibility to provide beneficial treatment, to benefit patients by not inflicting harm, by preventing and removing harm.
   a. True  
   b. False

23. A professional person will:
   a. take pride in their profession and pay attention to detail;  
   b. seek to improve and develop their skills;  
   c. be prepared to acknowledge mistakes and to learn from them  
   d. show respect for those who consult them in their professional capacity  
   e. All of the above.

24. Self-regulation and mindfulness are not traits that are required by individual dentists to develop and internalize their own guiding principles and values.
   a. True  
   b. False

25. Professionalism is that quality of conduct and character that accompanies the use of superior knowledge, skill, and judgment, to the benefit of another, prior to any consideration of self-interest.
   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.

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