Eucomis comosa
This beautifully meticulous picture of *Eucomis comosa* was painted by Professor Maeve Coogan (Mrs Jacobs) who is a past Head of the Department of Oral Microbiology at Wits. The Eucomis family is heavily exploited by traditional healers and *E. comosa* is used in a decoction made by boiling the bulb together with other plant extracts to make an enema administered to teething children. Source: Khumalo Indigenous Gardens.

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482 Notice - Small advertisements on the new web platform
We are in the midst of a dynamic time for sedation practice as this is probably the fastest growing area in anaesthesia care. According to all sedation guidelines, including the 2015 SASA guidelines on PSA, we can administer PSA outside the hospital in a medical or dental surgery, in the office, a facility, or in sedation clinics. This versatility makes PSA an attractive option for us.

PSA outside the hospital environment involves a multitude of providers, and non-anaesthesiologists will be and are part of this group. The choice of which provider delivers this care and the techniques and drugs used, is usually specific to each institution/country and is largely dependent on the availability of trained providers.

In developing countries we face different challenges. There are not enough anaesthesiologists and other healthcare providers available to provide anaesthesia services for all in-hospital procedures. PSA then becomes a very attractive option for certain surgical interventions as it can be used outside the hospital.

One needs to realize that the concept of “sedation” outside the operating theatre presents challenges. Training is necessary, accreditation of sedation providers should become mandatory, and we need practice inspection where procedures are done outside a hospital setting. The problem is how do we bring this all together?

The 2015 SASA Guidelines on Procedural Sedation and Analgesia present sedation providers with guidance to safe sedation practice. All the documentation and guidelines for safe practice for sedation practitioners and healthcare funders are available.

The evolution and revolution of safe sedation practice will bring challenges. Sedation practice continues to change in terms of sedation providers, who can do it, and how to do it; maybe our biggest challenge is the issue of anaesthesiologists and non-anaesthesiologists as sedation providers.

Important challenges in future will be the drugs we use, which ones, how do we administer them, are they safe for use outside the operating theatre, and the biggest issue of all, who can administer which drug?

There is still resistance from some Anaesthesia Societies and Departments of Anaesthesia on who should be allowed to give “general anaesthetic” agents like propofol and ketamine, which are in common use in sedation practice. Some anaesthesiologists still believe the “Pandora” box should be closed; propofol is for use just by anaesthesiologists. One wonders, is this challenge really important with the shortage of anaesthesiologists and other healthcare providers we have, and our commitment to sedation training not only in South Africa but worldwide. There is enough evidence available that non-anaesthesiologists trained in sedation can safely administer PSA.

However, accredited university training in specific sedation techniques barely exists in Africa, and is currently only available in Cape Town. This is a serious challenge to safe sedation practice.

Sedation services will become more popular as an alternative to general anaesthesia for certain procedures outside the operating theatre. More publications/research are available that show that PSA is a safe option for procedures.
outside the hospital environment. In a recent 500 case study (in press) on patient satisfaction after sedation, 94% of patients indicate that they would prefer sedation to general anaesthesia; only 2% wanted general anaesthesia as an option. The low side-effect profile e.g. low incidence of nausea and vomiting, pain, and cost-effectiveness of PSA make it an attractive option for the future.

How are we going to bring this all together so that sedation will become a safe option for procedures outside the operating room? The obvious answer to this question is that nobody should be involved in providing paediatric/adult sedation, including anaesthesiologists, without training. Recent guidelines by the Academy of Medical Royal Colleges in the UK (2013) state clearly, “safety will be optimised only if sedation practitioners use defined methods of sedation for which they have received formal training”. This includes everyone involved in sedation practice.

In South Africa the SASA guidelines on PSA (2015) state, “relevant qualifications and ongoing training remain the foundation of safe sedation practice”. It is recommended that sedation practitioners have a primary, registered, medical qualification, full registration with the HPCSA (Health Professional Council), formal training in standard and advanced sedation techniques, provide evidence of regular and recent sedation-related CPD activity, have a logbook reflecting cases where sedation was done as well as the technique used, comply with SASA recommendations for safe sedation practice, and have evidence available of updated qualifications in airway certification.

Sedation practitioners should only use the specific sedation techniques for which they have received formal training, to optimize patient safety. Operator-sedationists should only use simple or standard sedation techniques and should not administer combinations of drugs.

Currently both anaesthesiologists and non-anaesthesiologists are involved in sedation practice in our country and worldwide for a wide variety of procedures outside the hospital environment e.g. endoscopic procedures that include gastroscopies, colonoscopies, and bronchoscopies, egg retrievals, dentistry, minor surgical procedures, plastic procedures, and orthopaedic operations. Sedation for interventional radiology is a fast growing field. Laser therapy for lesions in small children is often done under PSA.

As far as current guidelines are concerned the SASA guidelines are seen as the guidance to safe sedation practice. These guidelines are for use by all medical practitioners and their teams.

What then about the future? Sedation services will become more popular as an alternative for general anaesthesia for certain procedures outside the operating theatre. This is a worldwide trend.

For clinical governance, accreditation of sedation services and practice inspections are suggested in the SASA guidelines. All practitioners involved in sedation practice must keep a logbook of cases performed under sedation, and are required to document and report adverse incidents and accidents.

The drivers of sedation practice in the future will be the private healthcare sector, public service, medical insurance, and patients. We often forget about patient satisfaction. In studies done by us, patients consistently rate sedation as a better option than general anaesthesia for certain procedures outside the operating theatre; the low side-effect profile, cost effectiveness, and quick recovery characteristics play a significant role in their choice.

As sedation trainers we have responded to the demand for sedation provision with sedation training and CPD activities. We have empowered healthcare professionals to become safe sedation providers.

A series of commentaries on this important clinical technique is planned for inclusion in the 2017 SADA Journals.
Oral manifestations of Tuberculosis: The role of the dentist

INTRODUCTION
The recent announcement by the Minister of Health in the National Assembly on South Africa’s position in fighting the spread of tuberculosis is welcomed by SADA. As oral health professionals we are in the forefront of diagnosing and assisting in preventing the spread of Tuberculosis.

Oral manifestations of tuberculosis have been considered to account for 0.1-5% of all TB infections. These lesions are usually secondarily inoculated with infected sputum or are due to haematogenous spread.

It won’t be an exaggeration if it is said that dental identification of the tuberculosis lesions have the potential of serving as an important aid in the first line of control for this dangerous, and often fatal, disease.

GLOBAL BURDEN OF TUBERCULOSIS
According the most recent report of WHO (2013), nearly 8.6 million people around the world became infected with TB disease. There were around 1.3 million TB-related deaths worldwide.

An estimated 1.1 million (13%) of the 8.6 million people who developed TB in 2012 were HIV-positive. About 75% of these cases were in the African Region.

HIV-1-associated TB is reaching epidemic proportions in many African countries. The prevalence and incidence of TB is similar in both HIV-positive and HIV-negative individuals, but the risk of active TB was elevated only for seropositive subjects. Increasing problems with TB may well continue because of the continuing emergence of MDR strains of M. TB, which is a major threat, particularly with HIV- and AIDS-infected patients, among whom mortality rates are high.

Saliva is considered to have a significant protective role which explains the paucity of oral lesions, despite the large numbers of bacilli present in sputum which are in contact with the oral mucosa in a typical case of pulmonary tuberculosis. Local factors that may facilitate the invasion of oral mucosa include poor oral hygiene, leukoplakia, local trauma, and irritation by clove chewing, etc. Self-inoculation by the patient usually results from infected sputum or by haematogenous or lymphatic dissemination.

Conditions that predispose to the disease include crowded urban living, drug abuse, poor health and hygiene, poverty. Viral infections like HIV with or without the development of AIDS, cause immunosuppression which has lately emerged as a very significant risk factor for the development of TB.

ORAL MANIFESTATIONS OF TUBERCULOSIS
Oral TB lesions may be either primary or secondary in occurrence. Primary lesions are uncommon, seen in younger patients, and present as single painless ulcer with regional lymph node enlargement. Primary oral TB can be present as painless ulcers of long duration with enlargement of the regional lymph nodes.

The secondary lesions are common, often associated with pulmonary disease, usually present as a single, indurated, irregular, painful ulcer covered by inflammatory exudates in patients of any age group but relatively more common in middle-aged and elderly patients.

Oral TB may occur at any location on the oral mucosa, but the tongue is most commonly affected. Other sites include the palate, lips, buccal mucosa, gingiva, palatine tonsil, and floor of the mouth. Salivary glands, tonsils, and uvula are also frequently involved. The oral lesions may be present in a variety of forms, such as ulcers, nodules, tuberculomas, and periapical granulomas.

The oral manifestations of TB can also be in the form of superficial ulcers, patches, indurated soft tissue lesions, or even lesions within the jaw that may be in the form of TB osteomyelitis or simple bony radiolucency.

Of all these oral lesions, the ulcerative form is the most common. It is often painful, with no caseation of the dependent lymph nodes.

Primary gingival involvement is more common in children and adolescents than adults. It usually presents as a single painless indolent ulcer, which progressively extends from...
the gingival margin to the depths of the adjacent vestibule and is often associated with enlarged cervical lymph nodes. They may be single or multiple, painful or painless and usually appear as irregular, well-circumscribed ulcers with surrounding erythema without induration. Satellite lesions are commonly found.

When oral TB occurs as a primary lesion, an ulcer is the most common manifestation usually developing along the lateral margins of the tongue which rest against rough, sharp, or broken teeth or at the site of other irritants. Patients with oral tubercular lesions often have a history of pre-existing trauma. Any area of chronic irritation or inflammation may favour localization of the Mycobacterium associated with the disease.

Deep tubercular ulcers of the tongue are typical in appearance with a thick mucous material at the base. These tongue lesions are characterized by severe unremitting and progressive pain that profoundly interferes with proper nutrition and rest. Classically, tubercular ulcers of the tongue may involve the tip, lateral margins, dorsum, the midline, and base of the tongue. They are irregular, pale, and indolent with inverted margins and granulations on the floor with sloughing tissue.

With the increasing number of TB cases, unusual forms of the disease in the oral cavity are more likely to occur and be misdiagnosed. Although rare, dentists should be aware of the oral lesions of TB and consider them in the differential diagnosis of suspicious oral ulcers. TB of the oral cavity frequently simulates cancerous lesions and other problems such as traumatic ulcers, aphthous ulcers, actinomycosis, syphilitic ulcer, or Wegener's granuloma. The traumatic ulcer, which occurs in areas of chronic irritation from either sharp cusps or prosthesis, is acute in presentation and exquisitely tender. Also, the source of irritation is usually evident on examination. The chronic indurated ulcer has to be carefully distinguished from a carcinoma, for, as with other TB lesions of head and neck, they can resemble each other and frequently coexist.

The history reported by the patient and the clinical and radiological examination play an important part in the diagnosis of TB. However, laboratory confirmation and thorough histopathological examination is most essential for the diagnosis, with culture of microorganisms taken as the absolute proof of the disease.

**TREATMENT**

The treatment of oral tuberculosis lesions is the same as the systemic tuberculosis. Currently, the most effective regimens require a combination of four drugs (isoniazid, rifampicin, pyrazinamide, and ethambutol) administered daily for the first two months, followed by an additional four months with only two drugs (isoniazid and rifampicin).

**PRECAUTIONS FOR DENTAL HEALTH CARE PROFESSIONAL**

Clinical Dental Practice has a potential for transmission of various infections from patient to Dentist, patient to patient as well as Dentist to patient due to close proximity to the nasal and oral cavities of the patient.

Thus, a barrier should be created to prevent the transmission of infections and to make the clinical procedures safe from the threat of cross infections.

A detailed history of TB should prompt the dental practitioner to discern whether the person is an active case under treatment, active case without treatment or previously infected but currently disease free. The non-treated active cases pose maximum risk to the dental healthcare personnel.

Dental healthcare professionals are at the constant risk of being exposed to TB by means of splatter, aerosols or infected blood. Dental treatment for those with active tuberculosis should be limited to urgent and essential procedures.

As numerous serious diseases are air-borne, blood-borne or can spread through the contact of other body fluids, and it is impossible to know which certain patients are infected, it is pertinent to avoid direct contact with blood, body fluids and mucous membranes. High standards of operator dis-infection and instrument sterilization should be maintained.

Rubber dams can be used to minimize aerosol contact however, if coughing is evident, rubber dam should not be used.

Maintenance of proper hand hygiene, personal protective equipment (eye shields, face masks, headcaps, gloves and surgical gowns) and proper sterilization procedures should be followed. Standard surgical face masks do not protect against TB transmission; dental healthcare personnel should use particulate face masks. Masks should be changed at regular intervals, inter-appointments (between patients) and intra-appointments (during patient treatment) if the mask becomes wet.

Reusable facial protective equipment (protective eyewear or face shields) should be cleaned and disinfected between patients. Handpieces and other oral instruments should be cleaned and autoclaved regularly.

The goal of the dental infection-control program is to provide a safe working environment that reduces the risk of both healthcare-associated infections among patients and occupational exposures among dental team members.

**CONCLUSION**

Intercepting the disease early will increase the morbidity and mortality of the patients.

It becomes the duty of the dentist to include tuberculosis in differential diagnosis of suspicious oral lesions to avoid needless delay in the treatment of this disease.

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**Holiday Season Salutations**

Good wishes to all our readers. May this be a time of great happiness and relaxation. And may 2016 bring new opportunities and joy.

- Team SADJ
Oral health and subjective psychological well-being among South African Adults: Findings from a national household survey

ABSTRACT

Objective: To determine the association between oral health and socioeconomic status with subjective psychological well-being.

Methods: An interviewer-administered questionnaire was conducted during 2011 on a nationally representative sample of South African adults ≥16 years (n=2,971) who reported on socio-demographic data, past dental visit patterns, number of remaining teeth and oral and general health status. Subjective well-being was computed as the sum of scores obtained from participants’ estimates of level of happiness (scale 0-6) and rating of level of satisfaction with life (scale 0-4). Analyses included t-tests and multivariable-adjusted Poisson regression.

Results: The average score on a scale of 0-10 for subjective well-being was 6.31 (95%CI=6.17-6.44), which decreased with age, but increased with level of education and frequency of dental visits. Even after controlling for socioeconomic status, those who rated their oral health as good were more likely to report a higher subjective well-being (Prevalence Rate ratio (PRR) =1.14; 95% CI=1.03-1.27). Those who reported visiting a dentist at least every 6 months reported higher subjective well-being (PRR=1.10; 1.04-1.16).

Conclusions: Good oral health is independently associated with greater subjective well-being. This highlights the need to prioritise oral health promotion as an integral part of promoting general health and improving the quality of life of South Africans.

INTRODUCTION

Although chronic diseases and disability are associated with unsatisfactory health outcomes, those affected may still be leading fruitful and productive lives. Conversely, those with predictable normative health outcomes may indicate subjective reduction in satisfaction about life and/or an unhappiness. Accordingly, individuals’ health care needs would be better managed if the subjective or self-perceived health outcomes of the patient are integrated with clinical practice.

The concept of health related quality of life (HRQoL), remains a well-established framework for assessment of subjective health outcomes. This framework is useful as it recognises health to be a multidimensional concept; thereby providing the impetus to move beyond normative domains like survival, the illness and impairment that may result from dental caries or missing teeth, and move to include functional and psychosocial domains in the planning and evaluation of health care.

Numerous studies have demonstrated an association between physical activity, daily intake of fruits and vegetables, and oral conditions and functional and social well-being as measured by levels of happiness. However, according to Piqueras et al, subjective well-being which is an evaluative reaction of a person to his/her life, has two components, namely the cognitive component (i.e. cognitive evaluation of life satisfaction) and an affective component (such as happiness). Yet, the limited number

ACRONYMS

HRQoL: Health related quality of life
PRR: Prevalence rate ratio
SASAS: South African Social Attitude Survey
SW: Subjective well-being

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of studies on the association between oral health and psychological well-being has focused mainly on the affective component – happiness.

Considering that no study to date has evaluated the association between oral health and subjective well-being among adults in South Africa in particular, and in Africa in general, this study sought to determine that association as measured by both level of happiness and perceived level of satisfaction with life. Furthermore, considering that the individual’s socioeconomic position can conceivably influence oral health and subjective well-being, this study also examined the role of socioeconomic status as the mediator of the effect of oral health on subjective well-being.

METHODS

Data source

This analysis was based on the 2011 South African Social Attitude Survey (SASAS), which is a nationally representative household interviewer-administered questionnaire survey. The SASAS is conducted annually by the Human Sciences Research Council. This study is part of a larger study to investigate the effect of socioeconomic position on oral health-related quality of life by including questions additional to the questionnaire of the 2011 SASAS. The target population of SASAS includes non-institutionalised South African adults aged 16 years and older. The SASAS used a multi-stage probability sampling strategy with census enumeration areas as the primary sampling unit. Sampling involved stratification by socio-demographic domain for each province and geographical subtypes, namely tribal areas, formal rural, formal urban and informal urban. This stratification was designed to ensure sufficient geographical distribution across all nine provinces, and adequate distribution between South Africa’s four ethnic/race groups as currently used in the South African population census, namely: self-identifying as Black African; Coloured; Indian or Asian; or White. The Human Sciences Research Council granted ethical clearance for this survey.

Outcome measures

Subjective well-being (SW) was measured using two items. Considering that previous studies have demonstrated the validity of a single-item life satisfaction measure and found this to be comparable with multiple-item measures, life satisfaction in this study was measured with the single-item: ‘How satisfied are you with your life as a whole these days?’ Responses were coded on a scale from 0 to 4, ranging from ‘very dissatisfied’ to ‘very satisfied’. The other measure of SW for the survey was based on the question: ‘If you were to consider your life in general these days, how happy or unhappy would you say you are, on the whole?’ Responses were coded on a scale from 0 to 6, ranging from ‘completely unhappy’ to ‘completely happy’. Subjective well-being was computed as a sum of the scores on both items with the possible score ranging between 0 and 10.

Independent variables

Self-reported oral health and general health status were considered the main predictor variables. Self-reported health is considered the individual’s personal evaluation of their (oral) health, integrating all aspects of (oral) health, including physical, social and functional aspects. The validity of these constructs has been demonstrated in previous studies. Self-reported general health was determined by the response of the study participants to a five scale question, ‘In general, would you say your health is,… [This refers to both physical and mental health]. Would you say it is poor (coded 0), fair (1), good (3), very good (4) or excellent (5)? The response options we collapsed into three categories of self-rated general health, namely 0 for poor, 1 for fair and 2 for good, very good or excellent. Similarly, self-rated oral health was determined by a response to a five scale question, ‘How would you rate your oral health? Response options included ‘very poor’ (0), ‘poor’ (1), ‘neither nor’ (3), ‘good’ (4), ‘very good’ (5). We also collapsed these options to form three outcomes of self-rated oral health: 0 for very poor or poor, 1 for neither nor and 2 for good or very good.

We further considered key individual demographic markers (age, sex, race, marital status) as predictors in our analysis. Information on the participants’ province and place of residence (rural, urban formal or urban informal area) as well as socioeconomic position was obtained using the questionnaire. Two different measures of socioeconomic position were used, namely the respondents’ highest level of educational attainment (<grade 12; grade 12; >grade 12) and subjective socioeconomic position. The latter was measured using a ten scale question: ‘In our society, there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself on this scale?’. Responses were coded from 1 to 10, ranging from the ‘Top’ to the ‘Bottom’ of the scale.

In order to measure pain experience from common oral conditions, the respondents answered ‘Yes or No’ to the question asking if in the last six months they had experienced pain from the teeth or gums. Furthermore, dental care behaviour was measured by the question: ‘How often do you visit a dentist or dental clinic?’. Responses were categorised as 0 for never, 1 for only when in pain or whenever needed, 2 for once every 2 years, 3 for once a year and 4 for once every 6 months.

Data analysis

Factor analysis using the principal component analysis was applied to develop the subjective well-being measure and Cronbach’s alpha was used to determine the reliability of the two-item subjective well-being scale. Construct validity of the subjective well-being scale was determined by exploring the association between self-reported general health and subjective well-being, as it was expected that self-reported general health would to be associated with subjective well-being.

Descriptive (median, mean and 95% confidence intervals) and bivariate statistics were employed to study the distribution of subjective well-being according to sociodemographic and self-reported oral health behaviour and condition. The conceptual framework introduced by Baron and Kenny was used for testing the mediation effect of socioeconomic variables. True mediation occurs when
both the predictor and mediator are associated with the outcome, the predictor is associated with the mediator, and the association between the predictor and the outcome is attenuated by the mediator.

As the outcome (subjective well-being) was a count variable, a multi-variable adjusted Poisson regression was used to test the independent association between the predictors and the outcome. Using purposeful selection, two separate models were constructed, namely one without the two socioeconomic potential mediator variables and the other with the two socioeconomic variables. The latter model allowed us to observe any attenuation in the magnitude of the association between the predictor variables and the outcome. All variables with \(P<0.25\) were kept in the final model. All statistical tests performed using STATA version 12, took into account the complex sampling employed in SASAS and estimates provided were weighted in respect of the response pattern and the need to keep the national representation of the study sample. All statistical tests were two-tailed and the level of statistical significance was set at \(p<0.05\).

RESULTS

The study participants, as expected, were representative of the national socio-demographic distribution namely that respondents predominately self-identified as black Africans (76.7%), female (52.5%), resident in the formal or

<table>
<thead>
<tr>
<th>Table 1: Sample behavioural and socio-demographic Characteristics</th>
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<tbody>
<tr>
<td><strong>% (n)</strong></td>
</tr>
<tr>
<td>Self-rated Oral health (OH)</td>
</tr>
<tr>
<td>Poor OH</td>
</tr>
<tr>
<td>Fair</td>
</tr>
<tr>
<td>Good</td>
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<tr>
<td>Self-rated General Health (GH)</td>
</tr>
<tr>
<td>Poor GH</td>
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<tr>
<td>Fair GH</td>
</tr>
<tr>
<td>Good GH</td>
</tr>
<tr>
<td>Dental visit pattern</td>
</tr>
<tr>
<td>Never visited</td>
</tr>
<tr>
<td>Symptomatic</td>
</tr>
<tr>
<td>Once 2 years</td>
</tr>
<tr>
<td>Once per year</td>
</tr>
<tr>
<td>Every 6 months</td>
</tr>
<tr>
<td>Reported number of natural Teeth left</td>
</tr>
<tr>
<td>None (edentulous)</td>
</tr>
<tr>
<td>≤ half of teeth</td>
</tr>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>Informal urban</td>
</tr>
<tr>
<td>Formal Urban</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
</tr>
<tr>
<td>Black African</td>
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<tr>
<td>Coloured</td>
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<tr>
<td>Indian/Asian</td>
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<td>White</td>
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<tr>
<td>Gender</td>
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<td>Male</td>
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<td>Female</td>
</tr>
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<td>Education</td>
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<tr>
<td>&lt;Grade 12</td>
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<tr>
<td>Grade 12</td>
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<tr>
<td>&gt;=Grade 12</td>
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<tr>
<th>Table 2: Socio-demographic and oral health-related factors associated with reporting being happy.</th>
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<tbody>
<tr>
<td>% Happy</td>
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<tr>
<td>Self-rated Oral health (OH)</td>
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<td>Self-rated General Health (GH)</td>
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<td>Dental visit pattern</td>
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<td>Reported number of natural Teeth left</td>
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<td>Gender</td>
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<td>Education</td>
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NS = Not significant i.e. \(p>0.05\), otherwise significant differences; SE = standard error. Where superscript letters differ means values are statistically significantly different.
informal urban areas (64.7%), and having achieved lower than grade 12 level of education (55.9%). In general, 4.6% reported poor general health, 8.1% poor oral health, 5.7% reported being edentulous and only 4.9% reported 6-monthly routine preventive dental visits (Figure 1), which translates to weighted counts of 1,546,798, 2,690,509, 1,904,272 and 1,620,071 people respectively. Of the study participants, 28.3% (weighted count = 8,784,535) reported being not happy and 26.3% (weighted count=8,750,029) reported not being satisfied with their life in general. Compared with those reporting being satisfied with their life, significantly more of those who reported not being satisfied with their life reported being unhappy (16.3% vs. 54.7%; p<0.001).

The two-item measure of subjective well-being was found reliable as demonstrated by a satisfactory internal consistency (Cronbach’s alpha = 0.68). Proportion of those who reported being completely/fairly happy was highest among those who reported good oral health (77.2%), good general health (78.2%), 6 monthly dental visits (90.9%), having all/most of their teeth (84.7%), residing in formal urban areas (81.7%), self-identified as white (91.9%), male (72.3%), had greater than grade 12 education (92.7%). There were significant differences in the reported levels of happiness across provinces with the highest proportion of those reporting being completely/fairly happy being in the Western Cape (87.3%) and the lowest being in the Eastern Cape Province (59.9%) (Data not shown). Similarly, the mean scores for subjective psychological wellbeing based on a scale of 0 to 10, was highest among those reporting good oral health, good general health, 6 monthly visits, formal urban residents, self-identifying as white, being male and having greater than grade 12 (Table 2).

Unadjusted Poisson regression showed a significant association between higher subjective wellbeing and reported good oral health status, good general health, one year and six monthly preventive dental visits, formal urban residence, higher level of education, self-identifying as white and reporting higher subjective socioeconomic position (Table 2). Following adjustment for socioeconomic status, age and provincial variations, although the prevalence rate ratios became attenuated, reporting good oral health (PRR=1.12; 1.01-1.24) and good general health (PRR=1.19; 1.07-1.37) remained significantly associated with better psychological wellbeing as compared with reporting poor oral health and poor general health. Furthermore, as compared with having never visited a dentist, only making preventive dental visits every six months was associated with better psychological wellbeing (PRR=1.08; 1.01-1.14) (Table 3). Race/ethnicity completely lost statistical significance in an adjusted regression model, suggesting that race/ethnic differences were completely mediated by socio-economic differences among the racial groupings.

| Table 3: Factors independently associated with subjective well-being |
|------------------|------------------|------------------|------------------|------------------|
|                  | Unadjusted PRR   | Adjusted* PRR    |                  |
| Oral Health      |                  |                  |                  |
| Poor             | 1                | 1                |                  |
| Fair             | 1.15 (1.03 – 1.29) | 1.07 (0.97 – 1.19) |                  |
| Good             | 1.33 (1.19 – 1.48) | 1.12 (1.01 - 1.24) |                  |
| General Health   |                  |                  |                  |
| Poor             | 1                | 1                |                  |
| Fair             | 1.11 (0.99 – 1.25) | 1.05 (0.94 – 1.17) |                  |
| Good             | 1.41 (1.26 – 1.57) | 1.19 (1.07 – 1.32) |                  |
| Dental visit pattern |                |                  |                  |
| Never            | 1                | 1                |                  |
| Symptomatic      | 1.04 (1.00 – 1.09) | 1.03 (0.99 – 1.07) |                  |
| Once 2 years     | 1.03 (0.91 – 1.17) | 1.01 (0.93 – 1.09) |                  |
| Once in 1 year   | 1.29 (1.06 – 1.20) | 1.02 (0.97 – 1.07) |                  |
| Every 6 months   | 1.22 (1.14 – 1.31) | 1.08 (1.01 – 1.14) |                  |
| Residence location |                |                  |                  |
| Rural            | 1                | 1                |                  |
| Informal Urban   | 1.05 (0.96 - 1.17) | 0.98 (0.91 – 1.07) |                  |
| Urban            | 1.26 (1.20 – 1.33) | 1.07 (1.02 – 1.13) |                  |
| Education        |                  |                  |                  |
| < Grade 12       | 1                | 1                |                  |
| Grade 12         | 1.18 (1.14 – 1.23) | 1.06 (1.02 – 1.09) |                  |
| > Grade 12       | 1.33 (1.21 – 1.39) | 1.07 (1.02 – 1.11) |                  |
| SEP ranking      |                  |                  |                  |
| Continuous (1-10)| 1.09 (1.08 – 1.10) | 1.06 (1.05 – 1.08) |                  |
*Also controlled for difference in rates per province and age. PRR=Prevalence rate ratio

DISCUSSION

The findings of this study suggest that there were almost twice as many people who reported poor oral health as there were people who reported poor general health. Furthermore, that subjective psychological wellbeing is independently influenced by self-reported oral and general health status, dental visit, place of residence, education and socioeconomic status. This study also showed that a substantial number of those who reported being unsatisfied with their life still reported being happy, confirming that these are two different constructs of subjective well-being.

The finding that good oral health is a significant predictor of better psychological wellbeing among South Africans is consistent with results from similar studies that have shown that dental pain, untreated caries, edentulism, inability to chew, malocclusion etc. impact on social interactions, influence happiness, and impact on the quality of life.14,17 Operating through the psychological pathway, oral health therefore seems to have an independent influence on subjective wellbeing in various settings.14,15

Remarkably, subjective assessment of oral health as opposed to the objective assessment such as physical absence of teeth had greater impact on the psychological wellbeing of South African adults. This has also been observed in several other studies in a variety of settings and supports the call for a shift from traditionally...
normative assessment of care to a patient-centered
centred clinical care.5,10,19 Patients’ global assessment
of their oral health would indeed not only be related to the
absence or presence of oral disease but may also include
perception of dental appearance and the extent that this
may influence social interaction. Those who perceive their
oral health as poor, would conceivably feel less happy,
less satisfied with life and thus have poor subjective
wellbeing. Perceived poor oral health, particularly among
those of low SES who might not be able to afford regular
routine preventive dental visits or afford to have prosthetic
replacements for missing teeth, may therefore impose
additional psychosocial burden resulting in further decline
in the wellbeing and quality of life of individuals.9,10,13

This study like other similar studies is prone to cross-
sectional design limitations, despite being nationally
representative. Hence the study’s findings should be
interpreted cautiously, given that direction of causal relation
cannot be accurately determined without evidence of the
temporal order of events. For instance, it is not known if
participants had been unhappy and unsatisfied with life
before developing poor oral health as opposed to the other
way round. Noticeably, properly designed longitudinal
studies are necessary to evaluate the temporal effects on
perception of oral health on subjective wellbeing. This study
nevertheless draws the attention of oral health practitioners
to the fact that perceived poor oral health, reduced levels
of happiness, dissatisfaction with life and thus poorer
psychological wellbeing may coexist within different strata
of South African population, particularly among already
vulnerable groups. These vulnerable subgroups include
those living in the rural or informal areas, less educated (≤
grade 12), and having had infrequent or no dental visit in
the last two years. Poor oral health therefore has the potential
to worsen inequality in health and wellbeing in South Africa,
thus the need for Government to prioritise interventions to
improve oral health among the identified vulnerable groups
in this study.

CONCLUSIONS

Good oral health status is associated with better subject-
ive psychological wellbeing independent of socio-
economic status. This study’s findings also highlight the
need to consider subjective wellbeing as an important
outcome in oral health interventions or oral health policy
outcomes.20,21 Therefore, in planning future healthcare
services such as that envisaged within the National Health
Insurance (NHI) scheme, health care outcomes should go
beyond clinical measures of disease but should incorpo-
rate improved subjective wellbeing. Finally, this study’s
findings highlight the need to incorporate oral health pro-
motion in all interventions to improve general health and
the quality of life of South Africans.

Conflict of interest: None declared

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322(7298):1557.
Background: Patient satisfaction is multidimensional. The clinician’s perspective of a good outcome and the patient’s experience of a satisfactory service are often two different end-points. The primary aim of our study was to assess the perioperative experience of patients undergoing procedural sedation. A secondary aim was to create a postoperative questionnaire which could be used as a measurement tool. The questions could also be used as an audit to assist with adherence to quality assurance and clinical governance.

Method: A questionnaire was compiled to attempt to assess the perioperative aspects of procedural sedation. Five hundred consecutive patients undergoing procedural sedation for dental-related outpatient procedures were asked to complete a questionnaire. Patients who didn’t complete it were excluded. Ninety-eight per cent of the patients returned the questionnaire and 489 questionnaires were evaluated.

Results: A total of 489 patients were included. Ninety-three per cent of the patients expressed a good (7+/10) overall experience of procedural sedation, and 92.6% indicated that they would recommend it to others.

Conclusion: Our study population showed a high level of satisfaction with their sedation experience. It is suggested that the devised questionnaire could be used successfully in future as an assessment tool or audit of patient satisfaction following procedural sedation for ambulatory surgery.

Keywords: patient satisfaction, postoperative questionnaire, procedural sedation

INTRODUCTION
The concept of procedural sedation is widely accepted for managing pain and anxiety for procedures outside the operating theatre. Defining patient satisfaction involves a multidimensional approach which includes clinical aspects of care, safety, and patients’ perception of a satisfactory outcome.

Procedural sedation is a rapidly expanding field. It is an alternative to general anaesthesia within the scope of widening ambulatory surgery. Patients are often poorly informed of what procedural sedation entails, and want reassurance that even though they are not unconscious, as in the case of general anaesthesia, they will still be comfortable, and without pain and anxiety while in the chair.

Measuring clinical outcomes is limited by a lack of validating instruments. Mortality and length of hospital stay are commonly used variables. However, neither is applicable in the case of elective ambulatory surgery. Patients expect more from an anaesthetic than merely being able to wake up afterwards. For example, postoperative nausea and vomiting (PONV) after general anaesthesia can increase the cost of the total health care by increasing recovery room time and potential hospital admission. It is equally important that patients are dissatisfied and uncomfortable with PONV. Patients report that avoiding PONV is of greater importance than preventing postoperative pain.

Patients are viewed as customers who expect a certain standard of care in a service delivery-driven world. Patient autonomy gives patients the right to partake in a number of available treatment options.

According to local sedation guidelines, an annual audit needs to be conducted of the performance of every practice for clinical governance and quality assurance. The primary aim of our study was to assess the perioperative experience of patients undergoing procedural sedation for ambulatory dental procedures. A secondary aim was to create a postoperative questionnaire which could be used as a measurement tool. The questions can also be used as an audit to assist with adherence to quality assurance and clinical governance within a practice setting.
### Table 1: The post-sedation questionnaire used in the study

<table>
<thead>
<tr>
<th>Questions asked</th>
<th>Method of answering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why did you opt for conscious sedation?</td>
<td>Tick the appropriate box</td>
</tr>
<tr>
<td>• Fear or anxiety about being awake while the surgeon is doing the procedure</td>
<td></td>
</tr>
<tr>
<td>• To avoid experiencing a gag reflex, as conscious sedation also helps to alleviate the gag reflex</td>
<td></td>
</tr>
<tr>
<td>• The length of the procedure is too long to be awake and experience the whole surgery</td>
<td></td>
</tr>
<tr>
<td>• A previous bad experience with surgery under a local or general anaesthetic</td>
<td></td>
</tr>
<tr>
<td>• A previous good experience with sedation</td>
<td></td>
</tr>
<tr>
<td>• It was suggested by the surgeon or dentist</td>
<td></td>
</tr>
<tr>
<td>• There is an advantageous cost benefit with sedation over the other procedures</td>
<td></td>
</tr>
<tr>
<td>• Other</td>
<td></td>
</tr>
<tr>
<td>Before sedation:</td>
<td>Circle “Yes” or “No” as your response to each subquestion</td>
</tr>
<tr>
<td>• Did you receive printed documentation on sedation beforehand?</td>
<td></td>
</tr>
<tr>
<td>• Did the surgeon explain sedation to you before the procedure?</td>
<td></td>
</tr>
<tr>
<td>• Did the sedationist explain sedation to you before the procedure?</td>
<td></td>
</tr>
<tr>
<td>• Did you feel more comfortable after the sedationist talked to you?</td>
<td></td>
</tr>
<tr>
<td>• Did you feel comfortable having the surgery performed under sedation?</td>
<td></td>
</tr>
<tr>
<td>• In hindsight, do you think that you were adequately prepared for sedation?</td>
<td></td>
</tr>
<tr>
<td>On a scale of 1–10, what was your experience of the operation under conscious sedation? (1 = “never again” and 10 = “excellent”)</td>
<td>Select the appropriate number</td>
</tr>
<tr>
<td>During sedation, did you:</td>
<td>Circle “Yes” or “No” as your response to each subquestion</td>
</tr>
<tr>
<td>• Feel uncomfortable at all?</td>
<td></td>
</tr>
<tr>
<td>• Feel as if you were choking?</td>
<td></td>
</tr>
<tr>
<td>• Feel cold at any stage?</td>
<td></td>
</tr>
<tr>
<td>• Have any problems breathing?</td>
<td></td>
</tr>
<tr>
<td>• Experience any pain?</td>
<td></td>
</tr>
<tr>
<td>The nature of conscious sedation allows for communication between doctor and patient during the sedation. You were frequently reassured throughout the procedure. Do you remember:</td>
<td>Tick an option:</td>
</tr>
<tr>
<td>• The nature of this?</td>
<td>• Not at all</td>
</tr>
<tr>
<td>• The sedationist’s intravenous injection in your arm or hand?</td>
<td>• A little</td>
</tr>
<tr>
<td>• The local anaesthetic injection by the dentist or surgeon?</td>
<td>• All of it</td>
</tr>
<tr>
<td>• Follow-up injections of local anaesthetic by the dentist or surgeon?</td>
<td></td>
</tr>
<tr>
<td>• The operation or procedure itself?</td>
<td></td>
</tr>
<tr>
<td>• How much of your journey home can you remember after the sedation?</td>
<td>Tick an option:</td>
</tr>
<tr>
<td>Did you have a headache after your procedure?</td>
<td>Tick an option:</td>
</tr>
<tr>
<td>After the sedation:</td>
<td>Circle “Yes” or “No” as your response</td>
</tr>
<tr>
<td>• Did you have to take antibiotics after your surgery?</td>
<td></td>
</tr>
<tr>
<td>• Did you feel nauseous before you left the surgery or clinic?</td>
<td></td>
</tr>
<tr>
<td>• Did you feel nauseous after you left the surgery or clinic? (i.e. within 24 hours of being discharged)</td>
<td></td>
</tr>
<tr>
<td>• Did you vomit before you left the surgery or clinic?</td>
<td></td>
</tr>
<tr>
<td>• Did you vomit after you left the surgery or clinic? (i.e. within 24 hours of being discharged)</td>
<td></td>
</tr>
<tr>
<td>How soon after surgery did you experience pain at the operation site, if at all?</td>
<td>Tick an option:</td>
</tr>
<tr>
<td>On a scale of 0–10, please rate the degree of pain experienced two hours after your operation was complete? (0 = “no pain at all” and 10 = “worst pain”)</td>
<td>Select the appropriate number</td>
</tr>
<tr>
<td>On returning home, did you suffer from a disturbance in your sleep pattern?</td>
<td>Tick an option:</td>
</tr>
</tbody>
</table>
**METHOD**

The questions were designed based on the entire peri-operative experience, starting with the indications and preoperative information given. Questions on the procedure itself, immediate postoperative time and the following 48 hours, based on common side-effects experienced, were also included. The questions were based on existing questionnaires that have been in use at our facility. A total of 28 questions was listed. The questionnaire is included in Table 1 in its entirety.

During August 2014, 500 adult patients who received procedural sedation for dental-related procedures were included in this study. They were asked to complete the questionnaire. A total of 490 patients (98%) returned it. The patients received it in a stamped envelope at the time of their procedure, and were asked to return it via mail or at their first follow-up visit. Patients who failed to complete the questionnaire were excluded. Patients’ responses remained confidential and anonymous.

Four hundred and eighty-nine questionnaires remained for analysis. All questions in the remaining eligible questionnaires were assessed separately and a record was kept of unanswered questions. We expressed each unanswered answer as a percentage of the total assessed (489).

Patients underwent procedural sedation, in which advanced techniques were utilised. Advanced sedation techniques are defined as the use of a combination of sedative and/or analgesic drugs administered via any route, or by using intravenous sedation, with the exception of titrated dosages of midazolam, or by target-controlled infusion. Patients received a combination of titrated midazolam, propofol and a small dose of ketamine immediately before the local anaesthetic injection.

Moderate sedation and analgesia levels were targeted and achieved for patients. This is defined as the drug-induced depression of consciousness, during which the patient responds purposefully to verbal commands, either alone or accompanied by light and tactile stimulation. Intervention is not required to maintain a patent airway. Spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

**RESULTS**

In studies done that utilizes mail to communicate information to and from patients, a response rate of 50% for mailing methods was considered to be adequate for analysis. Of the 500 patients in this study, 98% returned their questionnaire. The results are summarised in Table 2.

**Preoperative experience**

Two hundred and fifty-two patients (51.5%) opted for procedural sedation due to fear or anxiety of being awake during the procedure, while 233 patients (47.6%) had been recommended sedation. Four hundred and sixty-three patients (94.7%) felt more comfortable after discussing the procedure with the sedationist.

**During sedation**

Four hundred and fifteen patients (84.9%) reported that they never felt uncomfortable during the procedure, and 431 (88.1%) that they didn’t experience any pain. Of the 489 patients, 315 (64.4%) couldn’t remember the local anaesthetic injection.

**After the procedure**

Fifty patients (10.2%) felt nauseous after they left the clinic, and only 13 patients (2.7%) vomited. Four hundred and fifty-four (93%) patients expressed a good (7+/10) overall experience of procedural sedation. Four hundred and fifty-three (92.6%) patients would recommend it to others.

**DISCUSSION**

Overall, the patients were very satisfied with their experience of procedural sedation. They were well-informed about the procedure and sedation, as demonstrated by our study results. Patients recovered quickly, with minimal post-sedation sideeffects, which facilitated a speedy return to work and normal duties.

The response rate achieved using a mailed questionnaire is usually less than that obtained using an interviewing method. However, an extremely high response rate was accomplished in our study. This could possibly be explained by our chosen method of collecting the questionnaire. Patients could either mail the envelope back (the envelope was already addressed and stamped), or bring it with them to the first follow-up consultation. Patients

**Table 1:** (Continued)

<table>
<thead>
<tr>
<th>Questions asked</th>
<th>Method of answering</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long did it take before you felt as if you could resume your usual duties?</td>
<td>Tick an option:</td>
</tr>
<tr>
<td></td>
<td>• The same day</td>
</tr>
<tr>
<td></td>
<td>• The next day</td>
</tr>
<tr>
<td></td>
<td>• Within 2 days</td>
</tr>
<tr>
<td>What would be your choice of sedation if you were to undergo a similar procedure again?</td>
<td>Tick an option:</td>
</tr>
<tr>
<td></td>
<td>• Local anaesthetic</td>
</tr>
<tr>
<td></td>
<td>• Local anaesthetic with sedation</td>
</tr>
<tr>
<td></td>
<td>• General anaesthetic</td>
</tr>
<tr>
<td>How would you evaluate the cost of the sedation that you received?</td>
<td>Tick an option:</td>
</tr>
<tr>
<td></td>
<td>• Modest</td>
</tr>
<tr>
<td></td>
<td>• Fair</td>
</tr>
<tr>
<td></td>
<td>• Too expensive</td>
</tr>
<tr>
<td></td>
<td>• Not applicable</td>
</tr>
<tr>
<td>Do you feel that you would recommend conscious sedation to others?</td>
<td>Circle “Yes” or “No” as your response</td>
</tr>
</tbody>
</table>
### Table 2: A summary of the results

<table>
<thead>
<tr>
<th>Why did you opt for conscious sedation? (More than one indication is acceptable)</th>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear or anxiety about being rendered unconscious</td>
<td>51.5</td>
</tr>
<tr>
<td>To avoid experiencing the gag reflex, the norm with general anaesthesia</td>
<td>11.0</td>
</tr>
<tr>
<td>The length of the procedure is relatively short</td>
<td>23.5</td>
</tr>
<tr>
<td>A previous bad experience with surgery under a local or general anaesthetic</td>
<td>14.3</td>
</tr>
<tr>
<td>A previous good experience with sedation</td>
<td>26.2</td>
</tr>
<tr>
<td>It was suggested by the surgeon or dentist</td>
<td>47.6</td>
</tr>
<tr>
<td>There is an advantageous cost benefit with sedation over the other procedures</td>
<td>0.8</td>
</tr>
<tr>
<td>Other</td>
<td>2.0</td>
</tr>
<tr>
<td>No answer</td>
<td>0.2</td>
</tr>
</tbody>
</table>

#### Before sedation

<table>
<thead>
<tr>
<th></th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>No answer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you receive printed documentation on sedation beforehand?</td>
<td>96.0</td>
<td>3.3</td>
<td>0.6</td>
</tr>
<tr>
<td>Did the surgeon explain sedation to you before the procedure?</td>
<td>90.0</td>
<td>7.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Did the sedationist explain sedation to you before the procedure?</td>
<td>97.9</td>
<td>1.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Did you feel more comfortable after the sedationist talked to you?</td>
<td>94.7</td>
<td>3.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Did you feel comfortable having the surgery performed under sedation?</td>
<td>97.5</td>
<td>1.8</td>
<td>0.6</td>
</tr>
<tr>
<td>In hindsight, do you think that you were adequately prepared for sedation?</td>
<td>97.5</td>
<td>1.8</td>
<td>0.6</td>
</tr>
</tbody>
</table>

#### During sedation

<table>
<thead>
<tr>
<th></th>
<th>1 (never again)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10 (excellent)</th>
<th>No answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results (%)</td>
<td>0.0</td>
<td>0.4</td>
<td>0.2</td>
<td>0.4</td>
<td>2.0</td>
<td>0.8</td>
<td>6.7</td>
<td>11.0</td>
<td>16.6</td>
<td>59.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>No answer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feel uncomfortable at all?</td>
<td>12.0</td>
<td>84.9</td>
<td>3.0</td>
</tr>
<tr>
<td>Feel as if you were choking?</td>
<td>2.0</td>
<td>94.7</td>
<td>3.3</td>
</tr>
<tr>
<td>Feel cold at any stage?</td>
<td>5.9</td>
<td>91.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Have any problems breathing?</td>
<td>1.4</td>
<td>97.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Experience any pain?</td>
<td>11.5</td>
<td>88.1</td>
<td>0.4</td>
</tr>
</tbody>
</table>

### How was your experience of the operation under conscious sedation? (Rate it on a scale of 1–10)

The nature of conscious sedation allows for communication between doctor and patient during the sedation. You were frequently reassured throughout the procedure.

<table>
<thead>
<tr>
<th></th>
<th>Not at all (%)</th>
<th>A little (%)</th>
<th>All of it (%)</th>
<th>No answer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The nature of this?</td>
<td>50.9</td>
<td>38.9</td>
<td>24.5</td>
<td>0.4</td>
</tr>
<tr>
<td>The sedationist’s intravenous injection in your arm or hand?</td>
<td>9.8</td>
<td>31.9</td>
<td>57.5</td>
<td>0.8</td>
</tr>
<tr>
<td>The local anaesthetic injection by the dentist or surgeon?</td>
<td>64.4</td>
<td>21.3</td>
<td>13.3</td>
<td>1.0</td>
</tr>
<tr>
<td>Follow-up injections of the local anaesthetic by the dentist or surgeon?</td>
<td>78.9</td>
<td>13.0</td>
<td>6.5</td>
<td>1.4</td>
</tr>
<tr>
<td>The operation or procedure itself?</td>
<td>42.9</td>
<td>48.0</td>
<td>8.8</td>
<td>0.2</td>
</tr>
</tbody>
</table>

### How much of your journey home can you remember after the sedation?

<table>
<thead>
<tr>
<th></th>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>4.0</td>
</tr>
<tr>
<td>A little</td>
<td>23.5</td>
</tr>
<tr>
<td>All of it</td>
<td>71.4</td>
</tr>
<tr>
<td>No answer</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Did you have a headache after your procedure?

<table>
<thead>
<tr>
<th></th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>No answer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>79.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, lasting &lt; 4 hours</td>
<td>13.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, lasting &gt; 4 hours</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No answer</td>
<td>70.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### After the sedation

<table>
<thead>
<tr>
<th></th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>No answer (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you have to take antibiotics after your surgery?</td>
<td>55.8</td>
<td>43.8</td>
<td>0.4</td>
</tr>
<tr>
<td>Did you feel nauseous before you left the surgery or clinic?</td>
<td>3.5</td>
<td>94.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Did you feel nauseous after you left the surgery or clinic? (i.e. within 24 hours of being discharged)</td>
<td>10.2</td>
<td>88.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Did you vomit before you left the surgery or clinic?</td>
<td>2.7</td>
<td>97.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Did you vomit after you left the surgery or clinic? (i.e. within 24 hours of being discharged)</td>
<td>2.7</td>
<td>95.9</td>
<td>1.4</td>
</tr>
</tbody>
</table>
had to return for a follow-up, making it easier to track their response to the questionnaire.

Chanthong et al. noted that certain dimensions should be included in a questionnaire when assessing ambulatory anesthesia, including information on postoperative pain and home care management. The measuring instrument should also include questions on information provision, physical discomfort and emotional support, i.e. relaxed, reassuring and attentive. Our postoperative questionnaire contains all of these elements.

Eberhart et al. considered patient preference by interviewing patients after a preoperative visit where general information and the side-effects of anesthesia were explained. Avoidance of PONV was a major concern of patients, followed by the desire to experience no or mild pain. The restoration of postoperative vigilance was of minor importance. It was clearly shown in our study that

<table>
<thead>
<tr>
<th>Table 2: (Continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How soon after surgery did you experience pain at the operation site, if at all?</td>
</tr>
<tr>
<td>No pain</td>
</tr>
<tr>
<td>&lt; 1 hour</td>
</tr>
<tr>
<td>1–6 hours</td>
</tr>
<tr>
<td>6–24 hours</td>
</tr>
<tr>
<td>&gt; 24 hours</td>
</tr>
<tr>
<td>No answer</td>
</tr>
</tbody>
</table>

Post sedation

On a scale of 0–10, please rate the degree of pain experienced two hours after your operation was complete?

<table>
<thead>
<tr>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (no pain at all)</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10 (worst pain)</td>
</tr>
</tbody>
</table>

On returning home, did you suffer from a disturbance in your sleep pattern?

<table>
<thead>
<tr>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
</tr>
<tr>
<td>Yes, for 1 night</td>
</tr>
<tr>
<td>Yes, for 2 nights</td>
</tr>
<tr>
<td>No answer</td>
</tr>
</tbody>
</table>

On returning home, how long did it take before you felt as if you could have resumed your usual duties?

<table>
<thead>
<tr>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same day</td>
</tr>
<tr>
<td>Next day</td>
</tr>
<tr>
<td>2 days</td>
</tr>
<tr>
<td>No answer</td>
</tr>
</tbody>
</table>

If you were to have a similar procedure again, what would be your choice?

<table>
<thead>
<tr>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local anaesthetic</td>
</tr>
<tr>
<td>Local anaesthetic with sedation</td>
</tr>
<tr>
<td>General anaesthetic</td>
</tr>
<tr>
<td>All of it</td>
</tr>
<tr>
<td>No answer</td>
</tr>
</tbody>
</table>

How would you evaluate the cost of the sedation that you received?

<table>
<thead>
<tr>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modest</td>
</tr>
<tr>
<td>Fair</td>
</tr>
<tr>
<td>Expensive</td>
</tr>
<tr>
<td>No answer</td>
</tr>
</tbody>
</table>

Do you feel that you would recommend conscious sedation to others?

<table>
<thead>
<tr>
<th>Results (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>No answer</td>
</tr>
</tbody>
</table>
patients experienced a very low rate of nausea (10.2%) or vomiting (2.7%) following sedation. Four hundred and fifteen patients (84.9%) reported that they never felt uncomfortable during the procedure, and 431 (88.3%) that they didn’t experience any pain.

Few studies, if any, are available in which patient satisfaction and the side-effect profile after procedural sedation is compared.

It is noteworthy that numerous patients in our study did not complete the last few questions, while those on the last page were often overlooked. It could be concluded that the questionnaire contained too many questions. It was evident from our responses given that 361 (74%) patients would opt for the option of local anaesthetic and procedural sedation in a future procedure. However, 107 (22%) of patients didn’t answer this question.

A weakness of our study was that the focus was mainly on dental related procedures. It cannot be assumed that the expressed satisfaction would extend to other procedures. Also, the study population only consisted of adult patients.

CONCLUSION
A high level of satisfaction was demonstrated by our study population with their sedation experience. The postoperative sedation questionnaire is a useful tool with which to determine the perioperative experience of patients undergoing procedural sedation.

However, a validated assessment tool which can be used to audit the quality of sedation, train clinicians and establish protocolspecific guidelines for satisfactory procedural sedation is required. A possible suggestion is the identification of 8–10 core questions to be taken from this pilot study and included in a validated assessment tool.

Acknowledgements: Gratitude is extended to Sedation Solutions, London, UK, for use of the organisation’s patient information. The contributions of administrative support and guidance, given by Daniel St John-Hore and Katie Heffer of Sedation Solutions, are also acknowledged.

Source acknowledgement: This article is reprinted with permission from the South African Journal of Anaesthesia and Analgesia 2015; 1(1): 1-6.

References

TRIBUTE

Miriam Schraibman

Senior members of the Association will remember Miriam Schraibman who played such an integral part in the running and affairs of the Association several years hence. She has most sadly passed away a few days ago. Miriam held sway in the old Association Headquarters which was a house standing on the very site of our current Headquarters building. We will recall Miriam surrounded by piles of papers, the phone ringing, Sambo, our messenger, standing waiting and Miriam fully in control at all times. She made major contributions to the Association Congresses, notably those held at Sun City in the 1990’s to which she enlisted the help of her family. Not one to tolerate idleness, Miriam was the epitome of kindness when it came to members in need. She and Helmut were an indomitable team ensuring the smooth administration of the Association.

Our deep sympathy to Merle and the extended family.
Platelet- Rich Fibrin (PRF) -
The effect of storage time on platelet concentration

MT Peck1, D Hiss2, L Stephen3, A Satti4, A Majeed5

ABSTRACT
The aim of this study was to determine whether storage time had a significant effect on the platelet concentration of platelet-rich fibrin (PRF). Three blood samples were drawn from each participant into a sterile blood sampling tube. Two of the blood samples were centrifuged to form PRF. The third non-centrifuged sample was used to measure the baseline blood platelet concentration. After PRF had formed, it was removed from the respective test tubes at different time intervals i.e. immediately after centrifugation (Group A) and after 60 min of storage time in the blood collecting tube (Group B). The residual blood from each group was tested for platelet concentration and compared with the baseline reading (as an indirect measure of the platelet concentrate of PRF). The PRF produced in Group A (PRF A) had a mean platelet concentration of 274 ±57.8×10^9/L, whereas the PRF of Group B (PRF B) was 278 ± 58.2×10^9/L. A statistically significant difference was seen between the groups (p < 0.001).

Conclusions: Storage time has a significant effect on the platelet concentration of PRF. Further research is required to determine whether this has any clinical relevance.

INTRODUCTION
Wound healing is a complex process characterised by the repair and reconstitution of lost or damaged tissue. Identification of the pathological and biochemical mechanisms that regulate tissue repair and homeostasis has long been regarded as central to their therapeutic exploitation in the clinical setting. By the mid-1990s, several methods were proposed to enhance wound healing, including the administration of high concentrations of human platelets to affected areas.1-3 It was assumed that platelets optimised wound healing by promoting the secretion of growth factors (GFs) necessary for tissue repair.4-6 The most common platelet concentrate used in these procedures is platelet-rich plasma (PRP) and by the early part of the 21st century, its use in various surgical procedures was commonplace.7-12 However, the preparation of PRP often requires the use of specialised equipment, chemicals and animal-derived additives. This increases the risk for complications secondary to allergic reactions to certain animal-derived additives.13-14 As a result, researchers have sought more efficient and safer methods of concentrating platelets for surgical use.1 This led to the production of platelet-rich-fibrin (PRF), a platelet concentrate that neither contained additives nor required the use of specialised equipment during its preparation. First introduced by Choukroun et al (2001), PRF has been studied extensively and is now regarded as a biological scaffold different to PRP.15 However, even though the use of PRF is gaining widespread clinical acceptance, several questions regarding its biological stability remain unanswered.16-17 The aim of this study was to analyse the effect of storage time on the platelet concentration of this unique biomaterial.

MATERIALS AND METHODS
The study was conducted under the principles outlined by the “World Medical Association Declaration of Helsinki, Ethical Principles for Medical Research Involving Human Subjects” of 2008. Ethical approval was obtained from the Ethics Committee of the University of the Western Cape (Registration number 11/4/29). All participants were fully informed of the research protocol and were required to sign a declaration of informed consent before being allowed to participate in this cohort analytical study. A total of 30 healthy participants (16 females and 14 males) were enrolled into the study. Participants were drawn from the current patient pool as well as staff members based at the Dental Faculty, University of the Western Cape. All participants had three separate blood samples collected by venipuncture. Two of the samples were acquired using tubes containing clotting activators.
activators, i.e., Vacuette® 10ml serum tubes with Z Serum Clot Activator (Greiner BioOne International AG, Germany), whereas the remaining blood sample was drawn into a 10ml BD Vacutainer® tube that contained dipotassium-EDTA, an anticoagulant (BD Diagnostics, New Jersey USA).

All the blood samples collected in the anticoagulant-containing tubes were used to measure baseline platelet concentrations, whereas the remaining blood samples (collected in the Clot Activator containing tubes) were used to prepare PRF by centrifugation (400g for 12 minutes) in a standard benchtop centrifuge (PLC-03, Hicare International, Taiwan) (Figure 1). Therefore, from each study participant, two samples of PRF were obtained (Figure 2). The two PRF samples were then randomly allocated into either Group A or Group B, using a simple coin toss.

For Group A, the PRF was removed from the tube immediately after preparation (0min), whereas for Group B, the PRF remained in the tube and was only removed after 60 minutes. The PRF produced from each group was designated PRF A and PRF B respectively. Because a direct measurement of platelet concentration of PRF is not yet possible, we calculated the PRF concentration for each group indirectly, by determining the numerical difference between the residual platelet concentration (of the remaining serum after removal of PRF) and the baseline platelet concentration for each specific study participant. In this study, platelet concentration analysis was carried out using an electronic automated cell counter (Advia 2120, Siemens AG, Erlangen, Germany).

Data was collected and entered into a spreadsheet (Microsoft Office 2010 Excel, Microsoft Corporation, Washington). The results were compared and analysed statistically using SPSS® Version 13 for Windows.

RESULTS AND DISCUSSION

A total of 30 participants (16 females and 14 males) were entered into the study. The mean age of the participants was 41.7 years, with male subjects being slightly younger than their female counterparts (41.3 years for males vs 42 years for females). The youngest participant was 24 years old and the oldest, 58 years old.

Platelet concentrations obtained from analysis of all 30 participants were within the normal laboratory reference range of 170-400x10^9/L of circulating blood. None of the participants displayed any significant haematological disease. The mean blood platelet concentration was 282.8x10^9/L (Table 1). There was no significant difference between the genders.

After removal of formed PRF from Group A, the residual serum yielded minimal concentrations of platelets. The mean concentration of remaining platelets was 7.9x10^9/L (Table 2). For Group B, serum platelet concentrations were also minimal after removal of the prepared PRF with the mean concentration of the platelets being 4.0x10^9/L (Table 2).

The residual mean platelet concentration of Group A was higher than that determined for Group B with the mean difference in platelet concentrations between the two groups being 3.90 x 10^9/L. Using a non-parametric Signed Rank Test, the statistical significance of the differences in platelet concentrates between the Groups A and B was analysed. The difference between the two groups was statistically significant (p < 0.001).

The platelet concentration of PRF for both groups was calculated using the difference between baseline and residual platelet concentrations (Table 3). A paired t-test showed a statistically significant difference between the two groups (p < 0.001) (Table 4).

---

**Table 1: Mean baseline platelet concentration in cells x 10^9/L of blood**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>275.14</td>
<td>43.13</td>
</tr>
<tr>
<td>Females</td>
<td>289.50</td>
<td>69.64</td>
</tr>
</tbody>
</table>

**Table 2: Mean baseline platelet concentration of residual blood in cells x 10^9/L of blood**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>7.9</td>
<td>30</td>
<td>3.03</td>
<td>0.55</td>
</tr>
<tr>
<td>Group B</td>
<td>4.0</td>
<td>30</td>
<td>1.93</td>
<td>0.35</td>
</tr>
</tbody>
</table>

**Table 3: Mean calculated PRF platelet concentration in cells x 10^9/L of blood**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRF A</td>
<td>274.9</td>
<td>57.8</td>
<td>169</td>
<td>387</td>
</tr>
<tr>
<td>PRF B</td>
<td>278.8</td>
<td>58.2</td>
<td>171</td>
<td>390</td>
</tr>
</tbody>
</table>

**Table 4: Statistical analysis of PRF A and PRF B**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Significance (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-3.9</td>
<td>3.133</td>
<td>0.572</td>
<td>-5.67</td>
<td>-2.73</td>
<td>29</td>
<td>0.001</td>
</tr>
</tbody>
</table>

* Paired t-test performed, P value is significant
DISCUSSION

The purpose of this study was to determine whether storage time had any significant effect on the platelet concentration of PRF. Because the structural properties of the PRF clot does not allow for a direct measurement of its platelet concentration, we used the residual platelet values left in the blood tube after removal of the PRF clot as an indirect measurement of the platelet concentration in the PRF clot. This is in accordance with a previously published method. Higher residual values indicate that less platelets were contained in the removed clot whereas lower residual values would indicate that more platelets were transferred to the clot. The results from this study indicate that there is a significant difference in the mean platelet concentration of PRF when stored for 0 and 60 minutes.

From the platelet counts obtained in both test groups it was clear that a significant proportion of platelets had been removed from the blood after extraction of the PRF clots. In fact, when differences between the test groups and the baseline blood sample were compared, it was evident that 97%-98% of the platelets were concentrated in the PRF clot (Table 3). This observation is similar to results published for previous studies (97%). The natural process of fibrin and clot formation that occurs in the blood collecting tubes results in the entrapment of the majority of the available platelets in a fibrin matrix. This acts as a reservoir for a concentration of growth factors (GFs) required in the initial stages of wound healing.

Although the physiology of PRF has been studied extensively, very few reports adequately document the ability of this platelet concentrate to be stored. Previous research has indicated that storing PRF under certain conditions may affect its ability to clinically yield positive results. In fact, it is not recommended to store the platelet concentrate in its blood collecting tube since it is assumed that it may disintegrate into an unusable form after about 15 minutes of storage. Instead, several authors propose storing the biomaterial in a metal dish or a proprietary designed storage box. Data regarding the maximal storage time and ideal storage temperature of PRF are, however, largely lacking.

In this study, we used standard blood collecting tubes with clot activators to store PRF for at least 60 minutes at room temperature. This particular duration of time was chosen based on the average time of typical periodontal surgical procedures at the Faculty of Dentistry, University of the Western Cape. The results of the study indicate that by using the presented protocol for platelet concentrate preparation, it was possible to concentrate more than 97% of the available blood platelets into a readily usable form. This study also showed that by using the blood collecting tubes as a storage medium, there was no detrimental effect on the platelet concentration of PRF. Indeed, storing the concentrate for 60 minutes resulted in a form of PRF that had significantly higher concentrations of platelets compared with non-stored PRF. The reason for this phenomenon is unclear, but may be related to the “clot activators” that line these tubes. Clot activators are often silica based and are used in plastic tubes to mimic the clotting effect of glass based blood tubes. As a result, a longer contact time between blood and these activators may enhance fibrin activation and clot formation, with subsequent platelet entrapment. Another reason for the variation in platelet concentration seen in this study may be that the recommended centrifuge time is too short to allow for complete clot formation to occur. Therefore, allowing the PRF clot to remain in the tube for a period longer than the recommended time, may result in a more complete physiological reaction taking place.

The ability of PRF to sustain its platelet concentrate over the tested time may have significant clinical implications. Rather than having to draw blood during the surgical procedure, it allows for blood to be drawn before the start of the procedure, thereby improving patient comfort and saving operator time. The option to store the PRF in the same tubes in which it was formed negates exposure to other environmental factors that may contaminate the sample. It is also cost-effective, since no specialised equipment or storage facilities are required. This may be significant in resource-poor settings.

PRF has been recognised as a biomaterial that includes living cells. In order to sustain cell viability over time, an isotonic solution is required for storage. The blood collecting tubes, although not designed to store blood, act as containers for the PRF and the remaining formed elements and serum. Consequently, when PRF is stored in the blood that it was derived from, the remaining serum acts as a natural isotonic solution that sustains cell survival.

The release of growth factors is a significant property of blood platelets. Previous studies indicate that several of these factors play an essential role in osteogenesis and periodontal regeneration. When PRF is used, the release of these growth factors appears to be constant, and over a longer period of time when compared with that seen with PRP. In a direct comparison between the two, PRP was shown to have an initial larger release of growth factors after activation. However, these high concentrations were not stable and decreased over time. On the other hand, PRF releases less growth factors initially, but sustains this release for a longer duration. A number of authors speculate that this may be due to the fibrin clot that forms a network and acts as a reservoir for the trapped platelets. In the present study, it was shown that the platelet concentration of PRF improved over a period of 60 minutes of storage. We assume that this may be due to prolonged fibrin clot maturation. It is therefore reasonable to speculate that if PRF is stored until optimal fibrin formation is achieved, then higher concentrations of growth factors may be available from the PRF during wound healing. Whether this has any clinical significance requires further investigation.

Temperature may affect the storage potential of PRF and it has been suggested that storing it in near-freezing temperatures is not advisable. In this study, all the samples were stored at room temperature. It was clear that storage under these conditions had no detrimental effect on the platelet concentration of the PRF clot.

Although the present study showed statistically significant differences between the two groups tested, some limitations were also evident. These include the limited number of study participants as well as the inability to directly measure the platelet concentration of PRF. Other factors include the small difference between the platelet concentrations of
the groups tested. Although statistically significant, a mean difference of only 3.9 × 10^9 cells/L may not be clinically relevant and therefore further research is warranted to determine the clinical significance of these findings.

CONCLUSIONS

The viability of storing PRF in its own blood collecting tubes has not yet been reported. This study showed that by using the above method of platelet preparation, it is possible to concentrate more than 97% of the available platelets into a PRF clot. The study also indicated that, unlike in previous reports, clot disintegration does not take place after 15 minutes of storage, but rather remains stable over a period of at least 60 minutes and may in fact increase in platelet concentration during that time. Further investigations are warranted to determine whether this has any clinical implications.

Disclosure policy: The authors declare no conflict of interest regarding the publication of this paper. This paper forms part of the requirements of partial fulfilment towards the degree PhD.

References

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17. Dohan Ehrenfest, DM. How to optimize the preparation of leukocyte- and platelet-rich fibrin (L-PRF, Choukroun’s technique) clots and membranes: Introducing the PRF Box. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology 2010; 101 (6); 275-8.
An *in vitro* comparison of different techniques for glide path preparation

**ABSTRACT**

**Introduction:** The study compared modification of canal curvature and the incidence of canal aberrations after glide path preparation using four different instrumentation techniques.

**Methods:** One hundred and twenty S-shaped Endo-Training-Blocks were selected, the canals coloured with ink and digital images acquired. Glide paths were prepared by a single operator with stainless steel K-files by hand (Group 1), stainless steel K-files in a reciprocating hand piece (Group 2), PathFile (Group 3) and X-Plorer files (Group 4). Pre-instrumentation and post-instrumentation images were superimposed to evaluate the parameters investigated. The images were also examined by three blinded operators for the presence of aberrations. Differences in canal curvature modification were analysed with respect to logarithmic transformed change from baseline using ANCOVA (p<0.001) with logarithmic transformed pre-instrumentation values as covariate. The incidence of canal aberrations was analyzed using Fisher’s exact test (p<0.05).

**Results:** There was no difference between PathFiles and X-Plorer files (p<0.001) and both systems demonstrated significantly less modification of curvature compared with hand files and hand files in a reciprocating hand-piece (p<0.001). The Groups differed significantly regarding the number of aberrations (p=0.005). Hand files and hand files in the reciprocating hand piece did not differ statistically (p=0.254; 20% and 6.67%). However, hand files in reciprocating hand piece also did not differ significantly from PathFiles and X-Plorer files (p=0.326). There were no aberrations detected in the rotary NiTi Groups.

**Conclusion:** The stainless steel K-files in the reciprocating hand-piece performed better than their use by hand only. Overall, PathFiles and X-Plorer files equally demonstrated the least modification to original canal geometry. Further research utilising the different techniques in extracted teeth is warranted.

**Keywords:** Glide path, reciprocation, PathFile, X-Plorer File

**INTRODUCTION**

A glide path has been defined as a smooth passage from the orifice to the apical foramen. It is a refinement of the original canal anatomy, which allows a safer passage of mechanical shaping instruments. The preparation of a glide path has been shown to reduce separation and torsional stress of rotary nickel-titanium (NiTi) instruments even during the preparation of constricted root canals. Several techniques have been proposed for preparation of a glide path viz. stainless steel K-files manually; stainless steel K-files in the M4 reciprocating hand piece (Axis/SybronEndo, Coppel, Texas); and small hand files followed by rotary NiTi glide path instruments. PathFile Ni-Ti rotary files (Dentsply Maillefer, Ballaigues, Switzerland), have a square cross section and a 2% taper, which makes them resistant to cyclic fatigue, ensures flexibility and improves cutting efficiency. The tip angle is 50 degrees and is non-cutting, which reduces the risk of ledge formation. PathFile No.1 (purple) has an ISO 13 tip size, PathFile No.2 (white) has an ISO 16 tip size and PathFile No.3 (yellow) has an ISO 19 tip size. The gradual increase in tip size facilitates progression of the files. The M4 Safety reciprocating hand piece (SybronEndo, Coppel, Texas) is a contra angle that fits onto any E type slow speed hand piece connection. The reciprocating angle of the hand piece is 30 degrees, which replicates the watch winding, oscillating movement of hand instrumentation in an efficient manner. The technique involves negotiating a small size K-file to length before attaching the hand piece to the file. The hand piece is then moved vertically up and down, with an amplitude of 1mm to 3mm and bursts of reciprocation for approximately 15 to 30 seconds in the canal.

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Several NiTi glide path systems have been investigated and compared with the use of stainless steel K-files by hand for glide path preparation. However, there are no studies comparing the performance of these instruments with other techniques of glide path preparation. Furthermore, no studies have investigated the effect on curvature when stainless steel K-files are used in a reciprocating hand piece for glide path preparation.

The aim of this in vitro study was to compare the performances of stainless steel K-files used manually, stainless steel K-files used mechanically in the M4 reciprocating hand piece, PathFiles and X-Plorer files with respect to percentage change in canal curvature and the occurrence of aberrations during glide path preparation. The null hypothesis was that there would be no statistical differences between the techniques investigated.

MATERIALS AND METHODS
The materials and methods were similar to those employed by Berutti et al. One hundred and twenty ISO 15, 0.02-tapered, S-shaped Endo Training Blocks (Dentsply Maillefer) were used. Each simulated canal was injected with India ink using a syringe. To facilitate superimposition of pre-instrumentation and post-instrumentation images, three bur landmarks were placed in each resin block using a template to ensure uniformity. Specimens were randomly assigned to four different Groups (n=30).

In Group 1, the glide paths were prepared by hand using stainless steel K-files (VDW, Munich, Germany), in a sequence from size 08, through 10 and 15 to size 20. The files were used in a quarter turn and pull motion until each file reached working length before selecting the next size.

In Group 2, the glide paths were prepared using stainless steel K-files (VDW, Munich, Germany) in the sequence of sizes 08-10-15-20 in the M4 Safety (SybronEndo) reciprocating hand piece (30 degree reciprocation) driven by the TCM III (SybronEndo) electric motor at 900 rpm at the 18:1 setting.

In Group 3, the initial glide paths were first prepared by hand, using stainless steel K-files (VDW) sizes 08 and 10 before the glide paths were enlarged using the PathFile rotary instruments nos. 1, 2 and 3.

In Group 4, the initial glide paths were first prepared by hand, using stainless steel K-files (VDW) sizes 08 and 10 before the glide paths were enlarged using the three X-Plorer files (Clinician’s Choice Dental Products Inc).

All hand files were pre-curved 4mm from the tip. The rotary PathFiles and X-Plorer files were used in an endodontic hand piece (X-Smart Plus, Dentsply Maillefer) operating at 300 rpm, and at 4Ncm torque.

After glide path preparation the specimens were replaced in the photographic template and post-instrumentation images were acquired and saved as TIFF format files.

The images of pre-instrumentation and post-instrumentation blocks were used to evaluate the changes in the apical and coronal curvature as a result of glide path preparation. Rhinoceros Software (version 4.0; Robert McNeel & Associates, Seattle, WA) was used to identify and evaluate the following: (1) the mean axis of canal; (2) the reference points corresponding to the initial and end points of the two main curves of the canal; and (3) the apical and coronal radii of curvature using best fitting with circles of known radii.

The images were cropped and magnified to highlight the canal geometry. The image of each canal was used to identify its mean axis. Starting at the apex, 32 points were identified along the canal at 0.25 mm intervals, each point corresponding to the centre of the canal cross-section. These points were used as control points for the construction of a Bezier curve approximating the mean axis of the canal. A visual comparison between the canal geometry and the Bezier curve could reveal any errors in the tracing of the mean axis of the canal. The Bezier curve was analysed to evaluate the curvature, which was in general continuously variable along the axis (Figure 1a). The site of curvature change (null curvature) was taken as the flexus in the passage between the apical and the proximal curvatures of the canal and, as a consequence, as one of the reference points to be taken into consideration for quantitative curvature evaluation. The canal apex, the point of curvature change between the extremities, and the first proximal point of the canal having null curvature were selected for each canal to quantitatively evaluate the mean apical and proximal curvature by best fitting with circles of different radii (Figure 1b).

The change in radius of curvature from baseline (pre-instrumentation) and after instrumentation was expressed as a percentage using the formula: \( \frac{\text{post-instrumentation radius} - \text{pre-instrumentation radius}}{\text{pre-instrumentation radius}} \times 100 \). The lower the percentage, the less the change to initial canal anatomy, whilst a higher percentage meant a greater change. This constituted the quantitative assessment.

Using the bur marks as indices, the photographs after preparation were superimposed onto the pre-instrumentation photographs before glide path preparation using Adobe Photoshop Digital Software (Adobe Systems Inc, www.sada.co.za / SADJ Vol 70 No. 10

Figure 1: (a) The curvature analysis (white) of the Bezier curve showing the end points of the curve and the point of curvature change of the apical and coronal curves; (b) Determining the mean radius of apical and coronal curvature using best-fit circle circumferences (yellow) after evaluating the endpoints of the curves (white).
Three calibrated, blinded examiners independent assessed the canals after glide path preparation for aberrations in canal anatomy (ledging, zipping and elbows) and for any deviation from the original following the approach described by described by Thompson and Dunner. This constituted the qualitative assessment.

Statistical analyses were performed with StataCorp.2009 (Stata: Release 11.) software package (Statistical Software. College Station, TX: Statacorp LP). The Shapiro-Wilk test for normality of change from baseline was significant for both apical (p<0.001) and for coronal (p<0.001) radii overall. After logarithmic transformation for change from baseline, the Shapiro-Wilk test for normality was not significant for any of the prepared (post-instrumentation) Groups, both for apical and coronal curvature change.

Prepared Groups were then compared with respect to logarithmic transformed change from baseline using analysis of covariance (ANCOVA) with logarithmic transformed pre-instrumentation values as covariate. As confirmation, an ANCOVA for ranks was also performed. The point and interval estimates for both apical and coronal radii employed the geometric mean and its 95% confidence interval. After establishing preparation differences, both for change from baseline (pre-instrumentation) for apical and coronal curves, specific differences were tested using Fisher’s LSD for pairwise comparisons.

Post-instrumentation Groups were compared with respect to the presence of aberrations using Fisher’s exact test. Testing was done at the 0.05 level of significance.

RESULTS
Change to Curvature
The results relating to change in curvature are summarized in Table 1. The geometric mean and 95% confidence intervals for coronal and apical curves are shown in Tables 2 and 3 respectively. The ANCOVA test showed that Group 1 (Hand K-files) and Group 2 (M4 hand piece) differed significantly from the other Groups (p<0.001). Group 3 (PathFiles) and Group 4 (X-Plorer files) did not differ significantly from each other and were also superior to the other Groups (p<0.001).

Canal Aberrations
There were no differences in the assessments of the images by the three calibrated blinded examiners. There was a higher incidence of ledges (3), elbows (2) and apical zips(1) for Group 1 compared with all the other Groups. The only other Group that showed evidence of ledge formation was Group 2 (2 ledges).

With respect to the number of aberrations, Group 1 was statistically different from Group 3 and Group 4 (p=0.005).

DISCUSSION
Simulated canals have been widely used to investigate instrumentation techniques and the shaping ability of endodontic instruments. They were used in this study to standardize experimental conditions. S-shaped simulated canals were selected because of the inherent difficulty in shaping a canal with more than one curvature along its length without causing aberrations. This model also serves to highlight any differences in the performance of instruments.

The first part of the study used a quantitative analysis through observation of changes between pre-instrumentation and post-instrumentation curvatures. The stainless steel K-files in the M4 safety reciprocating hand piece performed better in maintaining the canal curvature compared with their use by hand only. The improved performance of the stainless steel K-files in the reciprocating hand piece could be attributed to the smaller arc of reciprocation of the hand piece (30 degrees) compared with the quarter turn-and-pull motion employed during hand filing (90 degrees).

The two NiTi rotary systems that were used for glide path preparation performed significantly better than the above-mentioned Groups. No significant differences between the PathFile and X-Plorer file systems were observed, even though their design characteristics differ. Therefore, under the present study conditions, it might be assumed that these instruments have more fidelity in adhering to the original canal anatomy, as shown in Figure 2. The findings of the present study were in agreement with previous studies which showed that NiTi glide path instruments caused less modification to canal curvature when compared with the effects of stainless steel hand instruments. Since the flexibility of an endodontic file may influence its ability to...
shape curved canals the difference in curvature modification is probably due to the higher flexibility of NiTi files compared with stainless steel files. However Alves et al. (2012) and D’Amario et al. (2013) found no difference between stainless steel K-files and NiTi rotary files during glide path preparation. This disparity is possibly due to the previous studies having been completed on extracted teeth, whilst resin blocks were used in the present study. These differences are probably due to the higher flexibility of NiTi files compared with stainless steel K-files by hand. The higher incidence of aberrations with stainless steel K-files could also be attributed to the stiffness of these instruments. The second part of the study comprised a qualitative observation of any canal aberrations. The use of stainless steel K-files by hand resulted in the highest number of canal aberrations compared with when stainless steel files were used in the M4 reciprocating hand piece. Furthermore no irrigants were used during preparation of the canals. The kinematics of both hand file methods employed under these dry conditions were different. Coronal flaring may also reduce this risk with hand instrumentation, as it would result in less lateral engagement of the instrument in the coronal portion of the canal and better tactile sense of the file tip. The higher incidence of aberrations with stainless steel K-files could also be attributed to the stiffness of these instruments. Camps and Pertot (1994) found that the bending moment of K Flexo-files (Dentsply/Maillefer) was less than half of stainless steel K-files (Kerr Company, Romulus, MI, USA) of the same size. The higher incidence of aberrations with stainless steel K-files by hand may be attributed to the quarter turn and pull, filing motion employed during glide path preparation. Furthermore no irrigants were used during preparation of the canals. The kinematics of both hand file methods employed under these dry conditions were different. 

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<tr>
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<tr>
<td>Mean Pre Post %Ch Pre Post %Ch Pre Post %Ch Pre Post %Ch</td>
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<tr>
<td>Mean 74.26 87.04 17.28 77.7 85.49 10.11 76.83 81.33 6.16 73.27 77.5 5.81</td>
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<tr>
<td>SD 3.94 6.29 7.37 4.84 6.15 5.93 4.24 4.88 3.66 5.16 5.67 3.62</td>
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<tr>
<td>Median 74.41 87.94 17.01 78.6 84.49 8.42 76.77 80.75 5.64 73.06 77.4 5</td>
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<tr>
<td>Minimum 66.24 73.95 4.38 68.44 76.02 2.53 67.81 69.11 1.67 61.57 65.13 0.43</td>
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<tr>
<td>Maximum 81.74 98.23 30.3 88.37 97.2 22.97 86.62 95.08 14.84 84.32 89.11 13.5</td>
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<tr>
<td>95% CI 75.74 89.39 20.04 79.51 87.79 7.53 76.63 81.33 6.16 73.27 77.5 5.81</td>
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<p>| Table 1: Coronal and apical curves: Descriptive statistics of the radii of curvature (mm) and their change (%) after glide path preparation. |
|---------------------------------------------------------------|---------------------------------------------------------------|</p>
<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-instrumentation</th>
<th>Post-instrumentation</th>
<th>Percentage change from pre-instrumentation</th>
<th>Pre</th>
<th>Post</th>
<th>% change</th>
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<tr>
<td></td>
<td>Mean</td>
<td>36.86</td>
<td>54.06</td>
<td>47.05</td>
<td>37.78</td>
<td>44.44</td>
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<tr>
<td></td>
<td>SD</td>
<td>3.23</td>
<td>9.91</td>
<td>26.34</td>
<td>3.71</td>
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<tr>
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<td>Median</td>
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<td>55.66</td>
<td>50.02</td>
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<tr>
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<td>Minimum</td>
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<tr>
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<td>Maximum</td>
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<td>74.24</td>
<td>97.73</td>
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<td>95% CI</td>
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<th>Table 2: Geometric means and 95% confidence interval for change to coronal radii by prepared Groups.</th>
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<td>Prepared Group</td>
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<tr>
<td>Group 2: Hand K-files in M4 Safety reciprocating hand piece</td>
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<tr>
<td>Group 3: Hand K-files and PathFiles</td>
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<tr>
<th>Table 3: Geometric means and 95% confidence interval for change to apical radii by prepared Groups.</th>
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<td>Prepared Group</td>
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<tr>
<td>Group 1: Hand K-files</td>
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<tr>
<td>Group 3: Hand K-files and PathFiles</td>
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<tr>
<td>Group 4: Hand K-files and X-Plorer files</td>
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Pre: Pre-instrumentation; Post: Post-instrumentation; %Ch: Percentage change from pre-instrumentation {(Post-Pre)/Pre}*100; SD: Standard deviation; CI: Confidence interval.
could have resulted in debris accumulation between the blades and canal walls, which would contribute to the occurrence of aberrations. It must be noted that in the clinical situation, irrigation of the canals is mandatory during instrumentation.

Our findings using plastic blocks as experimental models, are in agreement with those of other authors6,7 who have suggested the use of small stainless steel files followed by NiTi glide path preparation instruments. In this way the mechanical properties of both these alloys are utilized for safer subsequent root canal shaping.

In conclusion, within the limits of this study, there were no differences between PathFiles and X-Plorer files for glide path preparation. Both rotary Ni-Ti systems performed better than stainless steel K-files in the reciprocating hand piece which in turn performed better than stainless steel K-files used by hand. The null hypothesis was therefore rejected. Caution should be exercised when extrapolating the results in plastic blocks to the clinical situation. It may be advisable to use flexible hand files when employing plastic blocks as experimental models. Further research is warranted to compare the different methods of glide path preparation in extracted teeth.

References
SADA is a professional association with a purpose of serving the interest of its members to promote optimal oral health care in South Africa. Interested professionals are invited to apply for the following positions that have recently become available:

**MANAGER: CODING AND NOMENCLATURE**

The purpose of this role is to serve as the “knowledge expert” of the Association regarding all matters related to diagnostic and procedure coding, as well as other coding frameworks that may affect dentistry. This position is based at the SADA Head Office in Parktown, Johannesburg:

**KEY TASKS AND RESPONSIBILITIES:**
- Management and maintenance of existing coding structures, as well as SADA rules and guidelines for application of codes;
- Implementation of business processes to ensure continuous interaction with relevant stakeholders and specialist groups in order to ensure ongoing identification and definition of new procedures, as well as accurate interpretation of existing procedures;
- Provision of code interpretation and clinical advisory services to members, medical schemes, statutory bodies and the general public;
- Effective representation of member interests in respect of unresolved issues with medical schemes and other funding agencies.

**ESSENTIAL EXPERIENCE AND REQUIREMENTS:**
- A registered dentist with a minimum of 5 years recent experience in private practice in South Africa;
- Excellent knowledge and experience of dental coding and interpretation;
- Understanding of the medical and oral health care sector, specifically the medical schemes environment;
- Excellent people, networking and process management skills;
- Excellent verbal and written communication skills;
- Ability to work under pressure and to deadlines.

**HEAD: EDUCATION**

This role is responsible for the compilation of the Association’s annual educational plan and budget (including branch events and national congresses), as well as the management of the Institute of Dental Education (IDESA) business unit (profit and loss responsibility, strategy development, implementation and compliance). This position is based at the SADA Head Office in Parktown, Johannesburg:

**KEY TASKS AND RESPONSIBILITIES:**
- Direct the planning and administration of SADA’s educational strategy and programme;
- Registration of SADA as a Private Higher Education Institution;
- Product development – identify opportunities for the development of training programmes, development of curricula and project management of the content delivery team;
- Negotiation of strategic partnership arrangements within the health education sector;
- Management of the CPD programme, including coordination thereof through the branch events programme, annual congress and SADJ programme;
- Provision of education accreditation services;
- Preparation of policies and procedures related to educational services and provision of accreditation services;
- Supervision and management of departmental staff.

**ESSENTIAL EXPERIENCE AND REQUIREMENTS:**
- A registered dentist with minimum 7 years experience, either in private practice or the academic environment;
- Experience and established networks in the oral health care sector and the academic environment;
- Able to have a strategic outlook, whilst retaining the ability to remain hands-on;
- Excellent people, networking and organisational skills;
- Excellent verbal and written communication skills;
- Self-starter, with the ability to adapt to constant change;
- High degree of IT literacy (MS Office applications);
- Ability to work under pressure and to deadlines.

Applications, including a CV and motivational letter indicating your suitability for the position, must be submitted to jobs@sada.co.za by no later than 16:00 on 15 December 2015. Upon initial screening of applications, candidates may be requested to submit further information and certified copies of identification and qualifications. SADA reserves the right to verify qualifications, citizenship, credit standing and criminal records of applicants. Short-listed candidates may be subject to competency-based assessments.

Please quote the Job Title for the position that you are applying for in the subject line of all communications. Kindly note that copies of supporting documents will not be returned. Due to the specialty of the roles, SADA reserves the right to make changes to the role descriptions to fit the profile of suitable applicants. SADA also reserves the right not to make an appointment.

SADA subscribes to the principles of employment equity. While merit, based on qualifications, experience and proven achievements, forms the basis for appointment, the Association is committed to the need to transform and diversify its staff profile. As such, the company welcome applications from members of all the designated groups, including people with disabilities.
Assessing extent of undergraduate training in maxillo-facial surgery and the related skill levels amongst public service dentists

ABSTRACT

Aim: To assess the level of maxillofacial surgical skills amongst dentists in the Public Oral Health Services.

Objectives: To determine the level of training dentists had received in maxillofacial surgical skills during their undergraduate studies. To identify the training needs of dentists working in the public oral health sector.

Methods: A self-administered questionnaire was designed and sent to 96 dentists who were employed in the Public Oral Health Services between 2011 and 2012. The questionnaire elicited information on demographics and on the levels of undergraduate training the dentists had received in oral surgical skills.

Results: Seventy replies were received, a response rate of 73%. Respondents had received undergraduate training in the following procedures: surgical removal of impacted teeth 85.7%, closed reduction of fractured jaws 72.9%, placement of dental implants 14.3%, and incisional biopsies, 72.9%. Postgraduate training was considered required before attempting surgical removal of impacted third molars (41.4%), closed reduction of fractured jaws (67.1%), incisional (61.7%) and excisional (56.3%) biopsies.

Conclusion: Dentists working in the Public Oral Health Services believed that their undergraduate training in maxillofacial surgery did not equip them to perform more complex surgical procedures with skill and confidence.

Keywords: third molars; closed reduction; dental implants; biopsy

INTRODUCTION

Public Oral Health (POH) services in Gauteng, South Africa are provided by dentists, dental therapists and oral hygienists, mainly at Primary Health Care (PHC) facilities and District hospitals (DH). These facilities are often the first contact point for patients who require a range of primary oral healthcare services. These needs include fillings, prophylaxis, extractions, emergency endodontics, denture services, oral health education and promotion, preventive interventions and extend to minor oral surgery procedures such as removal of impacted wisdom teeth and fracture stabilisation. In Gauteng there are two academic dental hospitals located in the Johannesburg Metro region [Charlotte Maxeke and Chris Hani-Baragwanath Hospital affiliated to the University of Witwatersrand (Wits)]. In addition, there are another two academic hospitals located in the Tshwane region [Steve Biko and Dr George Mukhari Hospitals], affiliated to the University of Pretoria (UP) and to the Sefako Makgatho University respectively. These tertiary hospitals each have a maxillofacial department staffed by qualified maxillofacial surgeons and by registrars.

Although South African qualified dentists are expected to have received formal training in minor oral surgery during their undergraduate program; patients presenting at PHC facilities and DH in Gauteng are often referred by the attending dentist to tertiary dental hospitals, especially when...
the problem is impacted wisdom teeth.\(^1\) However, patients have difficulty in accessing these services because of transport problems, physical immobility and long waiting lists.\(^2\) Furthermore, the provision of such services in tertiary care settings places considerable financial constraints on the budgets of academic dental hospitals.

Oral health services (OHS) are classified into primary, secondary and tertiary health services. Competencies for primary OHS are clearly stated in the norms and standard documents,\(^3\) and include oral health promotive and preventive services, basic treatment services, emergency relief of pain and sepsis and minor oral surgery procedures. Secondary health services are mainly curative and are rendered in District hospitals. Unfortunately, these hospitals do not include Public Oral Health Services in their budgets. Almost inevitably, patients from the district primary OHS are referred directly to the academic hospitals.

Hobdell \( et \ al.\)\(^4\) and Myburg \( et \ al.\)\(^5\) identified that Africa suffers a very high prevalence of orofacial trauma, and of noma, oral cancer and oral manifestations of HIV. According to the Primary Oral Health Care Package\(^6\) some of the orofacial pain should be managed in level 1 District hospitals. The norms and standards for District hospitals\(^7\) highlight the expectation that competencies for oral health staff should include the ability to recognise and deal with the following procedures: trauma to the teeth and oral cavity; inhaled or swallowed foreign body including performing a Heimlich manoeuvre; lacerations of the tongue and face; swelling problems and dislocated or fractured jaws. The staff should be able to perform airway maintaining procedures like draining abscesses that may cause airway obstruction e.g. Ludwig’s angina.

The draft South African Oral Health Strategic document\(^8\) prescribes competencies as minimum requirements for employment of Dentists in level 1 District hospitals. These include the ability to carry out the following procedures: closed reduction of fractured jaws (IMF), removal of class I dental impactions, surgical removal of teeth, biopsies, immobilisation of loose, avulsed or inflexed teeth and multiple exodontia under General Anaesthesia (GA). The regional (Level 2) hospital service package for South Africa does not cover oral health, but recognises maxillofacial and oral surgery as a sub-specialty of surgery and recommends that a maxillofacial surgeon be appointed either on a permanent or sessional basis.\(^6,7\)

There is evidence that the large number of referrals for minor oral surgical procedures such as impacted wisdom teeth are causing bottlenecks at the tertiary centres as the specialists cannot cope with the volume of patients.\(^1\) Many could be handled at PHC facilities but dentists continue to refer patients with these minor conditions to specialist centres even though they are expected themselves to have the skills to manage such problems.

This survey reports on an audit of surgical skills of dentists in the Public Oral Health Services in Gauteng. The objectives were (1) to determine the level of training dentists had received in maxillofacial minor oral surgery during their undergraduate study, and, (2) to identify the deficiencies in surgical skills and the surgical needs of dentists working in the public sector in Gauteng.

### MATERIALS AND METHODS

This was a cross-sectional study, conducted between 2011-12 with the permission of the Director of Specialised Services, Gauteng Department of Health, and the approval of the University of Witwatersrand Human Research Ethics Committee [M130528]. A self-administered questionnaire was designed and sent to dentists employed in the POH services in Gauteng. The questionnaire elicited information on demographics and on specifics of the undergraduate training in the surgical skills required by the draft South African Oral Health Strategic document. Participants were further asked whether they practised these surgical skills in their district clinics and whether they required further training. Data were collected and analysed using Microsoft Excel and STATA 11 software version 15, and associations were tested using a chi-square test at a level of significance of \(p<0.05\).

### RESULTS

Questionnaires were sent to ninety-six dentists employed in the public sector and seventy responses were received (response rate 72.91%). A total of 48 (68.57\%) were female and 22 (31.43\%) were male. The majority (64.29\%) of the participants had qualified during and post the year 2000, with only 10\% having qualified in the 1970’s. The Sefako Makgatho University provided the highest number of dental graduates (37.14\%) followed by the University of Witwatersrand (Wits) with 24.29\%, the University of Pretoria (11.43\%) and the University of Western Cape (UWC) with the lowest percentage at 8.57\%. Graduates from universities outside of South Africa accounted for 18.57\%. The Tshwane and Johannesburg Metro had the highest number of dentists employed in the various clinics (Table 1).

Eighty-five percent of the participants indicated having received undergraduate training in the surgical removal of impacted wisdom teeth. A small group (15\%) reported not having received adequate undergraduate training in this procedure, of whom 70\% were from Wits. This was significantly more than from the other dental schools. However, this should be interpreted with caution due to the

| Table 1: Demographic Characteristics of Study Sample (N=70) |
|------------------|------------------|
| **Variables**    | **Frequency**    |
| **Gender**       |                  |
| Male             | 22               |
| Female           | 48               |
| **Year of Qualification** |                |
| 1970’s           | 7                |
| 1980’s           | 8                |
| 1990’s           | 10               |
| 2000’s           | 45               |
| **University of Qualification** |            |
| WITS             | 17               |
| Sefako Makgatho  | 26               |
| UP               | 8                |
| UWC              | 6                |
| OTHER            | 13               |
| **District of Employment** |           |
| Ekurhuleni       | 9                |
| JHB Metro        | 19               |
| Sedibeng         | 6                |
| Tshwane          | 23               |
| West Rand        | 13               |
| **Frequency %**  |                  |
| Male             | 31.43            |
| Female           | 68.57            |
| 1970’s           | 10.00            |
| 1980’s           | 11.43            |
| 1990’s           | 14.29            |
| 2000’s           | 64.29            |
| WITS             | 24.29            |
| Sefako Makgatho  | 37.14            |
| UP               | 11.43            |
| UWC              | 8.57             |
| OTHER            | 18.57            |
| Ekurhuleni       | 12.86            |
| JHB Metro        | 27.14            |
| Sedibeng         | 8.57             |
| Tshwane          | 32.86            |
| West Rand        | 18.57            |
There was a significant difference between perceived postgraduate training needs in the surgical removal of impacted teeth (55.7%) and the performance of excisional biopsies (60%) [p<0.05]. The majority of dentists from the Tshwane district (70%) reported that they required postgraduate training in surgical removal of impacted wisdom teeth while most dentists from the West Rand (77%) reporting that they did not require training on performing excisional biopsies (Table 4).

A further analysis was done to determine the postgraduate needs of the dentists and these data were related according to the University from which the respondents had graduated. Fewer than 30% of graduates from three of the four Universities indicated that they did not need further postgraduate training in the surgical removal of impacted teeth, incisional biopsy, excisional biopsy and closed reduction of fractured jaws. Approximately 45% of graduates from Sefako Makgatho University felt that they needed more postgraduate training on these interventions and this was significantly higher than the percentages reported for the other three universities [p<0.05]. Sixty percent of dentists who had qualified in the 1980’s and 1990’s indicated the need for further training in closed reduction of fractured jaws, with a significant correlation (p< 0.05) between year of qualification and the acknowledgment of that need.

DISCUSSION

The study found that although approximately 86% of dentists reported they had received undergraduate training in the surgical removal of impacted third molars, only 63% had actually undertaken this procedure in their district clinics.¹ These findings are comparable with those of Yiu et al² who surveyed newly qualified dentists in Hong Kong and reported that more than 52% felt comfortable in the area of oral and maxillofacial surgery, 98% felt competent to perform simple extractions, 62% felt confident to remove impacted third molars and 58% were able to manage complications of oral surgery. However, 64% of dentists felt inadequately prepared to identify and manage oral pathology with 82% not comfortable to perform soft-tissue biopsies, and only 54% of dentists undertaking such biopsies. In Mangalore, Taluk, India, Simon et al.³ reported that no oral health center provided for the removal of impacted teeth and oral biopsies; all complicated dental treatments were referred to the nearest Dental College or to the Dental Wing of the nearby Government Hospital, due to lack of equipment and staff.

Although the present study did not investigate the reasons for referral of patients to the Academic hospitals, Coulthard et al.⁴ reported that generally 69% of dentists made referrals because of the anticipated difficulty of surgery and 49% because of the complex nature of the patient’s medical history. In the South African context it is possible that the lack of equipment and high workloads are the reasons driving small sample size. Other relevant findings were that 100% of graduates from UP reported that they had received training on the closed reduction of fractured jaws; whilst fewer than 8% of graduates from UWC had received training in biopsy procedures (Table 2). Analysis of the relationship between the practice of the basic surgical skills at the district clinics indicated that approximately 63% of dentists had removed impacted wisdom teeth surgically, 73% had performed closed reduction of fractured jaws and only 20% had performed incisional biopsy procedures at these institutions (Table 3).
a high rate of referrals of patients for these procedures. Anecdotal evidence also suggests that lengthy procedures are not performed by the dentists at the lower level facilities as assessment of their performance is based on the number of procedures/patients treated rather than the nature of the procedure performed.

There was no significant difference between the females and males in relation to their undertaking extraction of impacted wisdom teeth. Our findings differ from Coulthard et al.\(^{11}\) who reported that in the United Kingdom female practitioners were less confident than male practitioners in relation to surgical skills. The study also showed that twenty seven percent of females and 13% of males performed incisional biopsies, approximately 43% females and 28% males did excisional biopsies; and 55% of females and 72% of males treated fractured jaws by closed reduction. In a study conducted in Manchester, United Kingdom, Diamanti et al.\(^{12}\) reported that 15% of dentists surveyed had performed oral biopsies but 60% felt that they lacked the skills to perform a biopsy even on benign lesions. Their main reasons for this were inadequate training and experience, and the fear of diagnostic error. In a developing country such as South Africa, the provision of these basic surgical services would improve the level of services to patients by not requiring them to attend a tertiary facility. This would also reduce the workload at the tertiary institutions and be more cost effective.

An analysis of the relationships between year of qualification and the practice of the different basic surgical skills found that the majority of dentists (70%) who had qualified during the 1980’s and 1990’s extracted impacted teeth surgically in their respective districts compared with those who qualified in the 2000’s (10%). This was not statistically significant. However there was a significant difference between year of qualification and the performing of closed reduction of fractured jaws (p<0.05), with approximately 71% of dentists who qualified in the 1970’s indicating that they did not require further training in closed reduction of fractured jaws compared with those who qualified in the 1980-2000’s who were not confident in the treatment. The older clinicians may have accumulated experience in their facilities due to the high prevalence of injuries requiring closed reduction of the jaws, related to the elevated levels of inter-personal violence in the country.\(^{13}\)

This study had limitations in that the participants were required to provide retrospective opinions on undergraduate training, which could have resulted in acquiescence or information bias. Clinical practice in the public sector has particular features, with patient volumes, treatment demands and opportunities distinguishing it from private sector practice.

<table>
<thead>
<tr>
<th>Surgical Skills</th>
<th>District</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ekurhuleni</td>
<td>JHB Metro</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>Surgical Removal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacted teeth</td>
<td>Yes</td>
<td>5 15.63</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4 10.53</td>
</tr>
<tr>
<td>Closed Reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of Fractured Jaws</td>
<td>Yes</td>
<td>4 8.51</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>5 21.74</td>
</tr>
<tr>
<td>Incisional Biopsies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>5 11.90</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4 14.29</td>
</tr>
<tr>
<td>Excisional Biopsies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>6 14.29</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>3 10.71</td>
</tr>
</tbody>
</table>

**Table 4: Further training needs in surgical skills of dentists at the various districts.**

**CONCLUSION**

The study showed that dentists working in the Public Oral Health Services of Gauteng reported a limited experience of surgical skills in maxillofacial surgery learned at undergraduate level. Oral Health Services provided by dentists in the Public sector could be improved if there was enhanced co-ordination amongst the different Dental Schools in South Africa in the training of dental undergraduates in specific surgical skills. There is also a need to offer postgraduate courses to improve clinical competency in minor oral surgery.

**References**

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Stannous fluoride forms a robust layer over the exposed dentin and within the exposed dentin tubules.1 This layer starts to build from first use6 and continues to build with twice-daily brushing1,6

29% improvement in gingival inflammation after 24 weeks compared to regular fluoride toothpaste*5

Clinically proven relief from dentin hypersensitivity pain*2,3

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

Helps control dental plaque*4,5

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

Supports good gingival health*4,5

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**Clinically proven relief from dentin hypersensitivity pain**2,3

**Helps control dental plaque**4,5

**Supports good gingival health**4,5

- **Up to 66%** reduction in dentin hypersensitivity from baseline after 8 weeks**1,3
- **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**5

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


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The use of Laser-based Technologies in dentistry: Ethical issues and safety considerations

The use of laser-based technologies in general dental practice in South Africa is growing each year both in numbers and in scope of use. It has been shown to be beneficial in treating a wide range of oral and dental conditions as well as being used as a therapeutic tool in tissue management. They have been used in the practice of dentistry for over thirty years and recently there have been numerous advertisements in the dental press regarding the advantages of owning and using lasers and how it can be a good marketing tool for a dental practice. In the United States patients seek out practices utilising laser technology and nearly two thirds of patients surveyed thought that dentists should own a laser. How can practitioners ensure that they are using laser treatment for their patients in a responsible and ethical manner?

Laser devices vary in their potential for light energy emission from low-powered hand-held or integrated devices, to high-powered units capable of cutting and ablating tissue and material. The dynamics of laser energy beams pose general risks to non-oral tissues and the immediate environment is at risk from direct or scattered exposure. Practitioners who own or are considering adding lasers to their treatment repertoire have an ethical and legal responsibility to ensure that the best interest and safety of the patient is paramount above the consideration of improving profit or personal gain. When considering the possibility of offering laser treatment to their patients, practitioners must make a decision based on the information available in terms of the laser application after reviewing meta-analysis or adequately conducted clinical trials prior to utilising lasers for dental procedures.

Furthermore, health professionals should adhere to their scope of practice, as defined in the Scope of the Professions of Dentistry under the Health Professions Act, 1974. The Health Professions Council of South Africa (HPCSA) guidance is set out in the following Ethical Rule 21, Performance of Professional Acts: “A practitioner shall only perform, except in an emergency, a professional act for which he or she is adequately qualified and sufficiently experienced”. In cases where a practitioner is not adequately qualified and sufficiently experienced, the practitioner: “shall not fail to communicate and co-operate with appropriately qualified health practitioners in the treatment of a patient.” Each dental laser has its defined intra-oral use, but when assessing the various extra-oral uses of lasers the practitioner must ensure adherence to the scope of practice.

When choosing a laser-based technology, the professional must first decide which laser will be the appropriate adjunct to the practice. Dental lasers have a large initial capital investment. There are additional set-up costs and running costs that should also be considered. Prior to purchasing a dental laser, the professional should ensure that they are able to register the laser with the South African Department of Radiation Control. The Department of Health has appointed the Radiation Control as the regulatory body to ensure safe use of lasers in practice. Radiation Control expects that there is a Laser Safety Officer (LSO) present during use and this is usually the primary user or owner. All lasers used in healthcare are classified based on the “Classification of risk”. The classification recognises risk associated with laser use and hazards pertaining to exposure of the eye and other tissues to the laser beam and the most commonly used in dentistry include:

**Class I:** For example, laser caries detectors. Viewing with the naked eye poses no implicit risk, but caution should be observed if wearing spectacles or using optical devices (Class IM – “magnifying”). The maximum power output of these lasers is 40W (blue light) and 400W for red light emissions.
Risks associated with laser use (adapted from Parker, 2007)²

<table>
<thead>
<tr>
<th>Risk</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser beam</td>
<td>Exposure of non-target tissues. Due to the intensity of the output beam and high concentrations of optical power at considerable distances, lasers can cause serious injuries to eyes and skin.</td>
</tr>
<tr>
<td>Optical</td>
<td>Majority of laser-induced ocular injuries are due to operator error and can affect the retina and cornea. Visible wavelengths may selectively destroy red or green cones, resulting in colour blindness, but the majority of retinal laser burns affect complete areas of tissue due to the high invisible wavelengths in dental lasers. Longer wavelengths affect the structure of the front of the eye and may cause ablation, scarring and distortion of vision.</td>
</tr>
<tr>
<td>Skin</td>
<td>May be combined risks of ablative damage to skin and possible ionising effects that may be pre-cancerous.</td>
</tr>
<tr>
<td>Non-beam</td>
<td>Physical damage arising from moveable components of the laser. Fire risks, through the ignition of tubing. Anesthetic gases or chemicals (eg. alcoholic disinfection) should be identified and avoided. Products of tissue ablation (plume) are a considerable hazard that can affect not only the clinician but also auxiliary personnel and the patient. Fine mesh face masks specific to surgical laser use, gloves and high-speed suction aspiration must be used to control the spread of all laser tissue ablation products.</td>
</tr>
<tr>
<td>Laser plume</td>
<td>The products of laser tissue ablation are collectively known as a “laser plume”. Whenever non-calciﬁed tissue is ablated, such as caries removal and soft tissue surgery, a complex chemical compound is emitted. Plume inhalation can be serious and result in nausea, breathing difﬁculties and inoculation of bacteria. The plume from dental hard tissues is potentially less dangerous.</td>
</tr>
</tbody>
</table>

Class III: The ‘old’ Class IIIA was replaced by Classes IM and IIM. Class IIIB represents maximal power output of 0.5 W. Examples include ‘soft’ medical lasers (LLLT).

Environmental controls, protective eyewear, appointment of assigned safety personnel (laser safety officer, laser protection advisor) and training in laser safety are required by personnel using these lasers. Class IIIR includes some low level medical devices and targeting lasers, but are generally lasers of lower power outputs than IIIA. For emission in the visual range of wavelengths (400-700nm), the maximum power output is 5mW and with invisible wavelengths, 2mW. The same safety measures are required as with Class IIIB lasers.

Class IV: This Class includes all high-powered, surgical and other cutting lasers. There is no upper limit of power output. All surgical lasers used in dentistry and oral and maxillofacial surgery are included. The protective measures applicable to Class III lasers are further endorsed with the additional risk of fire hazards, due to flash-point temperatures being reached in chemicals used adjunctively to surgical procedures. This group of lasers represents the greatest risk of damage, both to unprotected persons and target tissue, either through direct or reﬂected and scattered beams.

Many dental lasers are classiﬁed as Class IIIB or IV. The Department of Health’s Radiation Control “Requirements for the safe use of Class IIIB and Class IV lasers or laser systems, radiation control” advise on the various approaches that the LSO need to employ in the practice to ensure that the relative laser and radiation hazard is limited during the laser application. The relevant assessment of hazard controls² that the LSO must assess may include, but is not limited to:

- Access restriction during use and storage
- Eye protection
- Laser room access: area control during use and storage
- Laser safety features: barriers, shrouds, locked panels, beam stops etc.
- Administrative and procedural controls
- Education and training

It is essential that all practitioners are familiar with laser safety requirements before purchasing a laser for use in the dental setting.⁸ The safety of laser equipment is based on proper design of laser equipment and on the adoption of appropriate precautions during use. The safe, responsible and ethical use of lasers will ensure that risks are reduced and that the dental team work in a safe environment based on the Occupational Health and Safety Act.⁹ It is not easy to use a laser as it is unlike the use of a scalpel, hand piece or hand instruments and training is required¹⁰ based on the user’s scope of practice.⁵ The need for constant accredited Continuous Professional Development (CPD) refresher courses remain essential to keep up with relevant peer reviewed scientific research to ensure that the treatment provided is evidence based.¹⁰

All treatment decisions must be based on ethical principles, including that of patient autonomy, beneficence, non-maleficence, justice and veracity and informed consent.¹¹

For informed consent to be valid patient autonomy is critical. Autonomy refers to the right of the patient to make decisions for himself/herself regarding his/her treatment options, after having been provided with all the necessary and relevant information. Before subjecting a patient to any investigations, we need to obtain their agreement and consent. Patients should be fully informed about the use of laser technologies and the risks and benefits thereof enabling a reasoned assessment of the proposed treatment options. Consent must be voluntary and it is essential that the relevant information is provided in language that is easily understandable.¹²

Apart from the fact that dental practice is firmly rooted in the principle of “primum non nocere” – first do no harm, it is imperative the benefits and the potential harm of any treatment is balanced. The use of laser technologies can play an indispensable role in the clinical management of patients and is an important tool in the practice of modern day dentistry. However, it is accepted that it does involve risk to laser beam exposure and it is essential that any exposure has a potential net benefit to the patient against any possible detrimental effects.³ The risks, benefits and
effectiveness of alternative techniques must be considered. This decision-making process is called ‘justification’ and is both an ethical and legal requirement. Dentists should not misrepresent the use of the laser technology as an adjunct in treatment. The patient’s history, diagnosis and proposed treatment will determine its use and it should not be used routinely or for screening purposes. In some cases an additional fee might be charged for the use of the laser but it will be an ethical breach if it is used with no advantage or improvement to the treatment to be provided.

CONCLUDING REMARKS

The “best interest” of the patient means that professional decisions must include reasonable alternatives and that the dentist considers the values and personal preferences of the patient. This must be done in a manner that allows the patient to be involved in the decision-making process. Anyone working with or responsible for potentially hazardous laser equipment should be properly trained in laser safety, be aware of the nature of laser hazards and understand the procedures and safeguards that need to be implemented. The safe use of lasers in dentistry extends to all personnel and the lead clinician must ensure that an adequate safety policy is in place for the management and control of the risks of accidental exposure.

Readers are invited to submit ethical queries or dilemmas to Prof. S Naidoo, Department of Community Dentistry, Private Bag X1, Tygerberg 7505 or email: suenaidoo@uwc.ac.za

References


A fantastic learning opportunity awaits the dental profession
What’s new for the clinician?
Summaries of and excerpts from recently published papers

SADJ November 2015, Vol 70 no 10 p467 - p469
Compiled and edited by V Yengopal

1. Early loading of fluoridated implants placed in fresh extraction sockets


Immediate/early loading of implants in healed sites and extraction sockets is an increasingly popular treatment modality in implant patients undergoing planned tooth extractions due to the reduced treatment time required. Several clinical studies on immediate loading of implants have demonstrated successful results with regard to survival rate.1 An important factor in successful clinical outcomes is the type of implant used. The OsseoSpeed™ implant has been developed with a fluoride-modified titanium surface that has demonstrated firmer bone anchorage than an unmodified control surface.3 Results from two different five-year prospective clinical studies have shown that early and immediate loading of fluoridated implants resulted in a low degree of marginal bone reduction and high implant survival rates.1

Oxby and colleagues (2015)1 reported on a trial that sought to report on the clinical and medium- to long-term radiographic results of fluoridated implants placed into both fresh extraction sockets and healed bone in preparation for early loading with final prosthetic constructions.

MATERIALS AND METHODS

The study included patients who had consented to treatment with the OsseoSpeed™ implant system, who had undergone full surgical and prosthetic treatment and had loading with a permanent prosthetic construction less than 60 days after surgery (early loading). The sample comprised thirty-nine patients and, in 24 of these, one or more implants had been placed in healed sites as well as into extraction sockets immediately after tooth removal. All implants in the remaining 14 patients had been placed in healed bone. The radiographic examination prior to treatment included intraoral and panoramic radiographs and, if required, tomography.

None of the participants suffered from any severe systemic disease and the sample included smokers. The surgical procedures were standardized and carried out under local anaesthesia and with antibiotics (clindamycin 600 mg; Dalacin) from the day before surgery and for 9 days postoperatively.

A total of 182 fluoridated implants were placed in the 39 patients, with 72 (40%) inserted immediately after tooth extraction and 110 (60%) placed in healed bone. A suitable healing abutment was connected to each implant. The margins of the soft tissue around the extraction sockets were adapted and sutured with resorbable coated Vicryl® to reduce the open extraction wound. However, no attempts were made to mobilize the buccal mucosa to completely cover the wound.

Impressions were taken 10 to 14 days after surgery. The fixed partial prostheses (FPPs) and fixed complete prostheses (FCPs) were fabricated according to the Cresco Precision™ method (DENTSPLY) and were screw-retained. The single-tooth (ST) implants were restored by screw-retained metal-ceramic crowns. All ST crowns had adjacent teeth.

Forty-nine permanent fixed restorations were delivered and loaded within 53 days (range 14–53 days, average 31 days. Eight of the 39 patients received two restorations, while one patient merited three.

The patients were recalled annually for clinical and radiographic examinations during an observation time from 36 to 63 months (mean 55 months. The clinical examinations included evaluation of stability of constructions, oral hygiene, and health of peri-implant soft tissues using probes. Moreover, clinical photographs were taken at each follow-up visit to enable evaluation.
of the aesthetic outcomes over time, for which an index of three possible scores was created: 1 (intact buccal gingiva), 2 (exposed abutment), and 3 (exposed abutment and implant neck).

A conventional radiographic technique was used for the baseline examinations at delivery of the restorations, while a digital technique was used for the follow-up examinations. Measurements were recorded by an independent radiologist using paired views of the radiographs taken at baseline and at the final examinations. The outer rim of the implant platform was used as the reference point for the measurements. The bone level was defined and recorded as the distance from the reference point to the proximal implant-bone contact level.

RESULTS

During the course of the study, three of the 39 patients died from unrelated causes, and one patient relocated and was not available for the final examination. However, all 39 patients were followed for at least 36 months.

No implants were lost during the follow-up during the 36- to 63-month observation period, giving a survival rate of 100% for implants in both healed sites and in extraction sockets. There were no signs of peri-implant purulent infection with aggressive marginal bone loss during the follow-up period.

The aesthetic evaluation showed good soft tissue preservation over time. Soft tissue complications (exposed abutments and implant necks) were observed at only two of the implants, which were scored as “3” on the aesthetic index. The remaining 180 implants were evaluated as “1” (intact buccal gingiva).

The average bone level at baseline was significantly lower (p = .0002) at implants in fresh extraction sockets (−1.0 ± 1.3 mm) compared with implants in healed sites (−0.3 ± 0.6 mm). The corresponding values after three to five years of function were identical (−0.6 ± 0.7).

The change of bone level from baseline to the three- to five-year visits was significantly different (p = .0036). An average bone loss of 0.3 ± 0.9 mm was seen at implants placed in healed bone, and a bone level gain of 0.3 ± 1.4 mm was seen for the implants in fresh extraction sockets.

The frequency distribution of bone level revealed that 85% of implants placed in fresh extraction sockets and 84% of implants in healed bone did not show any loss of bone level during follow-up (p = NS). The proportions of implants with bone levels from 0 to 0.9 mm from the reference points at the three to five-year follow-up were 72% and 78% in implants placed in fresh extraction sockets and in those placed in healed bone, respectively (p = NS).

CONCLUSION

Early loading of fluoridated implants with permanent constructions appears to be a viable therapy for implants placed immediately in both extraction sites and in healed bone.

IMPLICATIONS FOR PRACTICE

Although this study provides another viable alternative for immediate implants, readers should be cautious in interpreting these results as ideally, one immediate implant system should be compared with another in a parallel group randomized clinical trial.

Reference


2. Efficacy of air polishing for the non-surgical treatment of peri-implant diseases: a systematic review


Air polishing has been available since the late 1970s as an alternative to using a prophy angle and rubber cup during supra-gingival polishing. The technology uses a combination of abrasive particles with water and compressed air delivered through an air polishing device. The most common abrasive agent used during supra-gingival air-polishing is a sodium bicarbonate, aluminum trihydroxide, calcium carbonate and bioactive calcium sodium phosphosilicate material (bioactive glass).

The abrasive nature of sodium bicarbonate, calcium carbonate, and bioactive glass contraindicate their safe use in subgingival air polishing. Two ingredients which can be used safely are erythritol and glycine. Research demonstrates that glycine powder air polishing (GPAP) is effective at removing subgingival biofilm and in cleaning root surfaces, a helpful addition to the efforts of clinicians to prevent both peri-implant mucositis and peri-implantitis.1

Despite the remarkably high success rate of dental implant therapy, increasing numbers of patients are developing peri-implant mucositis or peri-implantitis—both of which are infectious diseases. Experts at the 2012 Consensus Conference of the European Association for Osseointegration concluded that peri-implant mucositis can be successfully treated nonsurgically, and that all treatment modalities should disrupt the submucosal biofilm. Schwarz and colleagues (2015)1 reported on a systematic review
that sought to address the following focused question: In patients suffering from peri-implant diseases, what is the efficacy of air polishing on changing signs of inflammation compared with control treatments?

**MATERIALS AND METHODS**

A search strategy with a combination of key words and free text terms was developed for use in the PubMed database. This was complemented by a hand search of selected journals and the references of all selected full-text articles and related reviews were scanned. If required, the corresponding authors were contacted and requested to provide missing data or information.

Prospective randomized controlled (RCT), or non-randomized controlled (CCT) trials (split-mouth or parallel group designs) in humans comparing air polishing with control measures for the non-surgical treatment of peri-implant mucositis and peri-implantitis were considered for inclusion. Additionally, included studies had to report on the clinical changes in mucosal inflammation (i.e. bleeding scores) after treatment as an outcome measure.

A quality assessment of all selected full-text articles was performed according to the Cochrane Collaboration’s tool for assessing risk of bias (low, high, unclear) including the following domains: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, and incomplete outcome data. Quality assessment was performed independently by two authors and disagreements were resolved by discussion.

Data from included studies were extracted on the basis of the study design, population, case definition, observation period, interventions, comparisons, primary and secondary outcomes as well as the study quality. For data analysis, the changes in bleeding on probing (BOP) scores after respective healing periods were defined as primary outcome. Secondary outcomes included changes in pocket depth (PD) as well as the resolution of peri-implant mucosal inflammation.

Heterogeneity (I² statistics) between included RCT’s, meta-analysis (weighted mean difference and 95% confidence interval, subject based analysis) and forest plots were assessed using a commercially available software program (Comprehensive Meta-Analysis V2, Biostat). Meta-analysis was based on a random effect model to account for potential methodological differences between studies. Thresholds for the interpretation of I² values were used as follows: 0–30% (low heterogeneity), 30–60% (moderate heterogeneity), >60% (substantial heterogeneity).

**RESULTS**

A total of 288 potentially relevant titles and abstracts were identified, and of these 276 publications were excluded. The complete full-text articles of the remaining 12 publications were thoroughly evaluated and a further six papers had to be excluded at this stage because they did not fulfil the inclusion criteria of the present review. Finally, a total of five studies (corresponding to six publications) fulfilled the inclusion criteria required for this systematic review.

**Non-surgical treatment of peri-implant mucositis**

At 3 months after therapy it was found that both test and control groups resulted in significant improvements in bleeding index and PD values. The adjunctive single application of glycine powder air polishing was associated with a lower frequency of sites without bleeding when compared with the control group (29.3% versus 42.1%). At 6 months, the adjunctive single use of glycine powder air polishing resulted in a significantly higher bleeding index (BI) and PD reduction when compared with mechanical debridement alone.

A repeated application also resulted in significant BOP reductions after 12 months of healing. In both groups, the number of diseased sites (pocket depth ≥4 mm with bleeding/suppuration) was significantly reduced between baseline and 12 months. However, no significant differences were noted between groups at 12 months or in the reduction in number of diseased sites from baseline to 12 months.

**Non-surgical treatment of peri-implantitis**

At 3, 6 and 12 months after therapy, glycine powder air polishing resulted in a statistically significant higher BOP reduction than did mechanical debridement plus local antiseptic therapy (i.e. chlorhexidine digluconate) [3 months: 51.6 (SD = 28.6)% versus 24.8 (SD = 29.8)%; 6 months: 43.5 (SD = 27.7)% versus 11.0 (SD = 15.7)%; 12 months: 41.2 (SD = 29.5)% versus 16.6 (SD = 33.4)%]. Between-group comparisons failed to reveal any significant differences in mean PD reductions at 3, 6, and 12 months. No signs of inflammation, complications or allergic reactions in the form of swellings or redness of the surrounding soft tissues could be observed.

A single subgingival instrumentation using glycine powder air polishing or an Er:YAG laser (energy density of 12.7J/cm²) (control) resulted in significant BOP reductions at 6 months. The difference between both groups failed to reach statistical significance. A positive treatment outcome (i.e. defined as PD reduction ≥ 0.5mm and gain or no radiographic bone loss) at the implant level was noted in 47% of the test sites and 44% of the control sites.

The weighted mean difference (WMD) [SD; p; 95% CI] in BOP reduction between test and control groups was −23.83% [SD = 12.06; p = 0.048; 95% CI (−47.47, −0.20)] favouring air polishing over control measures (p value for heterogeneity: 0.128, I² = 56.88% = moderate heterogeneity). The WMD [SD; p; 95% CI] in PD reduction between test and control groups was −0.37mm [SD = 0.23; p = 0.119; 95% CI (−0.84, 0.096)] not favouring air polishing over control measures (p value for heterogeneity: 0.940, I²= 0.00% = low heterogeneity).

**CONCLUSIONS**

The authors concluded that while air polishing using glycine powder did not reveal any major improvement of bleeding index/ BOP or disease resolution at mucositis sites, it resulted in a significantly higher BOP reduction at peri-implantitis sites when compared with control measures (i.e. mechanical debridement with or without local antiseptic therapy, Er:YAG laser).

**IMPLICATIONS FOR PRACTICE**

Air polishing using glycine powder is a viable alternative for the non-surgical treatment of peri-implantitis.

**Reference**

Therese Elkerbout

Jonathan Blake
Jonathan Blake is a Physiotherapist in private practice in Johannesburg. His special interests are in sport, orthopaedic and spinal dysfunctions. He is very active and an accomplished cyclist and triathlete. He has an Honours degree in Sports Science and has always combined his interests in sports science and physiotherapy. He is Head of Institution of the Instructors Alliance which has a long legacy in training and continuing education in the health and fitness industry. He has presented at both local and international health and fitness conferences.

Mark Bowes
Mark Bowes qualified from the University of Witwatersrand in 1981. He then spent 23 happy years in private practice in London before returning to Cape Town. While in London he was a member of the British Academy of Aesthetic Dentistry, the American Equilibration Society, and involved in numerous international Study Groups. On his return to Cape Town he was approached to start the South African Academy of Aesthetic Dentistry (www.saaad.co.za), of which he is now Vice President. Mark is a Fellow of the International Congress of Implantologists, a member of the International Team for Implantology and SADA.

Paul Brandt
Paul Brandt is currently employed as Stomatologist at the Department of Odontology, School of Dentistry, University of Pretoria. Main duties include Dental Materials research and lecturing/teaching of dental, oral hygiene and post graduate students in the subject of Dental Materials. He is the course director for a post-graduate Diploma in Aesthetic Dentistry, external examiner and exam moderator. Main areas of interest is facial aesthetics, aesthetic dentistry, direct composite veneers, bonding agents, cements, tooth whitening, tooth hypersensitivity, post-operative sensitivity, dental lasers and the ART technique.

John Bronner
John Bronner graduated from the Dental School at the University of Pretoria in 1985, and completed an honours degree in Endodontology in 1986. His further post graduate studies were concluded in 1990 when he attained his MChD in Prosthodontics and an MSc(Odontolgy) in 1991 at the same faculty, both Cum Laude. In 1991 John commenced practice as a prosthodontist in Pietermaritzburg and Durban. John has lectured frequently in the subject of fixed prosthodontics, implants and cone beam volumetric imaging, and is a member of the International Academy of Osseointegration, the International college of Prosthodontics, the Academy of Prosthodontics of S.A, the South African Academy of Computerised Dentistry (SAACD) the International Team of Implantologists (ITI) and is currently the Vice President of the South African Association of Osseointegration (SAAO). John is a certified CEREC trainer, and a trainer in Galileos 3D dental imaging.

Colin Burns
Colin Burns is a Dentist with a Special Interest in Implant Dentistry. He balances a busy referral practice with lecturing, teaching and mentoring commitments, mainly under auspices of the International Team for Implantology (ITI), of which he is a Fellow. His passion is the delivery of successful and aesthetic Implant Dentistry. He is currently the Principal Implant Surgeon at G1 Dental Practice in Glasgow, Scotland. He is the Study Club Section Coordinator of the International Team for Implantology UK and Ireland Section since January 2013. He is also a fellow member of the Association of Dental Implantology.

Imran Cassim
Imran Cassim qualified with a BDS degree from University of Witwatersrand In 1999. He attained distinctions in Physiology, Pharmacology and Anaesthetics during his undergraduate study. He received the African Oxygen Horace Wells Bronze Medal for the most distinguished student of the year in Anaesthetics in 1998. In 2000 He completed his Post Graduate Diploma in Endodontics at University of Pretoria, with distinctions in Oral Biology and Endodontics. He achieved second place for his case presentation at the European Endodontic Forum held at Interlaken, Switzerland in June 2011. He has written and co-authored articles on endodontics. Imran is currently studying part time, towards an MSc in Endodontics at the University of Pretoria, and is in private practice focusing mainly on endodontics, restorative dentistry and minor oral surgery and periodontics in Durban.

Nuno Sousa Dias
Nuno Sousa Dias received his Dental Degree in 2007 (Porto). In the same year, he created and registered a Smile’s Analyses named SAEF® - Smile’s Aesthetic Evaluation Form®. From 2008 to 2012, he completed the full-time Orthodontic Postgraduate Program at Tel Aviv University (Israel). He was awarded with the 1st prize at the 4th Scientific Research International Competition of the Spring Meeting of the EAED (European Academy of Esthetic Dentistry), in 2010 (London). He was awarded by SEDO (Sociedad Espanola de Ortodoncia) with a fund to attend the AGE (Advanced Graduated Education) Didactic Courses at the Department of Orthodontics of HSDM (Harvard School of Dental Medicine), in 2013. He is a member of several national and international Orthodontic scientific organisations. He lectures internationally in the field of Orthodontics and Smile’s aesthetics.

Howard Farran
Howard Farran, DDS MBA is a noted international lecturer on faster, easier, more efficient dentistry. He has captivated audiences around the world with his innovative, informational and entertaining style. In his seminar entitled, “The Virtues of Profitable Dentistry” he gets down to the nitty gritty details of running a thriving family practice. He can show any dental team how they too can achieve their dreams and goals. He is the author of several dental practice management articles and multiple video series. His experience ranges from all aspects of practice management, including business planning, operations and finance, e-commerce business and Internet marketing.

Carlo Ferretti
Carlo Ferretti is a self-taught chef who is famous in the four corners of his home. He significantly overestimates his capabilities in the field. His is most accomplished with various forms of Mediterranean fare, but has on occasion attempted fusion cuisine. Both he and his dishes have traversed on these efforts to extend his repertoire. He is particularly renowned for a recipe of such unctuous creaminess it can make one forget ones worldly problems and be transported into a different celestial dimension. Desserts remain his Achilles heel. He thinks Jamie Oliver (although well intentioned) is a bit too showy but Antonio Carluccio is the real deal. In his spare time he dabbles in Maxillofacial Surgery and occasionally places implants (time permitting).

Ulundi Behrtel
Ulundi Behrtel obtained her BLC and LLB degrees at the University of Pretoria. She subsequently obtained a Certificate in Medicine and Law (Cum Laude) at UNISA, a Certificate in Legislative Drafting (cum laude) at the University of Pretoria and a Post Graduate Diploma in International Research Ethics (cum laude) at the University of Cape Town. She is a qualified attorney and has gained extensive experience in law and ethics in the healthcare sector over the past 23 years.

Jonathan Blake

Mark Bowes

Paul Brandt

John Bronner

Colin Burns

Imran Cassim

Nuno Sousa Dias

Howard Farran

Carlo Ferretti

Ulundi Behrtel

Jonathan Blake

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Ulundi Behrtel

Jonathan Blake

Mark Bowes

Paul Brandt

John Bronner

Colin Burns

Imran Cassim

Nuno Sousa Dias

Howard Farran

Carlo Ferretti
Bruce Fordyce

Bruce Fordyce, legendary South African winner of the Comrades Marathon, was born in Hong Kong, then a city under English administration on the eastern side of Pearl River Delta and now a Special Administrative "Region" of China. His parents moved to Johannesburg in 1956 when he was only thirteen years old. After finishing 4th in his first race in 1977, in which he turned forty-three, he improved steadily to win the Comrades eight years in succession (1981-1988) and again in 1990. No other runner has achieved this record in the history of the Comrades Marathon race. He has completed twenty-three Comrades Marathons and was voted 64th in the 2004 Top 100 Great South Africans.

Jameel Gardee

Jameel Gardee is a South African who has qualified as a dentist in the UK and completed further post graduate study in the USA. He is currently Clinical Director and Principal Dentist at the Glasgow Smile Clinic in Glasgow, UK where he practices Advanced Restorative Dentistry treating complex cases, teach other dentists how to carry out work in this field and write articles for dental publication. He is also Chairman of the Dental Advisory board at Welltime, a company providing online and mobile solutions for the Dental market.

Simone Grandini

Simone Grandini graduated in 1994 from the Dental School of Florence University. In 1995 he obtained a postgraduate certificate in Periodontology at the University of Genoa, Italy and in 1996 he obtained a postgraduate certificate in Restorative dentistry at the University of Florence, Italy. He was clinical instructor of Restorative Dentistry at the University of Florence (1997-1999). In 1999 he started working as visiting professor at the University of Siena, Italy. In 2002 he obtained a Master of Science in Dental Materials and Clinical applications, and in 2004 he completed his PhD studies at Siena University. Since 2005 he has been Head of Department and has the chair of Endodontics and Restorative Dentistry, at Siena University. He also teaches Restorative Dentistry and Dental Hygiene at the School of Dental Hygienists, and Preventive Dentistry at the postgraduate School of Orthodontics. Since 2010 he has been the Dean of the School of Dental Hygienists.

Howard Gluckman

Howard Gluckman completed his dental training at the University of Witwatersrand in Johannesburg in 1990. After spending a number of years in a general practice he completed a 4-year full time degree in Oral Medicine and Periodontics at the University of Stellenbosch in Cape Town, which he completed with distinction. He was intimately involved in the development of the postgraduate diploma in Implantology at both the University of Stellenbosch and later at the University of Western Cape. He is currently in full time private practice in Cape Town and in part time private practice in the United Kingdom. He is the director of the Implant and Aesthetic Academy, which is the only institution in South Africa currently providing a complete postgraduate training program in Implantology in South Africa. The Academy provides students with diplomas in implantology from The University of Frankfurt. He has been involved in Implantology training for 17 years.

Lizelle Loock

Lizelle Loock is an optometrist situated in the Paarl. She completed her B Optom degree at University of Johannesburg in 1991. She completed her diploma in Sports vision in 2006 from the University of Johannesburg. She is currently the owner of Dynamic Vision where they commit to help employers and their employees discover and develop the strengths and abilities they need to grow into strong teams and successful companies using the tools available through Gallup StrengthsFinder®, Tall Trees Leadership Profile®, Sensory Intelligence®, Emotional intelligence®, and the development of appropriate skills and knowledge.

Tony Mc Collum

Tony Mc Collum is a specialist orthodontist in private practice but also serves as an Adjunct Professor in the Department of Orthodontics, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa where he is active in research particularly in orthognathic surgery and teaching. He publishes and lectures locally and internationally. He is a co-author of a book on orthognathic surgery and recently contributed two chapters to a new book on orthodontics. He is a past president of the South African Society of Orthodontics and currently is an international editor of Seminars in Orthodontics.

Alasdair Mckelvie

Alasdair Mckelvie graduated from Dundee Dental School in 1984 remaining in the hospital environment for twelve months as a house officer, gaining experience in restorative dentistry. He then worked for 23 years in general dental practice first as an associate before opening his own private practice in which he worked until the practice was sold in 2008. Alasdair’s association with Dental Protection began with him working as a Local Dental Adviser in 2000 before becoming an associate Dento-Legal Adviser in 2003. In 2007 Alasdair graduated from the University of Wales with an LLM in Healthcare Law. Alasdair became a full time member of the advisory staff at DPL in 2008. He has been assisting members in South Africa since joining DPL full time in 2008 and is currently dental services lead for our South African hub services.

Nadia Mohamed

Nadia Mohamed currently occupies a full-time post in the Department of Orthodontics and Paediatric Dentistry at the University of the Western Cape’s School of Oral Health. She was appointed as Head of Department of Paediatric Dentistry in March 2012. She has been lecturing in the Department of Paediatric Dentistry since being permanently appointed in 2000. She has expertise in the following fields: Early Childhood Caries, Special Care Dentistry, Trauma/ Sports Dentistry, Pulp therapy, Interceptive orthodontics, E-learning and Forensic dentistry. She is also a member of the forensics team for victim identification.

Desi Moodley

Desi Moodley completed his PhD in Restorative Dentistry at the University of the Western Cape in 2007. He completed his MSc Dental Sciences at the University of Stellenbosch in Restorative Dentistry in 1999. Also completed Post Graduate Diploma in Aesthetic Dentistry (Cum Laude) in 1997 and Dentistry in 1982. He is the winner several awards including the Hatton Award for the best Post-Graduate Research. He was awarded the Liver Ponds Scholarship for outstanding undergraduate student and awarded Gold Medals for Prosthodontics, Oral and Dental Anatomy, Pharmacology, Oral and Dental Pathology. He has been in Private Practice in East London and is currently a Senior Lecturer/Stomatologist at the Department of Restorative Dentistry, University of the Western Cape.

Rajeshree Moodley

Rajeshree Moodley received her MsC Dental Public Health from the University of the Western Cape, her B. Dent Ther from the University of Durban-Westville. She is currently busy with her PhD in Health sciences, Occupational health and well – being of dental Practitioners.
Nazariy Mykhaylyuk

Nazariy Mykhaylyuk is a specialist in a field of microscopic dentistry (mostly indirect restorative dentistry). He works in Ivano-Frankivsk, Ukraine, in a family clinic in a team with his father and dental technician Bogdan Mykhaylyuk (Oral Design Ukraine). In 2013 he developed a hand instrument for finishing preparations (enamel chisels - Deppeler), developed MicroVision preparation kit for veneers and onlays (Komet), published an article in “The ACD Journal of Cosmetic Dentistry” Winter Edition, became a DentalXP expert. He became co-founder of the MicroVision Group. Since 2010, he organized about 80 courses in the Mykhaylyuk Study Center for about 700 dentists. He lectured about 70 times in Ukraine and worldwide. He did more and more international hands-on courses and lectures about microscopic dentistry worldwide (Taiwan, Costa Rica, Spain, USA, Brazil, Columbia, Argentina, Romania, Russia, Hungary) since 2013.

Anna O’Connell

Anne O’Connell graduated from Trinity College, Dublin and worked in general practice in UK before undergoing specialty training in Paediatric Dentistry at Eastman Dental Center, USA and a further degree in Cariology from the University of Rochester, New York, USA. She held academic positions in Eastman Dental Center, the University of Maryland and the National Institute of Dental and Craniofacial Research, USA. She returned to Ireland to establish the post-graduate training programme in Paediatric Dentistry and the Trauma clinic within the Dublin Dental University School and Hospital. Anne has numerous peer-reviewed publications in both basic science and clinical dentistry. Her areas of interest include cariology, pulp therapy, restorative treatment for children, trauma, infant oral health and developmental defects of the dentition and has lectured internationally on these topics. She is Board certified in Paediatric Dentistry and holds a Fellowship in Dental Traumatology. She is an active participant in organised dentistry both nationally and internationally. Anne serves on numerous national and international scientific committees/organisations including ISDC, AAPD, IADR and IADT. She has extensive experience with editorial boards and as an ad hoc reviewer of many dental journals. She is currently on the Board of the IAPD and Dental Traumatology.

Jeanne Oosthuysen

Jeanne Oosthuysen obtained the diploma in Oral Hygiene at the University of Stellenbosch in 1979. She started her career as oral hygienist in Bloemfontein in an orthodontic practice. As one of the founder members of REINOR Orthodontic Products in 1982, she managed the business until 1991. From 1991 – 1997 she worked part-time as oral hygienist in a general dental practice and in an orthodontic practice. During the 17 years of active involvement in orthodontics nationally and internationally, she was invited to several training sessions and sales meetings in the USA and Europe.

Jon Patricios

Jon Patricios is currently a sports physician at the Centre for Sports Medicine and Orthopaedics (CSMO) and director of the Morningside Sports Medicine Unit in Johannesburg. He is a Fellow of the American College of Sports Medicine and the Faculty of Sports & Exercise Medicine (UK). He is also an associate editor of the British Journal of Sports Medicine and Current Sports Medicine Reports (USA) and has recently been elected to his second term as president of the South African Sports Medicine Association (SASMA). Jon has been team physician to school, club, provincial and international sports teams in rugby, cricket, soccer, athletics and basketball, is a member of the Cricket South Africa and SA Rugby medical committees and the Rockies Comrades Marathon Panel of experts. He is chief medical officer for the MTN Qhubeka cycling team and the Kaizer Chiefs Football Club, founder and director of Sports Concussion South Africa and serves on tribunals for the South African Institute for Drug Free Sport (SAIDS).

Stavros Pelekanos

Stavros Pelekanos received his undergraduate degree in Dentistry (D.D.S.) in 1991 from the University of Athens, Greece. In 1993, he obtained his doctoral degree in Prosthodontics (Oral med dent) from the University of Freiburg (Prof Dr J.R. Strub), Germany. Following his professional training, he established a private practice in Athens, oriented towards prosthodontics, implantology and aesthetic dentistry. Since 2013 he is an active member of the European Academy of Esthetic Dentistry (EAED). His professional affiliations include: the International College of Prosthodontics (ICP), European Prosthodontic Association (EPA), Greek Prosthodontic Association and many others. He is a faculty member of gIDE Institute (Global Institute of Dental Education, Los Angeles, California) and Dental Tribune CME, lecturing internationally and performing hands-on courses on implants, esthetics and restorative procedures.

Maria Phalime

Maria Phalime is a medical doctor and award-winning author. Born and raised in the Johannesburg township of Soweto, Maria moved to Cape Town in 1991 to pursue her studies at the University of Cape Town, from where she graduated with a Bachelor of Science (BSc) degree in 1993 and a Bachelor of Medicine & Bachelor of Surgery (MBChB) in 1999. She practiced for a brief period in South Africa and the United Kingdom before leaving medical practice to pursue non-clinical interests. She has worked in trade and investment promotion and has undertaken research and consulting in the areas of economic development and business facilitation.

Erich Raubenheimer

Erich Raubenheimer received his BChD (Cum Laude) from the University of Pretoria, his MChD Degree in Oral Pathology from the University of Pretoria, a PhD, Medunsa, Doctor Scientiae (DSC Odontology) from the University of Pretoria, and a Level I CBCT Certification of competency: American Academy of Oral and Maxillofacial Radiology. He is a Forensic Odontologic Consultant (North Western region of South Africa), since January 1984 to present, and a Consultant for Metabolic Bone Disease for the South African Pathology fraternity since 1998 to present. He acted as supervisor for seven PhD degrees and several Masters Degrees in Dentistry, Medicine and Veterinary Science since appointment in 1982.
Daniele Rondoni
Daniele Rondoni graduated from the dental technicians school IPSIA “P.Gaslini” in Genoa in 1979. He continued his education by attending relevant workshops for the “Italian dental school “and -furthered his professional experience in Switzerland, Germany and Japan. He is particularly interested in the morphology and dental aesthetics, he has collaborated in the development of aesthetic dental restoration materials, and is author of “Techniques of Ceramic multistratification” (ed. UTET). He has created a manual for laboratory work on the use of composite materials by determining work protocols for the indirect technique and also for the technique of pressing composite structures on metal known as the “inverse stratification system” which he designed. He is the author of numerous articles on aesthetic restoration published in Italy and abroad.

Errol Stein
Errol Stein graduated in dentistry at the University of the Witwatersrand where he was the Gold Medalist of his year. He practised in London before returning to Johannesburg where, after five years in general practice, he went on to study for his Higher Diploma in Dentistry and the Diploma in Orthodontics at Wits. His subsequent qualifications were a Masters degree in Dentistry (Orthodontics) and a Fellowship in Dentistry (Orthodontics) at the College of Medicine of South Africa. He is a Professor in the Department of Orthodontics at Wits University. He has lectured extensively both locally and internationally, and is the author of many scientific papers in the specialist literature. He is an international member of the American Association of Orthodontists, and also the World Federation of Orthodontics. He is in practice as a specialist orthodontist in Johannesburg.

Charlotte Stilwell
Charlotte Stilwell is a specialist in prosthodontics. She qualified from The Royal Dental College in Copenhagen in 1983 and moved to London to pursue her interest in removable prosthodontics at the Prosthetic Department at The London Hospital Dental School. After five years of postgraduate training she practiced for nine years in general practice in West Wickham, Kent until she took up her current position in 1997 as a referral specialist at the multi-disciplinary Harley Street Dental Clinic in London. Over the past 20 years Charlotte has lectured widely and published articles on removable prosthodontics. She is a visiting lecturer at the Dental Faculty, University of Geneva and she has an interest in both conventional and implant prosthodontics and management of occlusion. Charlotte is a Fellow member of the International Team for Implantology (ITI), the ITI Education Committee and Senior Editor of the ITI Online Academy.

Georges Tawil
Georges Tawil obtained his Doctorat in Dental Surgery at St Joseph University, Beirut, Lebanon from 1967-1972. He gave clinical training in Periodontology and Oral Surgery at the Institut de Stomatologie Universite Pierre et Marie Curie, Paris from 1972-1975. He was teaching and research Associate. Department of Periodontology, School of Dental Medicine, University of Pennsylvania, USA. In 1980 he did his Doctorat in Odontological Science University of Paris VI DScOd. He is the founding member of the Near East Association Of Osseointegration with PI Brånemark.

Nic van Rheede van Oudtshoorn
As a Dux student at the University of Pretoria, he obtained his B.Ch.D in 1977, before starting a dental practice in Pietersburg. Elected to the executive committee of DASA (Dental Association of South Africa), Northern Province in 1985, he has since 1987 been President (Chairman) of SADA’s (South African Dental Association) Limpopo Branch. Elected to the Board of Directors of Limpopo Medi-Clinic in 2002, he still holds the position, as well as President of South African Academy of Computerised Dentistry (SAACD). He is also an exco member of the International Society of Computerised Dentistry (ISCD). In 2008 he opened a high-tech dental practice, The Dental Studio, equipped with lecturing and training facilities.

Sybrandt van Rheede van Oudtshoorn
In 2000, he obtained his B.Sc (Psychology and Physiology) Stellenbosch and BDS (MEDUNSA) in 2005. In 2008, Sybrand did his DipOdont (Postgraduate diploma in Dentistry - Oral surgery) in Pretoria and in 2010 obtained a PDD (Postgraduate diploma in Dentistry – Endodontics in Pretoria. He was in private practice from 2006 - 2012 in Polokwane and from 2008 - 2012 has been an ISCD (certified CEREC trainer).

Mark Wertheimer
Mark Wertheimer obtained his BDS degree, in June 1994. He obtained his MSc (Dent) degree in June 1986. In December 1995 he graduated with MDent in the branch of Orthodontics. He was admitted as Fellow of the College of Dentistry of South Africa - FCD (SA) Orthodontics in April 1996. He was involved in postgraduate teaching in the Department of Orthodontics at University of the Witwatersrand from 1996-2012. He is past President of the Paedodontic Society of S.A. He is chairman of the Gerald Gavron Reserve fund of SASO from 2004-2012. He is a member of National Council of SADA 2005-2014, member of SADA ExCo 2010-2011 and President of SASO 2012-2014. He is on the SADA Board of Directors 2011- present. He is in private orthodontic practice since 1996.
### Congress Programme Overview

**Saturday 19 March 2016**

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<thead>
<tr>
<th>Time</th>
<th>Lecture Centre 1</th>
<th>Lecture Centre 2</th>
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</thead>
<tbody>
<tr>
<td>07:30 - 08:00</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>08:00 - 09:00</td>
<td>OPENING - MARETHA SMIT</td>
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<tr>
<td>09:00 - 09:45</td>
<td>BRUCE FORDYCE - Setting goals and breaking barriers</td>
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<tr>
<td>09:45 - 10:30</td>
<td>NUNO SOUSA DIAS - Orthodontics in adult patients - a fundamental piece for an interdisciplinary treatment approach</td>
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<tr>
<td>10:30 - 11:15</td>
<td>TEA BREAK</td>
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<tr>
<td>11:15 - 12:00</td>
<td>SIMONE GRANDINI - Simplicity in direct posterior restorations</td>
<td></td>
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<tr>
<td>12:00 - 12:45</td>
<td>HOWARD FARRAN - Uncomplicated Business</td>
<td></td>
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<tr>
<td>12:45 - 14:15</td>
<td>LUNCH BREAK</td>
<td></td>
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<tr>
<td>14:15 - 17:00</td>
<td>COLIN BURNS</td>
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<tr>
<td></td>
<td>1. The Role of the Implant Surface is Successful Implant Dentistry</td>
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<td></td>
<td>2. Restoring at Bone level vs Tissue level/abutment level</td>
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<tr>
<td>19:00</td>
<td>GALA DINNER</td>
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**Sunday 20 March 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Lecture Centre 1</th>
<th>Lecture Centre 2</th>
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</thead>
<tbody>
<tr>
<td>07:30 - 08:00</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>08:00 - 10:15</td>
<td>HOWARD FARRAN - 1 day Dental MBA (Full Day Programme)</td>
<td>NAZARIY MYKHAYLYUK - MicroVision prosthetics. Full mouth reconstruction protocol</td>
</tr>
<tr>
<td>10:15 - 11:00</td>
<td>TEA BREAK</td>
<td></td>
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<tr>
<td>11:00 - 12:30</td>
<td>HOWARD FARRAN - continue</td>
<td>STAVROS PELEKANOS - Abutment solution for single implants in the aesthetic zone</td>
</tr>
<tr>
<td>12:30 - 13:15</td>
<td>SIMONE GRANDINI - Simplicity in direct anterior restorations</td>
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<tr>
<td>13:15 - 14:45</td>
<td>LUNCH BREAK</td>
<td></td>
</tr>
<tr>
<td>14:45 - 17:00</td>
<td>HOWARD FARRAN - continue</td>
<td></td>
</tr>
<tr>
<td>15:30 - 17:00</td>
<td>SIMONE GRANDINI - Simplicity in post-endo restorations</td>
<td>NUNO SOUSA DIAZ - Orthodontics in Adult Patients - a fundamental piece for an interdisciplinary treatment approach</td>
</tr>
<tr>
<td>18:00</td>
<td>SOCIAL EVENT</td>
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</tbody>
</table>

**Monday 21 March 2016 Human Rights Day**

<table>
<thead>
<tr>
<th>Time</th>
<th>Lecture Centre 1</th>
<th>Lecture Centre 2</th>
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</thead>
<tbody>
<tr>
<td>08:00 - 09:00</td>
<td>MARK BOWES - Aesthetic Dentistry in the Modern Dental Practice</td>
<td>DESI MOODLEY &amp; ALASDAIR McKELvie - 1. Complications of Local Anaesthetics in Dentistry</td>
</tr>
<tr>
<td>09:00 - 09:30</td>
<td>HOWARD GLUCKMAN - Surgical and Prosthodontic development of the single Implant in the Aesthetic zone</td>
<td>2. Medico-legal aspects of Local Anaesthetics in Dentistry</td>
</tr>
<tr>
<td>09:30 - 10:00</td>
<td>TEA BREAK</td>
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<tr>
<td>10:00 - 10:30</td>
<td>HOWARD GLUCKMAN - continue</td>
<td>GEORGES TAWIL - Chlorhexidine usage</td>
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<tr>
<td></td>
<td>1. Ethological treatment (how to manage acute phase)</td>
<td>1. Ethological treatment (how to manage acute phase)</td>
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<td></td>
<td>2. And supportive care phase on going</td>
<td>2. And supportive care phase on going</td>
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<tr>
<td>10:30 - 11:30</td>
<td>JOHN BRONNER - New concepts for implant-supported crowns, what have we learnt from our successes and failures</td>
<td>ANNE O’CONNELL - Advances in Paediatric Dentistry - aesthetic crowns</td>
</tr>
<tr>
<td>11:30 - 12:30</td>
<td>BRUNCH BREAK</td>
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<tr>
<td>13:15 - 14:00</td>
<td>NAZARIY MYKHAYLYUK - Use of ceramic veneers. Aesthetic upgrade</td>
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<tr>
<td>14:00 - 14:45</td>
<td>STAVROS PELEKANOS - Ceramic Veneers and onlays. How the development of materials and techniques has changed contemporary prosthodontics</td>
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<tr>
<td>14:45 - 15:00</td>
<td>LUCKY DRAW CLOSE</td>
<td></td>
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</tbody>
</table>

A comprehensive programme overview available at www.sadacongress.co.za
Delegate Registration Form

SADA Congress 19 March - 21 March 2016

Online registration: www.sadacongress.co.za

SECTION A
PERSONAL INFORMATION

(PLEASE PRINT IN BLOCK CAPITALS AND INDICATE THE APPROPRIATE BLOCKS WITH AN 'X'.)

SURNAME  ___________  ID NR  ___________  FIRSTNAME  ___________
ID NR  ___________  INITIALS  ___________  TITLE  ___________
NAME ON BADGE  ___________  HPCSA NR (not practice nr)  ___________
NAME OF PRACTICE/ ACADEMIC INSTITUTION  ___________
POSTAL ADDRESS  ___________  ___________  ___________  ___________
TELEPHONE NR (W)  ___________  ___________  ___________
CELLPHONE NR  ___________  ___________  ___________
E-MAIL  ___________
FAX NR  ___________  ___________
COMPANY VAT NR  ___________

ACCOMPANYING PERSON

SURNAME  ___________  ID NR  ___________  INITIALS  ___________  TITLE  ___________

SECTION B
REGISTRATION FEES (VAT INCLUDED)

25% CANCELLATION FEE WILL BE LEVIED FOR ALL CANCELLATION OF REGISTRATION MADE ON OR BEFORE 31 JANUARY 2016. NO REFUNDS WILL BE GIVEN FOR CANCELLATIONS RECEIVED AFTER THIS DATE.

REGISTRATION SECTION (MARK WITH AN 'X')

DENTAL CATEGORY  FULL REGISTRATION: 19 - 21 MAR 2016  DAY DELEGATE REGISTRATION FEES PER DAY

<table>
<thead>
<tr>
<th>DENTAL CATEGORY</th>
<th>EARLY BIRD (BEFORE 31 JAN)</th>
<th>LATE (AFTER 31 JAN)</th>
<th>MARK X</th>
<th>EARLY BIRD (BEFORE 31 JAN)</th>
<th>SAT 19 MAR</th>
<th>SUN 20 MAR</th>
<th>MON 21 MAR</th>
<th>LATE (AFTER 31 JAN)</th>
<th>SAT 19 MAR</th>
<th>SUN 20 MAR</th>
<th>MON 21 MAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>SADA IDESA Member</td>
<td>R 3 250.00</td>
<td>R 4 060.00</td>
<td></td>
<td>R 1 625.00</td>
<td></td>
<td></td>
<td></td>
<td>R 2 030.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SADA Core Member</td>
<td>R 4 390.00</td>
<td>R 5 490.00</td>
<td></td>
<td>R 2 195.00</td>
<td></td>
<td></td>
<td></td>
<td>R 2 745.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-SADA Member</td>
<td>R 6 825.00</td>
<td>R 8 530.00</td>
<td></td>
<td>R 3 410.00</td>
<td></td>
<td></td>
<td></td>
<td>R 4 265.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Technician/Therapist</td>
<td>R 2 275.00</td>
<td>R 2 840.00</td>
<td></td>
<td>R 1 140.00</td>
<td></td>
<td></td>
<td></td>
<td>R 1 420.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Hygienist</td>
<td>R 1 820.00</td>
<td>R 2 275.00</td>
<td></td>
<td>R 910.00</td>
<td></td>
<td></td>
<td></td>
<td>R 1 140.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental Assistants / Practice Management</td>
<td>R 1 480.00</td>
<td>R 1 845.00</td>
<td></td>
<td>R 740.00</td>
<td></td>
<td></td>
<td></td>
<td>R 925.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhibition ONLY Visitor</td>
<td>R 855.00</td>
<td>R 1 070.00</td>
<td></td>
<td>R 430.00</td>
<td></td>
<td></td>
<td></td>
<td>R 535.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spouse Visitor</td>
<td>R 570.00</td>
<td>R 715.00</td>
<td></td>
<td>R 285.00</td>
<td></td>
<td></td>
<td></td>
<td>R 360.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>TOTAL R</td>
<td></td>
<td>R 1 715.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R 1 715.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL NR OF DAYS

TOTAL SECTION B

* SADA IDESA Member - SADA Member who has purchased the IDESA (Educational) membership package which allows the member a discount of R1000 on the SADA Annual Congress registration fee.
** SADA Core Member - SADA Member who has purchased the CORE membership package. This does not qualify the SADA Member for a discount on the SADA Annual Congress registration fee.
## SECTION C: GALA DINNER
Please indicate whether you will be attending the Gala dinner on Saturday 19 March 2016 by marking the appropriate block.

<table>
<thead>
<tr>
<th>VENUE: MONTE CASINO</th>
<th>DRESS CODE: Formal</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>DELEGATE</td>
<td>R 450</td>
</tr>
<tr>
<td>ACCOMPANYING PERSON</td>
<td>R 450</td>
</tr>
</tbody>
</table>

**TOTAL SECTION C** R

## SECTION D: DIETARY REQUIREMENTS
All food served at the venue is Halaal friendly. Please indicate your Kosher requirements. Per special request only, please contact M van der Linde on congress@sada.co.za in this regard.

- Special dietary requirements, to register at least 10 days prior to 19 March.
  (cut off date 09/03/2016)

<table>
<thead>
<tr>
<th>DELEGATE</th>
<th>ACCOMPANYING PERSON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strictly Kosher requirements</td>
<td></td>
</tr>
</tbody>
</table>

## SECTION E: PAYMENT DETAILS

- **DEBIT / CREDIT CARD PAYMENTS ONLY**: Please fill in details below.
- **Debit / Credit Card Details**
  - **Charge by:** Visa [ ] Master [ ] Amex [ ] Diners [ ]
  - **To the amount of R**
  - **Card no.**
  - **Expiry date** D D / M M / Y Y Y Y
  - **ID no.**
  - **Initials**
  - **Surname**
  - **Date** D D / M M / Y Y Y Y

**TERMS AND CONDITIONS**
- Full payment of registration fees are required to confirm registration.
- Delegates are responsible for their own accommodation and travel arrangements.

I have read and understand the terms & conditions and cancellation clause, as indicated above.

**NAME**

**DATE** D D / M M / Y Y Y Y

The South Africa Dental Association (SADA) and its representatives respect your rights to privacy and protection of your personal information. SADA is seeking your written permission to release your name and contact details to traders participating in the Congress. Please indicate your preference by ticking the appropriate box.

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GENERAL

Oral health and subjective psychological well-being among South African Adults: Findings from a national household survey (p436)

1. Identify the incorrect statement: Subjective well-being, according to Piqueras et al, is:
   a. an evaluative reaction of a person to his/her life
   b. comprised of two components, namely the cognitive and affective.
   c. entirely dependent on high income
   d. gauged in part by the degree of happiness

2. Inequality in health and wellbeing in South Africa may be worsened by poor oral health status.
   a. True
   b. False

Patient satisfaction during and following procedural sedation for ambulatory surgery (p 442)

3. The majority of patients undergoing PSA in this study recalled the discomfort of having the local anaesthetic injection.
   a. True
   b. False

4. The study relied on a readily available validated assessment tool.
   a. True
   b. False

5. Identify the incorrect statement. Procedural sedation is:
   a. An alternative to GA
   b. Involves advanced techniques in administering combinations of drugs
   c. Drug induced depression of consciousness, patient still responds to verbal commands
   d. May be administered by nurses
   e. Requires active intervention to maintain the airway

An in vitro comparison of different techniques for glide path preparation (p 452)

10. There was a higher incidence of ledges, elbows and apical zips associated with the use of stainless steel K-files.
    a. True
    b. False

11. In this study, NiTi files were found to be more effective in curvature modification than stainless steel files, probably because of:
    a. higher flexibility of NiTi files
    b. smaller diameter of NiTi files
    c. square cross section of NiTi files
    d. the use of finger instrumentation with NiTi files

12. Coronal flaring may assist in avoiding ledges in hand instrumentation because improved vision enables better tactile sense of the file tip.
    a. True
    b. False

13. This in vitro study was limited by not including irrigants during instrumentation of the canals.
    a. True
    b. False

Assessing surgical skills in maxillofacial surgery among dentists in the public service (p 458)

14. How many academic dental hospitals are in Gauteng?
    a. 2
    b. 3
    c. 4
    d. 5

15. According the Primary Oral Health Care Package orofacial pain should not be managed in level 1 District hospitals.
    a. True
    b. False
16. Approximately 80% of dentists did not receive undergraduate training in minor maxillofacial surgical skills.
   a. True
   b. False

Clinical Windows (p 467)
17. In the Oxby et al trial, patients with immediate and delayed loading were included.
   a. True
   b. False

18. In the Oxby et al trial, the survival rate during the observation period was significantly higher for implants in healed sites compared to those in extraction sockets.
   a. True
   b. False

19. In the Oxby et al trial, bone level comparisons between implants in fresh sockets and those in healed sockets were non statistically significant.
   a. True
   b. False

20. In the Schwarz et al review, air polishing using glycine powder improved bleeding index/ BOP or disease resolution at mucositis and peri-implantitis sites.
   a. True
   b. False

ETHICS
The use of Laser-based Technologies in dentistry: Ethical issues and safety considerations (p 464)
21. “First do no harm” – non maleficence is one of the guiding principles of the healthcare sector.
   a. True
   b. False

22. It is an ethical responsibility that dentists ensure they have the best available information about lasers before using the technique for dental procedures.
   a. True
   b. False

23. If lasers are not specifically mentioned in The Scope of the Professions of Dentistry under the Health Professions Act, 1974., there is no ethical requirement for dentists to adhere to, regarding the inclusion of lasers as a procedure in dental practice.
   a. True
   b. False

24. Patients may be attracted to a practice offering laser treatment but a dental professional must weigh up the benefits and risks of any procedure, and if the potential harm outweighs the benefits, a patient request for laser treatment should be declined.
   a. True
   b. False

25. The National Health Act of No. 61 of 2003 requires that the following information be given to the patient who may request laser treatment:
   a. Range of diagnostic procedures and treatment options available
   b. Benefits, risks, costs and consequences associated with each option
   c. User’s right to refuse care, in which case the dentist should explain the implications, risks and obligations of such refusal
   d. Furthermore, this information must be provided in a language that the patient understands and in a manner that takes into account the patient’s literacy level.
   e. All of the above
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Andoalex Product Manager
Tel: 011 021 4155
E-mail: c.niemann@inovapharma.co.za

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Smalls Advertising Rules
- All smalls advertisements are restricted to a maximum 100 words per advertisement.
- All advertisement requests are required in writing with full contact details of the advertiser which should include:
  - the wording of the advertisement as you require it to be published;
  - the members professional number; (will not be published);
  - the members contact details (will not be published).
- Advertisement lifespan is two weeks from the date of upload.
- Advertisements to be repeated follow the same process as the original placement request.
- All advertisements which exceed a word count of 100 words will be forwarded to our publishers E-Doc for further processing as a potential advertisement to be placed in the SADJ electronically or as website advertising. E-Doc will contact you thereafter regarding your requirements.
- Advertisement must be paid in full prior to uploading on the web platform for Public Domain advertising.
- Invoice may be settled telephonically with the use of a credit card to prevent delay of placement.
- Telephonically processed payments will result in uploading of advertisement within 24 hours of settlement.
- Advertiser remains liable for placement costs should payment be dishonoured and invoice remains unpaid.

Contact details:
Ann Bayman
South African Dental Association
Tel: 011 484 5288
Fax to email: 086 683 0392
e-mail: ABayman@sada.co.za
or via fax to 086 683 0392

SADA Contact Numbers:

MEMBERSHIP
Adjustment / Application / Contact detail change / General enquiry / Renewal
All membership enquiries should be channelled through your allocated MRO (Member Relations Officer) who will direct your enquiry accordingly should they not be able to assist you.

Branch: Algoa Midlands
MRO: Nelisa Makubalo
Email: NMakubalo@sada.co.za
Fax: 086 758 9889

Branch: Border Kei
MRO: Nelisa Makubalo
Email: NMakubalo@sada.co.za
Fax: 086 758 9889

Branch: Free State
MRO: Joseph Moalusi
Email: JMoalusi@sada.co.za
Fax: 086 743 1309

Branch: Gauteng South
MRO: Sylinda Bayman
Email: Sylinda@sada.co.za
Fax: 086 688 5799

Branch: Kwazulu Natal
MRO: Nelisa Makubalo
Email: NMakubalo@sada.co.za
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Branch: Limpopo
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Fax: 086 743 1309

Branch: DPL Only Member
MRO: Nelisa Makubalo
Email: NMakubalo@sada.co.za
Fax: 086 758 9889

Branch: Affiliate (Non Branch Member)
MRO: Anna Tsumane
Email: ATsumane@sada.co.za
Fax: 086 644 2411

If you are not currently a member of SADA/DPL and would like to apply for SADA membership please speak to the MRO relevant to your provincial area.

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