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**SADA**

THE SOUTH AFRICAN  
DENTAL ASSOCIATION

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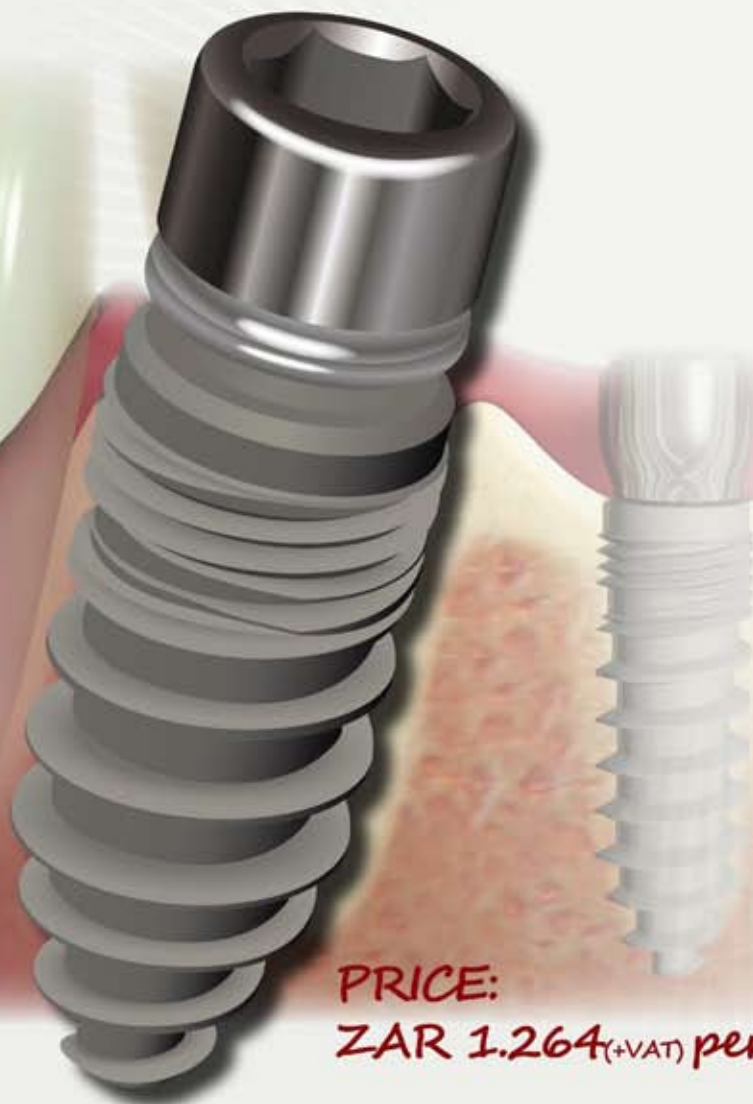


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# Consent to information

SADJ August 2014, Vol 69 no 7 p292

WG Evans



A considerable sigh of relief may have resounded through the profession when it was announced that the proclamation of those sections of the National Health Act dealing with the Certificate of Need were to be withdrawn. The Journal would not claim that publication of the satirical letter sent by Professor Stein (see July issue) had been instrumental in achieving the decision.... but it was certainly apposite! The Association, however, had been diligent in submitting rather more cogent legal reasons which ultimately were considered telling and hence the withdrawal of the proclamation... well done to those concerned, especially at Head Office.

The Department of Health, however, are not retiring from the field, for the Director General: Health has indicated an eagerness to continue the "development of the regulations relating to the Certificate of Need" in liaison with the Association. The acknowledgement of the role of the Association is of course a significant advance, close to being equivalent to the implementation

of an Informed Consent agreement. If the Association could always rely on the privileges of Informed Consent when dealing with proposed legislation affecting the profession, the task of representing the interests of dentists would be greatly facilitated.

Consider the essential provisions of Informed Consent... "a legal requirement to ensure that a patient or client is aware of all the potential risks, complications, side effects and costs of all alternative treatment modalities". We could insert the word "procedure" into that definition so it would read "... of all alternative treatment or procedure modalities." That would cover our dealings with the authorities and the manner in which the professions are themselves treated!

The Profession and the Association should be proud of their roles in the implementation of the entirely laudable principles of Informed Consent in practice management. Due cognizance has been paid to the four pillars on which Medical Ethics is based: Autonomy, Beneficence, Non-Maleficence and Equality, with Autonomy being the most relevant in the context of Informed Consent. Autonomy is the power to

govern oneself (Dictionary of Difficult Words: Wordsworth Reference). An uplifting and invigorating concept, but possible only if one is in sufficient possession of the facts. That is the nub for it is not always easy to regularly ensure that patients are indeed in possession of those facts. Even with the very best of intentions do we on occasion lean a little more than perhaps we should towards a certain mode of treatment and not allow the patient the full privilege of Autonomy? Intimately involved is the need for Evidence Based practice. We seem to be challenged on every front!

And a potentially devastating challenge lies in the outbreak of that dreaded disease caused by the Ebola virus. How prudent has been the dissemination of data on Ebola by the Association (SADA Communique 2014.026). Members are now in possession of the facts and will be alert to the possibility, however currently remote, that we could encounter a traveller who has been exposed. The World Health Organisation describes the outbreak in West Africa as an international public health emergency. We now have the chance to "Consent to Information" to ensure we can play an important role in defending against a possible invasion.

**WG Evans:** Managing Editor,  
E-mail: bill.evans@wits.ac.za

## SOCIAL MEDIA

### Recognition of commitment, cooperation and consistent competence

The KZN Branch of the Association recently acknowledged with gratitude these attributes in a colleague with whom many members had worked over several years. Paul Hermanides, dental technician supreme, decided after some 50 years, that it was indeed time to retire. The Branch honoured him with an Achievement Award, presented to him by the President of the KZN branch, Dr Regardt Perold. Applauding the presentation were the

SADA President, Dr Vivesh Rughubar, and the SADA CEO, Ms Maretha Smit. Paul, always encouraged by his wife Judy, had a long and successful career in Zimbabwe before moving to Durban thirty years ago, where he established a fine reputation and ultimately became the oldest practicing dental technician in South Africa. He also worked in the United States for a period of time. Paul has made a significant contribution to Dentistry in South Africa.

The Association and the Journal wish Paul and Judy an exceptionally happy and relaxed retirement





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# SADA Communique



SADJ August 2014, Vol 69 no 7 p294 - p295

M Smit

It has been a while since we provided an overall view as to progress with regards to various issues in the statutory environment that we are dealing with on behalf of the profession. This month, I focus on matters referred to the HPCSA. On reading through the various matters below, members will no doubt note that there is a common theme throughout the majority of these issues – the fact that the HPCSA is failing to provide the required direction in the context of a changing health landscape and economic environment.

As a profession, we cannot possibly respond to every single concern we experience in our changing environment with litigation. We need a robust, fair and respected Health Professions Council to give direction to the professions in the interest of the public. The matters detailed below are all clearly within the domain of expertise of the HPCSA and there is no other organisation that can be requested to resolve these issues. Unfortunately, the delays experienced in bringing these matters to conclusion does not bode well for the future of health regulation in our country.

These concerns over the tardiness of the HPCSA have even been escalated to the Minister of Health approximately a year ago, but even that escalation has not resulted in any improvement. In the context of the frustration to get seemingly simple issues resolved, one has no option but to ask the question as to why the HPCSA does not act effectively in terms of its mandate?

## Tariff Regulation

During October 2013 the HPCSA published a "Proposed Process for the Determination of Fee Norms by the Medical and Dental Professional Board", indicating their annual process for determination of fee norms as from 2015 onwards, with a condensed timeline for the publication of fee norms for 2014.

In our engagements with the HPCSA and in our documented submissions, it was made clear that there were certain procedural flaws in their proposed process for 2014 and SADA, along with

some of the other health professions associations, indicated that the publication of any fee norms for 2014 may lead to court action.

No further action has been forthcoming from the HPCSA. No communication was forwarded to associations, no publication of 2014 fees and no indication as to their intentions to proceed with the publication of a 2015 list of fees.

It is our understanding that the process was abandoned pending the outcome of the Market Inquiry into Healthcare, but this has not been formally confirmed.

In this matter, SADA maintains its position that there are compelling economic arguments to suggest that tariff regulation results in an increase in healthcare pricing, not a decrease. In order to improve access to oral health services, we need to consider constructive exploitation of free market principles as an alternative to the micro-management approach of tariff regulation.

## Scope of Practice: Dental Therapy

On 31 August 2012 the Dental Therapy and Oral Hygiene Board of the HPCSA published a new Scope of Practice for Dental Therapists. The provisions were of concern to SADA as included were many procedures that Dental Therapists were not qualified to perform. The Association made an application to court for a review of the regulations.

Over the last two years, as the result of many stakeholder meetings in this regard, it has transpired that there is an industry-wide acknowledgement that the Scope of Practice should be reviewed. It is our understanding that this process is underway.

Unfortunately the HPCSA has not yet formally withdrawn the published Scope of Practice and SADA can therefore not yet abandon its legal action.

## Split billing/Balanced Billing

SADA's first formal submissions to the HPCSA, requesting a review of the ethical rule regarding split billing and balanced billing, was sent on 14 March 2011. Since that date, the HPCSA has referred the matter from committee to

committee, without any constructive progress made over a period of at least three years. Current status is that the Human Rights, Ethics and Professional Practice Committee requested the HPCSA legal services department to obtain expert opinion on the matter, but this past year has seen no progress in obtaining such opinion. Follow-up letters are continuously being submitted by the Association in this regard.

## Advance payment of fees

Similarly, the first formal submission regarding a review of the ethical rule regarding advance payment of fees was made on 11 May 2012. This matter has also been referred to committees, and then to the HPCSA legal department who, more than a year later, is still busy with preparation of proposed changes to the ethical rules. Follow-up letters are continuously being submitted in this regard.

Charging for appointments not kept  
The HPCSA issued a directive in their May bulletin to indicate that practitioners are not allowed to charge patients for appointments not kept by the patient. SADA informed the HPCSA that we are in disagreement with them as to their interpretation of the relevant ethical rule and requested that the directive be withdrawn, pending further discussion. We were informed that this matter will serve at the upcoming meeting of the Medical and Dental Professional Board in September. In the interim, however, the HPCSA reissued exactly the same statement in their bulletin on 25 July 2014. It was very disappointing to note that the HPCSA dogmatically proceeds with their chosen position, without considering the submissions made by the profession. Follow-up letters have been submitted in this matter.

Review of Scope of Practice for Dentists – Non-Surgical Cosmetic Procedures  
On 3rd October 2012, SADA requested the HPCSA to review the scope of practice for dentists, in particular the right to perform aesthetic or cosmetic procedures to include administration of Botox beyond the oral and peri-oral areas.

The Executive Committee of the Medical and Dental Professions Board ap-

proved amendments to Rule 21 pertaining to performance of professional acts. The legal services department was then instructed to amend the booklets to make provision for guidelines on the interpretation of Rule 21 of the Generic Rules. We are, however, still waiting for the department to gazette these rules.

**Dental Technicians – Administration Fee**  
Dental technicians have been allowed, since February 2006, to claim directly from Medical Aids for laboratory work. However, many technicians prefer not to claim directly, thus transferring the administrative burden and risk of non-payment to the dentist.

SADA addressed the matter of dentists being allowed to charge their technicians an administration fee to in respect of these services rendered and submitted proposals to both the Dental Technicians Association of South Africa (DENTASA) and the South African Dental Technicians Council (SADTC).

After several years of discussion, SADA was informed by e-mail earlier in August that the SADTC was of the view that SADA had no locus standi to engage in this debate, as it is not a regulator. They requested that the matter be referred to the HPCSA for resolution with

the SADTC. This is clearly a tactic to ensure that the matter does not progress any further, as the fact that SADA is not a regulator does not preclude us from contributing to discussions in respect of the landscape of dentistry.

As the HPCSA appears to not have the ability to bring any matters to conclusion, SADA does not have any confidence that this issue will be resolved and, as such, we wish to encourage members to demand that technicians claim directly from schemes in respect of laboratory services rendered.

The extensive delays in bringing these matters to conclusion are of great concern and the regulatory ability of the HPCSA has to be questioned. Perhaps it is time for the profession to start considering alternative courses of action other than to proceed with official submissions that are clearly not receiving appropriate attention.

---

## Letter of appreciation

Dear Prof. Naidoo,

I really appreciate your regular ethics article in the S.A.D.J., because it is quite difficult to accumulate enough Ethics CPD's.

The June edition was on over-servicing and it reminded me of the other side of the coin, namely "professional neglect".

After 30 years in private practice, I often wonder how much better I could have done. Although I had a patient today with food stuck all over, bleeding gums and I looked back on my card and I had done oral hygiene instruction four times already, shown with a toothbrush in his mouth and shown how to floss.

So some patients will just not take notice...

Yours sincerely,  
John Benghiat.



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## Dentistry in South Africa is gravely ill, sick to the core

### Dear Editor

When high-ranking officials express the opinion that television advertisement for "extreme makeovers" by individual practitioners is beneficial because it "raises public awareness of dentistry," then the disease has become irreversible. It was this little remark, by a high-ranking SADA official, reported to me by an impeccable source, which has sparked my little tirade. The fears and doubts have been gnawing for several decades, however.

The remark by the SADA official was the final, conclusive, absolute proof of my long-held provisional diagnosis. It confirmed that we are now on the final road to the dark abyss.

My suspicions were first raised many years ago, possibly in 1987, when the concept of aesthetic dentistry was first promoted in this country. At first it seemed like an idea whose time had come. We all started experimenting with porcelain and posterior resin composite. In 1992 or 1993 Cerec came to these shores and the tide became ever more urgent. Simultaneously implants burst onto the scene setting the stage for wonderful reconstructions and rehabilitations. Today, even the worst kind of mouths can be made to look like those of the Hollywood stars. There is nothing inherently wrong with that. It is good to do good dentistry.

The real problem is situated very deep in the hearts and minds of the members of the profession. It even has a name. It is called Greed.

The problems with aesthetic or cosmetic dentistry are that it is expensive and that it carries severe risks and possible complications. These complications and their sequelae are the final toxins causing suppurative necrosis of the dental profession.

The spectacular financial "success" of a few practitioners, some even using television coverage and expensive internet marketing strategies, has unleashed a tsunami of greed-induced cosmetic dentistry, including therapies such as bleaching, Botox and full mouth porcelain restorations. Worst of all have been the outright lies and disinformation campaigns directed at two of the oldest and most trustworthy dental techniques, amalgam and root canal treatment. Unscrupulous operators have touted these trusted therapies as "poisonous", "dangerous", and "detrimental". The reason is of course the desire to sell cosmetic dentistry and implants.

The concept of "selling" and "marketing" professional services, especially medical services, was of course unknown a generation ago. All marketing was by means of word of mouth. Younger dentists laugh at this "outdated" concept.

Marketing and selling cosmetic dentistry is ethically unpalatable enough as it is but the final nail in the coffin is the lack of information, referring to the legal concept of "informed consent", provided to patients.

Cosmetic dentists are loathe to properly and honestly inform their patients of "the risks, complications and side effects of all treatment modalities", as required by the ethical, moral and legal code. Their patients are fed one-sided propaganda. No mention is made of the inherent dangers of post-operative sensitivity, leakage, pain, pulpal necrosis, implant failures, loss of bone, periodontitis and all the other real risks, complications and side effects of the cosmetic dentist's chosen treatment modality.

Recently I was confronted with the very ugly face of such a case. A colleague provided a patient with an all-porcelain, full mouth reconstruction, costing a couple of hundred thousand rand. This was followed by severe post-operative pain, leading the colleague to do fourteen root canal treatments a few months later, in the space of a few hours, on one day. The root canal treatments were clearly of inferior quality and the pain worsened. I redid all these root canal treatments and was forced to do two more. I then referred the patient to a team of specialists for periodontal and prosthodontic rehabilitation. (Most of the original porcelain restorations had been leaking).

I was contacted, and visited, by a team of lawyers, acting on behalf of the patient. They asked me to declare, in writing, for the sake of an urgent court application, that my colleague had been negligent, which of course he was. After much soul searching I reluctantly complied. It is now expected that this case will be settled, out of court, as most often happens, for a sum of nine hundred thousand rand, the bill being settled by my colleague's, (and my and every SADA member's), insurers. My affidavit was instrumental in my (and every SADA member's) insurance premium being significantly raised next year.

I am told that our medical colleagues, the surgeons and obstetricians, are paying upward of R20000 (twenty thousand rand) per month in liability insurance. As a result many are leaving the medical profession.

It is alleged that the lawyers view the medical profession as easy prey. This has become important since the demise (almost) of the road accident fund. They are now targeting the medical doctors, because of the cash abundance of their insurers. And this is the real threat cosmetic (and implant) dentistry pose to the profession. As more and more of these cases find their way to the offices of the lawyers, we will be facing increasing liability insurance premiums. It will eventually, soon perhaps, become too expensive to practice, except, ironically, for a few of the really big earners, with their television campaigns and billboards.

What irks me is that many patients would not have consented to cosmetic dentistry, or implants, or whatever, if they had been properly informed, beforehand, of "the risks, complications, side effects of all treatment modalities". If patients are properly informed, most would not consent, and as a result we would see fewer legal cases, our premiums would remain affordable, and we would continue practicing. I suspect that many colleagues silently know this and therefore are deliberately not informing patients properly. They are only interested in the bottom line.

It is wrong to actively promote expensive, "profitable", treatment, and to remain silent about simple, safe, tried and tested treatment modalities, or even worse, to badmouth these inexpensive procedures, simply in order to increase the "bottom line".

Dentistry in South Africa has got it all wrong. Dentistry is not a business. It is a service. We are bound by an ethical code to serve our patients' best interests. Dentistry is not about increasing the bottom line. It is not about marketing. It is about service. If we firmly believe that, and pursue that, the profit will come by itself. Profit is only a by-product of good service.

When we need all kinds of fancy marketing gimmicks, then we have lost the plot completely. When we willingly and knowingly advise patients to have well-functioning amalgam restorations replaced by so-called aesthetic restorations because of "health reasons", then we are insanely dishonest. When we fail to inform patients about alternatives such as no treatment, bridges, dentures, in order to "sell" implants, then we are no better than corrupt politicians or quacks. If we do these things, then we deserve to be sacrificed on the altars of the lawyers.

Kind regards  
Dr JT(Koos) Marais



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# Substance abuse: case management and dental treatment

SADJ August 2014, Vol 69 no 7 p298 - p315

YF Solomons<sup>1</sup>, PD Moipolai<sup>2</sup>

## INTRODUCTION

Any patient presenting for dental treatment may be abusing drugs – licit and/or illicit, or may have a history of substance abuse, often coupled with rehabilitative procedures. The media as well as the professional literature is replete with evidence that, globally, the use of illicit drugs is approaching epidemic proportions. Currently, cocktails of both legal and illegal substances are readily available on the street, meaning that there are people from all walks of life and socio-economic category who abuse drugs. This makes it imperative that all oral healthcare (OHC) providers be aware that any patient can be a substance abuser and that these patients can present for dental care at any stage of their abuse.

There is a high burden of dental disease in substance abusers which is further complicated by concomitant emotional/behavioural/personality issues, the often poor general health of the addict, inadequate nutrition and oral hygiene as well as by the pathological effects of the drugs on the dentition and periodontium. Currently, not only has the drug abuser become more sophisticated but a variety of trends, as well as patterns, of substance abuse are emerging. It is an essential that the dental community remains knowledgeable, educated and informed of developments in global and nationwide healthcare and it is increasingly evident that management of substance abuse is an important component. Ethically, OHC providers are expected to be able to identify any abnormalities within the oral cavity. New drugs are flooding the market before research on accompanying health risks and management can be undertaken, and hence there is a call for intensified vigilance to observe, identify and recognise the oral health complications of substance abuse. In addition to recognising the scope of the problem of substance abuse, OHC workers should be able to respond in a manner that addresses the best interests of patients who may be diagnosed as drug abusers. This response needs to include: understanding the terminology of drug abuse and of the substances often misused and abused; identifying individuals who may be at risk for abuse and managing at-risk patients in the dental setting.

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## ACRONYMS

<b>OHC:</b>	oral healthcare
<b>Meth:</b>	methamphetamine
<b>MA:</b>	methamphetamine
<b>GI:</b>	Gastro intestine
<b>TSL:</b>	tooth substance loss
<b>UDT:</b>	urine drug testing
<b>OTC:</b>	over the counter
<b>US FDA:</b>	United States food and drug administration
<b>NSAIDs:</b>	Non steroidal anti-inflammatory drugs

The focus of this article, then, is to identify for the dental professional the implications of substance abuse, to describe strategies to assist the dental team to recognise substance abusing patients, to discuss how they can assist these patients in managing their addictions and how the necessary treatment to rehabilitate and maintain the patient's oral health can be planned and safely delivered.

This overview will include discussion on the following:

- a) The implications of substance abuse on dental treatment
- b) A summary and outline of the most commonly abused substances including their 'direct' effects on oral health. Both physical and oral manifestations are listed (see **Annexure 1**).
- c) Identification and recognition of a substance abuser.
- d) Challenges and barriers to the dental treatment of a substance abuser.
- e) A proposed approach to the dental management of substance abusers.

## IMPLICATIONS OF SUBSTANCE ABUSE ON DENTAL TREATMENT

Given that dental comorbidities are a prominent feature of substance abuse and that many drug addicts may be



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**References:** 1. Euromonitor International. 2. Fine DH, Barnett ML, *et al.* Effect of an essential oil-containing antiseptic mouthrinse on plaque and salivary *Streptococcus mutans* levels. *J Clin Periodontol* 2000;27:157-161. 3. Santos T. Evidenced-based control of plaque and gingivitis. *J Clin Periodontol* 2003;30(Suppl 5):13-16.

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concerned about their dental appearance during the recovery and post-recovery phase, dentists can play a crucial role in the detection of substance abuse and can participate as integral members of a collaborative care team tending to the substance abuser. The use of both licit and illicit drugs has direct (induced by the drug) as well as indirect effects (life-style) on oral health and oral pathology.

The adverse impact of substance abuse on oral and systemic health means that dental professionals must be aware of these co-morbidities, be able to recognise pathological changes associated with the abuse of specific substances but, more importantly, need to understand how best to ensure the most efficacious treatment and to avoid possible consequences of contraindicated approaches.<sup>1</sup>

In 2005, the American Dental Association published a statement on the provision of dental treatment for patients with substance abuse disorders. In the absence of such a standardised policy in South Africa, it is highly recommended that all oral health care workers familiarise themselves with this statement.<sup>2</sup> See Table 1.

It needs to be recognised that dental professionals do not merely provide oral health care. Their interaction with patients provides a certain platform for becoming aware of the context of the problems as well as the overall interaction of risk factors which have contributed to a substance use disorder. This further enables an understanding that would significantly impact on optimal case management, safe treatment and appropriate referral.

The potential risk factors which contribute to the spectre of substance abuse include genetic and environmental influences (chaotic home life, abusive relationships with family, friends and acquaintances, peer influences, community pressures); duration of substance use; personality (low self-esteem, stress, personal attitudes; unrealised achievements, unmet expectations, depression); availability of drugs; patient's method of drug administration and co-existing mental disorders.<sup>2</sup> It has been shown that these factors impact on complex health issues as well as on behavioural patterns that hold significant implications for dental treatment. Long term substance abuse significantly alters the structures and functions of the brain, leading to uncontrollable compulsive and destructive (aggressive) behaviour; however, it remains important to realise that substance abuse is not a moral issue. In fact, the prevailing concept of substance abuse is that of a disease model in which the patient has no control. The case management of the substance abuser is therefore expected to differ from the management of a non-addicted patient.

All these complex issues highlight the fact that significant behavioural and medical issues can present with the substance-abusing patient that may necessitate modifications to the dental treatment plan. Furthermore, patients who use alcohol in excess or patients who abuse mind-altering substances may have problems accepting, receiving and completing dental treatment. In some cases, treatment may need to be deferred, limited in complexity, or sequenced in a different manner. It may be appropriate to first refer the patient to a physician for management of related potential or imminent medical problems or to a counsellor, thera-

**Table 1:** ADA statement on provision of dental treatment for patients with substance use disorders<sup>2</sup>

- Dental professionals are urged to be aware of each patient's substance use history, and to take that into consideration when planning treatment and prescribing medications
- Dentists are encouraged to be knowledgeable about substance use disorders – both active and in remission – in order to safely prescribe controlled substances and other medications to patients with these disorders
- Dentists should draw upon their professional judgement in advising patients who are heavy drinkers to cut back, or the users of illegal drugs to stop
- Dentists may want to be familiar with their community's treatment resources for patients with substance abuse disorders and be able to make referrals when indicated
- Dentists are encouraged to seek consultation with patient's physician when the patient has a history of alcoholism or other substance use disorder
- Dentists are urged to be current in their knowledge of pharmacology, including contents related to drugs of abuse; recognition of contraindications to the delivery of adrenaline-containing local anaesthetics; safe prescribing practices for patients with substance use disorders – both active and in remission – and management of patient emergencies that may result from unforeseen drug interactions
- Dentists are obliged to protect patient confidentiality of substance abuse treatment information, in accordance with applicable statutory law

pist or substance abuse specialist to assist with managing the dependency as well as the related psychological and behavioural issues. Once the addiction is managed and the concomitant medical issues addressed, oral health treatment may proceed in a routine manner. The awareness of the possibility of relapse remains critically important and demands skills and sensitivities on the part of the dental team that are not usually required when treating non-abusing patients.

## EFFECTS OF SUBSTANCE ABUSE

Some substance abusers experience pronounced effects in as little as six months to one year of starting to use the drug, whereas, in a non-user, such manifestations would take several years (along with severe oral neglect) to develop. Tobacco use by substance abusers can also exacerbate the oral health problems.

### Physical presentation and oral manifestations of substance abuse

Recognising pathognomonic signs of the possible physical effects and oral manifestations of substance abuse is critical in early detection for this encourages early intervention. Dental professionals should be aware of what to look for in substance abusers in order to aid appropriate case management as well as proper referral.

**Annexure 1** lists the physical presentation as well as possible physical and oral manifestations of the most popularly abused substances that are known to cause direct damage to oral and dental tissues.

Some additional substances typically available in South Africa need mention despite the paucity of scientific evidence



**Annexure 1: Manifestations of drug abuse**

Substance	Possible physical presentation & direct effects	Oro-facial manifestations
<b>Cocaine</b>	<ul style="list-style-type: none"> <li>- Dilated pupils</li> <li>- Anxiety</li> <li>- Movement disorder</li> <li>- Periodic nose bleeds</li> <li>- Chronic sinusitis</li> <li>- Cardiac lesions - (MI)</li> <li>- Paranoia</li> <li>- Depression</li> <li>- Facial/lip burns</li> </ul>	<ul style="list-style-type: none"> <li>• Transient chorea (irregular jerky movements of the face by incoordination)</li> <li>• Buccolingual dyskinesia (crack dancing/twisted mouth)</li> <li>• Perforation of the nasal septum and/or palate</li> <li>• Bruxism</li> <li>• Gingival recession - mostly on anterior maxillary teeth</li> <li>• Cervical tooth-substance loss</li> </ul>
<b>Opiates</b>	<ul style="list-style-type: none"> <li>- Impaired motor function</li> <li>- Excessive yawning</li> <li>- Itching of face, arms and body</li> <li>- Excessive sweating</li> <li>- Shallow breathing/slow respiratory rate</li> <li>- Neuropathology secondary to infection</li> <li>- Vasculitis</li> <li>- Septic emboli</li> <li>- Thromboembolism</li> <li>- Prolonged heroin-induced respiratory depression</li> <li>- Anxiety</li> <li>- Hypotension</li> <li>- Positional vascular compression</li> <li>- Acute Parkinsonism</li> <li>- Spongiform leukoencephalopathy</li> <li>- Constricted pupils</li> <li>- Increased consumption of a sugar rich diet</li> <li>- Venipuncture sites/needle tracks</li> </ul>	<ul style="list-style-type: none"> <li>• Xerostomia</li> <li>• Poor oral hygiene</li> <li>• Increased DMF teeth (decayed, missing, filled)</li> <li>• Chronic malnutrition</li> <li>• Increased susceptibility to periodontal disease</li> </ul>
Morphine		
Diamorphine (Heroin)		
Methadone		
<b>Marijuana</b>	<ul style="list-style-type: none"> <li>- Reddened eyes</li> <li>- Stained fingers</li> <li>- Cannabinoid hyperemesis (frequent vomiting episodes)</li> <li>- Short- &amp; long-term debilitating psychological effects</li> <li>- Carcinogenic exposure</li> <li>- Risky unprotected sexual practices, high HIV incidence</li> <li>- Immuno-suppression</li> <li>- Relaxed inhibitions</li> <li>- Increased appetite</li> <li>- Distinct odour of Marijuana</li> <li>- Lack of motor coordination</li> <li>- Loss of eye convergence</li> <li>- Distorted perception of time</li> <li>- Difficulty concentrating</li> <li>- Errors in judgment</li> <li>- Flattening of emotions</li> <li>- Lack of motivation</li> <li>- Impaired memory and attention</li> </ul>	<ul style="list-style-type: none"> <li>• Acidic erosion of enamel</li> <li>• Dental caries</li> <li>• Inflammation</li> <li>• Stomatitis with leukoedema (buccal mucosa)</li> <li>• Hyperkeratosis</li> <li>• Gingival hyperplasia-risk factor for periodontal disease</li> <li>• Uvulitis</li> <li>• Leukoplakia</li> <li>• Oropharyngeal cancer risk</li> <li>• Lowered anti-tumour immunity</li> <li>• Carcinoma: tongue (conflicting evidence)</li> <li>• Poor oral hygiene</li> <li>• Alveolar bone loss</li> <li>• Xerostomia</li> <li>• Irritated mucous membranes</li> <li>• Clinical periodontal attachment loss</li> </ul>
Cannabis		
<b>Hallucinogens</b>	<ul style="list-style-type: none"> <li>- Anticholinergic effect</li> <li>- Hyposalivation</li> <li>- Craving /Increased intake of sugary carbonated drinks</li> <li>- Increased motor activity - bruxism</li> <li>- Mild dysphoria (anxiety)</li> <li>- Oral soft tissues more susceptible to mechanical injury</li> <li>- High energy and increased wakefulness</li> <li>- Restlessness, excitement, agitation, talkative</li> <li>- Craving for high-calorie carbonated beverages</li> <li>- Increased motor activity</li> <li>- Decreased immune response</li> <li>- Vasoconstriction</li> <li>- Appetite loss – extreme, rapid weight loss</li> <li>- Deterioration in personal appearance and hygiene</li> <li>- Body odour or ammonia-like smell</li> <li>- Sores on skin from scratching at imaginary ("crank bugs")</li> <li>- Dilated pupils</li> <li>- Distorted auditory and visual perceptions</li> <li>- Unusual mood changes</li> <li>- Paranoid behaviour</li> <li>- Hyperthermia</li> <li>- Rapid heart rate</li> <li>- Increased blood pressure</li> <li>- Profuse sweating</li> </ul>	<ul style="list-style-type: none"> <li>• Xerostomia</li> <li>• Buccal and smooth surface caries typically interproximally</li> <li>• Blackened, stained, crumbling teeth</li> <li>• Fractured teeth</li> <li>• Rampant Class V caries "meth mouth"</li> <li>• Excessive tooth substance loss/wear</li> <li>• Clenching &amp; grinding</li> <li>• Dental attrition and enamel erosion</li> <li>• TMD</li> <li>• Poor oral hygiene</li> <li>• Halitosis</li> <li>• Periodontal breakdown</li> <li>• Bleeding gums</li> <li>• Osteoporosis</li> <li>• Structural weakness in dentition</li> <li>• Gingival lacerations</li> <li>• Oral traumatic lesions</li> <li>• Frictional keratosis</li> <li>• Traumatic ulcerations</li> <li>• Angular cheilitis</li> <li>• Glossitis</li> <li>• Oral candidiasis</li> <li>• Rhinitis (with nasal administration)</li> </ul>
Methamphetamine (MA) – "Tik"		
MDMA – Ecstasy		
LSD		
<b>Alcohol</b>	<ul style="list-style-type: none"> <li>- Malnutrition</li> <li>- Vitamin deficiencies esp. Vit B complex</li> <li>- Jaundice of skin, mucosa, sclera</li> <li>- Neurological disorders</li> <li>- Shakiness or tremors</li> <li>- Liver dysfunction – Alcohol Liver Disease</li> <li>- Aggravated CVD</li> <li>- Drug interactions</li> <li>- Impaired coordination</li> <li>- Personality changes</li> <li>- Memory loss</li> <li>- Immunosuppression</li> <li>- Acne rosacea</li> <li>- Spider angioma (dilated subcutaneous facial arterioles)</li> </ul>	<ul style="list-style-type: none"> <li>• Distinct oral mucosal changes - red atrophic oral mucosa</li> <li>• Stomatitis</li> <li>• Yellow-brown discoloration of the oral mucosa</li> <li>• Glossodynia : atrophic beefy-red tongue</li> <li>• Poor oral hygiene</li> <li>• Uvulitis</li> <li>• Decayed, missing, filled teeth</li> <li>• Periodontal disease progression</li> <li>• Peri-implant marginal bone loss</li> <li>• Increased severity of clinical attachment loss (CAL)</li> <li>• Recurrent infections</li> <li>• Enlarged parotid glands</li> <li>• Xerostomia</li> <li>• Predisposition to cancer of the oropharynx-effect multiplied by simultaneous tobacco use</li> </ul>
Ethyl alcohol		

on their potentially harmful effects on oral health. Nyaope, also known as whoonga or wunga, is a dangerous and highly addictive South African street drug. It is a fine white powder that is usually combined with marijuana (dagga) and smoked. The ingredients of nyaope are not always known, and in fact the recipe may vary from place to place. But one thing is clear, nyaope is a lethal combination of substances, which can include heroin, detergent powder, rat poison, and crushed anti-retroviral drugs (ARVs). Its addictive potential has been likened to that of heroin. It could be assumed that due to the "pronounced effect" of the abuse of this cocktail of substances, we may expect to see severe xerostomia, advanced periodontal disease and rampant caries among other signs and symptoms. The arrival of substances such as nyaope onto the drug market clearly emphasises the fact that future research should incorporate standardised measures and include drug epidemiology and dental public health research techniques to examine their actions and effects more effectively.

## IDENTIFICATION AND RECOGNITION OF THE SUBSTANCE ABUSER

During the dental appointment, the health questionnaire and subsequent verbal interview should pose the relevant questions, allowing for a patient to indicate a previous or existing substance abusing problem (see **Annexure 2** – modified ADA health questionnaire). Since it is known that patients can more easily falsify information on a questionnaire than when confronted directly, questions are best pursued verbally during an interview. Additional information can also be obtained from another health practitioner.

Ordinarily, the first essential step before initiating any comprehensive dental intervention is to obtain a thorough medical and oral health history. Of particular relevance in the case of for the substance abuser/abusing patient is the history. It is important to:

- elicit information about associated medical problems which may increase the susceptibility of the patient to a medical emergency
- reveal psychosocial sequelae of addiction
- identify other comorbidities (other diseases currently present)
- identify side-effects of abused substances and/or potential adverse interactions.

The stigma, shame and fear of judgement associated with substance abuse may cause patients to avoid revealing or denying a factual history because of the perceived risk of divulging their condition. For this reason, confidentiality of the interview and of the findings must be re-affirmed.

Following a review of the health history, the patient's general appearance and behaviour should be carefully scrutinised and observed. Generally, patients abusing stimulants may appear irritable, argumentative or overly aggressive, whilst patients abusing depressants may appear drowsy, lethargic and confused. Occasionally, patients may even use their preferred substance prior to their appointment to reduce anxiety in which event it may be best to postpone treatment.

There is merit in informing the patient that the questions pertaining to substance abuse have relevance to the provision of dental treatment. It is also critical to create an environment of mutual trust and confidentiality in order to enable the patient to be more forthcoming so as to obtain complete and accurate information. This has far-reaching implications for the delivery and outcomes of dental treatment which are not only safe and predictable but appropriate to the best short and long-term interest of the patient.<sup>3</sup>

The signs and symptoms of drug use and addiction vary depending on the drug. It may be difficult to recognise an abuser/addict based on appearance alone. Physical signs that can be helpful in recognising an abuser/addict include blood-shot eyes, changes in the size of the pupils, unusual smells on breath, body or clothing, tremors, burns on lips and fingers, grinding of teeth, clenching of the jaw, and slurred speech. However, absence of these signs does not exclude abuse or addiction. Alteration in behaviour and mood may be more indicative than changes in appearance but may be more difficult to detect. A decline in school and work performance and changes in friends and activities may also be revealing. Patients may miss appointments or be late for appointments and offer inconsistent excuses. There may be a change in their appearance and they may be withdrawn.

The possibility of substance abuse should be a consideration in all patients but especially those who present with frequent vague complaints, multiple pain medication allergies, and regimens with multiple narcotic medications. Polydrug use, either prescription or illicit, is also a possibility, and effective treatment requires prompt recognition.

It is not a given that the typical personality and behavioural changes suggestive of drug abuse will be evident when a substance abuser presents for dental treatment. On the contrary, it is most likely that these patients are generally in good health and well groomed. There may be no outward signs that will indicate substance abuse, making it difficult to identify most abusers or addicts; however, it is equally possible to find clues apparent from obvious signs which may raise suspicion of abuse.

Evidence-based dental literature reported that hard core abusers generally do not seek oral health care and neither are they self-reporting on dental needs. OHC providers are likely to see the young woman or businessman who is abusing or addicted to designer or prescription drugs. Table 2 lists specific concerns such a substance abuser is likely to have:

**Table 2:** Patients want to know:

- If I come into a dental office for treatment and admit substance abuse, will I be reported to the police?
- Can I talk openly about my addiction to meth without being judged by my dentist or dental hygienist?
- What rights to privacy can I count on as a patient?
- How has substance abuse harmed my teeth and overall oral health?
- What type of dental treatment can improve my appearance and restore my oral health?
- How can I improve my oral health?



## Annexure 2: Proposed Health Questionnaire: adapted from ADA (Stefanac 2007)

## HEALTH HISTORY FORM

Name: \_\_\_\_\_ Phone: (c) \_\_\_\_\_ (w) \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ Province: \_\_\_\_\_ Code: \_\_\_\_\_

Occupation: \_\_\_\_\_ Height: \_\_\_\_\_ Weight: \_\_\_\_\_ DOB: \_\_\_\_\_ Sex: M F

SA ID #: \_\_\_\_\_ Passport #: \_\_\_\_\_

Emergency contact: \_\_\_\_\_ Relation: \_\_\_\_\_ Cell: \_\_\_\_\_

If you are completing this form for another person, what is your relationship? \_\_\_\_\_

For the following questions, please (X) whichever applies. Your answers are for our records only and will be kept confidential in accordance with applicable laws. Please note that during your initial visit you will be asked some questions about your responses to this questionnaire and there may be additional questions concerning your health. This information is vital to allow us to provide appropriate care for you. This practice does not use this information to discriminate.

PLEASE COMPLETE BOTH SIDES

## DENTAL INFORMATION

Do your gums bleed when you brush? \_\_\_\_\_ How would you describe your current dental problem? \_\_\_\_\_

Have you ever had orthodontic treatment?(braces) \_\_\_\_\_

Are your teeth sensitive to cold, hot, sweets or pressure? \_\_\_\_\_ Date of last dental exam: \_\_\_\_\_

Do you have earaches or neck pains? \_\_\_\_\_

Have you had any periodontal (gum) treatments? \_\_\_\_\_ Date of last dental x-rays: \_\_\_\_\_

Do you wear removable dental prostheses? \_\_\_\_\_

Have you ever had a serious problem associated with any previous dental treatment? \_\_\_\_\_ What was done at that time: \_\_\_\_\_

If yes, explain: \_\_\_\_\_ How do you feel about the appearance of your teeth? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## MEDICAL INFORMATION

	Yes	No	Don't know		Yes	No
Are you in good health?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

Has there been any change in your general health within the past year?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Are you taking or have you recently taken any medicines including non-prescription medicine?	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------	--------------------------	--	--------------------------	--------------------------

Are you now under the care of a Physician?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, what medicines are you taking?	_____	
--	--------------------------	--------------------------	--------------------------	--	-------	--

If yes, what is/are the conditions being treated?	_____			Prescribed:	_____	
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_____				Over the counter:	_____	
-------	--	--	--	-------------------	-------	--

_____				_____		
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Date of last physical examination: \_\_\_\_\_ Natural or herbal and/or diet supplements? \_\_\_\_\_

Physician: (Dr) \_\_\_\_\_

Practice Address: \_\_\_\_\_

Do you drink alcoholic beverages? ☐ ☐

If yes, when last &amp; how much? \_\_\_\_\_

Are you alcohol and/or drug dependent? ☐ ☐If yes, have you received treatment? ☐ ☐Have you had any serious illness, operation or been hospitalised in the past 5 years? ☐ ☐ ☐Do you use drugs or others substances for recreational purposes? ☐ ☐

If yes, please list: \_\_\_\_\_

Frequency of use: \_\_\_\_\_

Number of years of recreational drug use: \_\_\_\_\_

Do you use tobacco (smoking, snuff, chew)? \_\_\_\_\_

Are you interested in stopping? Very Somewhat Not

Are you allergic to or have you had reaction to	Yes	No	Don't know		Yes	No	Don't know
Local anaesthetics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you had an orthopedic total joint replacement? (hip, knee, elbow, finger)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aspirin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, when was this operation done?			
Penicillin or other antibiotics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, have you had any complications with your prosthetic joint?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Barbiturates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Has a physician or previous dentist recommended Antibiotics prior to dental treatment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sulfa drugs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, what antibiotic and dose? _____			
Codeine or other narcotics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____			
Latex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Name of physician or dentist: _____			
Hay fever/seasonal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Phone: _____			
Animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>WOMEN ONLY</b>			
Food (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Are you or could you be pregnant?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Are you nursing presently?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metals (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Birth control or Hormone replacement?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
To yes responses, specify type of reaction: _____							
<b>Please (X) response to indicate if you have or have not had any of the following diseases or problems</b>							
Abnormal bleeding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Haemophilia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AIDS or HIV infection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hepatitis, jaundice or liver disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anemia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Recurrent infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Arthritis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, indicate type of infection: _____			
Rheumatoid arthritis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Malnutrition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Asthma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Night sweats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blood transfusion. If yes, date: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Neurological disorders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cancer. Chemotherapy/radiation treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, specify: _____			
Cardiovascular disease. If yes, specify below:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Osteoporosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Angina				Persistent swollen glands in neck	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Arteriosclerosis				Respiratory problems. If yes, specify:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Artificial heart valves				_____ Emphysema			
_____ Congenital heart defects				_____ Bronchitis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Congestive heart failure				Severe headaches/Migraines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Coronary artery disease				Severe or rapid weight loss	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Damaged heart valves /Rheumatic fever				Sexually transmitted disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Heart attack				Sinus trouble	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chest pain upon exertion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sleep disorder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chronic pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sores or ulcers in the mouth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Disease, drug or radiation-induced Immunosuppression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Stroke	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diabetes: If yes, specify below:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Systemic lupus erythematosus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Type I (insulin-dependent)				Tuberculosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ Type II Dry mouth				Thyroid problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating disorder. If yes, specify _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ulcers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Epilepsy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Excessive urination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fainting spells or seizures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Do you have any disease, condition or problem not listed above that you think I should know about?			
Gastrointestinal disease	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Please explain: _____			
G.E Reflux/persistent heartburn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____			
Glaucoma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____			
<i>I certify that I have read and understand the above. I acknowledge that my questions, if any, about enquiries set forth above have been answered to my satisfaction. I will not hold my dentist, or any other member of his/her staff responsible to any action they take or do not take because of errors or omissions that I may have made in completing this form.</i>							
Signature of patient _____				Date: _____			

Clinical, especially visual observation, is of critical importance during assessment of any patient, more so if there is any suspicion raised by either oral or physical signs and symptoms which cannot be justified from the patient's medical or dental history.<sup>1</sup> This would mean to vigilantly LOOK, SEE, SMELL and LISTEN whilst being cognisant of both the direct (drug induced) as well as indirect (life-style) consequences of commonly abused illicit substances on oral health.<sup>1</sup> The signs and symptoms of substance use and abuse vary depending on the substance. **Annexure 1** records most signs that are helpful in recognising a substance abuser.

The first suspicion raised by some of the observations listed and by indications of oral findings should be regarded with circumspection and prompt the OHC provider to enquire from the patient about the possibility of abuse and to discuss specific concerns. When queries are made, they should be intentionally couched in a non-confrontational manner. The tone of voice as well as body language must be neutral, age-appropriate and have a sensitivity about the scale of harm to which the patient may have subjected him/herself, which is often as a result of dire life circumstances.

Table 3 lists tips to OHC professionals on addressing substance abusers.

## THE GERIATRIC ALCOHOLIC PATIENT

Alcoholism is a psychiatric condition which OHC providers must treat as a specific disease without moral implications. Alcohol abuse often occurs in individuals who are financially solvent and lead reasonably normal lives. Many patients try to mask the addiction, but the alert clinician often can detect the signs and symptoms of substance abuse.<sup>4</sup> A comprehensive health questionnaire with follow-up questions usually provides an opportunity for the dentist to inquire about past and current use of alcohol and other mood-altering substances. In addition, if patients reveal the use of multiple and/or expired medications, pharmacy and dental provider shopping, conceal the smell of alcohol by the use of mints or perfume, and exhibit impaired coordination, the dentist should consider more focused screening tests. Based on the results of a preliminary health history, the dentist can screen further for alcoholism or alcohol abuse using either the Short Michigan Alcoholism Screening Test—Geriatric Version 5 (Table 4) or the CAGE Questionnaire.<sup>6</sup> These tests can indicate individuals in need of treatment for alcohol abuse. A recent study suggested that most patients do not object to alcohol screening and alcohol counselling by dentists.<sup>7</sup> This report also suggested that dentists should not be concerned about adverse patient attitudes toward counselling for behavioral change.

## CHALLENGES IN THE DENTAL MANAGEMENT OF SUBSTANCE ABUSERS

The dental practitioner may face many frustrations and challenges in the management of the patient who abuses alcohol or other substances. Both the active and the recovering substance abuser typically bring many fears and some measure of guilt to the dental setting. The recovering user may have fear of uncontrolled pain or an underlying anxiety

**Table 3:** Tips on talking with patients about substance abuse

- i) Communicate your concern.
- ii) Offer support.
- iii) Avoid shaming.
- iv) Ask non-judgmental questions
- v) Develop trust and offer hope.

**Table 4:** The Short Michigan Alcoholism Screening Test

### Short Michigan Alcoholism Screening Test – Geriatric version

Question	Yes (1)	No (0)
1. When talking with others, do you ever underestimate how much you actually drink?		
2. After a few drinks, have you sometimes not eaten or been able to skip a meal because you didn't feel hungry?		
3. Does having a few drinks help decrease your shakiness or tremors?		
4. Does alcohol sometimes make it hard for you to remember parts of the day or night?		
5. Do you usually take a drink to relax or calm your nerves?		
6. Do you drink to take your mind off your problems?		
7. Have you ever increased your drinking after experiencing a loss in your life?		
8. Has a doctor or nurse ever said he or she was worried or concerned about your drinking?		
9. Have you ever made rules to manage your drinking?		
10. When you feel lonely, does having a drink help?		
<b>TOTAL S-MAST-G SCORE (0-10)†</b>		
† Two or more "yes" responses are indicative of an alcohol problem.		

of relapsing into the substance habit. The provision of dental treatment may be compromised by the prevailing dental and oral conditions. Additionally, the risk of relapse is high and this needs to be factored in during the provision of dental treatment. Access to dental services is important for the recovering substance abuser to decrease the risk of relapse due to dental pain. Added to the biologic and restorative challenges that present are the financial and socioeconomic trials the substance abuser may have to deal with, wherein his/her primary goal is to secure the preferred substance of abuse instead of addressing the existing dental and oral damage. It is critical that dental treatment of substance abusers and of those undergoing detoxification incorporates careful pain relief, good local anaesthetic techniques and an understanding clinician to allow a positive experience which will not reinforce any dental anxiety.

### Pain control and management

The management of pain is often a daunting task, and may lead to elements of mutual mistrust between the drug abuser and dental practitioner. It is often reported that, as a routine, substance abusers associate the quality of dental care with the degree of effective pain management. They may also have special needs in relation to receiving dental care.



Anecdotally, they may be dentally anxious and have low pain tolerance requiring careful pain relief and a good rapport with the dentist.<sup>3</sup> It has been reported that they may also feel mistreated and view delayed provision of dental care, regardless of the reasons, as intentional mistreatment. A factor that may compound this perception is when the dental care providers are not knowledgeable about substance abuse and the recommended treatment protocols.

It is advised that patients who are high on certain drugs, such as MA, should not receive any dental treatment for at least six hours after the last 'hit'. The plasma half-life of MA ranges from 8 to 30 hours and intoxication from it is reported to last for up to 24 hours.<sup>3</sup> There is an increased risk of myocardial ischaemia and cardiac dysrhythmias in patients "high" on the drug. Local anaesthetics with adrenaline must not be used while the patient is "high" as these may potentiate the response of sympathetically innervated organs to sympathomimetic amines. This potentiation could result in a hypertensive crisis, cerebral vascular accident, or a myocardial infarction. Administration of general anaesthesia or sedation may be associated with sudden death in MA and cocaine users. Illicit drugs, such as MA, may potentiate the respiratory depressant effect of opioid drugs.<sup>11</sup>

If a dental patient presents with signs of recent illicit drug use, it is advised that treatment in the dental operatory should consist of supportive measures only. The patient's vital signs must be monitored as the heart rate and blood pressure can be elevated. In a patient experiencing toxicity from MA, the dentist should seek immediate medical attention for the patient. Rapid breathing (tachypnoea) precedes respiratory depression during MA toxicity so the patient should be administered 100% oxygen treatment. If the patient experiences cardiovascular collapse, cardiopulmonary resuscitation will be required. Patients may exhibit acute paranoid psychosis and may become violent. In this case, care must be taken to keep the patient calm and to ensure the safety of the patient and the dental team.<sup>8</sup>

Commonly used over-the-counter analgesics are routinely employed in many dental situations. These may however, increase bleeding tendency. In urgent cases requiring a reduction in inflammation and swelling, corticosteroids may be used to avert nerve damage. However, their potential to cause adrenal crisis and elevation of blood glucose levels should always be anticipated.<sup>9</sup> Adequate pre- and post-operative pain management is a priority to effectively manage the substance abuser's dental/oral problems.

Where local anaesthesia is needed for the delivery of dental treatment for patients who are substance abusers, a product without a vasoconstrictor should be used.<sup>10</sup> The degree of severity of the presenting dental condition may necessitate the selection of a stronger and more effective opioid analgesic. Dentists must be knowledgeable about the pharmacological effects, duration of action, and half-life of opioids in order to prescribe or to administer the correct medication for effective pain management. Combining analgesics with different modes of action is said to provide greater analgesic efficacy than therapy utilising a single agent. Combining an

NSAID (naproxen, mybulen, diclofenac, celebrex, ibuprofen) and acetaminophen can be as effective for some moderate to severe pain. Oxycontin is said to offer advantages through a dual delivery mechanism, characterised by an enhanced immediate release phase followed by sustained delivery to prolong the duration of action.<sup>9</sup> In patients who may have the potential to abuse or are abusing prescription analgesics, alternative strategies for limiting postoperative pain include administering prophylactic NSAID analgesics (that is, ibuprofen 400-600mg preoperatively) and the long-acting local anaesthetic bupivacaine to provide prolonged analgesia. In addition, full therapeutic doses of peripherally acting analgesic agents, such as ibuprofen and naproxen, are as effective as opioids for many patients who undergo minor dental surgical procedures, e.g. dental impaction surgery, that cause moderate to severe pain.<sup>9</sup> Moreover, these patients typically take NSAIDs for between four and six days. Therefore, there is evidence that non-opioid analgesic agents should be considered the first line of therapy for the routine management of acute post-operative dental-related pain.<sup>11</sup>

Cocaine users may experience convulsions with the use of lignocaine.<sup>12</sup> Intrapocket application of gingival retraction cord and a vasoconstrictor such as Oraqix gel (lignocaine and prilocaine) is also reported to have the potential to increase the risks due to the absorption of significant amounts of vasoconstrictors. It may therefore be advisable for the dentist to consult with the patient's physician or drug abuse specialist to outline a treatment plan that allows for conscious sedation for major dental procedures.<sup>12</sup>

The use of long-acting local anaesthetics in endodontic procedures should be considered in order to reduce the overall amount of anaesthetic used. These could delay the onset, and reduce the intensity of post-operative pain. It is advised that acetaminophen should be limited to less than 2.5g daily in dental patients with a history of substance abuse and having compromised hepatic function.<sup>11</sup> The reduction proposed by the manufacturers of the recommended daily maximum dose of acetaminophen for healthy individuals might also indicate the need for a revision of this regimen.

Unrelieved or unrelenting pain can be a relapse trigger and therefore adequate pain control is a necessity in the recovering chemically dependent patient. New modalities, such as co-analgesia with low-dose ketamine in the opioid-addicted, have been shown to work effectively. In the post-dental surgical patient with chemical dependency, agents with less psychoactive activity than their drugs of abuse, such as extended-release morphine (MS Contin) have been tried with variable success.<sup>9</sup>

Substance abusers, e.g. those using MA, cocaine and heroin, prescription pain medication etc., may claim to be allergic to codeine in an attempt to obtain a stronger drug such as morphine or hydrocodone. In these cases, NSAIDs can be prescribed.<sup>11</sup> When addicts seek dental care between drug binges the usual analgesic medications (i.e. NSAIDs or narcotic combinations) can be used. Analgesics that cause CNS depression are not contraindicated unless other depressants are being used by the patient at the same time. Consultation

with the patient's physician may be required to balance the need for pain relief with the risk for drug interactions.<sup>10</sup> Some patients may use their abuse substance of choice to reduce their anxiety related to their dental appointment. It is important to acknowledge the patient's anxiety and to offer other means of reducing it, including behavioural methods.

### Xerostomia

The cause of xerostomia induced by substance abuse is uncertain. In the case of MA use, it has been postulated that it may be due to activation of alpha adrenergic receptors in the vasculature of salivary glands, causing vasoconstriction and a reduction in salivary flow.<sup>13</sup> An alternative suggestion is the stimulation by MA of inhibitory alpha 2 adrenoreceptors in the salivary nuclei which may also decrease the salivary flow rate.<sup>14</sup> It is also postulated that some illicit drugs may alter the composition of saliva, leading to xerostomic effects intraorally. Dehydration related to substance abuse-induced elevation of metabolism and increase in physical activity may also contribute to xerostomia. Most substance abusers report feeling thirsty most of the time.<sup>15</sup>

The risk of dental caries, tooth substance loss/wear and periodontal disease is considerably increased by xerostomia, with an increased number and severity of carious lesions caused by poor oral hygiene and a high intake of refined carbohydrates and high cariogenic foodstuffs. The long term prognosis of dental rehabilitation measures in such patients would be considerably guarded.

Patients with substance abuse-induced xerostomia should be advised to drink 8–10 glasses of water per day and to avoid any beverages that have a diuretic effect such as caffeine, tobacco, and alcohol. The relief derived from salivary substitutes, oral moisturisers, and artificial saliva, though beneficial, is often inadequate. This may be due to the substitutes not exhibiting the correct viscosity to give most patients adequate relief. The substitutes are often not superior to the use of water and their effect is often short-lived because they are not retained in the oral cavity for very long.

Substance abuse-induced xerostomia can also be managed by pharmacological stimulation of the salivary glands. Agents such as pilocarpine HCl (Salagen) and cevimeline HCL (Evovac) have been advocated for the treatment of hyposalivation in patients with Sjogren's syndrome. These stimulate smooth muscle and exocrine secretions thus enhancing the production of saliva from major and minor salivary glands.<sup>17</sup> Increased production of saliva from minor salivary glands may be especially important for protection against oral disease because minor salivary glands produce most of the secretory IgA, a powerful component of the oral cavity's immunological defence system.

Patients with substance abuse-induced xerostomia should be carefully evaluated and the patient's physician should be consulted to determine if there are any contraindications before prescribing pilocarpine.<sup>16</sup> Caution should be exercised in patients with hypertension, pulmonary or renal disease, cardiac dysrhythmia or hypersensitivity to pilocarpine. Increased salivary flow is often reported to not necessarily

be accompanied by improvement of symptoms. There are other pharmacological sialogogues, such as bethanachol chloride, bromhexine, anethole trithione and Interferon Alfa which have been shown to stimulate salivary flow but these need further clinical evaluation.

### Caries risk and non-carious tooth surface loss

Caries development in substance abusers usually presents in a distinctive pattern resembling that observed in early childhood caries; specifically, the carious lesions are located on the buccal smooth surfaces of the teeth and the interproximal surfaces of the anterior teeth. A description typically related to MA users is teeth that are "blackened, stained, rotting, crumbling, or falling apart." Often, the teeth are in such disrepair that they are unsalvageable and must be extracted. Caries associated with chronic MA use, while rampant, is somewhat different from that seen in other disorders, such as cocaine or narcotic abuse or post-irradiation therapy for cancer. Similar to the pattern of caries associated with these other conditions, the caries occurs more frequently in the cervical region. However, the pattern of progression of the carious lesions is more similar to that seen with Sjogren's syndrome, wherein the carious lesions progress more slowly and go through periods of arrest instead of rampantly progressing.<sup>17</sup> The reasons for this pattern, although unclear, seem to be that some of the MA users actually practice some personal oral hygiene from time to time and therefore can slightly control the progressive rate of tooth decay.

One proposed cause of rampant caries - hyposalivation - minimises the normal protective capacities of the saliva and increases the risk of caries and demineralisation risk.<sup>14</sup> Because of the xerostomia resulting from the action of the drug on saliva production, along with dehydration related to elevated metabolism and increased physical activity, substance abusers report consuming large quantities of carbonated sugary soft drinks. Xerostomia also lowers salivary pH and promotes plaque and calculus accumulation, with resultant increase in caries incidence. Additional risk factors include: poor oral hygiene, the acidic composition of the substance abused (e.g. MA, heroin, cocaine), increased acidity in the oral cavity, GI regurgitation or vomiting and the drug's capacity for increasing motor activity, such as excessive chewing, tooth grinding and clenching. All contribute to the destruction of a compromised dentition, thus increasing the number and severity of the carious lesions. These risk factors predispose substance abusers to extensive caries.<sup>18,19</sup>

The dental disease evident in the mouths of substance abusers may also be attributed to methadone use as this is commonly prescribed for oral ingestion for short-term detoxification and long-term maintenance of opiate-dependent patients. The aim is to encourage users to switch from injecting the drug to administering it orally. The sugar content may be as much as 50% m v-1 and some users hold the medication in the mouth.<sup>20</sup> It has also been noted that those substance abusers who inject the drug may crave refined carbohydrates, either in an effort to counteract the xerostomia, to increase the 'high' or for unexplained reasons. Refined sugar is often used as a diluent for injected drugs, and addicts are reported to yearn for it and to routinely ingest it at the time of drug injection.<sup>21</sup> In the general population, caries commonly affects the

posterior teeth, therefore when adult patients present to the dental setting with rampant anterior lesions, it should be seen as a red flag for substance abuse, especially MA.

When making a differential diagnosis of non-carious tooth surface loss versus carious lesions, several parameters must be considered, including the distribution of the lesions within the dentition, aspects of the tooth involved, the disparity of the presence of the lesion on the facial and lingual surfaces, the specific sites in the dentition and their location relative to major salivary gland openings, the extent and size of the lesions on the surface of the tooth versus their depth (as detected clinically, radiographically, or post-excitation). Failing to identify the causative etiology could lead to an incorrect diagnosis that could in turn adversely affect treatment planning and misdirect a specified prevention protocol.<sup>22</sup> The rampant destruction that often occurs, coupled with late presentation for dental intervention, often results with a dentition that is beyond salvaging. In most cases, the treatment of choice is clearance of all non-salvageable dental units and provision of removable prostheses.

#### Soft tissue/mucosal/cutaneous damage

Oral mucosal ulceration is common in cocaine users. Oral effects of cocaine are related to administration of the drug via nasal inhalation, smoking and direct smearing on the oral mucosa, especially the gingivae. Rubbing the drug directly onto the gingivae has been reported to occasionally result in the development of grossly inflamed, profusely bleeding gingivae associated with epithelial desquamation.<sup>23</sup> Such an environment would make provision of dental care very challenging. Cocaine has a vasoconstrictive effect that causes ulceration and atrophy of the tissues. Regular use of cocaine is reported to have several orofacial effects, such as perforation of the nasal septum and palate and gingival lesions. Certain habits and behaviours adopted by these patients, such as using instruments like pens and pencils to remove nasal crustings, may also increase the risk of nasal perforations. Nasal septum perforation is a frequently reported complication, observed in approximately 5% of cocaine snorters. The perforation reduces nasal support and results in a broad, flat nose, the so-called saddle nose deformity.<sup>12</sup> The majority of the patients with cocaine-induced palatal necrosis are female (72%), despite the fact that more men than women use the drug.<sup>12</sup> With cocaine abuse, there are also increased nasal and sinus problems that manifest as congestion, stuffiness, discharge, and occasional pain. The presence of massive plaque formation, calculus deposits, and material alba is routinely seen.<sup>22</sup>

Morphine is known to exert an inhibitory effect on the phagocytosis of *Candida* by macrophages, which together with salivary gland hypofunction may predispose to oral candidosis in substance-abusing patients. The concomitant smoking of cannabis and/or cocaine may be an additional aetiological factor in the onset of mucosal dysplasia. These substances contain many carcinogens that are postulated to render the epithelium more susceptible to exogenous carcinogens.<sup>24</sup>

The provision of dental restorations in an oral cavity with extensive periodontal, mucosal and cutaneous damage is

challenging, if not impossible. It thus means that only emergency intervention can be undertaken prior to the management of the soft tissue lesions.

#### Predisposition to periodontal disease

The periodontal soft tissues of substance abusers, especially those abusing MA and cocaine,<sup>17</sup> usually demonstrate signs of periodontal disease and chronic marginal gingivitis, demonstrated by inflamed free margin of the gingiva that appear cherry red, oedematous, glistening, with loss of the entire stippling contour that bleeds easily upon touch.<sup>25</sup> The inflamed gingival tissues appear swollen and hypertrophied, resulting in the formation of multiple pseudo-periodontal pockets. The pattern of the presenting periodontal disease is typically one of adult periodontitis, although acute necrotising gingivitis has also been reported. It seems that the effects on the periodontium are due to a high rate of plaque accumulation, resulting from neglect and xerostomia, and may be exacerbated by the immuno-suppressive effects of opioids and potentially altered microbial profiles resulting in fungal infections. Dental plaque and *materia alba* are often found on most of the dentition, a sign of neglected oral hygiene. Other symptoms include bleeding gums, bad odour and taste in the mouth, loose teeth, abscessed teeth, and frequent toothaches.<sup>23</sup>

The periodontal disease would need to be managed and stabilised before any definitive restorative intervention can be undertaken. In this regard, patient compliance with the proposed dental treatment and appointments is crucial for a positive outcome and the required cooperation is usually a challenge with substance abusers.

#### Temporomandibular disorders (TMD) including bruxism, clenching and grinding

Long term use of most illicit drugs may lead to signs and symptoms of TMD, with substance abusers reporting symptoms that are often seen in patients suffering from TMDs. Robinson, Acquah and Gibson<sup>19</sup> reported that drug addicts recounted a range of traumatic episodes including grinding associated with tooth wear, damage to the oral soft tissues and symptoms of temporomandibular joint disorders. The use of stimulants has also been associated with bruxism and excessive tooth wear in the past.<sup>26</sup>

Bruxism and TSL are common in chronic substance abusers whose extremely high energy and neuromuscular activity can cause parafunctional jaw movement and activity.<sup>26</sup> Bruxism and muscle trismus can aggravate the effects and progress of periodontal disease and produce symptoms of TMD, such as tenderness in the joints and masseter muscles.<sup>15</sup> This in combination with damage to the intrinsic structure of the dentition caused by most of the illicit drugs would predispose to excessive TSL and tooth fractures.

McGrath and Chan<sup>15</sup> noted that 75% of study participants reported that after taking such drugs they 'felt like chewing something', with 52% reporting that they noted they had a habit of clenching or grinding their teeth. Amphetamine-like drugs are reported to have the ability to produce choreiform motor activity that may involve facial and masticatory muscles



and result in unusual patterns of tooth wear.<sup>27</sup> Hyper-irritability, a common feature among illicit drug users, leads to grinding and/or clenching of teeth. Combined with the presence of erosive acids and the lack of neutralising action due to reduced salivary flow, grinding/clenching promotes loss of softened decalcified tissues from the occlusal surfaces of the teeth and the formation of distinctive wear facets typical of the dentitions of substance abusing patients.<sup>22</sup>

### Diet

Substance abusers usually have unhealthy diets as a consequence of their chaotic lifestyles. They often report poor or suppressed appetites, altered taste and smell sensation, as well as a craving for sugar, which they consume in huge amounts.<sup>15</sup> Maintaining good dietary habits is not a priority for substance abusers, whose normal primary goal is to secure the next 'hit' in order to maintain the drug "high". Additionally, opiate abusers reported that they could not appreciate the taste of food, 'making ordinary meals taste like cardboard'. A typical diet is reported to consist of high sugary foods such as sugar, biscuits, ice cream, confectionary, doughnuts etc. These provide the energy for substance abusers to pursue their full-time occupation of drug use. Their food choices are limited to quick and easy foods which are also easy to consume on the go, but provide little nutritional value<sup>19</sup> and are highly cariogenic. The responsibility of maintaining a nutritional diet that is not highly cariogenic lies with the recovering or recovered substance abuser but the patient must be supported by appropriate diet counselling and dental health education as part of the dental treatment.

### Substance abuse rehabilitation plan/strategy

Substance-use interventions are clinically relevant for dentists, owing to the substantial effects of tobacco, alcohol and illicit drugs on oral health.<sup>28</sup> Treatment that involves accountability and support will require a lifetime of work. Substance abuse treatment should not only focus on the medical and psychological management of the patient, but needs to include oral and dental treatment that may be necessary. Attention also needs to be placed on the medications that are used for the management of the substance abuse, as they may also have potentially damaging effects on the dental and oral tissues. Timing and alignment of the dental intervention is important, to ensure the effectiveness of the rehabilitation strategy.<sup>28</sup>

Substance abusers may not be able to take full control of their lives and health until they are able to enter a place of safety, which in most cases is a drug treatment and rehabilitation unit. Removing the need to take drugs may help them to focus more on their health. The facilities available, the attention received, and the support of staff and fellow substance abusers can bolster self-esteem and motivate self-care. It follows that patients who are in rehabilitation should be given easy access to dental care. Indeed, if dental treatment plays a role in the reconstruction of a non-drug using identity it will contribute to their recovery from drug use.<sup>29</sup> Patients with substance abuse-related caries may have a high degree of patient "fallout"/drop-out — they may come into a dentist's office for one visit but then not return for further treatment. Great benefit will be derived by giving increased

encouragement and support for compliance with oral health procedures and dental care provision. The most important consideration should be restoring the patient's health.<sup>29</sup>

Within the appropriate scope of some dental practices, and in conjunction with substance abuse treating specialists, dentists may want to consider using urine drug testing (UDT) to document adherence to the rehabilitation plan or to aid in the diagnosis of drug addiction or diversion. In considering the use of UDT, dentists should refer to more specific guidelines.<sup>11</sup> Drug tests may be useful in practices with high rates of at-risk patients. In most other practices, however, there may be little opportunity or incentive for dentists to conduct UDT as a proactive step. Substance-use interventions are clinically relevant for dentists, owing to the substantial effects of use of tobacco, alcohol and illicit drugs on oral health.<sup>28</sup>

Dentists will recognise the importance of screening for substance use, but they may lack the clinical training and focused practice-based systems that could facilitate intervention. They may also be willing to address substance use among patients, including use of alcohol and illicit drugs in addition to tobacco, if barriers are reduced through changes in reimbursement, education and systems-level support.<sup>28</sup> Instructions concerning referral to a substance abuse program or, in the case of the patient who may require more immediate treatment, to the emergency department are important aspects at the time of discharge from the dental office.<sup>6</sup>

### Health factors complicating treatment

Adverse effects of substance use that are relevant to dentistry include the risk of the development of abscesses at injection sites, viral hepatitis, human immunodeficiency virus disease, endocarditis, anaesthesia complications, increased post-operative bleeding, delayed soft tissue healing, cardiac complications, hepatic and renal episodes.<sup>19,23,30</sup>

There are evidence-based studies that confirm the occurrence of hepatitis C in substance abusers.<sup>19,23,30</sup> Many drug abusers can also be alcoholics with hepatic impairment. The resulting compromise in the hepatic function requires extra caution with the use of amide-type anesthetics like lignocaine and prilocaine, both of which are metabolised in the liver. Therefore, these patients require the standard amount of local anesthetic for each treated site. It is advisable to treat only one quadrant at a time to minimise the total dose.

### Dental management of the geriatric alcoholic patient

Alcoholic patients may present severe management problems for the dentist especially during the uncontrolled phases of the disorder. These individuals are frequently poor at keeping appointments, cooperating with treatment plans and completing courses of treatment. The alcoholic patient is more likely to attend for emergency treatment than for routine examination.<sup>31</sup> This is a situation that is liable to get worse rather than better as the proportion of the cost of dental treatment borne by patients increases. In view of the serious sequelae of chronic alcoholism it is important that the dentist is aware of the general and oral effects of the disorder.<sup>32</sup>

It is incorrect to assume that the alcoholic patient cannot be treated by the general dentist. Anxiety levels often are elevated in elderly alcoholic patients,<sup>33</sup> and they may drink alcohol before the appointment to alleviate anxiety. Pretreatment relaxation techniques should be a consideration in the management of these patients. Close monitoring of the patient's health status during treatment can result in successful dental therapy without undue stress for the patient.<sup>32</sup>

Preventive dental education and maintenance of good oral health are important, particularly given the research findings which suggest that oral microflora may contribute to the development of intraoral carcinoma. The consequences of using over-the-counter (OTC) medications for postoperative pain and infection may be problematic. Alcohol is present in many OTC drugs, including mouthwashes, liquid analgesic preparations, liquid vitamin preparations, and liquid sleep-enhancing medications. The small amount of alcohol ingested through these medications possibly could trigger a relapse in a recovering alcoholic. Therefore, extreme care must be taken when prescribing for this group. In the active alcoholic patient, use of these medications in combination with alcohol greatly enhances their effects.<sup>34</sup>

Surgery for the alcoholic patient is complicated by problems with anesthesia, postoperative bleeding and wound healing. The alcoholic patient usually has increased tolerance for drugs and anesthetics, therefore the use of lower dosages for surgical procedures may be appropriate. Delayed blood clotting, wound healing, and osteomyelitis are often reported after routine oral and periodontal surgical procedures. A preoperative antibiotic regimen should be considered routinely.

The airway should be protected during surgical procedures because the gag and cough reflexes may be depressed in the alcoholic patient. Intravenous sedation and nitrous oxide should be avoided because of the potential for cardiovascular or respiratory depressive events and for initiating relapse in the recovering alcoholic. It is advisable that postoperative pain medication should not be given in both the active and recovering alcoholic patient. If required, a minimal amount should be prescribed and the medication controlled by a reliable family member or friend to reduce the chance for abuse by the patient.<sup>31,32</sup>

The US FDA has estimated that of the most commonly prescribed drugs, more than 50% have at least one ingredient that could react with alcohol. Enhancement of the toxic effects of some drugs is also a possibility. Alcohol inhibits the absorption and enhances the breakdown of penicillin within the stomach for up to three hours after intake. NSAIDs promote gastric bleeding when combined with ethanol and can cause gastric and oesophageal hemorrhage. Medications that may interact with alcohol should carry a warning about possible adverse effects of the combination and appropriate recommendations for modifying alcohol use should be provided. It is likely, however, that the active alcoholic will ignore these warnings. The reactions with aspirin and metronidazole are significant. Peripherally acting analgesics are the most effective drugs to use for the relief of dental pain.<sup>35</sup>

## BARRIERS TO THE PROVISION OF ORAL HEALTH CARE

### Drug seeking behaviour

Substance abusers can be quite adept at seeking ways to sustain their habit. Behaviours can include a drug addict choosing to retain an unrestorable tooth as a means to obtain prescription for potent analgesics.<sup>23</sup> Occasionally they may contact the dental professional at an inopportune time for a prescription claiming to be allergic to non-narcotic agents and request specific narcotics for pain relief. Warning signs of possible abuse of prescription drugs include the use of more than the recommended dosage of medication and then the requesting of repeat scripts, complaining of vague symptoms to get more medication, lack of interest in treatment options other than medications, seeing several physicians and/or pharmacies and/or dentists to gather yet more medication.<sup>1</sup> Often the drug requested is more potent than the dental procedure requires. In such instances, in order to maintain vigilance and control, the patient must be carefully confronted with the suspicion of substance abuse, references must be carefully checked and the minimum amount of medication prescribed.<sup>2</sup> Such behaviour may also be observed in the recovering drug addict, not only in the active drug abuse patient. It is therefore important that dentists are well versed in noticing signs of drug abuse so as not to become enablers of the problem.

### OHC Practitioner Scepticism

Another barrier may be the scepticism of dental practitioners about these patients committing to treatment and their reliability to keep appointments, as they are reported to constantly miss dental appointments.<sup>36</sup>

Behavioural change, although difficult, is not impossible. However, in their dedication to the oral health of these patients, dentists may in effect coerce the patient into commitments that he/she cannot or will not keep. Feeling incapable of achieving unrealistic goals, the practitioner may quit trying, discharging all responsibility to the patient, who in effect is unstable and has an altered psychological mind-set.

### Associated psychological factors and perceptions

Substance abusing dental patients may experience an inordinate degree of anxiety over dental treatment, a fear of dental needles and a low pain tolerance. When patients display visible psychological distress, they must be approached with caution, allowing the opportunity to explore whether the underlying problem is dental anxiety or a dental phobia, symptomatic of a psychological disturbance.<sup>37</sup> When dealing with a nervous patient, consideration should be given to explaining the processes involved and allowing the patient to present their oral symptoms and concerns about themselves. A good chair-side manner and excellent team approach makes the encounter less frightening for these individuals.<sup>38</sup> Moulton<sup>39</sup> suggests that good therapy starts with good history-taking, establishing the basis for good communication and confidence building. An attempt should be made to determine whether the distress is due to dental anxiety or other more deep-seated psychological causes<sup>40</sup> as the pain may be a somatic representation of a psychical pain.<sup>41</sup> Where it is

apparent that other aspects of the patient's life affects their need for, or ability to accept treatment, counselling skills on the part of the OHC provider become critical for the effective management of the patient and the presenting condition. The agenda may differ from the one apparently presenting, and an attempt should be made to explore the possibility of both overt and covert agendas.<sup>41</sup> Treatment may be compromised without this understanding.

Behavioural management strategies should form part of a comprehensive plan to manage the recovering or active drug addict.<sup>38</sup> One reported strategy of constantly talking to patients during active dental treatment will keep the patients' minds off what is being done and encourages them to maintain appointments and to comply with oral hygiene and dietary instructions. An integrated approach may be adopted which may include:

- education of the dental team on the use of counselling skills; patient-centred counselling where closeness and empathy is provided by the clinician to encourage the patient to divulge delicate material;
- possible referral to other healthcare providers (psychologists; counsellor etc.);
- utilisation of various models such as
  - **the Egan model** - a method that provides a structure for counselling that is to follow
  - **psychodynamic counselling** – whereby the dentist is enabled to adapt to the patient's needs, reformulating the way they relate to the patient and allowing the patient to return from a childlike to an adult state
  - **cognitive behavioural therapy (CBT)** - this uses the view of human experience involving the four interactive elements of cognition, emotion, behaviour and physiology. CBT helps clients break out of negative chain reactions.<sup>42</sup> It also helps patients recognise that their beliefs and thinking styles are pathological and that they contribute to addictive behaviour. CBT teaches people skills for coping with difficult and stressful situations, cravings and feelings that in the past would have forced them to their abuse substance of choice.

Another barrier is the perception of the patient that there is difficulty in getting a dentist to deliver treatment. Patients report being alienated by OHC providers and their fear of being treated differently causes them to hide their substance abuse history.

Other barriers identified by substance abusers include their preoccupation with avoiding withdrawal, homelessness, prolonged bingeing, waiting lists for drug treatment and low self-esteem.<sup>19</sup>

## CASE MANAGEMENT OF THE SUBSTANCE ABUSING PATIENT

Diagnosis and treatment planning when faced with a substance abuser is complex, potentially encompassing the entire field of dentistry and some of medicine as well, especially when decisions have to be made on the prognosis of the proposed interventions. Often the prognosis is so clouded by a myriad of issues that the treatment finally adopted

is a compromise. For instance, a complete clearance and provision of full removable dentures may be the preferred choice but may not be justified at that time for the patient. This may then necessitate giving/leaving the patient with an incomplete and debilitated natural dentition and instituting 'patchwork' dentistry – i.e. the application of add-on and wraparound direct restorations, and or various types of shell crowns in an attempt to forestall the inevitable. It should be noted that patchwork dentistry does not justify the provision of poor quality restorations. Good quality patchwork can prolong the useful life of a terminal dentition and postpone total clearance. This application requires that cost-benefit ratio must be considered, i.e. (i) is the time and money to be invested justified in light of the prognosis? and (ii) the patient must know, understand and accept this treatment approach for what it is – a temporary holding action.<sup>43</sup>

Managing the drug addicted or substance abusing dental patient is different from treating the non-addicted patient due to differences related to the emotional/behavioural/personality issues of the addict, the often poor general health and poor nutrition, on-going problems of oral hygiene and the effects of drugs on the oral mucosa, gingiva and dentition.<sup>1</sup> Due to the complex social and clinical aspects of managing the health problems of substance abusers, a different/huanced approach to their dental management must be considered. This differs from the 'traditional/normative' approach, which tends to focus primarily on morphological and technical aspects as determinants of treatment need.

OHC providers see a broad proportion of the population and have regular contact with people who may not otherwise seek oral health care.<sup>28</sup> There is strong evidence that even brief interventions in primary health care settings can produce significant and sustained reductions in tobacco use and alcohol consumption.<sup>44,45,46</sup>

The most important factor in treating the oral effects of substance abuse is for the patient to stop using the drug. Continued use of the substance of abuse will comprise the prognosis of well - intended therapy. Moreover, financial difficulties that result from abuse of alcohol and other illicit substances will make it difficult for the patient to afford dental treatment making complete dentectomy the most appropriate treatment option.<sup>18</sup> Chronic substance abuse can result in psychosis and paranoia that can last for years after the illicit drug use is stopped. Thus, the OHC team must determine how well the patient is able to participate in his/her dental care. If the patient is able to participate, there are treatments that can improve salivary flow and reduce development and progression of caries. Meticulous oral hygiene with minimally abrasive fluoridated dentifrices and irrigation devices is desired. Frequent oral hygiene instruction and prophylaxis is mandatory. The patient's nutrition must improve with an emphasis on decreasing the consumption of refined carbohydrates. Referral to a dietician may have merit. Frequent application of concentrated fluorides delivered either as a direct brush-on or by custom-made trays can prevent the rapid progression of caries.<sup>10,47</sup> Non-prescription fluoride rinses are inadequate. Sodium fluoride (5000 ppm) is preferred over stannous fluoride for several reasons.<sup>47</sup>



Stannous fluoride has an unpleasant metallic taste, may cause burning sensations in patients with xerostomia, and may stain enamel.

## TREATMENT AND MANAGEMENT STRATEGIES

In recognition of the move towards the provision of evidence based treatment, the adoption of the sociodental approach is proposed.<sup>48</sup> This is aimed at ensuring safe and effective clinical practice in the prosthodontic rehabilitation of substance abusers. It is mainly directed towards limiting restorative interventions to the minimum necessary.<sup>48</sup> In contemporary clinical practice, patients increasingly assume an active role in determining their actual treatment needs, by stating their expectations and desires.

A phased approach to managing the oral healthcare needs of the substance abuser should be considered, with the emphasis placed on a medical approach to the dental intervention. This approach is focused on managing the underlying disease. Normative systems for determination of prosthodontic treatment-needs usually disregard social aspects. Little or no value is given to how oral conditions affect the daily lives of patients or whether they can change behaviour to facilitate a real health gain.<sup>49</sup> Dental management of substance abusers cannot be done in an isolated manner. It has to be delivered in conjunction with other healthcare providers - a multi-health team approach which is part of the drug rehabilitation strategy.

### Shared decision making

Shared decision means educating the patients about their problems and making them partners in determining the appropriate course and the specific elements of a proposed treatment plan.

Dental professionals are most-often concerned with the technical aspects of dental treatment and the risk for treatment outcomes while patients place a higher value on symptomatic relief of oral disease.<sup>50</sup> Furthermore, patient perceptions of oral health and disease are strongly related to an acceptance of the proposed treatment, and their subsequent compliance is dictated by their psychological and economic preferences.

Whilst the autonomy of the patient in the decision-making-process is an important legal and ethical requirement, the desire of an individual patient for knowledge and for discussions of treatment options is highly variable and difficult to predict. Some patients do not desire an active role in making decisions regarding their health and treatment. A screening tool to determine the depth of desire for information could be useful to determine specific needs, and to assist with customizing the treatment discussion.<sup>51</sup>

The most fundamental dental relationship involves just two parties – the dentist and the patient. However, in managing complex cases, a number of relationships may need to be considered to participate in treatment planning decisions (Figure 1).<sup>52</sup>

### The clinical application of a socio-dental approach in prosthodontic management of the substance abusing patient

Substance-abusing patients have many problems and associated diagnoses, often interrelated and complex, which require analysis before treatment can begin. The concerns with which OHC practitioners struggle most are:

- intervention or no intervention?;
- the extent of intervention;
- the most appropriate option;
- the sequence of intervention;
- patient's awareness of the extent of the problem and
- prognostic factors.

Prosthodontic care, as a rule, allows multiple treatment choices. Multidimensional aspects of needs assessment and determination, involving both the clinician and the patient, must guide clinical decisions, and can be summarised as follows:

1. Patient's chief complaint: assessment of present dental status, self-perceived needs and susceptibilities, priorities for care, perception of symptoms, and feelings of threat of disease, as well as a professional identification and judicious assessment of normative needs.
2. Patient's desires and expectations: assessment of patient's expected outcomes and patient's beliefs about potential risks and benefits of treatment.
3. Patient's preferences: evaluation of patient's previous concepts and beliefs about prosthodontic alternatives, and attitudes in response to proposed treatment plans; if necessary, unrealistic thoughts may be changed by a thorough professional orientation.
4. Impact of intervention on quality of life of the patient: evaluation of the potential influence of treatment on daily activities and interference with social environment.
5. The likelihood of a favorable prognosis for the individual patient: the probability of success and long-term survival of treatment.
6. Patient's ability in maintaining a healthy oral condition after treatment: involves individual's potential for increased dental health care, promoted and supported by appropriate dental health education.
7. Viability of other treatment alternatives: assessment of effectiveness and safety of different intervention approaches.
8. Patient's capacity to handle the stress associated with all stages of treatment, mainly with extensive and invasive approaches.
9. The availability of resources : financial, personnel, technical support, and professional skills to perform the proposed treatment plan (in some cases referral is advised).

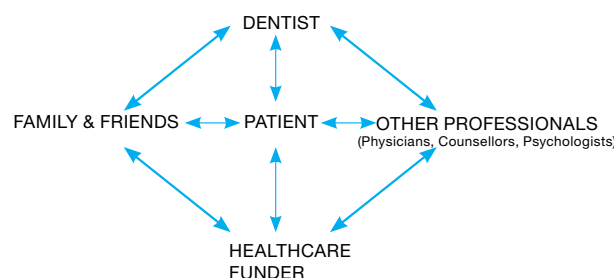


Figure 1: Shared decision - making relationships

These determinant factors should always be considered as playing an important role in a successful prognosis. More aggressive care levels may be selected only if a strong supporting rationale takes into account these determinants in diagnosis and treatment planning. The dental practitioner must be able to integrate all phases of treatment and coordinate all the various disciplines in order to ensure proper sequencing and continuity of care and treatment. An effective dental treatment plan is a general and comprehensive plan, involving the patient first, directed towards goals established with and for that individual patient.

Fundamental skills would involve developing treatment objectives, separating treatment into phases, presenting the treatment plan, sequencing procedures, consulting with other practitioners as multi-disciplinary liaisons dictate, obtaining informed consent and then documenting the treatment plan. Much material is presented in the dental literature, guidelines which must be modified by the circumstances of each individual patient.<sup>48,49,50,51,52</sup>

Figure 2 represents a simplified treatment planning process in dentistry (modified from Stefanac, 2007).<sup>52</sup>

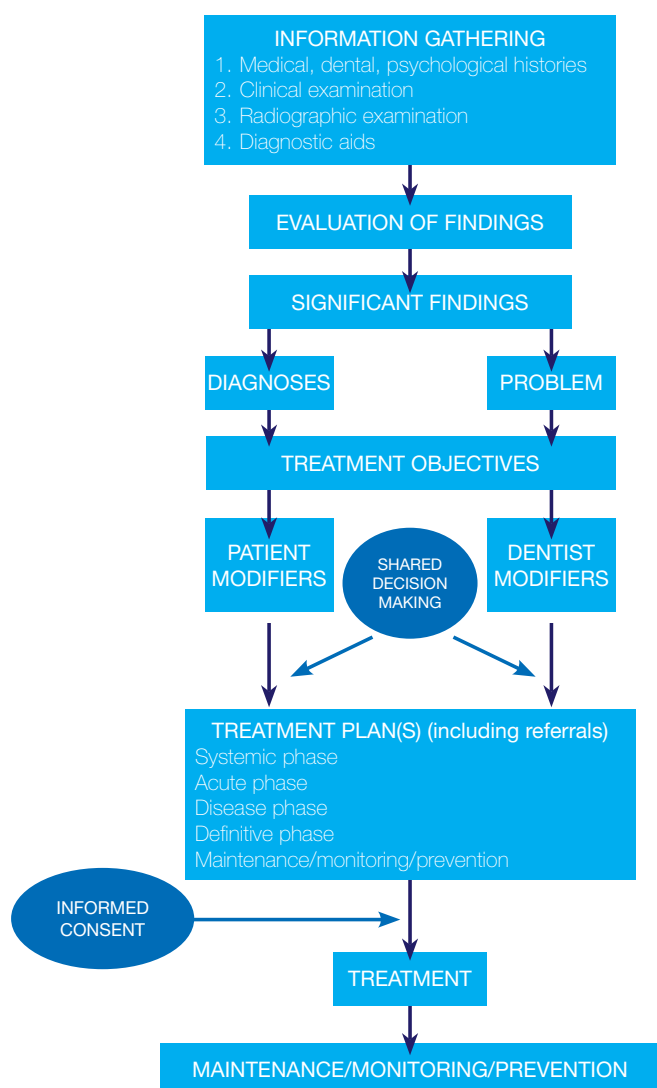


Figure 2: Simplified treatment planning process (adopted from Stefanac, 2007)<sup>52</sup>

I SYSTEMIC TREATMENT	
A.	Consultation with physician/psychologist
B.	Premedication
C.	Stress/fear management
D.	Any necessary treatment considerations for systemic disease
II ACUTE TREATMENT	
A.	Emergency treatment for pain or infection
B.	Treatment of the urgent chief complaint when possible
III DISEASE CONTROL	
A.	Caries removal to determine restorability of the questionable teeth
B.	Extraction of hopeless /problematic teeth <ul style="list-style-type: none"> <li>• Possible provisional replacement of teeth</li> </ul>
C.	Periodontal disease control Oral hygiene instruction Initial therapy <ul style="list-style-type: none"> <li>a) Scaling and root planing, prophylaxis</li> <li>b) Controlling other contributing factors:               <ul style="list-style-type: none"> <li>a. Substance abuse habit</li> <li>b. Replace defective restorations, remove caries</li> <li>c. Address parafunctional habits</li> </ul> </li> </ul>
D.	Caries control <ul style="list-style-type: none"> <li>1. Caries risk assessment</li> <li>2. Provisional (temporary) restorations</li> <li>3. Definitive restorations (i.e. Plastic restorations – resins/ glass-ionomers)</li> </ul>
E.	Replace defective restorations
F.	Endodontic therapy for pathologic pulpal or periapical conditions
G.	Stabilisation of teeth with provisional restorations
H.	Post-treatment assessment
IV DEFINITIVE TREATMENT	
A.	Advanced periodontal therapy
B.	Stabilise occlusion (VDO, anterior guidance, plane of occlusion)
C.	Surgical Treatment – elective extractions
D.	Definitive restoration of individual teeth
E.	Aesthetic Dentistry
F.	Prosthetic replacement of missing teeth: <ul style="list-style-type: none"> <li>Fixed partial dentures</li> <li>Removable Partial Dentures</li> <li>Complete Dentures</li> </ul>
G.	Post-treatment assessment
V MAINTENANCE THERAPY	
A.	Periodic visits

Figure 3: Guidelines for Sequencing Dental Treatment

### Guidelines for sequencing dental treatment

A functional treatment plan must be considered to be dynamic, not static, evolving in response to changes in the patient's oral or general health. Although the order in which the treatment should proceed may vary, some general guidelines can be followed initially to sequence procedures. The resulting list of procedures addresses the patient's most severe problems first and concludes with those of less consequence (Figure 3).

Success in the effective accomplishment of disease control is achieved through the active control of modified contributory risk factors and a decrease in caries susceptibility. The utilisation of transitional restorations has several benefits for the patient and clinician, including quickly increasing self-esteem; providing immediate motivation by improving dental

aesthetics and oral health; reduction and control of pain; assessing patient's caries risk with a view of reducing that risk; provision of restorations utilising dental materials with a high cariostatic potential.

Re-evaluation stages are necessary to monitor disease stabilisation; patient motivation and compliance prior to further active intervention. It also provides an opportunity to finalise the choice of the materials intended to be utilised during the restorative and rehabilitative phases. The patient's host response will also play a key role in this decision.

## CONCLUDING REMARKS

Despite increased awareness about the disease of addiction, the number of patients with a history of substance abuse has been consistently increasing. Being presented with complex problems that defy our attempts at simplification is becoming the norm. With the pending health care reforms in South Africa, it is expected that all health care professionals, including dentists, will be treating more patients with substance abuse issues. Hence, there will be an increased need to have effective screening processes in the dental office. Also, given the correlation between oral and general health status, increased attention should be accorded to oral health concerns among substance abusers. Dental and substance abuse problems should be regarded as associated co-morbidities, requiring the development of treatment plans which address both the substance abuse as well as the potential and resultant oral health problems.

Understanding the risk of interactions between the drugs which OHC practitioners use or are likely to prescribe and the substances some patients consume, along with the potential risk of patients being or becoming addicted to prescribed pain medications, OHC practitioners have a legal and ethical responsibility to be increasingly aware of substance abuse issues. Furthermore, as dentists frequently develop long-term relationships with patients, they are in a unique position to assist in national public health efforts to screen for substance abuse and to help affected patients to access available resources. Awareness among the care providers has to be continual to ensure a sound foundation of knowledge on the topic.

Knowledge and recognition of the oral and dental conditions manifested by abused substances is necessary in order to both properly diagnose and treat (or sometimes delay treatment) in an efficient manner without doing harm to the substance abusing patient. Success in the treatment of complex cases usually depends greatly on a well thought-out plan and meticulous execution of that plan. As there are few shortcuts in taking on the challenge of such treatment plans, OHC practitioners must be prepared to devote extra time and effort. The risks are greater, and the additional time required for a successful outcome often makes for comparatively modest monetary rewards. The satisfaction to be gained from a successful intervention as well as the patient's gratitude and appreciation over the ensuing years are priceless and make all the extra effort worthwhile.

Finally, the authors support the recommendation of the 1995 Institute of Medicine Report, "Dental Education at the Crossroads", that there is a need for the development of a dental healthcare delivery system that focuses on patient centered care and recommends an education system in which "patients' preferences and their social, economic and emotional circumstances are sensitively considered". It is common knowledge that the undergraduate dental curriculum pays inadequate attention to this significant social disease and its management. Considering the global increase in substance abuse as well as the harm caused, a call needs to be made to not only mainstream addictive disorders and substance abuse into dental care but, imperatively, for the inclusion of and emphasis on this subject matter in the undergraduate dental curriculum. Programmes designed to improve the oral health of substance abusers need to be developed and implemented in a manner amenable to the varying social circumstances of this marginalized group of the community.

Recommendations for finding help and support for substance abuse and drug addiction:

### Drug help centres for possible referrals:

**Narcotics Anonymous:** 083 900 6962; [www.na.org.za](http://www.na.org.za)

**South African National Council on Alcoholism & Drug Dependence (SANCA):**

SANCA National Directorate: 08614 SANCA, 08614 72622  
[sancanational.org/index.php/component/content/article/10-portfolio/12-research.html](http://sancanational.org/index.php/component/content/article/10-portfolio/12-research.html)

**SANCA centres (31) contact details:**

<http://sancanational.org/index.php/database.html>

**Tharagay Treatment Centre:** 021 762 2425

**Drug Rehab S.A:** [www.drugrehabsa.co.za](http://www.drugrehabsa.co.za)

**Narconon:** [www.narconon.org/drug-abuse/parents-get-help.html](http://www.narconon.org/drug-abuse/parents-get-help.html)

### 12 Step Programs:

**Alcoholics Anonymous:** [www.aa.org.za](http://www.aa.org.za)

**Narcotics anonymous:** [www.na.org.za](http://www.na.org.za)

**Cocaine anonymous:** [www.ca.org.za](http://www.ca.org.za)

**Searchlight Intervention East London, South Africa:**

071 544 825, [www.facebook.com/loveadonai](https://www.facebook.com/loveadonai)

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# A comparison of preload values in gold and titanium dental implant retaining screws

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## ABSTRACT

This *in vitro* investigation compared the effect of using either gold or titanium retaining screws on preload in the dental implant-abutment complex. Inadequate preload can result in screw loosening, whilst fracture may occur if preload is excessive. These are the most commonly reported complications in implant-retained prostheses, and result in unscheduled, costly and time-consuming visits for the patient and the clinician. This study investigated changes in preload generation after repeated torque applications to gold and titanium screws. The test set-up consisted of an implant body, a cylindrical transmucosal abutment, and the test samples of gold and of titanium retaining screws. The implant bodies were anchored using a load cell, and the transmucosal abutments were attached using either gold or titanium retaining screws. A torque gauge was used to apply torque of 20Ncm, 32Ncm, and 40Ncm to the retaining screws. The preloads generated in each screw type were compared at each torque setting, and after repeated tightening episodes. In addition, the effect of applying torque beyond the manufacturers' recommendations was also examined. Gold retaining screws were found to achieve consistently higher preload values than titanium retaining screws. Preload values were not significantly different from the first to the tenth torque cycle. Titanium screws showed more consistent preload values, albeit lower than those of the gold screws. However due to possible galling of the internal thread of the implant body by titanium screws, gold screws remain the retaining screw of choice. Based on the findings of this study, gold retaining screws generate better preload than titanium. Torque beyond the manufacturers' recommendations resulted in a more stable implant complex. However, further investigations, with torque applications repeated until screw breakage, are needed to advise on ideal maintenance protocols.

## INTRODUCTION

Osseointegrated implants have revolutionized the options of clinicians in restorative dentistry. Physiological success is dependent on the integration of the implant within the surrounding osseous tissue, while prosthodontic success relies on a good mechanical fit between the components within the implant-abutment-prosthesis complex.<sup>1</sup> In screw-retained restorations, the screw is responsible for clamping the transmucosal abutment to the implant fixture, and predictable long-term success relies on the integrity of that screw joint.

### Literature review

The retaining screw connects the transmucosal abutment to the implant body and confers the advantages of retrievability, and of allowing for periodic implant and soft tissue assessment, the debridement of calculus, and prosthetic modifications or repairs.<sup>2</sup> The screws are designed to loosen or fracture before damage to the implant fixture or overlying prosthesis occurs.<sup>3</sup> This fail-safe characteristic is due to their reduced size, metallurgical composition, and the biomechanical parameters of the screw joint assembly.<sup>4,5</sup>

Application of torque to the retaining screw causes elongation and the subsequent elastic recovery results in the generation of a compressive clamping force.<sup>6</sup> The tension thus created in the retaining screw during tightening is defined as the preload.<sup>7</sup> Maintenance of an optimum preload in the screw joint is of critical importance to ensure the long term functioning of the implant-abutment-complex and to minimize fatigue in the screws.<sup>8</sup> Inadequate preload results in increased wear and accelerates fatigue of the screw. Metal fatigue is the most common cause of structural failure and occurs after repeated loading even though such loading occurs at stress levels below the maximum tensile strength of a material.<sup>9</sup>

Preload is affected by many factors, including torque applied to the screw, type of screw alloy, screw head design, abutment alloy, abutment surface and the presence of lubricants.<sup>10</sup> The greater the torque applied the greater the preload generated. Size and surface area of the contacting threads, pitch, screw radius and diameter of the head play major rôles in the relationship between applied torque and preload.<sup>11</sup> Surface area contact is also dependent on length of the screw, which determines the number of thread surfaces engaging. Frictional forces acting on these interfaces affect the relation between preload and applied torque. The amount of friction depends on the geometry and material properties of the interfaces, with additional energy being needed to overcome these forces.<sup>10</sup>

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Screw loosening following functional loading has been cited as the most common mechanical complication for implant supported prostheses, and may be an early indicator of design inadequacies.<sup>1,12</sup> The resulting micro-movement at the implant interface may lead to mechanical irritation of the surrounding soft tissues, gingival tenderness, bacterial colonization, inflammation, hyperplasia and later fistula formation with peri-implantitis.<sup>13</sup> Fracture of the overlying prostheses and implant body fracture have also been reported.<sup>1</sup> These complications result in costly and time-consuming unscheduled visits.<sup>8</sup> Screw loosening occurs when the axial and bending moments acting on the screw (joint separating forces), generated by the cyclic forces of mastication, are greater than the clamping force.<sup>14</sup> These displacing forces are amplified by excursive contacts, off-axis centric contacts, interproximal contacts, long cantilevers, lack of a passively engaging prostheses, and parafunctional habits.<sup>2,13,15</sup> From an engineering perspective, screw loosening and/or fracture may be attributed to inaccurate or inadequate machining tolerances, inappropriate component materials, metal fatigue, micro-movement during function, and the settling of screws. This settling effect or embedment relaxation occurs when the surface asperities produced during milling and tapping of the retaining screws are burnished with the initial application of torque.<sup>16,17</sup> It has been reported that 2% to 10% of preload is lost within ten minutes of the initial torque application.<sup>9,18</sup> To mitigate the problem of screw loosening, screw designs have been modified for improved performance, although the optimum design has not yet been fully established. Current designs generally consist of a flat head seat (for less frictional resistance and higher preload), long stem length (for optimal elongation and preload) and six threads to reduce friction because the first three threads carry most of the load,<sup>19</sup> with the maximal stress being concentrated between the shank and first thread.<sup>20</sup>

The incidence of reported screw loosening is variable but is high, with a recorded 65% of screws in single tooth implants becoming loose within the first three years.<sup>2</sup> Screw loosening within the first year is the most common problem for 42% of maxillary and 27% of mandibular prostheses.<sup>13, 20-23</sup>

The most commonly utilised retaining screws are constructed of either gold or titanium. Gold screws were designed to be the most "flexible" portion of the implant assembly due to their higher modulus of elasticity, which permits a degree of micro-movement, and distribution of forces.<sup>4</sup> This design attribute also makes them the "weakest link" in the implant-abutment complex. In cases of occlusal overload the gold screw will fracture first, thus protecting the implant and underlying bone from excessive stresses.<sup>3</sup> Gold screws can in fact attain a preload almost twice that of titanium alloy screws,<sup>19</sup> but are weaker and will fracture due to metal fatigue sooner than titanium.<sup>4</sup> The latter are stronger but their main disadvantage is the large frictional resistance between mating male and female threads, which has a tendency to cause galling.<sup>16,17</sup> Galling is defined as the condition where excessive friction between two mating surfaces results in localized welding and roughening of the mating surfaces. It occurs when the titanium surfaces of the retaining screw and implant body slide in contact with each other. There is generation of increased friction that leads to transfer of titanium molecules from the mating surfaces, causing damage to both.<sup>8,16</sup> Conversely, gold retaining screws have a smaller coefficient of friction, and can be tightened more effectively than titanium without risking galling between threads.

Screw tightening aims to generate an optimum preload that will maximise the fatigue life of the retaining screw, but at the same time offer protection against loosening.<sup>8</sup> An optimal preload is important to maximize the frictional forces between mating threads and to ensure the stability of the implant complex. There is a difference between optimum torque, which is that torque which achieves an optimum preload, and the design torque specified by the manufacturer as being that needed to achieve optimum preload. Design torque is based on the nominal properties of the retaining screw and is calculated at 75% of ultimate torque-to-failure values.<sup>24</sup> Manufacturer recommended values usually do not approach full design torque, as they have established a safety margin to optimise preload whilst decreasing the risk of screw fracture. Metallurgical properties of titanium screws allow for the generation of a more consistent, albeit lower, preload than with gold retaining screws. Recommended torque values of below 57.5% of the yield strength for gold alloy screws and 56% for titanium screws have been advocated.<sup>19</sup> In a separate study, a preload of 75% of yield strength was not established using recommended tightening torque values.<sup>25</sup> Despite these findings, torque cannot be applied arbitrarily without due consideration being given to the elastic limit of the screw and the biomechanics of the bone implant interface.<sup>16,17</sup> If too much torque is applied to the implant complex, loss of integration at the implant-bone interface can occur.<sup>26</sup> The retaining screw can also fail if torque is applied beyond its yield strength<sup>27</sup> and threads can be stripped.<sup>2</sup>

The manner in which torque is delivered to the system is also important to ensure consistency. Variations have been found between hand screwdrivers, torque wrenches and electronic torque drivers, the latter being the most consistent when regularly calibrated.<sup>10</sup> There are currently no suggestions for the torque that can safely be applied to the retaining screw beyond the manufacturers' recommendations. It is difficult to predict the fatigue life of retaining screws because of the differing material fatigue rates, and variable intra-oral loads. The estimated fatigue life of an implant screw has been reported to be about 20 years.<sup>9</sup> Other authors agreed and stated that gold retaining screws can be removed and tightened up to 20 times with no effect on their tensile strength<sup>28</sup>, and suggested re-torquing within the first 3-12 months to compensate for embedment relaxation. Opinions differ as to how often screws should be retightened thereafter. However, to avoid fracture the critical number of torque cycles must not be exceeded.<sup>13,28</sup> Screw thread deterioration after 4 to 10 years has been noted, hence the recommendation that retaining screws be replaced every 10 years.<sup>16</sup> Other workers suggest replacement of gold screws during the lifetime of the restoration with no further detail given.<sup>4</sup> There seems to be little consensus in the literature regarding maintenance protocols for abutment screws.

Abutment screws have either slotted, square, star or hexagonal driver engagement. A guiding effect can be achieved with the geometric designed engagements, resulting in more effective force transfer and greater stability, while it may be more difficult to apply manual force when tightening the slotted screws as clinicians are "anxious" to avoid slippage of the driver from the slot.<sup>13</sup> The slotted, flat head retaining screw was investigated in this study because this design is commonly used in practice

## AIM

The aim of this study was to evaluate the preload generated in gold and in titanium retaining screws and the effect of repeated torque on this preload.



## MATERIALS AND METHOD

This was an *in vitro* laboratory study. An unused stack of components of the same batch (lot number 07A07/1) from one manufacturer (Southern Implants, Irene, South Africa) was used in this experiment to reduce the variations that occur between different lots and manufacturers. The test set-up consisted of:

- an implant body,
- a cylindrical transmucosal abutment,
- the test retaining screws.

Two self-tapping external hexagon implant bodies of 5mm diameter and 13mm length were used (Southern Implants, BA13 lot number 06051801/2). Each external hexagon was 2mm in height. The external hexagon has been shown to increase resistance to screw loosening,<sup>29</sup> while the 2mm height is considered the most effective in dispersing lateral and bending forces through to the hexagon corners, thereby securing the preload in the retaining screw.<sup>27</sup> Two titanium cylindrical transmucosal abutments (TC-BASnh, lot number 06051801/2, Southern Implants) designed for use with single implant restorations, were attached to the implant body with the retaining screws (Figure 1).

The test sample consisted of twenty slotted retaining screws. Ten were titanium (TSS2, alloy composition 90% Ti, 6% Al, 4% Vn) and ten were gold (GSS2, alloy composition 61% Au, 16.5% Ag, 13.5% Pt, 9% Cu). Each group of screws was tested using a new implant body and cylindrical transmucosal abutment.

A load cell (Loadtech, model number LT-400, South Africa), comprising of a central adjustable clamp for fixation of the implant body and a horizontal plate housing the cylindrical transmucosal abutment and retaining screw was used to measure preload in the screw (Figure 2). Preload was measured digitally in kilograms.

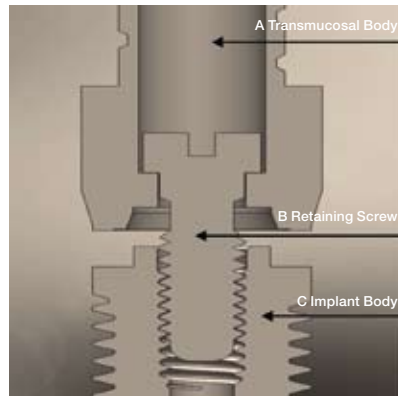


Figure 1: The test set-up

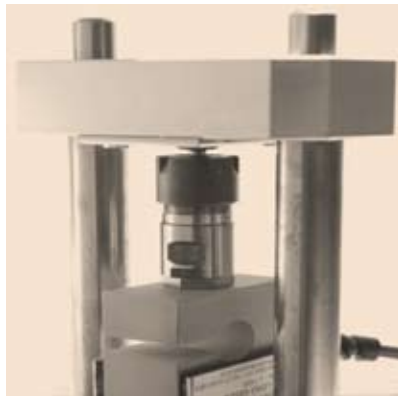


Figure 2: Loadtech load cell (model LT-400, South Africa)



Figure 3: Mechanical torque gauge with selected driver tip.

Torque was delivered to the system using an implant driver (I-WI-BL, Southern Implants), which was slotted into a torque gauge (Tohnichi, Japan, model BTG 150 CN, serial number 501935T) (Figure 3). The torque gauge and load cell were calibrated using known loads to give accurate and reproducible recordings prior to testing. All tests were performed in an air-conditioned environment set at 25°C. Tests were performed by a single operator to ensure consistency in recording of data. Retaining screws were carefully handled throughout testing using plastic tweezers to ensure that no operator-induced damage to the thread occurred. Screw torque was delivered in a steady manner by stabilizing and holding the head of the driver vertically with one hand, while the other hand applied the torque force to the torque gauge.

### The procedure was as follows:

An initial torque of 20Ncm was applied to the retaining screw, that being the recommended tightening torque for TSS2. After a two minute waiting period to allow for embedment relaxation, 20 Ncm torque was re-applied to the screw and a reading was captured. After 30 seconds torque was increased to 32Ncm (as per manufacturers' recommendation for GSS2) and data was captured. After a further 30 seconds torque was applied up to 40Ncm and data captured. The purpose of the time intervals between applications of torque was to permit some settling, so that at the next torque application there would be better contact between mating surfaces allowing for a greater preload value. The three torque levels correspond to 62.5%, 100% and 125% of manufacturer's recommendations respectively. This process was repeated ten times per screw at each of the selected torque values, with the screw being removed and replaced at each cycle.

### Statistical analysis

Preload values for each group of screws were obtained at each of the specified torque values (20Ncm, 32Ncm and 40 Ncm). For preload values during the first cycle, the mean and the standard deviation for each metal-torque combination as well the marginal values (i.e. the metals value divided by the torque measurements) were calculated (Table 1). The preload data was subjected to an analysis of variance (ANOVA) for repeated measures in the first cycle analysing preload on the (natural) logarithmic scale. ANOVA showed that the performance of the metals differed significantly ( $p < 0.0001$ ). Geometric means were calculated as the antilog of the mean of the log values and hence the geometric mean of gold is significantly higher than that of titanium, 43.7Ncm as opposed to 29.3Ncm, as illustrated in Table 2.

To determine whether there was an inherent difference in the qualities of the different screw types, a final analysis comparing the two screw types with respect to the changes in preload from 20Ncm torque in the first cycle to 40Ncm torque in the tenth cycle was done using an analysis of covariance (ANCOVA) with the value at 20Ncm torque in the first cycle used as baseline covariate. The two metals did not differ significantly with respect to the mean change in preload, adjusted for baseline, ( $p=0.5159$ : 18.7 for GSS2 and 16.9 for TSS2).

## RESULTS

For titanium, the mean value of the preloads measured at each sequence of ten torque cycles were 20.270Ncm, 31.520Ncm and 39.580Ncm at 20Ncm, 32Ncm and 40Ncm respectively, while for gold the values were 31.240Ncm, 47.250Ncm and 58.250Ncm (Figure 4). The mean preload

**Table 1:** Number of observations (N), means and standard deviation (SD) of observed preload, and torque by metal

Torque	Preload in Kg /cm			
	GSS2	TSS2	TOTAL	
20Ncm	10	10	20	(N)
	31.240	20.270	25.755	(MEAN)
	4.620	1.070	6.506	(SD)
32Ncm	10	10	20	(N)
	47.250	31.520	39.385	(MEAN)
	7.710	2.078	9.763	(SD)
40Ncm	10	10	20	(N)
	58.250	39.580	48.915	(MEAN)
	9.458	1.487	11.625	(SD)
Total	30	30	60	(N)
	45.580	30.457	38.018	(MEAN)
	13.419	8.201	13.406	(SD)

**Table 2:** Geometric means of preload torque by metal

TORQUE (Ncm)	GSS2	TSS2
20	30.959	20.244
32	46.726	31.457
40	57.637	39.554
TOTAL	43.686	29.313

value for all the torque cycles was 30.457Ncm for titanium and 45.580Ncm for gold. An ANOVA of the repeated measures in the first cycle (i.e. for each screw preload measured following torque measured at, respectively, 20Ncm, 32Ncm and 40Ncm) revealed that there was no significant difference between the metals ( $p < 0.0001$ ).

A further analysis was done to compare titanium to gold with respect to the change in preload from 20Ncm in the first cycle to 40Ncm in the tenth cycle, using an ANCOVA. This revealed that the metals were not significantly different ( $p > 0.5159$ ), showing mean preloads of 16.9226Ncm for titanium and 18.6874Ncm for gold.

## DISCUSSION

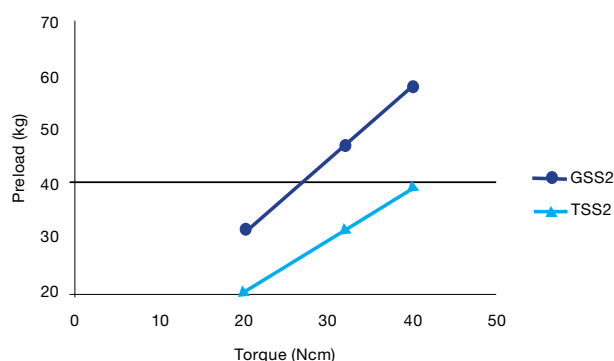
Screw loosening is a recognised problem in dental implant therapy. Retaining screws have been extensively studied and are constantly being improved upon. They are limited by size, material properties and maximum torque tolerance. The gold screw was originally designed to withstand only 10Ncm of torque (corresponding to that force which can be generated by hand tightening), and were intended to be the "weakest link" that would fracture first before damage to the prosthesis or implant body could occur.<sup>21</sup> Screw loosening

results from cyclic forces of mastication causing repeated deformation of the screw. This is compounded by a loss of preload due to embedment relaxation (the settling effect) where energy is expended in the burnishing of surface asperities of mating surfaces caused during manufacturing.<sup>17</sup> Up to 10% of the initial preload may be lost within the first two minutes.<sup>9</sup> This loosening is initiated when the mating threads slip, termed the critical bending moment and subsequently the loss of preload reaches a threshold point where any vibration will allow the screw to back out.<sup>10</sup>

Many strategies have been suggested in the attempt to minimise screw loosening, most of which are focused on precision implant placement and appropriate prosthesis design. Implants should ideally be parallel to the applied occlusal forces with the prosthesis designed to direct those forces through the long axis of the implant.<sup>2</sup> Further screw loosening can be limited by minimising cantilever length, eliminating posterior working and balancing contacts, centralising centric contacts, sharing anterior guidance with the natural dentition, engaging anti-rotational features and ensuring passively fitting frameworks.<sup>3</sup>

The results of this study indicated that material composition of the retaining screw significantly influenced the preload with the gold screws generating consistently higher preload values. This is in accord with previous studies, but preload figures in this study were slightly below the 2:1 ratio of gold to titanium shown by Tan *et al* (2004).<sup>19</sup> This may be due to manufacturing differences.<sup>15</sup> The gold screws had a higher modulus of elasticity and are "softer" than titanium, and thus generated higher preload values. This was partially attributed to more intimate mating of female and male threads. However, this "softness" results in long-term deformation of the threads and subsequent loss of preload after the first torque cycle, although it did remain reasonably constant thereafter. In contrast the smaller preloads generated by titanium screws remained unchanged during successive tightening episodes. However gold screws are still preferred because of the potential galling of the titanium screws. As the titanium slides in contact with titanium, the coefficient of friction is initially fairly low, but with repeated tightening and loosening, the values gradually increase, causing damage to the internal thread of the implant body.

Published preload values in retaining screws vary considerably among studies, which may be due to differences in the manufacturing processes, lot numbers, and experimental procedures followed. Some studies calculated preload from opening torque values,<sup>30</sup> compression in the implant complex,<sup>31</sup> or from rotational angles.<sup>8</sup> This may account for the slightly lower preloads recorded here. The optimum preload recommended for the retaining screw is that which produces a stress level between 60% and 75% of the yield strength of the material.<sup>32</sup> Preload that is equal to the ultimate tensile strength of the material results in tightening-induced stress and finally fracture of the retaining screw. Stress at or slightly above yield causes the retaining screw to function in the plastic deformation zone with resulting sub-optimal function and loss of preload. However, a preload within the elastic range of the material is the most appropriate in terms of resisting joint separating forces generated during occlusal loading. Furthermore, optimum preload maximises the fatigue life of the screw as the load is transferred from the abutment to the implant surface with minimal effect on the screw.<sup>5</sup>

**Figure 4:** Graph showing mean preloads achieved for titanium (TSS2) and gold (GSS2) at torques of 20Ncm, 32Ncm and 40Ncm

In this study, torque beyond the manufacturers recommendations, corresponding to 125% of the stipulated torque, resulted in consistently higher preload values. However, one is still unsure as to whether this is within the elastic limit of the screw. In addition, the biomechanics of the clinical situation must be carefully evaluated before exceeding the manufacturers guidelines as debonding between the implant and bone interface can occur with forces as little as 30Ncm.<sup>26</sup>

There is a relationship between preload, screw design, and material property. Friction influences preload generation, especially when new components are used, as in this investigation where the results suggest that wear from repeated closing/opening cycles may decrease the coefficient of friction between the screw head, threads, and other mating components. Consequently, resistance to opening gradually decreases as the resultant preload values fall. The coefficient of friction is affected by the manufacturing process, the metallurgical properties of the components, design and quality of the surface finish. As the study was done under dry conditions, the results may differ in the clinical situation where oral fluids could act as a lubricant to decrease the coefficient of friction and allow for greater tightening. It then follows that the preload values in this study would be lower than those expected clinically.<sup>30</sup> This will also be affected by how many times the prosthesis is inserted and removed clinically.

This study showed that higher preload values could be achieved using gold retaining screws with a higher torque. This may avoid the screw loosening, adverse soft tissue reactions, and loss of implant function associated with insufficient or reduction of preload. Limitations of this study are that the experimental screws were all from one manufacturer and the results may not be transferable to designs or items produced by other manufacturers. The number of torque cycles in this study was limited to ten and may have been insufficient to cause screw joint deterioration. Additionally, the study was conducted under dry and static conditions. Furthermore, the same implant body was used for each of the test groups. Particulate matter from the screw threads could have coated the implant internal threads, especially from the gold retaining screws, further reducing preload values. Considering the host of challenges in the oral environment, it is clear that this study understates the loss of preload that would occur clinically.

## CONCLUSIONS AND RECOMMENDATIONS

Gold screws generate higher preload values than titanium. Torque of 40Ncm to the retaining screw results in consistently higher preload values, thus, depending on the clinical situation, torque beyond the manufacturers' recommendation (by 25%) can be safely applied to ensure a more stable screw joint.

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# Oral medicine case book 62:

## CREST syndrome

SADJ August 2014, Vol 69 no 7 p324 - p325

BK Bunn<sup>1</sup>, AW van Zyl<sup>2</sup>, L Rahman<sup>3</sup>, WFP van Heerden<sup>4</sup>

### CASE REPORT

A 42-year-old female patient presented to the Department of Periodontics and Oral Medicine, with a main complaint of labial gingival recession on tooth 41. A comprehensive periodontal examination was performed with no findings of periodontitis. Gingival recession was found on teeth 41, 43, 45, 31, 34, and 13. Clinical examination of the intra-oral mucosa and peri-oral facial skin showed multifocal asymptomatic telangiectases (Figures 1 to 3). The patient disclosed a chronic history of Raynaud's phenomenon which was initially diagnosed in her early teens. In addition, there was evidence of sclerodactyly and focal areas of calcinosis cutis (calcinosis of the skin) (Figure 4). The patient complained of mild dysphagia and gastric reflux.

The severity and pain associated with her Raynaud's phenomenon, particularly on exposure to cold, had prompted the patient to consult a physician many years previously. At that time, laboratory testing had shown increased antinuclear antibody (ANA) titres. Some years later she consulted a rheumatologist, who diagnosed CREST syndrome on the basis of her clinical features and the presence of anti-centromeric antibodies on laboratory testing.

The patient was on antidepressant medication and occasionally took non-steroidal anti-inflammatory drugs for digital and joint pain. The Miller's Class II gingival recession of tooth 41 was surgically managed by means of a subepithelial connective tissue graft, using a microsurgical technique. Healing was uneventful.

### DISCUSSION

The slowly progressive cutaneous form of systemic sclerosis (scleroderma) is termed CREST syndrome. The acronym CREST is derived from the clinical symptoms of Calcinosis

### ACRONYMS

<b>ANA:</b>	Antinuclear antibodies
<b>CREST:</b>	Calcinosis of the skin, Raynaud's phenomenon, Esophageal dysmotility, Sclerodactyly and Telangiectasia
<b>GERD:</b>	Gastro-esophageal reflux disease
<b>SS:</b>	Sjögren's syndrome

of the skin, Raynaud's phenomenon, Esophageal dysmotility, Sclerodactyly and Telangiectasia.<sup>1</sup> The oral manifestations of CREST syndrome are poorly documented. This case presentation aims to discuss a fairly rare clinical entity and the implications for dental management.

Scleroderma is contemporarily referred to as systemic sclerosis but remains a poorly defined, ill-understood form of autoimmune disease. It is characterised by sclerosis of the dermal connective tissue and occasionally involves the visceral organs. Vasculopathic involvement and increased circulating autoantibodies are typical features.<sup>1</sup> A localised form of systemic sclerosis occurs in the cutaneous lesions of morphea and linear scleroderma. Systemic sclerosis may occur as a diffuse condition or as the specific form denoted by the acronym CREST.<sup>1</sup> Patients with CREST syndrome present with sclerodermatous changes of the oral mucosa and peri-oral soft tissue. They frequently complain of limited mouth opening and induration of the tongue with resultant speech and swallowing difficulty.<sup>1,2</sup> Previous studies of periodontal disease in patients with systemic sclerosis have shown mucogingival involvement characterised by loss of attached gingiva and multifocal areas of gingival recession.<sup>1,3</sup> The increased incidence of dental caries and periodontitis encountered in these patients necessitates a greater need for prophylactic plaque control measures and preventative dental management. Patients may also suffer from xerostomia as a result of Sjögren's syndrome (SS).

### CLINICAL CHARACTERISTICS

**Calcinosis:** Soft tissue deposition of calcium in CREST syndrome are a late manifestation of the disease process and are unrelated to disorders of calcium metabolism.<sup>1,4</sup> Calcium deposits are noted within the extremities and occur superficially within the dermal connective tissue. They rarely interfere with patient function and seldom require additional therapy.

**Raynaud's phenomenon:** Raynaud's phenomenon is usually the earliest manifestation of CREST syndrome and represents a vasomotor disorder affecting the extremities. Patients suffer from vascular spasms of the acral arteries which are induced by exposure to cold. The vascular spasm results in decreased peripheral perfusion which may last several minutes followed by painful re-perfusion. Vasoactive

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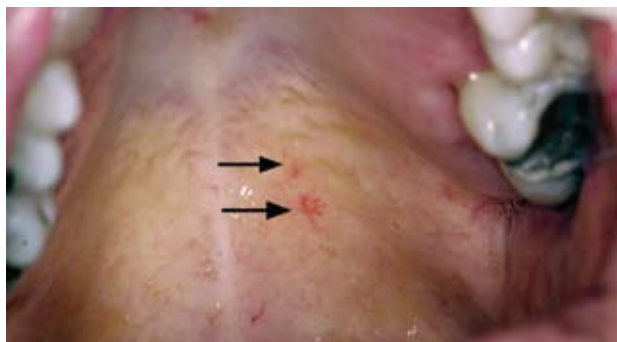




**Figure 1:** Numerous red macules on the face representing telangiectatic blood vessels.



**Figure 2:** The vermillion areas of the lips are commonly affected. Dilated vessels are also present on the tongue.



**Figure 3:** Telangiectatic blood vessels are also present on the palate (arrows).



**Figure 4:** The patient presents with healing ulcerations of skin (white arrows) following spontaneous exfoliation of calcium deposits. The fingertips were tender and had a blue discoloration (blue arrows) due to venous stasis.

medication in the form of calcium channel blockers can be used to alleviate these symptoms in only the most severe cases.<sup>5</sup> Generalised gingival overgrowth may result from administration of this medication and further complicate plaque control and periodontal involvement.<sup>1</sup>

**Esophageal dysmotility:** Esophageal involvement in CREST syndrome is due to smooth muscle atrophy and fibrosis which

results in uncoordinated contraction, dysphagia and gastro-esophageal reflux disease (GERD).<sup>2,6</sup> Severe chemical erosion of tooth enamel may result from chronic GERD.

**Sclerodactyly:** The tightening of the skin with tapering of the fingers and toes is termed sclerodactyly. The most severely affected digits may show clinical features of contracture. Initial clinical changes include oedema followed by atrophy and thinning of the skin. The fingers become progressively rigid which may result in a loss of dexterity which may interfere with the patient's ability to manually perform plaque control measures.<sup>1</sup>

**Telangiectases:** Telangiectatic lesions in CREST syndrome are usually noted to involve the oral and gastro-intestinal mucosa as well as the skin of the trunk and extremities. Unlike the hereditary telangiectatic lesions seen in Rendu-Osler Weber disease, there is no association with haemorrhagic episodes in CREST syndrome. Lesions appear to increase in number as patients' age but are largely asymptomatic.<sup>7</sup>

The diagnosis of CREST syndrome is often delayed as the disorder is slowly progressive and not all features are present from the outset. Laboratory detection of ANA's, in particular anti-centromeric antibody, is supportive of the clinical diagnosis. The oral health care worker should also be aware that patients with CREST syndrome have a higher incidence of associated auto-immune disease, notably of SS.<sup>1</sup> The xerostomia occurring in SS further complicates the oral manifestations of CREST.

The soft tissue changes seen in CREST syndrome become progressively more severe over prolonged periods of time. Plaque control becomes more difficult for patients to manage. Early clinical recognition and diagnosis together with the institution of regular dental examinations and a rigorous plaque control programme may serve to prevent or at the very least delay the onset of periodontal disease and dental caries in this group of patients.

## CONCLUSION

CREST syndrome is a rare form of auto-immune disease. An interesting example of a patient with this disorder is presented here to highlight the oral manifestations as well the importance of optimal plaque control in these patients. Appropriate referral of patients to specialist physicians and rheumatologists may be necessary for systemic immunosuppressive therapy.

**Declaration:** No conflict of interest declared.

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# Forensic dentistry case book 2: Dental identification of severely carbonised remains

SADJ August 2014, Vol 69 no 7 p326 - p327

H Bernitz<sup>1</sup>, C Solomon<sup>2</sup>

## INTRODUCTION

A 19-year old adult male was reported missing after he failed to arrive on his scheduled flight, following a working gap year in the United Kingdom. His parents who had been in the arrivals hall for some time, had not seen or received any calls from their son. The next day, a burned out car was found on the N2, with several carbonised bone fragments, including a maxilla, assumed to be from a human corpse. Experts confirmed that accelerators had been used in an attempt to totally destroy any possible evidence in the torched vehicle. The extremely burnt remains were brought to the Medico-Legal mortuary for possible identification (Figure 1).

At first glance, any possibility of dental identification from the maxillary dentition seemed remote, as all the crowns of the teeth had been destroyed by the heat of the fire. On closer inspection, it was noted that the 15 and 25 had been extracted ante-mortally. A radiograph of the maxillary arch showed that the roots of the 4's had been orthodontically moved backwards and not just tilted with a removable apparatus, or left to drift after extraction of the second premolars. At this stage, no connection between the burned body on the N2 and the missing 19-year old was made. It was only later, after full details of the missing individual were provided by the parents to the investigating officer, that a link between the two incidents was suspected and a match could be attempted between the carbonised corpse on the N2 and the missing person from the London/Cape Town flight.

*[Details of this case have been changed to protect the identity of the deceased. Permission to publish this case study was obtained from the Ethics Committee of the Faculty of Health Sciences, University of Pretoria. No informed consent required. This case has been cleared by the SAPS in terms of Section 20(4) of the Inquests Act 58 of 1959.]*

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Figure 1: Severely carbonised maxilla.

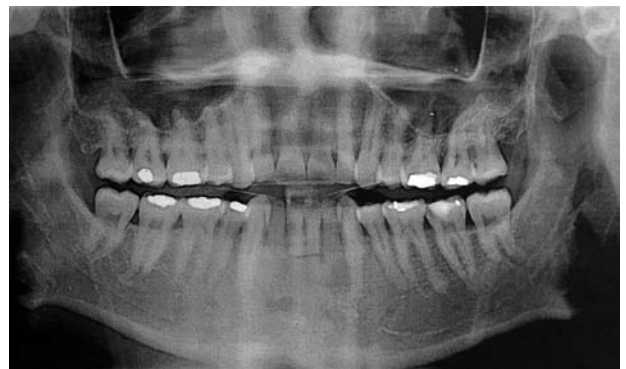


Figure 2: OPG ante-mortem record from orthodontist.

## MATCHING OF ANTE-MORTEM RECORDS AND POST-MORTEM REMAINS

After receiving a printed orthopantomograph (OPG) from the orthodontist (Figure 2), a comparison of the post-mortem and ante-mortem material was conducted. The following points of concordance were established:

- a. The teeth in the maxillary arch were well aligned
- b. The 15 was missing ante-mortem.
- c. The 25 was missing ante-mortem.
- d. The 18 was missing ante-mortem. (from dental records but was still present on OPG)
- e. The inclination of the root of the 14 was similar
- f. The inclination of the root of the 24 was similar
- g. The anatomy of the maxillary sinuses was similar
- h. The relationship of the roots in both the first and second quadrants to the sinuses was similar.



**Figure 3:** Post mortem radiograph of 1st quadrant.

The conclusion of the forensic report read: "In the presence of multiple concordant maxillofacial and dental features present in the victim and the ante-mortem records supplied and no unexplained discrepancies, it can be stated with absolute certainty that corpse DR XXX is that of Mr YYY."

## DISCUSSION

This case illustrates several important issues regarding the identification of mutilated or carbonised remains. Firstly, the human dentition remains fully or partially intact under even the most extreme conditions. Secondly, the importance of keeping dental records cannot be over-emphasised.<sup>1</sup> Thirdly, records can be used many years after last date of treatment and lastly, that in cases with little or no dentistry, comparisons can be made on dental arch morphology, anatomy of the sinuses and teeth missing within the dental arch.

In this case, the orthodontic treatment had been done several years previously, but excellent reference material was still available for comparison years later. The final comparison included the ante-mortem absence of the second premolars and the relationship of the roots of teeth 13, 14 and 16 to the maxillary sinus cavity (Figure 3).

In a retrospective study of ante-mortem records, it was demonstrated that most dental practitioners do not comply with the requirements pertaining to dental charting and record keeping.<sup>2</sup> It should be noted that if an oral healthcare worker performs an oral examination of a patient and charges using an 8101 code, a charting is mandatory.<sup>3</sup> The study of van Niekerk and Bernitz<sup>2</sup> was restricted to private dental practitioners and did not include specialist orthodontists. In our experience, this speciality of dentistry can be relied on to produce good ante-mortem records. The reasons are multiple and varied, possibly including the litigious nature of orthodontic practice, but the bottom line is that orthodontists keep good, accurate records, as was evident in this case.

The exact circumstances leading to the demise of the unfortunate young man have never been established, but the parents have nevertheless achieved closure as they were able to bury their son.

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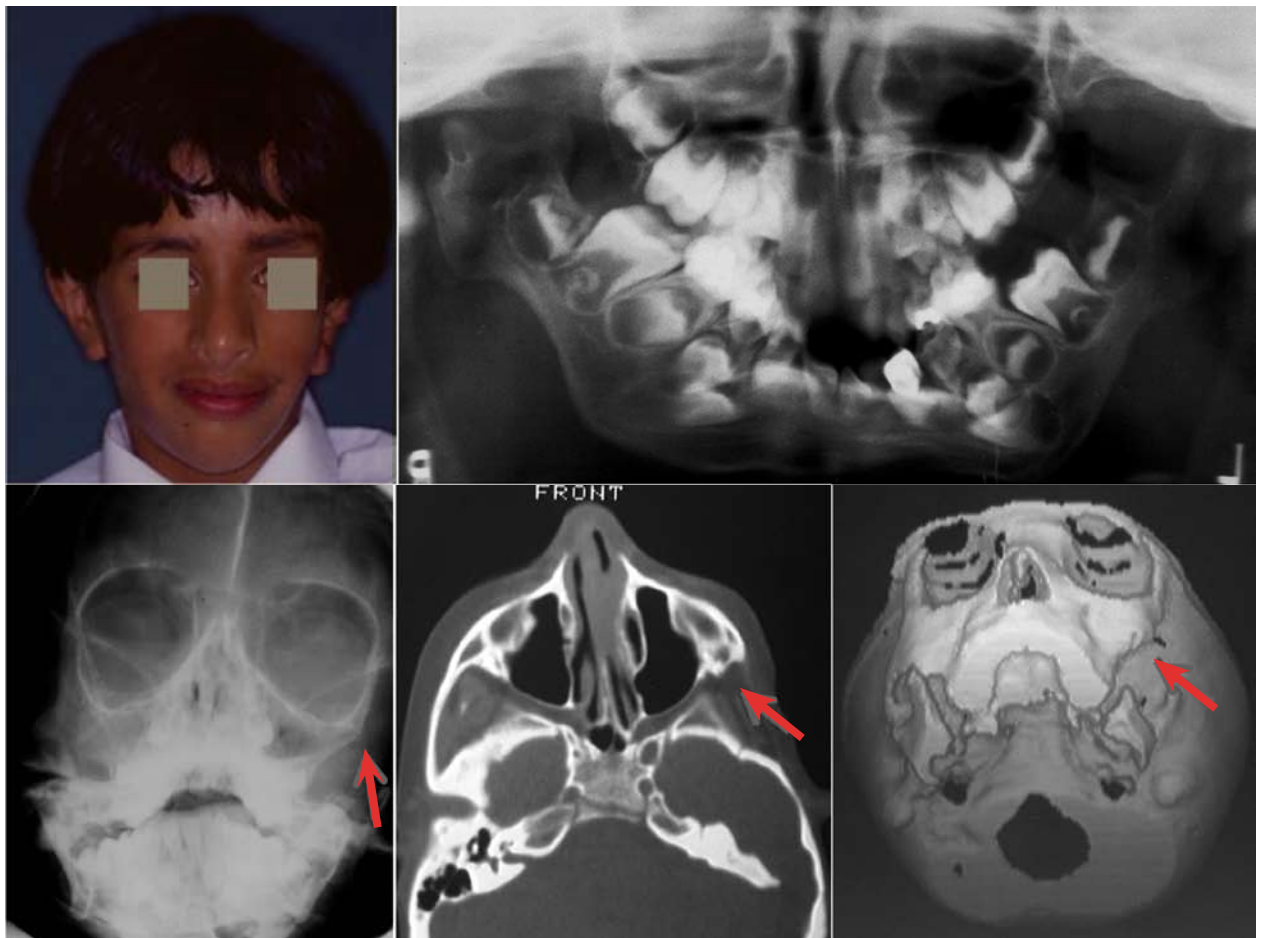


# Maxillo-facial radiology case 123

SADJ August 2014, Vol 69 no 7 p328

CJ Nortjé

This six year old patient presented at the Faculty with the main complaint that he was not happy with his facial appearance. His medical history indicated that he had almost complete atresia of his left ear and complete absence of the middle ear, resulting in total deafness on the left side. He had palsy of the temporal branch of the facial nerve, which resulted in an inability to close the left eye. What are the most important radiological features and what is your diagnoses?



## INTERPRETATION

The pantomograph shows bilateral mandibular hypoplasia with very short rami and an absent zygomatic arch on the left side (arrows). A diagnosis of Mandibulofacial Dysostosis was made. Mandibulofacial syndrome is a group of head and face malformations, most often hereditary in pattern and generally dominant in transmission. The condition is thought to result from failure in differentiation of maxillary mesoderm at the 50mm stage of intrauterine development (i.e., at about 2 months). The syndrome was first described by Thomson in 1847, and is also described as the Treacher Collins's syndrome. The major components of the syndrome are: absence or deficiency of the medial eyelashes, abnormalities of the external and middle ear, hypoplasia or agenesis of the malar bone and macrostomia. The palate is noted to be high or cleft in over 40 percent of the patients and the mandible is almost always hypoplastic. Blind fistulae may be present between the angles of the ears and the commissures of the lips and arid, atypical tongue-shaped processes of the hairline may be seen extend toward the cheeks. The lower border of the body of the mandible is often pronouncedly concave. Because of poor development of the maxilla, the mandibular hypoplasia and the high or cleft palate, dental malocclusion is frequent. The characteristic facial appearance is described as "birdlike" or "fishlike." The cranial vault is normal and most patients have normal longevity. Differential diagnoses, Goldenhar syndrome and Apert syndrome.

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# Ethical management of patients with hearing impairments

SADJ August 2014, Vol 69 no 7 p329

S Naidoo

## SCENARIO

Mrs Zuma is a 75 year old patient who has been living alone for six years since her husband died. Her hearing has deteriorated over the past few years. She has lost all her natural teeth and has been wearing upper and lower dentures for the past eight years. Recently she noticed that her dentures had become very loose and she has been having difficulty eating. She has been putting off her trip to the dentist because she is very nervous. When she eventually makes an appointment, her first words are "I don't really like dentists ...". What can one do to minimise her anxiety, what are the ethical duties of confidentiality and how can one give an empathetic response to Mrs Zuma's comment that she "doesn't like dentists". ?

## COMMENTARY

Communication and a trusting relationship between a patient and the dental professional rely on a total respect for patient autonomy. Good communication is fundamental to good clinical practice, as it allows the practitioner to inform, be informed and to exchange information so as to understand the patient's reason for attendance, their medical history, to explain treatment needs, obtain valid informed consent and provide appropriate preventive advice. It builds patient rapport and trust, thereby reducing patient anxiety while enhancing patient satisfaction and compliance.<sup>1</sup>

There are three main elements of communication: words, tone of voice and body language.<sup>1</sup> Selecting and using the "right" words account for only a small part of communication and are used to transmit what we want to say. All communication needs to be clear and jargon-free and checking patient understanding is a useful way of monitoring comprehension. Verbal communication accounts for only 7% of transmission. Tone of voice is estimated to convey 33% and body language or non-verbal communication for 60% of the message. Receiving information involves active listening to all elements of communication, including non-verbal and verbal feedback. Attentive listening is indicated by facing the speaker at the same level, leaning forward slightly to signal interest, making appropriate eye contact, uttering encouraging sounds or gestures to continue and reflecting on what

has been said. Additionally, reinforcement of messages and a brief summary of the main points help people to remember salient information.<sup>2</sup>

Communication relies, to a large extent, on seeing and hearing. If one or other of these sensory systems is impaired, the communication process can also be impaired. This can have a profound effect on access to dental services by complicating the appointment making process. In addition, in the dental setting this can have an impact on the ability to ascertain vital information during history taking, to build patient rapport and the provision of effective preventive information can be prejudiced. The communication process can become time-consuming and frustrating for all involved if it is not well managed.<sup>3</sup>

A variety of patient disabilities impact on "normal" communication and patients who are deaf or hard of hearing, require special consideration in the dental surgery for effective care and management. *Deaf* is a general term used to refer to people with all degrees of hearing loss, with the level of deafness defined by the quietest sound a person can hear. Hearing impairment or deafness can be congenital, inherited, or acquired as the result of accident, disease, or as part of the ageing process. It can be difficult to recognise deafness, often referred to as the "invisible disability", as there may be no visual clues that the person has a severe hearing loss and even profoundly deaf people may not wear hearing aids. If you have a patient who is deaf, ask them what their preferred method of communication is, record it and ensure it is used. The way in which deaf people communicate often depends on the time in their lives when they lost their hearing. Those who were born deaf, or lost their hearing before learning to speak, will generally be sign language users. People who have lost their hearing in later life, after they have learnt to speak, will generally communicate by lip-reading and speech. Do not assume that a person wearing hearing aids can hear what you are saying, as they may only be able to hear particular sounds or background noise.<sup>4</sup>

Deaf patients experience difficulties in communication at the dental visit, not responding when called from the waiting room, having erratic interchanges with the dentist and/or dental assistant and not understanding what will take place in the dental visit.<sup>3</sup> They often rely on the use of hearing aids, however power-driven dental instruments such as high-speed drills and scalers may result in a high-pitched whistling interference when operated in close proximity to the listener.

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**Table 1:** Tips for improving communication with the hearing impaired patient (adapted from Dougall & Fiske, 2008)<sup>1</sup>

- Position yourself with your face to the light so you can be seen clearly and face the patient so they can read your lips; Remove your face mask or wear a clear face shield to facilitate lip reading;
- Ask the patient if a gentle tap on the hand or arm is an appropriate way to get attention;
- Plan in advance for a signal with which the patient can show reaction or discomfort;
- Ensure the patient is comfortable and aware of everything that's happening, including when treatment will begin and when the chair will be tilted backwards;
- Minimise background noise, (such as saliva ejector suction), distractions and interruptions;
- Speak clearly and distinctly and use natural facial expressions and gestures;
- Do not raise your voice – it is uncomfortable especially for a hearing aid user;
- Avoid jargon and unfamiliar abbreviations;
- Ensure the person you are talking to can follow you. Be patient and take the time to communicate properly;
- Allow extra time for the person to respond to any questions;
- If what you say is not understood, do not keep repeating it but rather say it in a different way;
- Be prepared to write down what you have to say or use pre-prepared written prompts;
- Use gestures for visual feedback, such as a thumbs-up for "you are doing well";
- If using an interpreter, always remember to talk directly to the patient and not the interpreter;
- Always provide a written appointment card to ensure understanding;
- Make appointments and communicate with the patient through texting or other technology;

Communicating with someone who is deaf or hard of hearing is not difficult. There are a number of basic rules to enable successful communication (Table 1).

## CONCLUDING REMARKS

Empathy means putting yourself in the other person's position and with empathic response, acknowledge their feelings. Dental practitioners must have, or must develop skills to enable them to relate to patients in ways that are both ethical and empathetic, so that people with special needs can have confidence in the dental profession. These interpersonal skills will complement the technical competence of the dentist.

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*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*

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# What's new for the clinician?

## Summaries of and excerpts from recently published papers

SADJ August 2014, Vol 69 no 7 p331 - p332

Compiled and edited by WG Evans

### 1. Longitudinal investigation of the relationship between developmental changes in sagittal occlusion and caries in lower first permanent molars.

The incidence of caries in the teeth of children continues to be of serious concern despite indications that overall the occurrence of caries has diminished and there being considerable optimism that the disease will be eradicated. The majority of caries in children affects the occlusal surfaces of the teeth, the first molars in particular. This study undertook a review of the data on the state of the occlusal surfaces of the lower first permanent molars from first emergence into the mouth to the age of 16 and related the incidence of caries to the sagittal relationship of the first permanent molars.

The Department of Paediatric Dentistry at Tokyo Dental College holds records of a cohort of 60 children (27 boys and 33 girls) from the age of three to 22 years. Throughout this period dental examinations were conducted from the time of eruption of the lower first molars and upper and lower casts were secured every two months. The models were poured in yellow stone and were articulated in centric occlusion. Oral examinations recorded general oral health status and any treatment which had been provided for caries. No applications of sealants were performed. The state of the occlusal surfaces was noted every two months as one of two categories: 1. Sound. 2. Caries (filled). The sagittal occlusion of the molars was assessed every two months and recorded as Class One, Class Two or Class Three.

Analysis of the data revealed that of the total of 120 lower first permanent molars, 36 had been filled by the end of the study, ie 30%. Caries incidence had been most prevalent between 24 and 48 months and again between 49 months and 72 months. However further caries did occur throughout the study period, even though the teeth had been erupted for 14 to 16 years.

As regards the sagittal relationship, those cases having a Class Two molar pattern showed consistently a higher and statistically significant incidence of caries in the lower molars than when it changed from Class Two to Class One. Cases retaining a Class Two pattern showed an increase in caries incidence throughout the study period.

Previous work had indicated that caries susceptibility decreased within a few years of eruption and the conclusion has been that there is little need for preventive pit and fissure sealant after teeth have been in the mouth for several years. However the current evidence points to a relatively constant rate of attack on the lower first molars, at odds with prevailing wisdom. Hence there remains a need to apply pit and fissure sealant in those cases seen as being at moderate or high risk, even though the patient may be in an older age group.

The presence of a Class Two molar relationship was clearly linked to a higher incidence of caries. A possible explanation is that it has been shown that plaque accumulation on the occlusal surfaces of the molars was significantly lower in a Class One occlusion than when there was a  $\frac{1}{4}$ ,  $\frac{1}{2}$  or  $\frac{3}{4}$  cusp distal occlusion. Hence this study supports the concept that incomplete cuspal interdigitation plays a significant role in plaque accumulation and hence caries incidence.

#### CLINICAL IMPLICATIONS

In cases showing a Class Two molar relationship, occlusal sealing is warranted even years after eruption, with caries risk remaining relatively high up to ten years after eruption.

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1. Yonezu T, Kojima T, Kumazawa K and Shintani S. Longitudinal investigation of the relationship between developmental changes in sagittal occlusion and caries in lower first permanent molars. Bull. Tokyo Dental College. 2013; 54(4): 209-13.

## 2. Can black extrinsic tooth discolouration predict a lower caries score rate in young adults?

Black stain on teeth causes concern for aesthetic reasons only for it does not cause any pathology. When removed by scaling and polishing it tends to return in a few months. It is not associated with smoking although the two stains are often confused. Lower caries rates have been found in children having black stain but the relationship has not been tested amongst adults.

The study population included 280 young soldiers, 175 of whom were males. 110 soldiers showed black stain whilst 170 randomly selected subjects who revealed no black stain formed the control group. The stain was determined as either present or not and was carefully differentiated from other stains, caused for example by coffee or chlorhexidine.

The same clinician examined all patients, recording DMFT scores after both clinical and radiological assessment. Third molars were not included in the study so the possible DMFT score range was 0 to 28. Subjects were allocated to one of three groups depending on their DMFT scores: caries free (DMFT Of zero) ; third quartile (1 to 8), and fourth quartile (above 8).

The average scores and standard deviations for both groups were calculated and a t test applied to effect comparison. A multiple logistic regression analysis was applied to identify independent influences (age, pigmentation, gender and smoker).

Mean DMFT scores of the study group were consistently lower compared with the control group (4.2 +- 3.9 in contrast to 6.0 +- 4.8). Group one (caries free) had a significantly higher presence in the study group, whilst maximum DMFT score in the study group was 16, and in the control group, 25. Older patients were shown to have a higher caries prevalence but the possibility of a subject with black stain having a DMFT above median score was 2.5 times lower than for a subject without black stain.<sup>1</sup>

The study recorded a high rate of DMFT, indicating that the association between black stain and DMFT is valid. It has

been shown that there is a relationship between the severity of black stain and DMFT scores.<sup>2</sup> The authors conclude that there is a lower caries incidence in subjects with black stain.<sup>1</sup>

There is still uncertainty regarding the etiology of black stain, with changes in saliva composition, differing oral flora or both being proposed as reasons. Calcium and phosphate in high concentrations have been found in the gingival debris of children with black stain.<sup>3</sup> Such concentrations of minerals can facilitate enamel remineralisation.<sup>4</sup>

The authors explore the influence of including bitewing radiographs on the DMFT scores, for their study actually recorded a lower DMFT than previous work 15 years ago which did not use radiographs. The surmise is that over the years the oral health status of the study population had improved.

### CLINICAL IMPLICATIONS

The association between black stain and a reduced incidence of caries was validated for this group of young adults. The timing of recommended check up visits and the scheduling of radiographic examinations may be influenced by the presence of black stain. However the mechanism by which caries incidence is lowered has not been explained and more research is required.

### Reference

1. Shmuly T, Zini A, Yitschaky M, Yitschaky O. Can black extrinsic tooth discolouration predict a lower caries score rate in young adults? Quintessence International. 2014;45 (5): 439-44.
2. Gasparetto A, Conrado CA, Maciel SM, Miyamoto EY, Chicarelli MC, Zanata RL. Prevalence of black tooth stains and dental caries in Brazilian schoolchildren. Braz Dent J. 2003; 14: 157-61.
3. Reid JS, Beeley JA. Biochemical studies on the composition of gingival debris from children with black extrinsic tooth stain. Caries Res. 1976; 10: 363-9.
4. Cochran NJ, Cai f, Huq NL, Burrow MF, Reynolds EC. New approaches to enhanced remineralisation of tooth enamel. J Dent .Res.2010; 89:1187-97.

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# CPD Questionnaire

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

## GENERAL

### Substance abuse: case management and dental treatment (p 298)

- Both licit and illicit drugs may exert direct and indirect influences on the user.
  - True
  - False
- Identify the inappropriate action: When treating patients who may be abusing drugs, the dentist should:
  - be cognisant of contraindications to the administration of local anaesthetics
  - be ready to consult with other professionals on the problem
  - always confront heavy drinkers, instructing them to stop the habit
  - accept the obligation to protect patient confidentiality.
- The current concept of substance abuse is that of a disease model in which the patient has no control
  - True
  - False
- Identify the incorrect statement: When dealing with a suspected drug abuser it is important to:
  - elicit information about associated medical problems which may increase the susceptibility of the patient to a medical emergency
  - reveal psychosocial sequelae of addiction
  - identify other co-morbidities (other diseases currently present)
  - discount embarrassing signs of drug abuse such as aggressive behaviour
  - identify side-effects of abused substances and/or potential adverse interactions.
- Identify the incorrect statement: The drug abusing patient will want to know:
  - If I come into a dental office for treatment and admit substance abuse, will I be reported to the police?
  - Can I talk openly about my addiction to meth without being judged by my dentist or dental hygienist?
  - What rights to privacy can I count on as a patient?
  - Will I be banned from treatment at a public hospital?
  - How has substance abuse harmed my teeth and overall oral health?
  - What type of dental treatment can improve my appearance and restore my oral health?
  - How can I improve my oral health?
- A practitioner should suspect alcohol abuse if the patient habitually uses mints and strong perfume and shows signs of incoordination.
  - True
  - False

- Even when a rehabilitated drug user has been completely free of abuse for a long time, the risk of relapse remains high.
  - True
  - False
- Local anaesthetics administered to known drug abusers should contain no vasoconstrictor.
  - True
  - False
- Liaison and consultation with a medical practitioner is advisable before prescribing drugs for a known substance abuser'
  - True
  - False
- The typical location of caries in the mouth of a drug abuser is on the occlusal surfaces of the teeth.
  - True
  - False

### A comparison of preload values in gold and titanium dental implant retaining screws (p 316)

- Preload is associated with the compressive force generated when the retaining screw is tightened and a tension is created within the screw.
  - True
  - False
- Micro-movements associated with marginal loosening of the retaining screw are too small to have any deleterious effects on the implant/tissue interface.
  - True
  - False
- Gold retaining screws for implants achieve an initially higher preload value than seen when using titanium screws and those levels are retained in use.
  - True
  - False

### Radiology case 123 (p 328)

- Pindborg originally described mandibulofacial dysostosis.
  - True
  - False
- The characteristic facial appearance in Treacher Collins syndrome is "bird face."
  - True
  - False

### Forensic Dentistry Case 2: Dental identification of severely carbonised remains (p 326)

- Only current dental records can be used to positively identify carbonised human remains.
  - True
  - False

17. The human dentition is generally destroyed if individuals are burned to death.
  - a. True
  - b. False
18. Skeletal structures such as the anatomy of the maxillary sinuses can be used to individualise human carbonised remains
  - a. True
  - b. False
19. If the dental practitioners charge patients code 8101 for a dental examination, a dental charting is mandatory.
  - a. True
  - b. False
23. Good communication is fundamental to good clinical practice as it provides an opportunity for the practitioner to:
  - a. to inform, to be informed and to exchange information with the patients
  - b. understand the patient's reason for attendance,
  - c. explain treatment needs
  - d. obtain valid informed consent and to provide appropriate preventive advice
  - e. All of the above
24. Deaf patients experience various difficulties in communication during the dental visit, including:
  - a. being called from the waiting room
  - b. communicating with the dentist and/or dental assistant
  - c. understanding what will take place in the dental visit
  - d. All of the above

#### Oral medicine case book 62: CREST Syndrome (p 324)

20. The soft tissue changes occurring in CREST syndrome become less severe with the passage of time.
  - a. True
  - b. False

## ETHICAL

### Ethics corner: Ethical management of patients with hearing impairments (p 329)

21. Communication and a trusting relationship between a patient and the dental professional relies on a total respect for patient autonomy.
  - a. True
  - b. False
22. Patients who are deaf or hard of hearing do not require special treatment in the dental surgery for effective care and management.
  - a. True
  - b. False
25. Tips for improving communication with the hearing impaired patient include
  - a. Minimise background noise (such as saliva ejector suction), distractions and interruptions
  - b. Speak clearly and distinctly and use natural facial expressions and gestures
  - c. Allow extra time for the person to respond to any questions
  - d. Always provide a written appointment card to ensure complete understanding
  - e. All of the above

## THE CPD EQUATION

Simply put, we should have: **CPD=RA...**

Where **CPD** = well earned CPD points, and **RA** = Reasonable but pertinent questions with unequivocal Answers.

The JOURNAL appreciates the input of members who commented that perhaps the JOURNAL had rather too many CPD questions. **Readers will note that we have reduced the number of General Questions to twenty whilst retaining five Ethics based questions.** Our allocation of CPD points remains unchanged. There is optimism that this section will continue to provide members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure Continuing Education.

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