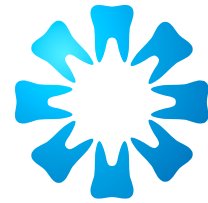


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SADA

THE SOUTH AFRICAN
DENTAL ASSOCIATION

*Ulysses H Grant,
18th President of the
United States of America*



The SS City of Tokio by Alexander Charles Stuart, 1874

Ulysses H Grant, 18th President of the United States of America:

President Ulysses H Grant wore dentures ...he stained them by smoking, and in 1877 whilst he was on a world cruise on the ship City of Tokio, a steward threw the set overboard. The President endured considerable difficulty in speaking and eating until a new set could be provided. He failed to address crowds gathered to hear him.



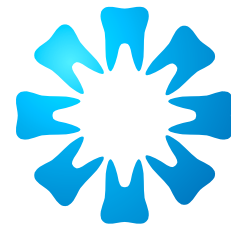
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Our Front Cover for this Issue...

Teeth have on occasion been central to historical, social and humorous events. The Front Cover in 2019 will reflect some of these Famous Teeth.



Ulysses H Grant, 18th President of the United States of America: President Ulysses H Grant wore dentures ...he stained them by smoking, and in 1877 whilst he was on a world cruise on the ship City of Tokio, a steward threw the set overboard. The President endured considerable difficulty in speaking and eating until a new set could be provided. He failed to address crowds gathered to hear him.

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Closer to natural perfection

SADJ July 2019, Vol. 74 No. 6 p279

WG Evans



For each one of us there has surely been a time when we have simply savoured nature.. exemplified by “the bush”. Looking out over the endless expanse of trees, grass, termite mounds, bushes... and antbear holes - imparts a sense of tranquillity and peace.

There is a strange paradox for whilst there is a veritable jumble of branches, spikes and leaves, there is somehow a perception that is all in balance. Many have queried the concept of Perfection in Nature ...how could such an apparently chaotic scatter nevertheless evoke such a reaction of appreciation in an observer? It would seem that the awe with which we view the complex arrangements arises mainly because of that very complexity! How could nature continue to survive if the complexities themselves are not perfect? Consider that it is estimated that there are some 8.7 million different species alive in our world ...and it is claimed that 1458 live in the human umbilicus!

There have been five catastrophic events over the aeons, each eliminating much of life on the planet... and yet there have been marvellous recoveries in each case, leading to the teeming life we observe today. Surely it is that complexity of life that produces the unexpected opportunities, the escape holes that allow for survival and reconstitution?

That does not mean however that complexity equates to perfection. There probably is at least some opportunism in a less than perfect system. And yet, and yet, ...there are amazing patterns definable in nature... the most striking being the adherence to the Fibonacci series... the petals on flowers are arranged in a Fibonacci series, ensuring that each has the opportunity to receive a fair amount of sunlight... the logarithmic curve of a sea shell is Fibonacci, the human face reflects the ratios... the double spiral of DNA molecules... these are not necessarily in themselves absolutely perfect but the pattern is unmistakable. Nature has indeed found a way that is in accord with balance... and in many instances may come close to perfection using that sequence.

Not always however... things can go wrong. This month draws attention to a tragic example... for this is recognised in the United States as Cleft Lip and Palate Awareness and Prevention Month.²

The website of the American Dental Association records: The defect may be genetic or the result of maternal environmental exposures during pregnancy.



This year, the Centre for Disease Control (CDC) is highlighting research on the association between smoking during early pregnancy and orofacial clefts.

The CDC said that although the causes of most lip and palate clefts are unknown, the 2014 Surgeon General's report confirmed that maternal smoking during early pregnancy can cause orofacial clefts in babies. In the U.S., about 7,000 babies are born with orofacial clefts each year. Women are encouraged who are thinking about becoming pregnant to quit smoking before pregnancy or as soon as they find out that they are pregnant.

The most recent surveys in South Africa report a prevalence of 0,3 per 1000 live births. It is a devastating experience for parents. There are currently eleven specialised academic centres for CLP treatment.³ The Wentworth Clinic, championed by Dr Singh in Durban, provides an impressive example of essentially private initiative in providing care for these patients. The South African Society of Orthodontists supports that initiative.

To these centres are accorded accolades for it is with their care that the CLP patients are brought closer to meeting the Fibonacci series... closer to natural perfection.

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The Council of Medical Schemes (CMS) will be investigating claims of racial discrimination in healthcare

SADJ July 2019, Vol. 74 No. 6 p280

The Council of Medical Schemes has announced that it will be investigating claims of racial discrimination in healthcare. The Council made this commitment on Wednesday the 15th May 2019.

This investigation follows revelations by more than 1000 Black, Coloured and Indian healthcare practitioners who reported that they are not treated by Medical Aid Schemes in the same manner as are their white colleagues, and that they have endured being exploited and harassed over the years.

Some practitioners have come out detailing various experiences in this regard. The issues revolve around allegations of racial profiling, blacklisting for payments, blocked payments, demands of confidential clinical information, bullying and harassment, coercion, entrapment and the use of hidden cameras.

The CEO of the Council, Siphon Kabane, says they are opposed to any conduct involving racial profiling and harassment. "We are opposed to any conduct that includes racial profiling, harassment, bullying and blacklisting of service providers. These actions are not permissible by the Medical Schemes Act and the Constitution".



National Healthcare Professionals Association's Dr Prudence Buthelezi discouraged black practitioners or anyone affected from signing an acknowledgement of debt saying "Once you sign that acknowledgement of debt, then you've put yourself now as fraudulent and you have to pay them back. So that thing has caused many black practitioners to have depression and commit suicide". His view is that if any healthcare practitioner is seen to be committing a felony, the Schemes should report the case to the police and a file should be opened accordingly.

Other schemes, apart from Discovery, apparently did not respond to an enquiry by the SABC, Discovery responded to report that they act only against those practitioners suspected of fraud. "These issues have nothing to do with race and everything to do with fraud and billing abuse. We have from time to time, blocked practitioners from payment after many years of cumulative evidence. That list sits at 367 people out of 35 000; we have no idea of the race. In this context, consider the volume of claims, which exceeds 200 000 a day. The claims are handled by machines (computers). Risks are identified and where applicable our investigators call and meet with those implicated".

The Council for Medical Schemes (CMS) have retained advocate Tembeka Ngcukaitobi to chair an investigation into these allegations of racial profiling against black, coloured and Indian doctors. Ngcukaitobi is an advocate of the High Court and was recently nominated for Senior Counsel status by the Johannesburg Bar.

He will be assisted by two colleagues, Adila Hassim, an advocate of the High Court who practises in various areas with a focus on constitutional law and Kerry Williams, an advocate who has advised extensively on health care matters over the last 15 years.

The CMS Investigating Panel have invited written submissions to be sent to cmsinvestigation@medical-schemes.com which should have been received by 19th of July 2019. Interviews and public hearings will be conducted from the 8th of July through to September. The final report is expected to be delivered by the Investigating Panel on 1 November 2019.

SADA is very much opposed to any racial behaviours and supports the appointment of the Investigation Panel. The Association awaits the conclusion of the hearings and the findings of the Panel. Should these allegations be proven to be true, it would be justice to see the culprits face the might of the law.

SADA has encouraged those members who may have relevant information or have suffered an experience as described above, to register with the Investigation Panel and to participate in the public hearings. SADA will be following this investigation very closely and from time to time we will inform our members of the progress and the outcome.

Understanding different professional indemnity options for dentists

SADJ July 2019, Vol. 74 No. 6 p281 - p286

In recent years a number of countries have introduced a statutory requirement that dentists should hold professional indemnity or insurance arrangements to deal with any liabilities arising from their practice.

Although there is currently no such requirement in South Africa, it is absolutely crucial that all practitioners have an indemnity that can protect them against claims.

Professional indemnity should protect you not only for the claim in compensation but should also provide also for the costs and expenses associated with defending/settling such an allegation.

You need this protection at all times; whilst you practice, when you retire and even after you die, as claims can still be made against your estate for adverse incidents that occurred whilst you were practising.

Claims can come to light a number of years after professional services are rendered, which is why it is important for you (and potentially your estate) to consider your options at the time you purchase professional indemnity. Adult patients can usually bring lodge a negligence claim up to three years after they become aware, or show to have become aware, that they have suffered harm. In the case of children, the limit is usually extended to three years after the age of legal majority (i.e. 18).

There are two different products available for dental professionals and allied healthcare professionals, namely: claims-made indemnity/insurance and occurrence-based indemnity. Your clear understanding of both types of indemnity is essential to making a fully informed decision on which type of indemnity/insurance to buy. Occurrence-based indemnity is still considered the "gold standard" by indemnity providers and commercial insurers.

When a clinician is protected by occurrence-based indemnity, that clinician can be assured that if they leave clinical practice for any reason, they can still request assistance with any incidents arising out of the clinical practice during their membership period, no matter when that incident, whether it be a complaint, claim or regulatory matter, comes to light. The protection needs only to be in place on the day the treatment was provided.

Claims-made insurance provides a specified level of cover for specified circumstances and for a specified period, usually the duration of the policy. Generally,

the policy is purchased on a year-by-year basis and is designed to cover only a proportion of the claims that might arise from each year of the policy. It is for this reason that the policy can be priced lower than an occurrence-based product in the first few years. Claims-made policies are generally favoured by many commercial insurers because they are more predictable.

At the point you stop purchasing claims-made insurance, the insurer's liability stops, unlike an occurrence-based protection which offers indemnity for incidents long into the future. There is also a contractual obligation on the insured to report all adverse incidents to the insurer during the active policy.

What this means is that if you rely on claims-made insurance, you will need to purchase "tail" or "run off" cover in order to give you an extended reporting window which is included and priced in an occurrence-based policy. Insurers are not obliged to offer you run off cover when you end a policy of insurance and the run off cover must give you provide extended reporting benefits given that claims are still being reported up to 10 years or more after the treatment was provided delivered.

The permissible delay between provision of care and when a claim or complaint is reported is unique to dentistry. It is not unusual for complex implant treatment to fail slowly over many years, and it is often the case that the "post-mortem" after the failure begins to identify failings in the original patient assessment/selection and consent process that means the claim cannot be defended.

The decision to select the correct type of indemnity should not be determined by price alone. Professional Indemnity can protect you against a legal liability to compensate third parties (patients) who have sustained injury, loss, or damage due to your own professional negligence or breach of professional duty in the conduct of your profession or occupation.

The indemnity is usually priced for your own risk and does not normally provide indemnity for the acts and omissions of clinical colleagues who provide clinical services under a contract of employment.

Any dentist, oral therapist or oral hygienist must have their own indemnity whilst employed unless you purchase a group or corporate indemnity which will be priced depending upon the number of dentists, therapists and hygienists you employ.

A failure to ensure that all clinicians employed by you have in place their own indemnity arrangements in place may potentially leave you potentially exposed to a claim for vicarious liability, to which that your own indemnity may not respond to.

The table below illustrates some of the key differences one needs to consider before deciding on the type of indemnity product that suits your needs.

	Occurrence-based, discretionary indemnity	Claims-made insurance policy
Provider/s	<ul style="list-style-type: none"> Dental Protection – part of The Medical Protection Society (MPS), the world's largest professional defence organisation. Member-owned: subscriptions paid by members create a mutual fund that is owned by members and used to provide benefits. Not-for-profit: Long-term commitment to support members throughout their career. No shareholders to inform their decisions. 	<ul style="list-style-type: none"> Some short-term commercial insurers provide the product. Insurance companies are for-profit companies, paying dividends to shareholders. You have recourse to the Financial Advisory and Intermediary Services Act or the South African Ombudsman of Short-Term Insurance (OSTI).
What are the key differences?	<ul style="list-style-type: none"> Occurrence-based indemnity offers life-time protection for incidents that occur during the membership period. There is no limit on the indemnity offered or the expenses that will be paid. There are no additional costs or excesses to pay. There is no contract of insurance with terms and conditions that will apply. (there is no policy document). No reporting requirements. Claims or complaints should be reported in a timely manner. When your indemnity period has ended, there is no need to renew the policy or purchase extended reporting benefits to cover in respect of events during your indemnity period. Subscriptions can be suspended for periods in which the dentist is not practising. For example, if due to illness, or if you are on a maternity or paternity break, if the practitioner is taking time off or is unable to practise for other reasons. 	<ul style="list-style-type: none"> Claims-made cover offers protection for incidents reported to the insurer whilst the policy is in force (i.e. it provides protection for incidents provided they both occur and are reported during the policy period). Some policies provide for purchase of a retroactive date which essentially backdates the cover period for which the new insurer would be responsible. The two main rules to offer retroactive cover are that: <ul style="list-style-type: none"> the practitioner must have had a claim made policy in place, previously with another insurer; and any claims already notified or known to the practitioner prior to changing to the new insurer would not be the responsibility of the new insurer as they should have been lodged with the first insurer. Most companies offer indemnity limits from R1m to R50m. Practitioners can choose the limit of their indemnity. Excess may become payable in terms of the policy for that part of the claim that remains uninsured which requires the insured to pay the first portion of the claim with the insurer settling the balance up to the limit of indemnity. You would require an understanding of the policy language used in the insurance contract. Expert guidance from broker may be necessary. Insurance policy contract will stipulate the time period within which claims are to be reported. Failure to report the claims timeously may lead to the claims being declined. You may be requested to sign and complete a no-claims declaration on inception of the policy or possibly during any renewal. Your claims today are covered by the policy you have today. This gives you the benefit of purchasing policy limits that correspond with the current economic and legal environment in which your business operates. Once a claim made policy is terminated, there is no further cover for new and not-previously reported claims. Once cancelled and not renewed, that is the end of that policy. One would have to consider whether legal costs are included within or paid in addition to the limit of indemnity available to settle a claim. You cannot suspend your premiums as you still need the right to report adverse incidents that you become aware of from when you were practising to maintain your protection. The policy may or may not include an Extended Reporting period (ERP) sometimes at a cost or at no cost up to a specific period for example, 60 months and, subject to certain conditions. It is important that you check this with the broker.

<p>Indemnity provision</p>	<ul style="list-style-type: none"> Indemnity is discretionary and governed by the constitution of the provider (Memorandum and Articles of Association) which regulates the relationship between the organisation and its members). No tightly worded contracts, exclusions or excesses. No caps on the indemnity provided. Flexibility to respond to unforeseen changes in the dentolegal environment. Allows greater freedom to consider unusual requests for help. Decisions made by informed people (including fellow clinicians) exercising good judgment and insight. 	<ul style="list-style-type: none"> Application necessary to indemnity insurer by submitting a proposal form and then paying a premium when it is accepted. A document (the contract – usually called a policy) is then issued which sets out the terms and conditions of the cover, clearly detailing what is and is not covered, the maximum indemnity limit, and what obligations exist on the part of the practitioner and the insurer. This is a legally enforceable contract.
<p>What is indemnified?</p>	<ul style="list-style-type: none"> Assistance with all of the legal costs and compensation payments. Members can request assistance for any action, civil procedure, claim or demand for money arising from an incident related to their professional practice and which occurred during the period of membership. <p>This can include:</p> <p>Clinical negligence claims</p> <ul style="list-style-type: none"> Assistance from first notification to conclusion, including all the legal costs and compensation payments. Defence of a claim will depend on quality of records, treatment and consent process. Settlement of cases where they are not defensible only with the express consent of member. <p>Investigations</p> <ul style="list-style-type: none"> Advice and legal representation for HPCSA inquiries arising from health, performance, and professional conduct. Includes drafting letter and legal representation at hearing. <p>Disciplinary procedures</p> <ul style="list-style-type: none"> Advice and representation if practitioners face allegations arising from the provision of clinical care to patients, concerning their professional conduct, competence and performance, or in relation to health problems that are having a significant effect on their clinical performance. <p>Preparing for inquests</p> <ul style="list-style-type: none"> Assistance with preparation of a report for the coroner and advise practitioners on how to conduct themselves at the inquest. If necessary, legal representation can be arranged on their behalf. <p>Criminal proceedings</p> <ul style="list-style-type: none"> Assistance if you become the subject of criminal investigations that arise directly from provision of clinical care to patients. This includes investigation or prosecution for gross negligence manslaughter. <p>Indemnity for Good Samaritan acts</p> <ul style="list-style-type: none"> A Good Samaritan act is one in which dental assistance is given, free of charge, in a <i>bona fide</i> dental or medical emergency upon which practitioners may chance, in a personal as opposed to a professional capacity. In the unlikely event that legal proceedings follow, the dentist would be entitled to ask for assistance. <p>Dentolegal advisory service</p> <ul style="list-style-type: none"> Phone or email advice 24 hours a day, seven days a week for urgent advice. Incident reporting via website with established panel of local expert lawyers and experienced medicolegal advisers. <p>Complaints</p> <ul style="list-style-type: none"> Help formulating a response to a complaint and assisting and supporting you through to its resolution. 	<ul style="list-style-type: none"> The Insurance contract will state the extent of cover and must be studied by practitioners. It is important to study the extent of the cover in the policy and whether it would at least provide protection for most of the issues mentioned under occurrence-based indemnity. Cover for claims will only be considered when BOTH the alleged incident (treatment date) AND the resulting claim happen during the period the policy is in force. The policy will probably define what a “claim” is. Practitioners will have to read their policy documents carefully. The definition might constitute civil proceedings, regulatory proceedings, a simple written demand, or even a complaint or expression of dissatisfaction.

	<p>Handling media attention</p> <ul style="list-style-type: none"> ▪ Issuing press statements and acting as spokesperson with the press, to shield you as far as possible from having to deal directly with the adverse media attention. <p>Counselling and support</p> <ul style="list-style-type: none"> ▪ Access to 24/7 counselling service. ▪ Members are requested to contact Dental Protection at the earliest opportunity when a complaint or potential for a claim may arise. This allows Dental Protection to pro-actively manage the matter and in many cases avoid escalation into a more complex and challenging environment. ▪ Complaints investigated by the HPCSA require the practitioner to respond within a specified time. 	
<p>Reporting requirements</p>	<ul style="list-style-type: none"> ▪ Members are requested to contact Dental Protection at the earliest opportunity when a complaint or potential for a claim may arise. This allows Dental Protection to pro-actively manage the matter and in many cases avoid escalation into a more complex and challenging environment. ▪ Complaints investigated by the HPCSA require the practitioner to respond within a specified time. 	<ul style="list-style-type: none"> ▪ Claims-made insurance will contractually require a clinician to notify the insurer of all adverse incidents in accordance with the terms and conditions within a specified time frame. This is known as reporting. Failure to report an incident may invalidate the policy. ▪ An informal email might make certain allegations and seek redress, but if the policy definition of “claim” includes, for example, written demands, such a complaint may or may not trigger cover. Failure to appreciate this policy trigger and notify the “claim” in accordance with the policy requirements may result in loss of coverage. ▪ Even if the complaint does not constitute a claim, the policy and its obligations may nonetheless be triggered if the complaint can be considered a “circumstance”. ▪ Many liability policies also contain a “deeming provision”, such that an insured can (or maybe should) notify a circumstance which may give rise to a future claim. Once notified to the insurer, any subsequent “claim” that arises out of that circumstance is “deemed” to be a claim made within the earlier policy period to which the circumstance was notified.
<p>Provision period / Period of Cover</p>	<ul style="list-style-type: none"> ▪ Protection is offered on an occurrence basis, based on the date on which an adverse incident occurs irrespective of the date a complaint or claim is made. ▪ Members can ask for assistance with dentolegal consequences at any time - even if it is years later, they are no longer a member, or have ceased practising. <p><i>This is important because it can often be years before the matter is brought and fully resolved.</i></p> <p>Example:</p> <p>Assume you had an Occurrence-based cover in force for the calendar year of 2019. If a claim is made in 2022 based on treatment performed on a patient in 2019, the 2019 occurrence-based protection offers assistance even if you are not a member for the period 2020 to 2022.</p>	<ul style="list-style-type: none"> ▪ Claims made policies will provide protection only during the period of indemnity only. The insured practitioner must have had cover both on the date of incident and the date on which the claim or complaint is made. ▪ Some policies have extensions to the period of cover, either at the beginning (retroactive) or at the end “tail” or “run- off” cover. ▪ Claims-made policies provide cover so long as the insured dentist continues to pay premiums for the initial policy and any subsequent renewals. ▪ For each succeeding year the policy is renewed, the “cover period” is extended backwards. ▪ Once premiums stop, the cover stops. ▪ Claims made after the policy period ends will not be covered, even if the alleged incident occurred while the policy was in force unless extended reporting benefits have been purchased. ▪ Practitioners will have to consider what the additional costs of tail- off cover is likely to be and whether the insurer will still be writing insurance when you retire or stop clinical practice. ▪ For many practitioners on a claims-made insurance, there may be no choice other than to continue their insurance for many years into retirement to ensure that they are adequately protected against claims-made long after the work was completed. ▪ If you die before retirement, your estate will need to purchase run-off cover and continue to report adverse incidents to the insurer

		<p>Example:</p> <p>Let's say you purchased a claims-made policy from SADA Insurance Company, with an effective date of January 1, 2019 and liability limits of R2 million. You elect to let the 1-year policy lapse at the end of 2019, and you do not purchase "tail" cover from SADA Insurance Company. You are then sued in 2020 for treatment you provided in June of 2019. Since the incident was reported after the policy period ended, and no tail cover was in place to extend your right to report claims, SADA Insurance Company will not assist with the claim.</p>
<p>Accessing benefits on Retirement, Death or Disability</p>	<ul style="list-style-type: none"> You do not have to make any further arrangements during a career break, after you leave membership, cease practice (retire), or to protect your estate after your death. 	<p>Retirement / Death</p> <ul style="list-style-type: none"> Some insurers will provide extended reporting benefits under claims-made professional liability policies. Usually there will be an additional cost and it will be at the insurers discretion as to whether you can purchase extended reporting benefits to cover your retirement and your death until your estate is wound up. Naturally, this will only be available for claim(s) resulting from an act that took place while the policy was in force. In some cases, retirement coverage is provided if two conditions are met. First the insured practitioner reached a specific minimum age, generally 55, but under some insurers' forms the minimum age requirement is 60. Second, the insured must have been a policyholder with this particular insurer for a specified period of uninterrupted indemnity. <p>Permanent Disability</p> <ul style="list-style-type: none"> It is advantageous if a policy's definition of "disability" is as liberal as possible.
<p>Paying for your risk</p>	<ul style="list-style-type: none"> Risk is assessed on the long-term trends in the regulatory and claims environments (i.e., the current number and size of claims being reported in a specialty, the likelihood they will arise in future years, and how much it will cost to resolve these matters at that future time). Occurrence-based subscriptions are priced with this element of uncapped, future risk included, so you pay more at the start. No need to buy any run-off cover when retiring, or to protect your estate after your death. 	<ul style="list-style-type: none"> Risk is assessed by the indemnifier on the current claims' environment. Premiums are calculated on an annual basis. When the contract of insurance ends and is not renewed, whether at retirement or other career break, extended reporting benefits need to be purchased to allow claims to be reported and future protection provided into retirement. Practitioners may benefit from lower premiums initially, however with claims-made insurance you must continue paying into retirement or when you take a career break for the same level of protection you will have secured with occurrence-based indemnity.
<p>Indemnity limit</p>	<ul style="list-style-type: none"> No predefined financial limits on the indemnity offered, either for the cost of an individual claim or investigation arising from a single incident, or for the total of all the incidents in any period of membership. Members are required to choose the grade that most closely resembles their scope of practice and pay the membership fees for the category chosen. 	<p>Retirement / Death</p> <ul style="list-style-type: none"> Claims-made insurance policy will have a cap specifying financial limits for each claim and will aggregate all claims arising from a single year. The limit of indemnity is the maximum amount an insurer will pay in respect of any one claim first made against the insured and notified to the insurer during the policy period. This amount will usually have to be selected by the practitioner. Terms and conditions specify the scope of assistance and this absence of discretion may prevent the insurer from assisting with a complaint where there are clear grounds for a refund, until it becomes a claim for compensation. When deciding on what Limit of Indemnity is best suitable for the practitioner, it is important to remember that the limits on most professional indemnity policies include defence costs (fees and all other expenses that are incurred in order to assist with the investigation or settlement of a claim) as well as representation costs in an inquest, an inquiry or any other proceedings in respect of matters which have a direct relevance to the claim.

Excess	<ul style="list-style-type: none"> No excesses are payable. Where a member has been found negligent or breached their duty of care, they may be asked to make a very small contribution equivalent to the profit element of the negligent treatment provided, otherwise all other costs may be paid by the indemnity Members may also be requested to contribute to the costs where they act contrary to advice given by the organisation. 	<ul style="list-style-type: none"> An excess, also known as the 'first amount payable' or deductible or uninsured amount, is a payment that has to be made by the practitioner before cover is undertaken in terms of a policy The size of an excess depends on the sum insured, a person's claims record or even age. The excess amount may have a significant influence on the premium payable, the lower the excess, the higher the premium and vice versa.
Exclusions - What is NOT covered?	<ul style="list-style-type: none"> Discretionary protection provides flexibility to assist individual cases in a wide range of situations where most contractual policies would exclude cover. However, there may be situations where assistance may be declined or withdrawn. 	<ul style="list-style-type: none"> Policy exclusions tend to narrow the scope of the insurance contract. Normally excluded from cover would be claims covered under some other forms of insurance, specified risks not covered under the policy or restriction of cover unless some extension is provided. Some of the more common provisions is exclusion of liability in USA and Canadian jurisdictions. It is crucial that practitioners read the policy document dealing with what is EXCLUDED from cover.

Do the CPD questionnaire on page 337

The Continuous Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.



Online CPD in 6 Easy Steps

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

A single centre retrospective review of 25 patients treated for full arch edentulism with the All-on-4® concept

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SUMMARY

Purpose

To establish the outcomes and their reproducibility for the All-on-4® treatment protocol for full arch edentulism.

Materials and Methods

A retrospective observational cohort study of patients treated at a surgical private practice. Primary outcomes were three year cumulative implant and prosthesis survival. Secondary outcomes were surgical or prosthetic complications not resulting in implant or prosthesis loss. Marginal bone loss, measured on standardized panoramic radiographs was recorded if the loss exceeded Albrektsson's standards (less than 1 mm in the first year and maximum of 0.2 mm per year thereafter).

Results

Twenty-five patients (15 women, 10 men) were reviewed, with 124 implants supporting 31 full-arch fixed prostheses. Twenty had greater than three year follow-ups (range 40.7–139.7 months, mean 96.9 months), comprising 96 implants, and 26 jaws. Three implants failed in two patients, (survival rate 97.9%). One prosthesis failed (96.2% survival rate). Two patients required prosthesis replacement due to implant loss. One abutment screw fractured, which required replacement. A total of seven implants, in four different patients, had marginal bone loss in excess of the Albrektsson norm.

Conclusion

This study found that the reliability and predictability of the All-on-4® concept is verifiable for the treatment of total edentulism.

Keywords

All-on-4®, implant rehabilitation, long-term survival.

INTRODUCTION

Edentulism is a common condition in elderly patients, and has a negative impact on oral health related quality of life.¹ The goal of rehabilitation is to improve oro-dental function with a prosthesis that restores function and aesthetics with the lowest possible morbidity.

The loss of posterior dentition at an early age causes significant resorption of alveolar bone in the posterior segment of the jaws. Decreasing bone volume ultimately results in the surfacing of the inferior alveolar nerve in the mandible, and in sinus pneumatization in the maxilla. This makes the placement of dental implants impossible, without reconstructive procedures such as grafting.

Classical implant treatment for edentulous patients with loss of the volume of posterior bone was initially described by Brånemark and colleagues in the 1970's.² Four to six vertical and parallel implants are placed in the anterior mandible or maxilla, to support a cantilevered full-arch prosthesis. Whilst this treatment was and remains a viable option for restoring edentulous jaws, the reported complication rates would, by today's standards, be considered relatively high.²

It has been considered that these elevated complication rates may be due to excessive cantilever length.³⁻⁵ Cantilever lengths of less than 15 mm yield decreased marginal bone loss, resulted in higher implant survival, and decreased prosthesis failure as a consequence of better load distribution.³⁻⁶ To achieve the desired reduction in cantilever length, one may either shorten the dental arch or place the posterior implants more distally in the arch.

One method of enabling the distalizing of implants is to restore posterior bone volume with procedures such as bone grafting, sinus or ridge augmentation, and nerve lateralization. These approaches incur additional surgeries, higher costs, longer treatment time, and greater morbidity. An alternative implant placement philosophy introduced by Mattsson and colleagues and shortly thereafter by Krekmanov, exploited all usable bone anterior to the mental nerve in the mandible, and

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Author contributions:

1. Nika Vafaei: Principal researcher: Data collection – 70%, Analysis – 80%, Write-up – 60%
2. Carlo Ferretti: Second author: Conception – 100%, Surgery – 100%, Data collection: 20%, Analysis: 30%, Write-up: 40%

anterior to the maxillary sinus in the maxilla by placing the two distal implants at an angle, thus decreasing cantilever length.^{6,7} Subsequently Maló and colleagues modified this approach, reducing the number of implants to four per arch.⁸

The All-on-4® (NobelBiocare®, Kloten, Switzerland) design allows for the rehabilitation of an edentulous jaw by placing four implants in such a manner as to exploit as much of the available bone as possible, thus reducing the need for augmentation procedures. This is accomplished by placing two implants anteriorly (axially), and two posteriorly (tilted between 30° and 45° to the occlusal plane).⁸ By tilting implants posteriorly, longer implants can be placed which improves primary stability.

Increasing the antero-posterior spread of the implants decreases cantilever length and reduces the risk of prosthesis fracture due to the more favourable load distribution.^{6,7,9,10} In addition to the reduced surgical morbidity, this concept offers numerous biomechanical advantages which have been validated in finite element analysis studies. Inclined implants, in conjunction with a short cantilever, decrease stress on the peri-implant cortical bone, on the framework and implants.^{5,11-14} Success rates using the All-on-4® technique compare favourably with traditional vertical implants.^{8,10,15,16}

Since the early reports by Maló and colleagues, several other authors have reported high cumulative implant survival rates using this technique.^{8,9,15,17-21} A longitudinal study by Maló and colleagues including 245 patients with completely edentulous mandibles rehabilitated with the All-on-4® treatment concept, reported cumulative implant survival rates (depending on follow-up period) ranging from 93.8% at 6-10 year follow-up, to 97.6% at a one year follow-up.²²

Another study by the same group reported the results for 968 implants placed in 242 patients in the maxilla and the mandible. A cumulative implant survival rate of 98% was obtained at a five year follow-up.²³ Duello summarized the findings of these and other authors in a literature review, and reported that the implant survival rate was influenced by length of follow-up. In the maxilla, short term follow-up yielded up to 100% implant survival, and decreased to 92.5% after seven years. Similarly, mandibular implants with short term follow-up had up to 100% survival rate, dropping to 93.8% at a 10 year follow-up.^{24,25}

With regard to marginal bone loss, the consensus is that there is no significant difference between traditional vertical splinted implants and a combination of axial and tilted implants.^{6,10,16,26-29} Therefore this technique is a good alternative for clinicians treating edentulous patients requiring full-arch rehabilitation, in particular those with atrophic jaws that would normally require traditional bone grafting before implant placement.

The purpose of this study is to present our experiences with the All-on-4® technique for treatment of full jaw edentulism from a single surgical practice using only clinical and radiographic data garnered in the process of treatment. No other investigations were done for

research purposes. It is the intention to assess the outcomes for this treatment protocol in a general oral surgical private practice. The accumulation of reproducible results using the All-on-4® technique from a variety of sources, particularly after an above average follow-up period, aids in providing further scientific data to support this treatment rationale.

METHODS

A retrospective cohort observational study of patients was performed at a single surgical private practice. Patients were either edentulous or had a dentition deemed unrestorable by the attending clinician.

Pre-treatment assessment included clinical examination, panoramic radiography, prosthodontic and surgical consultation, and when indicated, cone beam computational tomography. Patients were offered treatment with this protocol if the alveolar bone volume was insufficient for traditional implant placement of six fixtures per jaw, and if they met the following criteria:

- good general health with acceptable oral hygiene.
- an alveolus of at least 10mm height.
- for immediate loading, implants achieved an insertion torque of at least 35 Ncm.
- in the mandible, the position of the mental nerve allowed for distalization of the prosthetic platform (mental foramen was at least 5 mm below alveolar crest).
- anterior maxillary wall position allowing for placement of tilted implants where the prosthetic interface would emerge at least at the position of the upper first premolar.

The following data were recorded: demographic data, number of jaws treated, whether the implants were placed in edentulous jaws or immediately following extraction of non-salvageable teeth (immediate placement), insertion torques, whether a prosthesis was placed immediately (immediate loading no later than 48 hours post placement), or whether a delayed loading protocol was used (no earlier than three months). Follow up appointments assessed prosthesis integrity, gingival health and radiographic bone levels. Patient identification was removed from the data set to maintain anonymity.

Surgical protocol

The alveolus was exposed using a crestal incision with distal relief. In the maxilla, the nasal rim and anterior lateral maxillary wall were identified, and in the mandible the mental foramen was identified. Implant placement was guided by the All-on-4® surgical guide. The guide was placed into a 2mm osteotomy made in the midline of the jaw and the metal band was contoured to the arch form (Figure 1).

The anterior maxillary wall was identified and explored through a window in the lateral maxillary sinus wall and the tilted implant placed just anterior to that (Figure 2). In the mandible, with the guide in position, preparation of the osteotomy sites for the tilted implants was commenced on the alveolar crest above the distal aspect of the mental foramen (Figure 3).



Figure 1. All-on-4® surgical guide in the mandible with the metal band contoured to the arch form facilitating optimal spacing, parallelism and inclination of the implants.

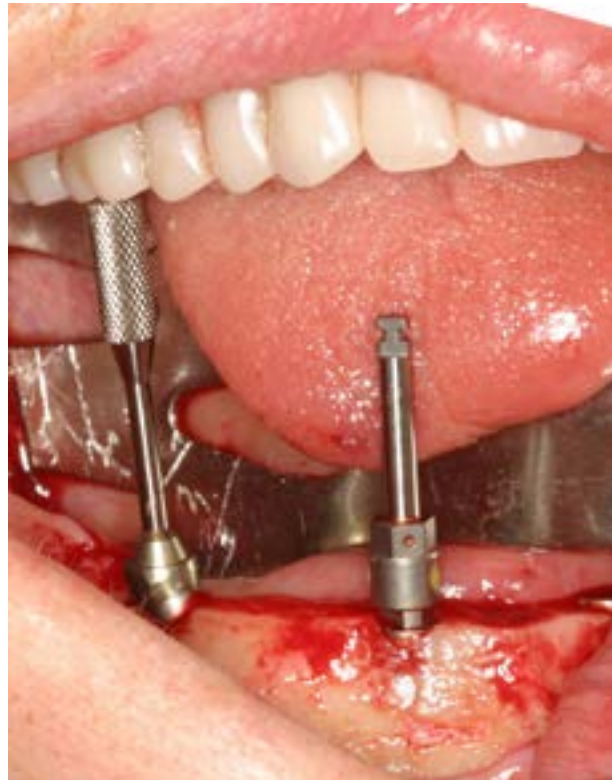


Figure 4. A trial prosthetic abutment *in situ* used to ensure correct rotational position of prosthetic platform.

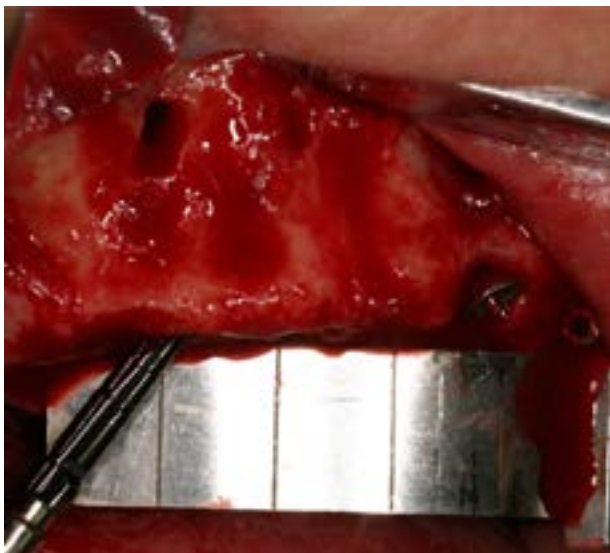


Figure 2. The anterior wall of the maxillary sinus is identified through a window in the lateral wall. The tilted implant is placed just anterior to the anterior maxillary sinus wall. Angulation of the drill is guided by markings on the guide.



A

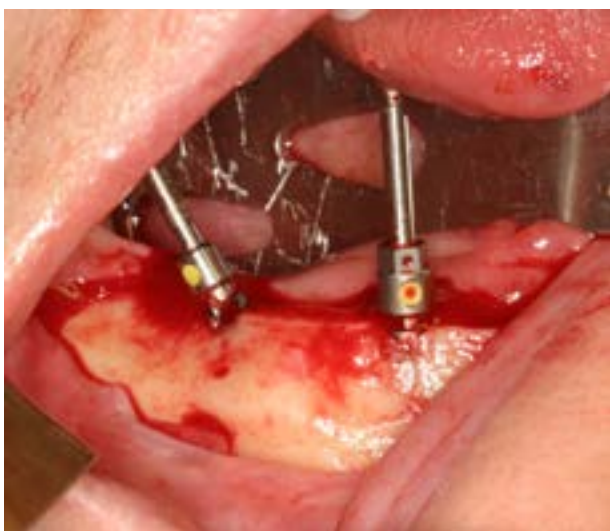


Figure 3. Preparation of the osteotomy site in the mandible for placement of tilted implants above the distal aspect of the mental foramen.



B

Figure 5. Occlusal view of maxilla (A), and with prosthesis *in situ* (B) showing favourable implant distribution.

NobelReplace Tapered Groovy® implants were placed in all patients. A trial prosthetic abutment was used to ensure the correct rotational position of the prosthetic platform, and to determine whether a 17 or 30 degree multi-unit abutment would be required (Figure 4). If prosthodontic requirements dictated, straight abutments were placed in the axial implants.

Torque out values were recorded as fair (20-29 Ncm), good (30-39 Ncm) and excellent (>40 Ncm). Patients were offered immediately loaded prostheses if implant stability met the minimum torque out value of 35 Ncm, and was contingent on the patients' budget (thus not all patients whose implants could have been loaded immediately actually accepted this option). Alternatively, conventional dentures were used as a temporary measure.

The canon for the classification of an implant post-placement is that described by Albrektsson et al. An implant is classified as successful when it meets all four of the following criteria:³⁰

1. No radiolucency around the implant.
2. No signs of infection, pain or ongoing pathological processes present at the implant site.
3. The implant is restored and functionally loaded.
4. The prosthesis is stable for multiple implants supporting a complete arch prosthesis.

An implant is classified as "surviving" when it remains in the jaw and is functionally loaded even though all the individual success criteria may not be fulfilled; and as a "failed" implant if the implant has fractured beyond repair or cannot be classified as successful or surviving.³⁰

In this study implant success and survival rates were calculated only for patients for whom there was three year or greater follow-up. A prosthesis was classified as surviving if the original prosthesis remained *in situ* and the patient was content with its function. More detailed assessment of prosthesis success is beyond the scope of our expertise and was thus not considered. A prosthesis requiring replacement, unrelated to implant loss, was deemed a *primary prosthesis failure*. Prosthesis loss due to implant failure was considered a *secondary prosthesis failure*. Loss or fracture of a component of a prosthesis was deemed a minor prosthetic complication if it did not require replacement of the whole prosthesis.

Marginal bone loss was measured on orthopantograph films. All radiographs were taken on the same machine (Sirona Orthophos, Sirona Dental Systems, Bensheim, Germany) at standardized exposure settings and with standardized patient positioning.

Calibration of the radiograph was done by measuring the radiographic length of an implant and dividing it by the actual implant length to obtain a magnification factor. This was then used to adjust the bone loss measurement obtained from the radiograph.

The implant prosthetic platform was used as the fixed reference for measurement and bone loss was measured to the depth of the peri-implant defect. The benchmark for the assessment of peri-implant bone loss is

the peri-apical radiograph. This had not been obtained on a routine basis on all implants at regular intervals and therefore we elected to not use that data. Albrektsson et al. described the maximum acceptable bone loss commensurate with implant success. The criteria are: bone loss less than 1mm in the first year and thereafter 0.2mm per year.³⁰ Bone loss was recorded only for those implants that exceeded the criteria of Albrektsson et al.³⁰

RESULTS

Twenty-five patients were reviewed in the study, 10 males and 15 females, with a mean age of 61 ± 9.58 years (range of 37-74). Total number of implants placed was 124, 56 in the maxilla and 68 in the mandible. There were 31 jaws: in nine patients maxilla only, in 10 patients mandible only, and in six patients both maxilla and mandible. Of these 31 jaws, 26 had received immediate implant placement whilst the remaining five jaws were edentulous at the time of implant placement. In 19 jaws, loading occurred after implant integration (delayed), whilst in 12 jaws immediate loading was done.

Torque values

One hundred and eighteen implants (95.2%) had peak torque values greater than 40 Ncm (excellent stability), four implants (3.2%) had good primary stability, and 2 (1.6%) had fair primary stability.

Follow-up

Two patients passed away, with their implants and prostheses surviving at the last follow-ups for, respectively, six months and 18 months post treatment. Three patients had follow-ups of less than three years and were therefore excluded from the calculation of the results. The follow-up for the remaining 20 patients included in this cohort ranged from 40.7–139.7 months, with a mean of 96.9 ± 20.4 months.

Implant failure

Three implants failed in two patients. In one patient two implants failed 10 years post placement (one tilted and one axial implant). This patient's implants had been immediate placements without immediate loading. In the other patient, a single tilted implant (immediate placement with immediate loading) failed two years post placement and the patient was subsequently lost to follow-up. The 20 patients who had greater than three year follow-ups received 96 of the 124 implants placed. In this cohort, 87 of the 96 implants were classified as successful (90.6%), the implant survival rate was 97.9% (94 of 96 implants).

Marginal bone loss

Marginal bone loss exceeded the generally accepted standard in seven implants in four patients. Three implants in one patient, whose prosthesis remained *in situ* after 12 years, had marginal bone loss of 6.8mm, 5.6mm and 4.4mm in two axial and one tilted mandibular implants, respectively. The second patient whose prosthesis had been *in situ* for seven years had peri-implantitis and marginal bone loss of 7.8mm around a single axial implant in the maxilla. The third patient had marginal bone loss around a single axial implant in the mandible measuring 7.5mm after 8 years with the

prosthesis *in situ*. The fourth patient had marginal bone loss around the two axial mandibular implants, measuring 5.3mm and 4.8mm. In two of these patients, a single implant required debridement under local anaesthetic. The remaining patients were referred back to the restoring practitioners to remove the prosthesis and to undergo debridement of the peri-implant space. They were enrolled in a high supervision oral hygiene maintenance programme.

Prosthesis failure

Treatment with this surgical design allowed for a broad distribution of implant prosthetic platforms and the manufacture of a prosthesis with 10-12 teeth but with very short cantilevers (Figures 5A & B). One patient had primary prosthesis failure and two patients had secondary prosthesis failure. One patient had a fractured prosthetic screw in an angled abutment requiring replacement of the abutment. One of the 20 patients had a primary prosthesis failure (1 of 26 jaws) due to fracture, resulting in a 96.2% prosthesis survival rate.

Surgical complications

The only meaningful surgical complication was lower lip paraesthesia experienced by two patients, which resolved with no active treatment after four and five weeks respectively.

DISCUSSION

This study evaluated the outcomes of the All-on-4® treatment concept for rehabilitation of edentulous jaws in a surgical private practice. The aim was to determine results and to compare them with those obtained by others. Duplication of results is an important mechanism for strengthening the scientific validity of a treatment philosophy.

Although the criteria enunciated by Albrektsson et al.³⁰ are widely accepted as the standard for differentiating implant success, survival and failure, the terms implant success and implant survival are often used inappropriately and interchangeably. Careful scrutiny of the studies we reviewed (and to which we are comparing our results), reveal that in fact, the most common criterion used was that of implant survival.^{14-18,22,23,31-33} Thus for the purpose of comparison with other studies, it is possible to use only the implant survival rate. In this study, the cumulative implant survival rate (at a mean follow-up of 96.9 months) for this cohort is 97.9%, and the prosthesis survival rate is 96.2%.

A recent systematic review of 24 studies summarized the clinical outcomes of the All-on-4® technique. The pooled mean follow-up period for the studies under review was five years (range 3-10 years).³³ The implant survival rate was 99.8% at a two year follow-up, with a decline to 95% after five years.³³ Two of the studies reviewed had follow-ups of up to 10 years. Maló et al. reported cumulative implant survival rates between 94.8% and 98.1% at five year follow-up, and 93.8-94.8% at 10 years. The mean follow-up in this study was six years, with only a small group of eight patients having a follow-up of 10 years.²² A follow-up study by the same authors in 2015 reported a cumulative implant survival

rate of 95.4% at seven years for 260 of 324 patients.¹⁴ Lopes et al. reported a cumulative implant survival rate of 96.6% at a five year follow-up, in 23 patients.³¹ The results in these reports show cumulative implant survival rates between 96-98.4% at a five year follow-up, with a decrease to 93.8-95.4% survival rate after 7-10 years.^{10,14,22,31,32}

Although the sample size is smaller than many of the above mentioned studies, the average follow-up in the current study was eight years, with nine of the 20 patients having a longer follow-up. Our implant survival rate of 97.9% at a mean follow-up of eight years is slightly higher than that obtained by other authors; however it is likely that a larger sample size would have yielded figures consistent with previous reports.^{1,14,22,23,31,34}

Peri-implant bone loss is an ongoing concern of much of implant research. A systematic review of complications associated with implant-supported fixed dental prostheses reported a peri-implant bone loss greater than 2mm of 20.1% after five years and 40.3% after 10 years.³⁵ A limitation of this study is the technique used for the measurement of marginal bone loss. It should be borne in mind that the measurement of peri-implant bone loss was not a primary objective of this study.

The reality of performing retrospective reviews of patients not previously recruited into a formal study (thus not subjected to investigations required only for research purposes, but only for clinical need) means that sub-optimal data may be collected. The implications are that whilst the absolute figures for bone loss may be inaccurate, more importantly, the identification of implants that have had no bone loss as opposed to those that have, can be done very reliably with a screening panoramic radiograph. It has been contended that the use of any one parameter, including peri-implant bone loss, cannot be used as a determinant of success in implant treatment.³⁶

The results of this study support the hypothesis that the rehabilitation of the edentulous mandible and maxilla using the All-on-4® concept is predictable and reliable.²² The numerous benefits of this technique are somewhat mitigated by the tenuous implant support offered by the implants for the prosthesis. The loss of a tilted implant invariably entails the loss of the prosthesis. This is one of the major disadvantages of the treatment concept over the traditional axial philosophy or the placement of more implants. Nevertheless, it is a complication that remains rare enough to not dissuade the clinician to consider this treatment option.

CONCLUSION

Our experiences with the All-on-4® technique have corroborated the findings of others. Within the limitation of this study, our results indicate that it is a treatment modality that is safe and predictable with a high implant survival rate even after up to 12 year follow-up.

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The antibacterial effect of herbal alternatives, Triphala and Turmeric, on *Enterococcus faecalis* – an *in vitro* study

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ABSTRACT

Introduction

Disinfection and shaping of the canal with a combination of chemical agents and endodontic instruments play important roles in the success of endodontic therapy. Root canal irrigants aid in achieving disinfection in canal systems inaccessible to biomechanical preparation.

A wide variety of synthetic irrigants are available today but some may be ineffective, and there may be safety concerns and side effects. Herbal alternatives may be advantageous.

Aims and objectives

To evaluate the antibacterial properties of herbal extracts, namely turmeric and triphala as irrigants during endodontic treatment in comparison with the conventional irrigating solutions.

Materials and method

Agar well diffusion assay and MIC methods were used to determine the efficacy of the experimental irrigant in removing *E. faecalis*. The difference between groups was statistically analysed.

Result

2% chlorhexidine showed the highest zone of inhibition against *E. faecalis* followed by triphala. There was no significant difference between triphala and turmeric but triphala showed more inhibition effect against *E. faecalis* because of chelating properties.

Conclusion

Chlorhexidine has significant antimicrobial efficacy against *E. faecalis*. Considerable reduction in growth of *E. faecalis* was seen in the herbal extract groups and considering their non-toxic nature and other physiological benefits, further studies are warranted.

Keywords

Herbal irrigants, *E. faecalis*, chlorhexidine.

INTRODUCTION

The goal of endodontic therapy is the removal of all vital or necrotic tissue, microorganisms, and microbial by-products from the root canal system. This may be achieved through chemo-mechanical debridement of the root canal.¹

The complex nature of the root canal complex and the presence of many inaccessible areas requires a combination of mechanical instrumentation and irrigation to decrease the amount of bacteria/microorganisms in the system.²

E. faecalis is an enteric facultative gram positive bacterium which can grow independently in the root canal.² It is the most commonly isolated species from the root canals of the teeth, especially those with failed endodontic treatment.^{3,4}

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The bacterium possesses certain virulence factors such as lytic enzymes, cytolysin, pheromones, and lipotechoic acid^{5,6} which suppress the action of lymphocytes, potentially contributing to endodontic failure.⁷

In this modern era of dentistry, we are looking towards herbal alternatives. Herbal medicines are drugs of plant origin which are used to attain or maintain a condition of good health and to treat diseases.⁸

It has been known for thousands of years that extracts of plant origin have therapeutic properties, and it has been found that natural plant extracts could be used as effective endodontic irrigants.⁹

Some of the commonly used antibacterial agents are associated with increased antibiotic resistance and toxic and harmful side effects. There is a need for alternative agents which are affordable, non-toxic and effective.⁹

Traditional medicine is known to be fertile ground for the sourcing of modern medicines.¹⁰ Medicines in that category are turmeric and triphala.¹¹ Keeping in view the advantages of using natural irrigants, the present research was undertaken to evaluate the antibacterial properties of herbal extracts, namely turmeric and triphala, as irrigants during endodontic treatment, compared with conventional irrigating solutions.

MATERIALS AND METHODS

The study was conducted in Department of Microbiology. The samples were divided into a study group and a control group. Turmeric and triphala were used in the study group, whilst in the control group, chlorhexidine served as the positive control and saline as the negative control.

The bacterial strain used to identify *E. faecalis* was MTCC 439 (Microbial Type Culture Collection and Gene Bank, Chandigarh (UT), India). The analysis was carried out using the Agar well diffusion assay method.¹² The size of the sample to be used in the study was determined after consultation with statistician.

Preparation of aqueous solution of Turmeric

The *Curcuma longa* rhizomes were washed with distilled water and patted dry. They were then cut into pieces and completely dried in an oven by a tray drying process at a temperature of $40 \pm 5^\circ\text{C}$ for a period of about 7-10 days till they were moisture-free.

The pieces were ground to form a coarse powder which was then placed in a large glass chamber into which 80ml of sterile distilled water was added to prepare the aqueous extract.

The glass chamber was closed with a glass lid to prevent evaporation of the menstruum and the chamber was allowed to stand for seven days with occasional stirring of the contents.¹²

The liquid was then strained and the solid residue, called "marc", was pressed to recover as much solu-

tion as possible. The strained and expressed liquids thus obtained were mixed and clarified by filtration. Pure turmeric extract was taken and mixed with distilled water. (Turmeric preparation was 6.4gms in 80ml of distilled water).

Preparation of aqueous solution of Triphala

Ripe fruits of *Terminalia chebula*, *Terminalia bellirica* and *Embellica officinalis* were collected dried and powdered.

25g of the powder of each of the three fruits were separately passed through an 80# sieve and then mixed together in equal proportions to produce uniformly blended triphala churna.

This powder was then mixed with distilled water and allowed to stand for seven days in a glass chamber, with occasional stirring. (Triphala preparation was 20gms in 80ml of distilled water).

Agar Well Diffusion Assay method

The bacterium under test was *E. faecalis* (MTCC 439). Pure *E. faecalis* was grown on blood infusion agar plates. The micro-organisms were inoculated into tubes containing 5mL 0.9% sterile saline solution. The suspension was adjusted by using McFarland tubes to match the turbidity to 1.5×10^8 cfu/mL. The blood infusion agar plates were flooded with the test suspension.

Then four wells (4mm depth \times 6mm diameter) were cut in the agar, one for each test irrigating solution (turmeric, triphala, chlorhexidine and saline). Into each well was placed 0.4ml of one of the irrigants, using a sterile syringe.²

The plates were then incubated at 37°C under appropriate atmospheric conditions (80% N_2 , 10% CO_2 , 10% H_2) for seven days under anaerobic conditions in a CO_2 incubator. The diameters of the zones of inhibition of bacterial growth around the wells containing the test substances were recorded after the period of incubation.

The inhibitory zone was determined in millimetres by measuring the shortest distance between the outer margin of the well and initial microbial growth, a method previously established.¹² Each experiment was performed six times and the means and standard deviations of the measurements of the inhibitory zones were calculated.

Table 1. Mean and standard deviation of zone of inhibition.

Materials	Sample number	Mean	Standard deviation
2% Chlorhexidine	30	32.77	0.38
Triphala		24.08	0.33
Turmeric		12.95	0.25

RESULTS

The means and standard deviations of the dimensions of the inhibition zones for each concentration of all the preparations are presented in Table 1.

Table 2. Inter-group and Intra-group comparison for statistical significance (p<0.05).

	Groups	P	R
Study Group	Group I 2 % CHX - Triphala	< 0.05	-0.399
	Group II 2% CHX - Turmeric	< 0.05	-0.035
	Group III Triphala - Turmeric	< 0.05	-0.59
Control Group	Group IV 2 % CHX - Saline	< 0.05	∞
	Group V Triphala - Saline	< 0.05	∞
	Group VI Turmeric - Saline	< 0.05	∞

p = Probability Value (paired t test)
r = Pearson Correlation

The results were tabulated using Microsoft Excel software and an independent t-test was applied for statistical analysis which was carried out using SPSS v16 software by qualified statistician. Comparison of the results is recorded in Table 2.

Triphala was more efficacious an inhibitor than turmeric but the co-relation suggests that neither are as efficacious against *E. faecalis* as chlorhexidine.

Overall, 2% chlorhexidine effected the largest zones of growth inhibition in the well diffusion assay. Triphala and turmeric had significant inhibitory effects on *E. faecalis* when compared with the results of the control group.

DISCUSSION

The present research compared the antibacterial properties of herbal with conventional endodontic irrigants. The agar diffusion test used in this study is useful for evaluating and comparing the *in-vitro* antimicrobial activities of irrigants before performing more advanced tests; many studies have used this method for evaluation of antibacterial effects of various endodontic irrigants.¹⁴

The results obtained from this test must be interpreted with caution, as this assay may not demonstrate the full clinical potential of the material being tested. The MIC test is also a research tool to determine the *in-vitro* activity of new medicaments and antimicrobials.

The bacterial species *E. faecalis* was selected as representing an organism commonly isolated from the root canals of teeth that have been previously root filled¹⁵ and its prevalence in such infections ranges from 24% to 77%.⁷ There have been several studies which applied *E. faecalis* as a target micro-organism in the evaluation of the effects of antibacterial agents.

The study conducted by Somayaji et al. compared the antimicrobial efficacy of sodium hypochlorite, triphala, *Withania somnifera*, a combination of triphala and *Withania somnifera* against *Enterococcus faecalis*.

Sodium hypochlorite, triphala and *Withania somnifera* failed to eliminate bacteria completely. But, considerable reduction in growth of *E. faecalis* was seen in the herbal extract groups though none were as effective as was seen in the sodium hypochlorite group. Another study was conducted to compare the antimicrobial activity of triphala (plant-derived solution) with

0.5%, 1%, 2.5% and 5% concentrations of sodium hypochlorite (NaOCl) against *E. faecalis*.¹³ In our study, Triphala exhibited better antimicrobial activity against *E. faecalis* compared with 0.5% and 1% NaOCl (P<0.05).

E. faecalis has ability to invade and to live within dental tubules and can endure prolonged periods of starvation. *E. faecalis* may occur alone, in pairs or in short chains, can survive harsh environments like extreme alkaline pH (9.6) and a temperature of 60°C for 30 min.⁴

The primary objective of endodontic therapy is microbial reduction or elimination to promote healing and re-establishment of health of the periradicular tissues.¹⁶

A variety of chemicals have been introduced. Whilst the commonly used endodontic irrigants have many potentially favourable properties, they can also cause cytotoxicity, allergic reaction, hypersensitivity or immunosuppression.

According to the World Health Organization (WHO) more than 80% of the world's population relies on traditional medicine for their primary healthcare needs. Plants used in traditional medicine contain a wide range of ingredients which are used to treat chronic as well as infectious diseases.¹⁶

Many drugs used in allopathic medicine have their origin in medicinal plants and traditional healers have relied on plant parts as folklore medicine since time immemorial.

Herbal products have a wide range of application in dentistry, such as: anticaries activity; root canal irrigants; anti-collagenase activity; anti-microbial and anti-oxidant effects and as a mouth rise. The most commonly used herbal products are turmeric and triphala.¹⁷

Turmeric appears to derive from the Latin: *terra merita* (merited earth) or turmerite (*Curcuma longa*) and belongs to the ginger (*Zingiberaceae*) family.¹¹ Curcumin, a yellow colored phenolic pigment, is the most important fraction responsible for the biological activities of turmeric.

The product has a wide spectrum of therapeutic effects such as anti-inflammatory, antibacterial, antiviral, antifungal, anti-diabetic and anti-coagulant actions, while it also acts as an antioxidant and astringent. Curcumin has been shown to kill several pathogenic bacteria that can cause infections and skin diseases.

Triphala is a well known ayurvedic herbal formulation consisting of the dried and powdered fruits of three medicinal plants, namely *Terminalia bellerica*, *Terminalia chebula* and *Emblia officinalis* with tannic acid being its principal constituent.

Other chemical constituents of triphala include Quinones, Flavones, Flavonoids, Gallic and Vitamin C. It has long been used in Indian traditional medicine (Indian system of medicine, ISM), for the treatment of headaches, constipation and hepatic disorders.

Initial studies have shown bacteriostatic or bactericidal effects of tannic acid on gram-positive and gram-negative pathogens although the preparation is not as effective as is the chlorhexidine group. Compared with commonly used root canal irrigants, it is safe and is composed of compounds with appropriate physiologic effects in addition to its anti-oxidative and anti-inflammatory properties.

The most important advantages of triphala include easy access, low cost, long-term stability, less toxicity and absence of microbial resistance.¹⁸ It has anti-cariogenic and thermogenic effects and can act as a probiotic.

The antibacterial property of triphala extract has been shown in the present study by the measurement of the zone of inhibition against *E. faecalis*, as has also been demonstrated by Shakouie et al.¹⁷

The study found turmeric to be the most effective herbal product when used as a root canal irrigant. However, this was an *in vitro* investigation which may not have demonstrated the full clinical potential of a tested material. Dentin can interact with herbal endodontic irrigants and the presence of a smear layer could delay any antimicrobial effects of the solutions.

Further studies should be carried out under *in vivo* conditions to confirm the clinical efficacy of these herbal products as useful irrigants in endodontics.

CONCLUSION

In this study 2% Chlorhexidine (CHX) showed maximum antibacterial activity against *E. faecalis*. Triphala and Turmeric did show antibacterial activity against the organism but at significantly reduced levels. Nevertheless, herbal alternatives as root canal irrigants might prove to be advantageous considering the several undesirable characteristics of CHX.

The non-toxic nature and other physiological benefits of these herbal extracts warrant further studies. Further research is needed to conclusively recommend herbal solutions as root canal irrigants.

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Prevalence of peri-implant mucositis at single tooth bone level dental implants in a South African population

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SUMMARY

Introduction

Peri-implant mucositis (PIM) is characterized by inflammation of the soft tissues surrounding dental implants. It affects 43% of implant patients on average and despite its reversible nature, it can, if left untreated, progress to peri-implantitis and potentially implant failure. To date, there is a paucity of data on the prevalence of PIM in South Africa.

Aims and objectives

To determine the prevalence of peri-implant mucositis in patients from the Faculty of Dentistry of the University of the Western Cape, and to evaluate potential risk factors including systemic (smoking, diabetes), implant-related (implant position and diameter, connection and crown) and soft tissue-related (keratinized gingiva, oral hygiene) issues.

Design

Cross-sectional cohort study.

Methods

A total of 74 partially edentulous patients with at least one implant that had been restored with a single crown for at least 12 months were clinically examined.

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- Carla C Pontes:** Scientific writing - 20%
- Haly Holmes:** Research - 15%

ACRONYMS

KM:	Keratinized Mucosa
MDB:	Peri-implant Mucositis

Results and conclusions

PIM was highly prevalent (70.3% of the sample), highlighting the need for maintenance programs for the long-term success of dental implants.

Anterior location of the implant, poor oral hygiene, pre-operative oral hygiene instructions and a wide band of KM were associated with PIM. However, due to the limited sample size, these findings should be interpreted with caution.

INTRODUCTION

Infection of the peri-implant soft tissues is a frequent cause of implant failure after healing.¹ Peri-implant mucositis (PIM) is a condition characterized by inflammation of the soft tissues surrounding dental implants, affecting on average 43% of implant patients.^{2,3} Despite the fact that PIM is a reversible condition, it has the potential to progress to peri-implantitis if left untreated, a condition in which the inflammatory response results in bone destruction and potentially implant failure.^{4,5} Currently, there is no consensus on the best approach to treat peri-implantitis, making prevention the most important strategy.³

It has been suggested that the anatomical characteristics of the peri-implant mucosa make it more prone to inflammatory changes when compared with gingival tissues around teeth, mainly due to poorer connective tissue attachment and reduced vascular supply.^{6,7} The primary etiological factors for developing PIM are the presence of biofilm and the elicited host response. A variety of other factors can contribute to the development and progression of the disease, including patient-related, implant-related and prosthetic-related factors. A recent systematic review and meta-analysis suggested that appropriate maintenance therapy, customized according to the patient's risk, is important to limit the development of biological complications such as PIM.⁸

To date, there is a paucity of data on the prevalence of PIM in South Africa. The aim of the present cross-sectional study was to determine the prevalence of peri-implant mucositis in a sample of patients from the Faculty of Dentistry of the University of the Western

Cape, South Africa, and to evaluate potential risk factors, whether systemic (smoking, diabetes), implant-related (implant position in the arch, type of connection, implant diameter, type of crown,) or soft tissue-related (width of keratinized gingiva, oral hygiene) issues.

MATERIALS AND METHODS

The study protocol was approved by the Research Committee from the University of the Western Cape (registration number 12/1/19).

Sample size calculation

The population from which the sample was generated consisted of patients from the Faculty of Dentistry of the University of Western Cape, who had had a single implant-supported crown placed during the period 2005 to 2011.

Partially edentulous patients with at least one implant that had been restored with a single crown for at least 12 months were included. Only bone level implants placed and restored according to the delayed protocol were included. Excluded were those cases having had bone or soft tissue grafting during implant placement, immediate implants, tissue level implants, bridge restorations and splinted crowns.

The literature reports the prevalence of peri-implantitis among various populations to be 43% on average.³ This figure was used to calculate the recommended sample size of 97 for this cross-sectional study in order that precise data could be generated, with a 95% confidence interval to fall within 10% of the estimate. The University records offered 120 eligible patients, of whom 100 were randomly selected to receive a free recall and oral hygienist visit. Of the 100 patients contacted, 74 agreed to participate in the study.

Data collection

A standardized form was used to collect patient information, including follow-up time after implant placement, gender, smoking status (current smoker or non-smoker), diabetes (self-reported, yes or no). Data on the implant included position in the dental arch (anterior from incisors to canines or posterior at pre-molar and molar sites), implant diameter ("standard" if between 3.7mm and 4.2mm or "wide" if greater than 4.2mm), type of restoration (screw or cement-retained crown).

Peri-implant mucositis was diagnosed according to the 7th European Workshop of Periodontology consensus, as the presence of bleeding in at least one site after gentle probing (<0.25N).⁹ The clinical parameters were measured by a calibrated examiner at the implant site using a pressure constant probe (Vivacare TPS Probe, Schaan, Liechtenstein) at a probing pressure of 20g.

The oral examination included measurement of the width of keratinized gingiva (<1mm; ≥1-2mm; >2mm) and recording of bleeding on probing at six sites per implant (mesio-buccal, buccal, disto-buccal, mesiolingual, lingual, and distolingual).

Oral hygiene was evaluated according to the modified plaque index from Silness & Loe.¹⁰ Toothbrushing frequency, flossing frequency and use of mouthwash was categorized into twice daily, every second day and never. Patients were asked whether oral hygiene instructions had been given prior to implant or crown placement.

Statistical analysis

A chi-square test was used to evaluate the relationship between PIM and the local and general risk factors in the studied population through a statistical software program. A 95% confidence interval was used and a *p*-value <0.05 was considered statistically significant.

RESULTS

A total of 74 patients with at least a single implant each were evaluated, of whom 72% were females (*n*=53) and 28% males (*n*=21). The age range varied between 20-84 years, with the majority (63.5%, *n*=47) being 50 years and older (Table 1). Peri-implant mucositis was detected in 70.3% of the sample (*n*=52,) with no statistically significant differences between affected males (71.4%) and females (69.8%). Average follow-up time was 3 years and four months.

Systemic risk factors

Diabetes was present in 5% (*n*=4) of the sample. A total of 22% (*n*=16) of the patients were smokers. Prevalence of PIM was not statistically associated with smoking or diabetes (Table 2).

Local risk factors

For the implant-related variables, 68% of the implants had been placed in posterior areas. The anterior implants (32%) were associated with an increased prevalence of PIM (*p*=0.005). Regarding implant diameter, the majority of the implants (91%, *n*=67) had standard diameters, while 9% were wide. This variable was not statistically associated with prevalence of PIM (Table 3).

A total of 68% (*n*=50) of the crowns were cement-retained, while 32% were screw-retained (*n*=24); there were no significant differences between the groups in relation to the prevalence of PIM. Follow-up time after implant placement was categorized into 1-2 years (22%, *n*=16) and above 2 years (78%, *n*=58), with no statistical differences observed between groups for PIM prevalence (Table 3).

The data recording the width of keratinized mucosa (KM) were divided into two categories, less than 2mm (*n*=21, 28%) and 2mm and above (*n*=53, 72%). Prevalence of PIM differed between these groups, 22 patients presenting with PIM in areas with 2mm or less, compared with 30 patients in the group with at least 2mm of keratinized gingiva (*p*=0.03, Table 4).

A total of 57 patients (77%) had poor to fair oral hygiene, while 17 (23%) presented good oral hygiene. The two groups differed, with 44 patients presenting

Table 1. Demographics of the studied sample.

	Age Groups							Gender		Total
	20-29	30-39	40-49	50-59	60-69	70-79	80-89	Males	Females	
N	9	7	11	26	13	7	1	21	53	74

Table 2. Frequency table for the evaluated systemic risk factors.

	Peri-implant mucositis		Total	Chi-square	P-value
	Positive	Negative			
Smoking					
Yes	9	7	16	1.921	0.166
No	43	15	58		
Total	52	22	74		
Diabetes					
Yes	3	1	4	0.045	0.831
No	49	21	70		
Total	52	22	74		

Table 3. Frequency table for the evaluated implant-related local risk factors.

	Peri-implant mucositis		Total	Chi-square	P-value
	Positive	Negative			
Dental arch position					
Anterior	22	2	24	7.784	0.005
Posterior	30	20	50		
Total	52	22	74		
Implant diameter					
Standard	48	19	67	0.638	0.425
Wide	4	3	7		
Total	52	22	74		
Crown type					
Cemented	37	13	50	1.027	0.31
Screwed	15	9	24		
Total	52	22	74		
Follow-up time					
1-2 years	12	4	16	0.219	0.640
Over 2 years	40	18	58		
Total	52	22	74		

Table 4. Frequency table for width of keratinized mucosa.

	Peri-implant mucositis		Total	Chi-square	P-value
	Positive	Negative			
Keratinized mucosa					
Under 2mm	22	2	24	4.492	0.003
≥2mm	30	20	50		
Total	52	22	74		

Table 5. Frequency table for the evaluated oral hygiene-related local risk factors.

	Peri-implant mucositis		Total	Chi-square	P-value
	Positive	Negative			
Oral hygiene status					
Poor to fair	44	13	57	5.692	0.017
Good	8	9	17		
Total	52	22	74		
Brushing frequency					
Once/day	10	3	13	0.334	0.563
Twice/day	42	19	61		
Total	52	22	74		
Flossing frequency					
Never to seldom	32	13	45	0.039	0.844
Everyday	20	9	29		
Total	52	22	74		
Use of mouthwash					
Never - every other day	41	19	60	0.570	0.450
Everyday	11	3	14		
Total	52	22	74		
Use of waterpik					
Yes	5	2	7	0.005	0.944
No	47	20	67		
Total	52	22	74		
Use of interdental brush					
Yes	9	4	13	0.008	0.928
No	43	18	61		
Total	52	22	74		
Other oral hygiene aids					
Yes	14	6	20	0.001	0.975
No	38	16	54		
Total	52	22	74		
Pre-operative hygiene instructions					
Yes	32	6	38	7.266	0.007
No	20	16	36		
Total	52	22	74		

Table 6. Odds ratio, confidence interval (CI) and statistical significance for the evaluated risk factors for PIM.

Variables	Odds ratio	CI lower limit	CI upper limit	Chi-square	P-value
Gender	1.081	0.355	3.292	0.019	0.891
Smoking	0.449	0.142	1.416	1.921	0.166
Diabetes	1.286	0.126	13.086	0.045	0.831
Arch position	7.333	1.550	34.696	7.784	0.005
Implant diameter	1.895	0.387	9.277	0.638	0.425
Follow-up time	1.350	0.383	4.764	0.219	0.640
Crown type	1.708	0.603	4.833	1.027	0.311
Keratinized gingival width	0.322	0.110	0.940	4.492	0.034
Oral hygiene status	3.808	1.223	11.855	5.692	0.017
Brushing frequency	1.508	0.372	6.111	0.334	0.563
Flossing frequency	1.108	0.401	3.063	0.039	0.844
Use of mouthwash	0.589	0.147	2.357	0.570	0.450
Other hygiene aids	0.983	0.320	3.013	0.001	0.975
Waterpick	1.064	0.19	5.949	0.005	0.944
Interdental brush	0.942	0.257	3.456	0.008	0.928
Prior oral hygiene instructions	4.267	1.432	12.716	7.266	0.007

PIM in the poor to fair oral hygiene group and 8 in the good oral hygiene group ($p=0.02$). Brushing once ($n=13$, 18%) or twice a day ($n=61$, 82%) had no association with the incidence of PIM. Frequency of flossing, described as never to seldom ($n=45$) or daily ($n=29$) was not associated with prevalence of PIM, neither was use of mouth rinse, categorized into never or every other day ($n=60$) or daily ($n=14$). Use of other oral hygiene aids, waterpik and interdental brush were not associated with prevalence of PIM (Table 5).

A total of 38 (51%) patients received oral hygiene instructions prior to implant placement, while 36 (49%) patients received no pre-surgery instructions. A higher prevalence of PIM was present for the group that had pre-treatment instructions ($n=32$), as compared with the group who had received no instructions ($n=20$, $p=0.007$).

Among the evaluated factors, anterior location (odds ratio [OR]=7.3), having received pre-operative oral hygiene instructions (OR=4.2), having poor to fair oral hygiene habits (OR=3.8) and having a band of keratinized gingiva of at least 2mm (OR=0.3) were associated with PIM (Table 6).

DISCUSSION

Understanding the epidemiology of peri-implant diseases is the first step for the development of preventive strategies.³ The primary aim of this cross-sectional study was to determine the prevalence of PIM in a South African sample of patients who had a single bone level implant placed at the Faculty of Dentistry of the University of Western Cape.

The secondary objective was to assess possible associated risk factors. However, the sample size was calculated based on the primary objective, and hence was too small to draw definitive conclusions about the role played by the systemic and local factors that were measured. Our findings revealed a diagnosis of PIM in 70.3% of all evaluated single crown implant supported crowns. This surpasses prevalence rates of PIM that have been reported in the literature.^{3,9}

A systematic review on the epidemiology of peri-implant mucositis worldwide reported prevalence rates ranging from 19 to 65%, with average of 43%.³ Few studies have presented PIM prevalence rates over 70%. Henriques et al. (2016) reported that 81% of implants placed at a Brazilian University were diagnosed with PIM. The average follow-up time in that study was 2.6 years.¹¹

Two cross-sectional studies evaluated implants that had been in function for more than five years and reported PIM in 79% of the subjects¹² and in over 90% of the implants.¹³ A study from Rinke and coworkers (2011) showed that in patients with a history of periodontitis who smoked, prevalence of PIM was 80%; mean follow-up time was 5.6 years.¹⁴ Differences in prevalence rates can be attributed to variations in case-definition, level of analysis (subject or implant), follow-up time, population type and type of implant-supported restoration.^{5,15}

Certain population groups can present higher risk for peri-implant diseases.¹⁵ The current study included patients who had their implants placed at a University Clinic; none of them had been enrolled in maintenance programs after implant placement, which could be one of the reasons for the high prevalence of PIM. Since patients who received oral hygiene instructions prior to implant surgery had higher prevalence of PIM, our results indicate that pre-operative instructions are not of themselves sufficient to maintain peri-implant health, highlighting the need for consistent follow-up to control plaque and potentially to prevent peri-implant diseases.⁸

From the evaluated risk factors, none of the self-reported systemic factors were associated with PIM, which contradicts previous studies suggesting a role for smoking and diabetes.^{1,12,14,16} Reliability of self-reported data can be considered as a potential limitation, as indicated in an epidemiological study by Ning et al. (2016), where prevalence of self-reported diabetes was underestimated when the same patients were subjected to glucose tests.¹⁷

In our study, implants located in the anterior area had 7.3 higher odds of having PIM. The majority of the implants (75%) in the anterior area had cemented crowns. Although no statistically significant association was found between location of the implant, type of crown and PIM, the detrimental effect of residual cement cannot be underestimated and the lack of significance can be related to the small sample size.¹⁸

The role of plaque has been well established in the development of PIM, hence oral hygiene is essential for the long-term success of dental implants.^{19–22} According to our results, poor oral hygiene increased the odds of having PIM 3.8 times, highlighting the importance of plaque control and follow-up.

The presence of a band of KM of 2mm and above had a weak association with PIM (OR=0.3) in our study. In the literature, there is evidence of a protective effect of a wide band of KM²³, evidence of the opposite, with KM being a risk factor for PIM¹² and other studies suggesting that KM is not as important as maintenance and plaque control for the development of PIM.^{22,24} Thus, our findings are difficult to interpret; further studies are required to explore the role of KM for peri-implant diseases.

The main limitation of the study is the lack of data on periodontitis, since several studies have suggested previous periodontitis as a predisposing factor to PIM.^{19,25,26} Another limitation is the lack of radiographs, which could have resulted in the identification of peri-implantitis cases. In future studies, it will be interesting to evaluate other potential risk factors, such as titanium corrosion, which has been recently linked to irritation of peri-implant tissues.²⁷

CONCLUSIONS

This first study on PIM in South Africa revealed high prevalence rates in the studied sample, highlighting the need for supportive maintenance care programs for

the long term success of dental implants. In this study, anterior location of the implant, poor oral hygiene, pre-operative oral hygiene instructions and a wide band of KM were associated with the prevalence of PIM. However, due to the limited sample size, these findings should be interpreted with caution. Further studies are necessary in order to provide a better understanding of the risk factors associated with PIM.

Conflict of interest

The authors have no conflicts of interest to declare.

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Prevalence of impacted third molars in the South African Indian population of the eThekweni Metropolitan Region

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SUMMARY

Introduction

An impacted tooth is partially erupted or un-erupted, positioned against another tooth, bone or soft tissue in such a way as to prevent further eruption. Normal dental arch relationships are disrupted.

This study investigated the prevalence of impactions of third molar teeth amongst Indians residing in the greater eThekweni Metropolitan area.

Materials and methods

A sample of 274 digital panoramic radiographs was examined. Impacted third molars were identified on 222 scans. The impactions were classified using Winter's, and Pell and Gregory's schemes. Statistical analysis was applied to determine any relationship between impactions and sex and age.

ACRONYMS

DOH:	Dental Therapy and Oral Hygiene Board
MDB:	Medical & Dental Board
OHPs:	Oral Health Professionals
PCC:	Professional Conduct Committee

Results

Eighty-one percent of individuals presented with at least one impacted third molar, mandibular frequency being significantly higher in both sexes (p -value=0.000). The most prevalent types of impaction were mesio-angular (mandibular) and vertical angulation (maxillary).

For level of impaction, Class B and Class A were respectively most prevalent in the mandible and the maxilla. With the exception of angulation of impacted mandibular third molars on the right side, all parameters showed a statistically significant correlation with age (p -value=0.000).

Conclusion

The high frequency of these eruption problems in this study may alert maxillo-facial and dental surgeons, and forensic investigators, to potential clinical challenges.

Keywords

Mandible, maxilla, prevalence, third molar impaction, radiology.

INTRODUCTION

Tooth impaction is a pathological condition wherein a tooth is completely or partially unerupted and positioned against another tooth, bone or soft tissue, thus being prevented further eruption into its normal functioning position.^{1,2}

The third molars, which are commonly called wisdom teeth, are the only teeth to erupt during adolescence or early adulthood, often referred to as the age of "wisdom," hence the name.¹ However, variations exist in the age of eruption, which generally occurs between the ages of 18-24 years.³ The mandibular third molars are the most frequently impacted teeth in humans followed by the maxillary third molars, maxillary canines and mandibular canines.⁴ The factors causing third molar impaction include crowding, ectopic position of the tooth germs, supernumerary teeth, genetic factors and soft tissue or bony lesions.^{4,5}

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- Kapil S Satyapal:** Write-up of manuscript - 20%

Many theories have been proposed to explain the prevalence of the impacted third molar and the majority discuss the relationship of jaw size to the tooth size. This is suggested to result from the regional differences in dietary habits.⁵

It has been recorded that as the mandibular third molar teeth are the last to erupt, they are therefore often impeded in their eruption and either become impacted or remain unerupted within the jaw bone.¹

Impacted teeth are often associated with pericoronitis, incisor crowding, resorption of the adjacent tooth roots and temporo-mandibular joint dysfunction.^{1,2}

Furthermore, the development of the third molar is used as a tool by many forensic dentists to assign age to young adults who have been victims of violent crimes, fires, motor vehicle and airplane accidents.⁶

This study aims to investigate the prevalence of impacted third molar teeth for the Indian population group presenting at public and private Health Dental Facilities that serve the greater eThekweni Metropolitan area.

MATERIALS AND METHODS

The third molar teeth were studied in 274 South Africans of Indian descent (129 males; 145 females) within an age range 16 to 30 years, as these are the dominant years for the occurrence of third molar impaction. The sample size was selected by convenience sampling.

The patients from the public sector were randomly selected from a public sector hospital which treats mainly Indian and Black patients. The private sector sample was randomly selected from four private practices from the eThekweni Region; which treat, in the main, patients of Indian origin. This study was a retrospective review that grouped the digital panoramic radiographs according to sex and age.

The ages were categorized into three intervals, viz. 16 - 19; 20 - 25 and 26 - 30 years, which was similar to the age intervals selected in previous studies.^{4,5}

The methodology was devised to determine the prevalence of impactions among the greater eThekweni Metropolitan population, and to determine if impaction is related to age, sex, and side (right or left).

Radiographs were obtained from the Radiology Departments of one public sector hospital and from four private dental practices within the eThekweni region. All records were collected utilizing consecutive sampling and ranged from 2009-2015. Ethical Clearance was obtained (BE: 410/13).

Inclusion criteria

The inclusion criteria of this study were:

- Panoramic radiographs of patients between 16 and 30 years of age who presented with no history of trauma and whose records were complete.

Exclusion criteria

The exclusion criteria of this study were:

- Poor quality radiographs (distorted/blurred/unclear images as a result of technique and projection errors caused by patient preparation, viz. radiopaque artefacts and improper positioning of the patients).
- Panoramic radiographs of patients who presented with fracture of the jaws that may have affected the normal development of the permanent dentition.
- Panoramic radiographs of patients which showed an absence of a second molar tooth adjacent to the third molar.

Morphological analysis

The panoramic radiographs were examined by a single examiner (first author), using a Kodak digital x-ray viewer, to determine the prevalence and characteristics of the impacted third molars in the sample. The first author assessed the angles and the depth of impaction on two separate occasions to find intra-observer variability.

A second examiner (second author) assessed every 10th digital panoramic radiographs using the same methodology to determine the inter-observer variability. The Student's *t*-test was then employed to compare the two sets of data. These characteristics included the angulations and level of the impacted third molars.

The classification schemes of the impacted mandibular and maxillary third molar teeth were as follows:

• Angulation of impacted third molars

The angulations of the impacted third molar were recorded using Winter's classification scheme.^{2,7,8}

• Level of impaction and relation to the ramus of the mandible

The level of impaction was recorded using Pell and Gregory's classification scheme.⁹

Statistical analysis

An appropriate sample size was calculated by using the mathematical formulae $n = \frac{Z^2 pq}{E^2}$ and the collected data were captured and analysed using the Statistical Package for Social Sciences (SPSS version 21.0) with the assistance of a biostatistician. The statistics used included the mean, range and standard deviation for each age interval. The Pearson Chi-Square Test, One-Way Anova Test and Independent Samples *t*-Test were used to analyse the relationship between age, sex and the prevalence of impaction. A 95% confidence level was adhered to for all statistical tests. A *p*-value of less than 0.05 was considered to be statistically significant.

RESULTS

Prevalence of impacted third molars

Of the 274 panoramic radiographs, 222 (81.0%) were found to show at least one impacted third molar with a male:female ratio of 1:1.2 (i.e. 101:121). A total of 709 impacted third molar teeth were identified among

Angulation of impacted third molars

A. Impacted mandibular third molars

The most common type of angulation for impacted mandibular third molars in both males and females was mesio-angulation [$\frac{210}{410}$ (52.5%)] (Figure 2), followed by vertical angulation [$\frac{96}{400}$ (24.0%)], with the least prevalent being disto-angulation [$\frac{6}{400}$ (2.8%)] (Table 1).

For the correlation with all age categories, only the type of mandibular angulation for the left side of the mandible was statistically significant with a p -value=0.006 (Table 1).

B. Impacted maxillary third molars

The most prevalent type of angulation for impacted maxillary third molars in both males and females was vertical [$\frac{206}{309}$ (66.7%)] (Figure 3), followed by disto-angulation [$\frac{51}{309}$ (16.5%)], with the least prevalent being horizontal angulation [$\frac{2}{309}$ (0.6%)] (Table 1). A statistically significant relationship between the type of maxillary impaction and age was recorded (p -value=0.000).

Level of third molar impaction

A. Impacted mandibular third molars

According to the Pell and Gregory classification scheme,⁹ Class B [$\frac{218}{400}$ (54.4%)] was recorded as the most prevalent type of mandibular third molar impaction, followed by Class C [$\frac{117}{400}$ (29.3%)], and the least prevalent, Class A [$\frac{65}{400}$ (16.3%)] (Table 2).

A statistically significant relationship was recorded between impacted mandibular third molars and age (p -value = 0.000).

B. Impacted maxillary third molars

While Class A [$\frac{231}{309}$; (74.8%)] was recorded to be the most common type of maxillary third molar impaction, followed by Class C [$\frac{47}{309}$; (15.2%)] and Class B

[$\frac{31}{309}$; (10.0%)] (Table 2). A statistically significant relationship was recorded between this parameter and age (p -value = 0.000).

Intra and Inter-observer variability

The first author assessed all digital panoramic radiographs twice, yielding an intra examiner variability of 0.076 (p -value>0.05). A second author assessed every 10th panoramic radiographs using the same classification.

No statistical significant difference between the two sets of data was recorded (p -value>0.05).

DISCUSSION

Prevalence of impacted third molars

Third molar impaction is a common problem affecting a large proportion of the world's population, with a global prevalence ranging from 16.7% to 68.6%.² The current study estimated the prevalence of an impacted third molar among the South African Indian race group in the Greater eThekweni Metropolitan area of KwaZulu-Natal at 81.0% [$\frac{222}{274}$]. This differs significantly when compared with a calculated weighted mean of 31.3% derived from a comparable series of studies which had investigated the prevalence of impacted third molars in different countries around the world (Table 3).

There are studies which do show similarities, however, for example, a 73.0% prevalence of impacted third molars was found among a young European population.^{10,11} Prevalences recorded in this study were higher than those previously reported (Table 3).^{2,5,12,13} However, this study analysed radiographs of patients within a narrow age range (between 16-30 years) and the literature records that impacted third molars are most prevalent

Table 2. Prevalence of third molar impaction according to Pell and Gregory's classification.⁹

Level of Impaction	Prevalence (in %)										
	Mandible							p-value			
	Males			Females			Both	Sex		Age	
	Right	Left	Total	Right	Left	Total	Total	Right	Left	Right	Left
A	12 (6.5)	18 (9.7)	30 (16.2)	19 (8.8)	16 (7.4)	35 (16.3)	65 (16.3)	0.801	0.512	0.000	0.000
B	53 (28.6)	48 (25.9)	101 (54.6)	58 (27.0)	59 (27.4)	117 (54.4)	218 (54.5)				
C	25 (13.5)	29 (15.7)	54 (29.2)	30 (14.0)	33 (15.3)	63 (29.3)	117 (29.2)				
Level of Impaction	Prevalence (in %)										
	Maxilla							p-value			
	Males			Females			Both	Sex		Age	
	Right	Left	Total	Right	Left	Total	Total	Right	Left	Right	Left
A	49 (36.3)	52 (38.5)	101 (74.8)	60 (34.5)	70 (40.2)	130 (74.7)	231 (74.8)	0.893	0.619	0.000	0.000
B	8 (5.9)	6 (4.4)	14 (10.3)	8 (4.6)	9 (5.2)	17 (9.8)	31 (10.0)				
C	9 (6.7)	11 (8.1)	20 (14.8)	14 (8.0)	13 (7.5)	27 (15.5)	47 (15.2)				

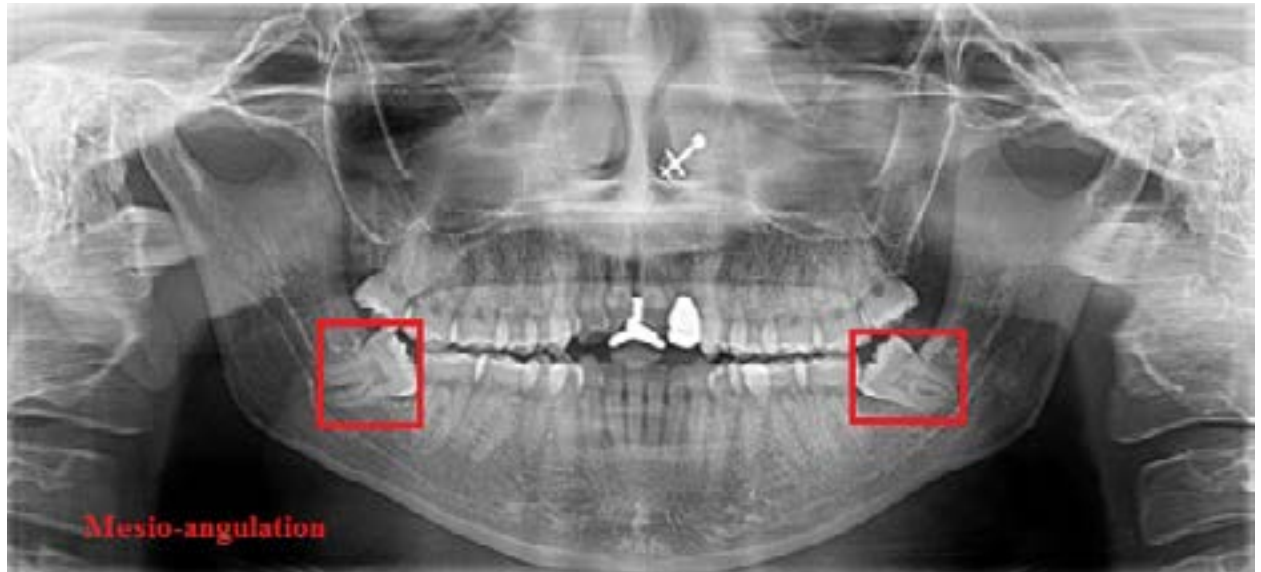


Figure 2. Mesio-angulation impaction of the mandibular third molars.

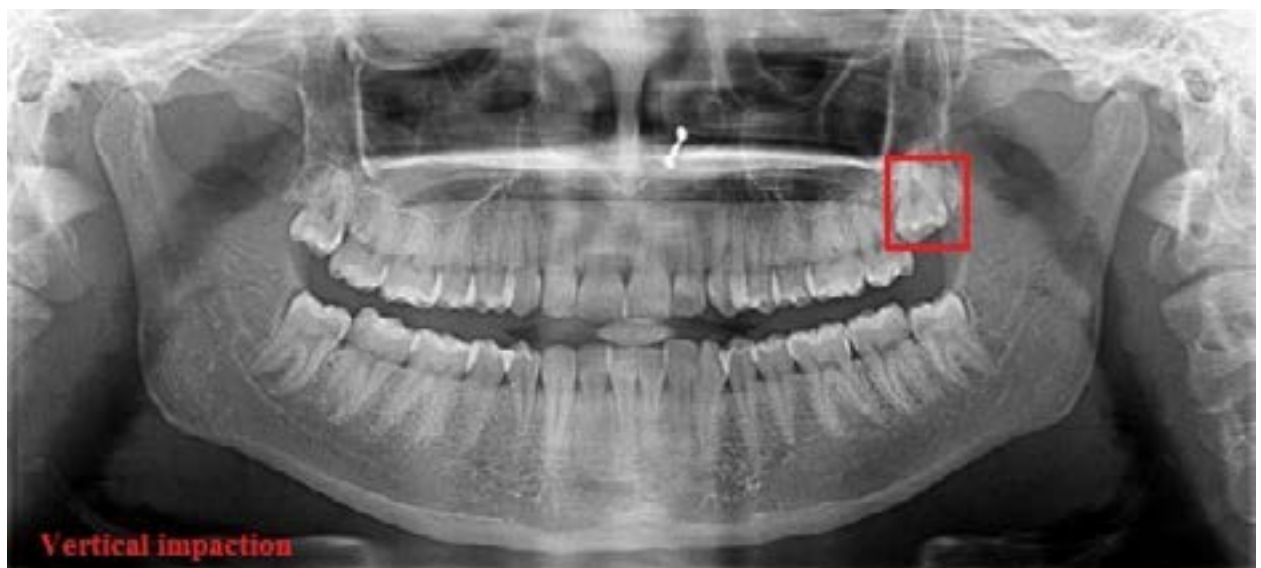


Figure 3. Vertical angulation impaction of the maxillary third molars.

Table 3. Prevalence of impacted third molars in different population groups.

Authors	Year	Population	Sample Size	Prevalence of impacted third molars (%)
Sandhu and Kapila ¹²	1982	Indian	1015	26.0
Hattab et al. ³³	1995	Jordanaian	232	33.0
Eley and Rock ¹⁰	2000	European	-	73.0
Chu et al. ¹⁵	2003	Hong Kong Chinese	7486	27.8
Quek et al. ¹³	2003	Singaporean	1000	68.6
Omar ⁴	2008	Hawler	1150	43.8
Ramamurthy et al. ¹	2012	Indian	1005	41.3
Tsabedze ⁸	2012	South African	1215	17.0
Hashempouret al. ²	2013	Irani	2300	44.3
Sabra and Soliman ²¹	2013	Saudi Arabian	113	67.9
Syed et al. ⁵	2013	Saudi Arabian	3800	18.7
Weighted mean				31.3
Present Study	2014	South African (Indian)	222	81.0

in young adults, with an estimation that in patients aged between 15-35 years, one in every eleven mandibular third molar teeth are impacted.¹⁴ A number of studies utilized a wider age range and the number of individuals sampled among the different age groups will play a role in the global estimate.^{8,15,16}

The prevalence of an impacted third molar tooth was shown in this study to be higher in the mandible than the maxilla, with prevalences of 56.4% and 43.6%, respectively (Table 4). These results are similar to those of previous studies conducted in Asian countries, viz. India (mandible=63.21% and maxilla=36.79%),¹² Hong Kong (mandible=82.50% and maxilla=15.60%),¹⁵ and Iraq (mandible=59.04% and maxilla=39.42%).^{4,15}

A 2008 study considered that the growth of the mandible influences the frequency of impacted mandibular third molar teeth as a small retro-molar space results in an insufficient area for the eruption of the mandibular third molars.¹⁷ However, other workers found maxillary third molar teeth to be more frequently impacted than mandibular third molar teeth (maxillary impaction: 58.87%; mandibular impaction: 33.47%,¹⁸ and maxillary impaction: 62.57%; mandibular impaction: 37.44%¹⁹) (Table 4).

The possibility has been mooted that the discrepancy in the prevalence of the impacted third molars may be due to genetic or racial differences.² Furthermore, the jaw size in relation to the cumulative teeth size has been identified as a contributing factor, which may result from the difference in dietary habits.⁵

Angulation of impacted third molars

A. Impacted mandibular third molars

In the present study, the most prevalent pattern of impacted mandibular third molars is mesio-angulation (52.5%), followed by vertical angulation impaction (24.0%), with the least prevalent being disto-angulation impaction (1.5%). The findings of the study, conducted on the South African Indian ethnic group, concurred with the findings of previous investigators all of whom reported mesio-angulation to be the most prevalent in the Indian, Pakistani and Saudi Arabian populations, respectively.^{5,16,20,21} However, the current study differed from other reports which recorded vertical impaction as the most frequent pattern of the mandibular third molar

impaction.²²⁻²⁴ It is apparent that racial differences may indeed play a role in the angulation pattern of impacted third molars. Furthermore, there are a number of population-specific differences that may exert an influence such as genetically inherited factors, lack of proper dental care and type of food and dietary habits (coarse abrasive diet versus the soft western diet).⁴

Postulated in the literature which has been under review are numerous theories which endeavour to explain the development of impacted mandibular third molars.¹⁴ The change in orientation of the occlusal surface from a straight mesial direction to a straight vertical direction occurs primarily during root formation and it may be that during this time the tooth rotates from primarily a horizontal, to a mesio-angular and then to a vertical position.²⁵

In addition, a study group at Queen's University, known as the Belfast group, proposed that differential root growth between the mesial and distal roots causes the root to either stay mesial or to move to a vertical position, depending on the amount of root development.⁴

2. Impacted maxillary third molars

Vertical impaction (66.7%) is recorded to be most prevalent in the maxilla, according to Winter's (1926) classification scheme.⁷ This observation concurs with data published in two papers which recorded prevalences of 45.3% and 52.0% 2,5 respectively. However, two earlier studies reported that disto-angulation was the most frequent type of maxillary third molar impaction, viz. in 75.5% and 58.5% of cases respectively.²⁶⁻²⁸ It has been suggested that this discrepancy could be attributed to the maxillary third molars generally assuming different degrees of distal angulation during the primary phases of development.²⁹

Since the third molar tooth germ develops from the backward extension of dental lamina, the germs of the third molar tooth develop with their occlusal surfaces positioned distally. This surface then swings into a vertical position only when the maxilla has developed sufficiently to provide room adequate for the movement.³⁰ During the period of root development a vertical position is thus essential for normal eruption to occur. However, if the space is insufficient, impaction is likely to occur.²⁹

Table 4. Distribution of impacted third molars in the mandible and maxilla.

Authors	Year	Population	Sample Size	Prevalence of impacted third molars (%)	
				Mandible	Maxilla
Kramer ¹⁸	1970	American	-	33.47	58.87
Sandhu and Kapila ¹²	1982	Indian	1015	63.21	36.79
Kruger ¹⁹	1984	-	-	37.44	62.57
Chu et al. ¹⁵	2003	Chinese (Hong Kong)	7486	82.50	15.60
Omar ⁴	2008	Hawler	1150	59.04	39.42
Hashemipour et al. ²	2013	Iranian	1215	54.90	28.80
Syed et al. ⁵	2013	Saudi Arabian	3800	49.40	18.40
Weighted mean				68.50	20.80
Present Study	2014	South African	222	56.40	43.60

Level of third molar impaction

A. Impacted mandibular third molars

When the Pell and Gregory classification scheme was applied, this study recorded Class B to be the most prevalent type of mandibular third molar impaction, followed by Class C and, by the least prevalent, Class A, with observations of 54.4% (B), 29.3% (C) and 16.3% (A), respectively. These findings concurred with those of a Singaporean study, which reported Class B to be most prevalent in 85% of the cases, followed by Class C (9%) and Class A (6%) as the least prevalent.¹³

B. Impacted maxillary third molars

This study found Class A (74.8%) to be the most common type of maxillary third molar impaction, followed by Class C (15.2%) with the least prevalent being Class B (10.0%). These findings confirmed those of a 1988 study.³¹ A more recent investigation reported results similar to the present study, with the highest prevalence being Class A (80.9%).² However, they recorded Class B (10.9%) as the second most prevalent, with their investigation showing Class C (8.2%) to be the least frequent type of third molar impaction.²

In contrast, the Singapore study reported Class B to be the most common type of maxillary third molar impaction, with a prevalence of 59.0%, followed by Class C (39.0%) and Class A (3.0%).¹³ It has been suggested that racial and genetic differences may account for the variation in the level of impaction from one population to another.¹⁶

Sex estimation

This study recorded a higher prevalence of impacted third molar teeth in females (54.5%) which is in agreement with previous studies: 55.7% females; 44.3% males; 12 51.0% females; 49.0% males;⁴ 64.9% females; 35.1% males. A possible reason is that the jaws of females stop growing as soon as the third molars begin to erupt, whereas in males the growth of the jaws continues beyond the eruption of the third molars.³²

Therefore, the incidence of third molar impaction is more frequent in females than in males.^{1,4} There is agreement amongst researchers that the mandibular third molar teeth in males erupts approximately three to six months earlier than do these teeth in females, consequently resulting in a higher prevalence of impacted mandibular third molars in females.^{14,32}

Age estimation

The majority of third molar impactions were observed in the age group of 20-25 years (39.2%), followed by the 16-19 year age interval (33.3%), with the 26-30 year interval having the least prevalence of impactions (27.5%).

This correlated with the findings of a study which reported 47.9%, 43.3% and 23.5% prevalences of impacted third molars in the 21-25, 17-20 and 26-30 year age intervals, respectively.⁴

However, two investigations have recorded the highest prevalence of impacted third molars as being in individuals between 20-30 years old, with records of 55.1% and 57.4%, respectively.^{15,16}

This may be due to population-specific differences which vary from one region to another. In addition, these results may be influenced by the number of individuals sampled among the different gender groups.

Limitations

The study did not include a consideration of crowding in the arches, nor whether the dentition was complete. Both factors may have contributed to the impaction of third molars.

The study did not aim to explore etiological factors. With regards to crowding, the observation made on panorex films would have been limited as to whether or not crowding was present elsewhere in the arch. Further studies which may consider these factors would preferably include study models.

CONCLUSIONS

The prevalence of impacted third molars in the specific race group studied in the Greater eThekweni Metropolitan population was found to be the higher than the weighted mean recorded in the literature surveyed.

Eighty-one percent of this population presented with at least one impacted third molar, with impactions being more prevalent in females than males (1.2:1). A possible reason for this was that this study analyzed radiographs of patients within a narrow age range (between 16-30 years) as the predominant age of impaction was 18-24 years,³³ whereas other studies examined samples with a wider age range, and therefore the number of individuals sampled among the different age groups will play a role in the global estimate.

A greater prevalence of impacted third molar teeth was recorded in the mandible than the maxilla, with a ratio of 1.3:1, respectively.

In this study, the most prevalent patterns of an impacted third molar were found to be mesio-angulation in the mandible and vertical angulation in the maxilla.

With regard to the level of impaction, Class B and Class A were most common in the mandible and maxilla, respectively. Therefore, to minimise the risk of complications during the removal of third molar, maxillo-facial surgeons, dentists and orthodontists may use these results (classifications) to predict, assess and diagnose the difficulty of surgical procedure and subsequently may be able to evaluate and provide treatment to the patient more efficiently.

In addition, the results may be used to diagnose whether the patient has a predilection for third molar impaction by correlating the type of impaction and the depth of impaction, with age and sex, as the general age of eruption is between 18-24 years.

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Dental malpractice cases in South Africa (2007-2016)

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SUMMARY

Introduction

Malpractice complaints against Oral Health Professionals (OHPs) are increasing globally, and include breach of confidentiality, failure to obtain valid informed consent, issuing fraudulent medical certificates, claiming for services not rendered and violating regulations governing the dental profession.

South African dentists were most commonly charged with clinical complaints (59%) whilst 29% of dental cases and 46% of dental therapist cases were for fraud.

Aim

To analyse the nature and outcome of malpractice by OHPs as reported by the Health Professions Council of South Africa (HPCSA)

Methods

A cross sectional descriptive survey of the data between 2007–2016.

Results

A total of 118 cases and 198 counts of dental malpractice were identified, predominantly by dentists (74.6%), then specialists (17%) and dental therapists (11%). Males recorded 77.1% of complaints, Gauteng practitioners, 53.4%, and 53.8% were OHPs who had worked for 10 years or more. Approximately a third (37%) of the OHPs had more than one count of malpractice. Mean ages for independent practice were calculated. Fraud, clinical misconduct and unprofessionalism constituted 66.7%, 22.2% and 11.1% of all counts of malpractice respectively, while there were significant differences between the involved dentists and dental therapists.

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ACRONYMS

DOH:	Dental Therapy and Oral Hygiene Board
MDB:	Medical & Dental Board
OHPs:	Oral Health Professionals
PCC:	Professional Conduct Committee

Conclusion

Fraud remains the most serious and ever increasing form of malpractice among Oral Health Professionals.

Keywords

Dental malpractice, HPCSA, misconduct, oral health professional.

INTRODUCTION

Malpractice claims against Oral Health Professionals (OHPs) are on the increase worldwide.¹⁻⁴ Malpractice encompasses breach of confidentiality, failure to obtain valid informed consent, issuing fraudulent medical certificates, claiming for services not rendered and violating regulations governing the dental profession.⁵

The major cause of malpractice is a failure to adhere to norms and standards of the profession, and a failure to achieve the desired therapeutic goals that are commonly accepted and rendered by peer practitioners.²

The literature records considerable variation in clinical malpractice claims lodged against OHPs. In the Netherlands, Turkey, Saudi Arabia, Spain and United States of America (USA), the clinical discipline most frequently implicated is oral surgery.^{3,4,6-8} In contrast, in Kerman province in Iran, the highest number of clinical complaints are in endodontics, followed by prosthodontics, operative dentistry and oral surgery.² According to Postma, et al.⁹ a similar distribution of implicated clinical disciplines was recorded in South Africa (SA).

The study also showed that fraud was the leading form of malpractice laid against dental therapists (46%), and accounted for 29% of malpractice claims laid against dentists.⁹ In most instances potential malpractice suits are settled between OHPs and the patients. In the absence of an amicable solution, patients normally report their complaints to the Health Professions Council of South Africa (HPCSA) or, rarely, lodge a civil malpractice suit.¹⁰

While anecdotal evidence points to a rising incidence of malpractice in SA, there has not been any scientific study in the past 10 years. Hence this project which sets

out to investigate the nature, frequency and outcome of malpractice amongst OHPs as recorded by the HPCSA.

The findings could inform curriculum changes, for example practice management and ethics modules. For the regulator, the findings will serve as evidence during engagement with health professionals.

METHODOLOGY

Study design and sampling

A retrospective cross sectional survey was undertaken on the records of claims of malpractice against OHPs published by the Medical & Dental Board (MDB), and the Dental Therapy & Oral Hygiene Board (DOH) over the period, 2007 - 2016.

These records included all malpractice cases finalised by the Professional Conduct Committee (PCC) of the HPCSA.¹¹⁻¹³ No sampling and sample size determination were undertaken, as all available and complete records were included in this study.

Ethics

Ethical clearance to conduct this study was granted by the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC) (SMUREC/302/2016: PG). Further approval was granted by the HPCSA to access data for this study. Anonymity and confidentiality was observed throughout.

Data collection and data collection tool

A specially designed data abstraction form was utilised to collect data on the (i) demographic profile of the oral health professional; (ii) academic and professional details, (iii) nature, frequency and outcome of malpractice.

Data were sourced from HPCSA databases including registration records and finalised cases, for 2007 - 2016. The nature of malpractice was categorised as clinical and non-clinical, and these categories were recorded as indicated below.

Clinical categories

The clinical categories were classified according to the dental disciplines in which the offence occurred, namely: (i) Operative dentistry (ii) Maxillo-facial and Oral Surgery – this included exodontia complications and failure of implants; (iii) Prosthodontics; (iv) Oral Medicine and Periodontology; (v) Orthodontics and (vi) not specified (no indication of the nature of clinical department).

Non-clinical malpractice complaints

Non-clinical malpractice complaints were categorised as fraud and unprofessionalism.

(a) Fraud

Fraud included all activities bearing monetary benefit to the OHPs such as claiming for services not rendered, employing an unregistered person(s) and practising out of the prescribed scope of practice.

(b) Claiming for services not rendered

Matters related to claiming for services not rendered included, split billing, over-charging, drafting misleading,

inaccurate or incorrect statements to be submitted to Medical Aids. For example, (i) knowingly providing professional cosmetic procedures which are not covered by Medical Aids; (ii) fitting a gold filling and thereafter submitting a claim to the patient's Medical Aid Scheme as a direct restoration. Claiming for services not rendered also included the use of dental practitioner codes either by a dental therapist or by an unregistered person. The use of unlicensed radiographic machines was also included in this category.

(c) Practising out of the prescribed scope of practice

Practising out of the prescribed scope included dental therapists and oral hygienists undertaking surgical, orthodontic and prosthodontic procedures, whilst for dentists the category included performing implant procedures without adequate training.

(d) Unprofessionalism

Unprofessionalism encompassed not acting according to the norms and standards as set out by the profession. Unprofessionalism included poor record keeping, failure to obtain informed consent, poor infection control measures, poor communication, lack of confidentiality, failure to honour patient appointments for follow up treatment, failing to ensure that the patient was attended by another practitioner in your absence, advertising in contravention to the HPCSA guidelines, being in contempt of Council by failing and/or neglecting to respond to Council correspondence and practising whilst not registered or suspended from the HPCSA register.

Statistical analysis

Descriptive and inferential statistical analyses were undertaken using Statistical Package for Social Sciences (SPSS) version 24. Descriptive statistics determined the nature, frequency and outcome of malpractice, as well as enumerating the demographic profiles of the OHPs. Analysis of variance (ANOVA) and Student's *t* test were used to compare the means between groups, as well as to compare the duration of independent practice before the offence was committed, in relation to the profession and gender and the nature of the malpractice. The association between the category of OHPs and the nature of malpractice committed was evaluated using the Chi-square test. The level of statistical significance was set at $p < 0.05$.

RESULTS

The HPCSA received 26,958 complaints for processing during the study period. Excluded from the study were 47.3% ($n=12758$) of the total, constituting cases that did not include OHPs or where information was not forthcoming from the plaintiff.

During this period 19% ($n=5434$) of the complaints were referred to the Ombudsman, 32% ($n=8766$) cases were finalised at the preliminary enquiry stage and 1% ($n=248$) were referred to the Professional Conduct Committee (PCC) which investigated matters concerning OHPs.

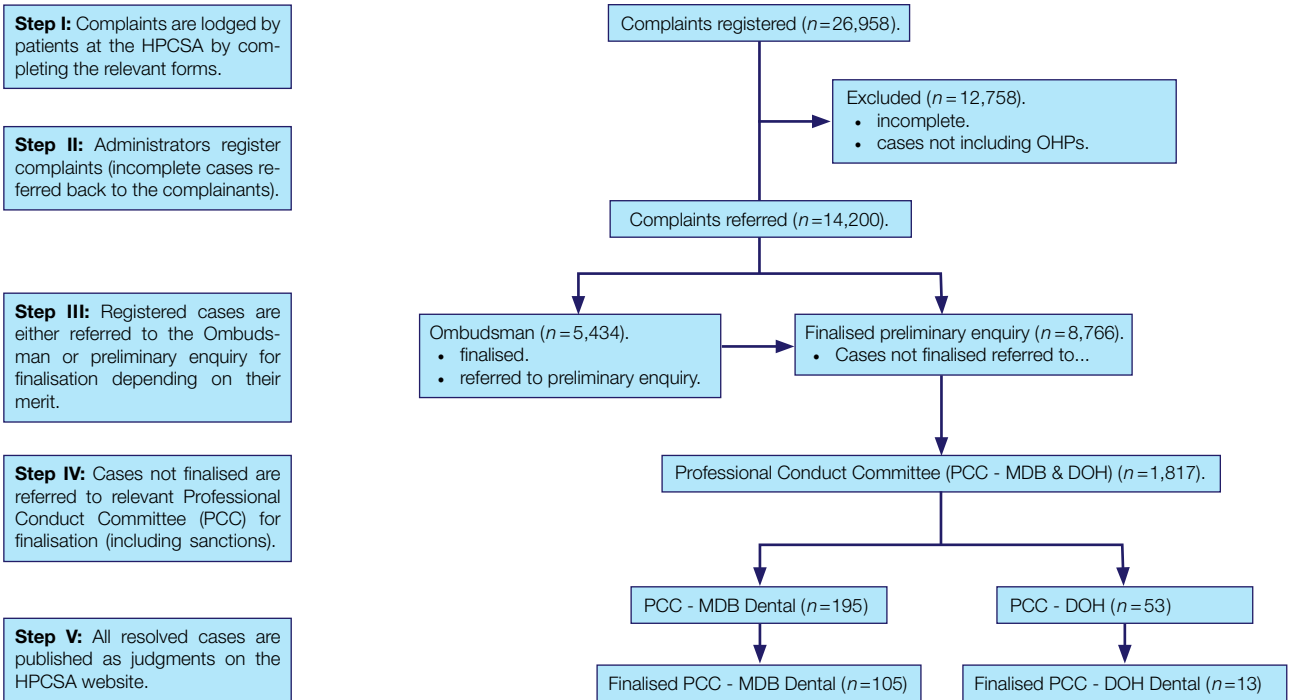


Figure 1. Overview of HPCSA complaints process.

Almost half (118/248) of these cases of dental malpractice were finalised and judgments published from 2007 to 2016 (Figure 1).

For the period 2007- 2016 the incidence of malpractice cases has remained almost constant. The PCC - MDB dental cases peaked from 2010 to 2014 whilst the PCC DOH cases showed a peak starting in 2011 and climaxing in 2014. Guilty verdicts handed down by the PCC - MDB dental showed three peaks namely in 2008, 2012 and 2014. On the other hand, the guilty verdicts delivered by PCC - DOH had a single peak in 2009 (Figure 2).

Descriptive statistics of the participants

The oral health practitioners charged by the HPCSA were predominantly dentists 76% (88/118), followed by dental specialists 14.4% (17/118) and then dental therapists 11% (13/118). Majority practiced in Gauteng province, 53.4% (63/118), were male, 77.1% (91/118), had graduated from Medunsa, (UL) 28.8% (34/118), followed by the University of Pretoria 18.6% (22/118) and the University of the Western Cape 17.8% (21/118). The majority of foreign qualified dentists 93% (13/14) who had been implicated in malpractice were from universities in India.

The mean age at independent practice for dental therapists was 25.8 (SD: 4.9), for dentists 26.9 (SD: 3.9) and for dental specialists, 38.1 (SD: 5.8), these differences were significant at $p=0.000$. However, there were no significant differences in the ages of participants at the time of their first offence ($p=0.234$) (Table 2). Dental therapists entered independent practice comparatively older, but took a shorter time to commit an offence as compared with dentists and dental specialists.

Malpractice

The majority of dentists 69.3% (61/88) and dental specialists, 94.1% (16/17) had one count of malpractice, in comparison with 69.2% (9/13) of the dental therapists who faced two or more counts. These differences were significantly different ($p=0.002$).

Nature and frequency of malpractice

Non-clinical misconduct by OHPs accounted for 77.8% (154/198) of the counts, with fraud and unprofessionalism respectively registering 66.7%, and 11.1% of all counts of malpractice. The nature of malpractice between dentists and dental therapists was statistically different ($p=0.000$) (Table 3).

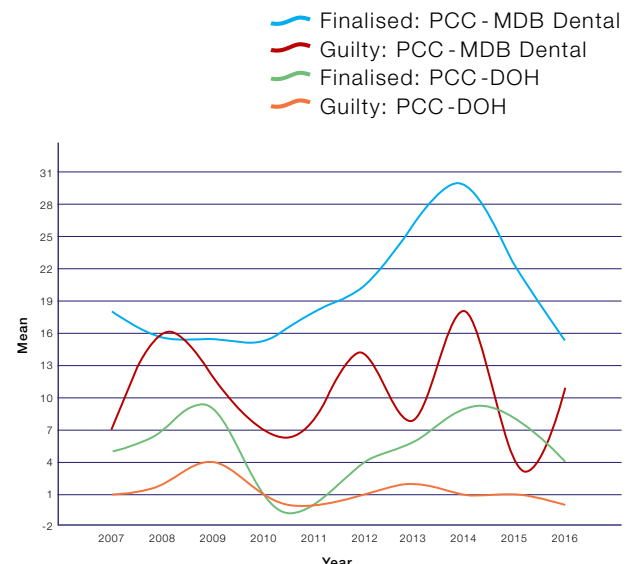


Figure 2. Cases finalised by type and dental professional board.

Table 2. Ages of the oral health professionals

Variable		Profession (%)			ANOVA	
		Dental therapist	Dentists	Dental specialists	F	P value
Age: Independent practice	Mean (SD)	25.8 (4.9)	26.9 (3.9)	38.1 (5.8)	50.459	0.000
	Minimum	20.25 -	20.52 -	31.3 -		
	Maximum	34.57 -	45.47 -	55.8 -		
Age: First offence	Mean (SD)	36.98 (9.2)	41.13 (11.94)	44.36 (9.9)	1.473	0.234
	Minimum	24.72 -	24.09 -	25.83 -		
	Maximum	52.29 -	72.41 -	61.47 -		

Table 3. Nature and frequency of the categories of malpractice complaint.

Variable		PROFESSION (%)			N	
		t	Dentists	Dental specialists	Total	
Clinical	Clinical negligence	0 (≈1)*	38 (26.4)	6 (31.6)	44 (22.2)	
Non Clinical	Fraud	Claiming for services not rendered	30 (85.7)	80 (55.5)	10 (52.6)	120 (60.6)
		Employed unregistered person	- -	5 (3.5)	2 (10.5)	7 (3.5)
		Scope of practice	3 (8.6)	2 (1.4)	- -	5 (2.5)
	Unprofessionalism	2 (5.7)	19 (13.2)	1 (5.3)	22 (11.1)	
Total		35 (100)	144 (100)	19 -	198 (100)	

*0 approximated to 1, for statistical reasons; X² = (14.59, 1, 0.00).

Clinically related complaints

The study shows that the majority [72.7% (32/44)] of the clinically related complaints involved maxillo-facial oral surgery 27.3% (12/44), followed by endodontic therapy and prosthodontics at 22.7% (10/44) each (Table 4).

Table 4. Clinical negligence categories

Clinical negligence categories	N	(%)
Maxillo-facial and oral surgery	12	(27.3)
Endodontics	10	(22.7)
Prosthodontics	10	(22.7)
Operative dentistry	4	(9.1)
Periodontics	3	(6.8)
Orthodontics	2	(4.5)
Not specified	3	(6.8)
Total	44	(100)

The preponderant complaint in Maxillo-facial and Oral Surgery: was poor pre-surgical planning resulting in implants being placed in the incorrect position thereby compromising the final prosthodontic rehabilitation of the patient. For example, implants which should be placed on the alveolar ridge were positioned too high up under the lip in the gingival tissue, which is not appropriate for the necessary mechanical and biological seals. Following these complications, dentists also failed to adequately manage and to appropriately refer these patients.

Complications that arose during exodontia procedures included poor management of ankylosed teeth, broken or fractures roots, lingual nerve damage and oro-antral opening.

Endodontic therapy complaints referred mainly to the following transgressions: Failure to diagnose root perforation during the performance of a root canal treatment on the patient; failure to diagnose surgical emphysema, using unknown mixtures in a tooth as root canal medicament, failure to take post-operative radiographs and omitting to inform the patient of a fractured endodontic file.

Prosthodontic failure referred mainly to: poor clinical planning and execution of prosthodontic treatment such as delivering poorly fitting dentures of poor quality and/or workmanship, failure to achieve proper occlusion, and constructing an over-denture resulting in the loss of vitality of teeth and/or abscess.

Operative Dentistry complaints related to: poor clinical judgement when performing restorative procedures, e.g. not checking occlusion, incorrect bites.

Oral Medicine and Periodontology complaints referred to: failed surgical procedures such as gingivectomy not meeting the aesthetic needs of the patient.

Orthodontic complaints referred to: refusal to remove patient's orthodontic appliance.

Unspecified clinical complaints included: Failure to provide emergency treatment to the patient, performing complex operations which the practitioner was not sufficiently skilled to undertake and/or neglecting to refer the patient to a specialist.

Duration before committing offence

The mean time elapsed after commencing practice before a first offence was committed varied from 14.58 years (SD11.36) for dentists, 9.01 years (SD 7.4) for dental specialists to 11.22 years (SD 7.49) for dental therapists. There were no significance differences in these time periods (p=0.113). However, there was a significance difference between the duration of times for the genders (p=0.030) (Table 5).

Outcome of malpractice disciplinary hearing

Only 3.4% (4/118) practitioners were acquitted of malpractice. One case was closed due to the OHP being medically incapacitated. Penalties meted out to guilty practitioners included fines 49.2% (58/118), suspension 28.8% (34/118), caution 8.5% (10/118) or a combination of the penalties 13.6% (16/118).

Table 5. Period before committing an offence.

		N (109)*	Mean (SD)	ANOVA/T test	
				F	P-value
Profession	Dental therapists	12	11.20 (8.22)	2.22	0.113
	Dentists	80	14.58 (11.36)		
	Dental specialist	17	9.01 (7.49)		
Nature of malpractice	Clinical	43	13.23 (11.18)	1.18	0.312
	Fraud	57	12.6 (9.94)		
	Unprofessionalism	9	18.47 (12.64)		
Gender	Female	25	9.3 (5.5)	4.83	0.030*‡
	Male	84	14.55 (11.55)		

* indicates smaller denominator
‡T test

The PPC - MDB also recommended the following: (i) attendance at a post graduate fixed prosthodontic course for one OHP and (ii) attendance at a course in Ethics for two OHPs. The duration of suspension ranged from 30 months to five years, with a significant majority (68.2%), suspended for a year or more. The fines imposed ranged between R1,000 and R125,000 (mean of R13,147.06).

DISCUSSION

The discussion provides an overview of the nature, frequency and outcome of malpractice claims by patients (as processed by the HPCSA) against OHPs.

Non-clinical malpractice

This study indicates a gradual rise in reported cases of malpractice against OHP, which confirms a reported global phenomenon.¹⁻⁴ The study revealed that non-clinical malpractice accounts for 77.8% of all reported cases, of which fraud was 66.7% and unprofessionalism, 11.1%.

Compared with findings by Postma, et al., cases of fraud, at 32.5%, have more than doubled from 2007 to 2016.⁹ Similarly, clinical misconduct by OHPs are on the rise globally.^{1-4,9,10,14-16}

The apparent spate of malpractice in South Africa may be attributed in part to a greater tendency of patients to report incidents as they become more empowered and knowledgeable. Other reasons for the increase could be attributed to (i) the reduction in dental benefits by third party funders; (ii) closing down or consolidation of medical schemes; (iii) increasing operational costs of running a dental practice and (iv) competition in a shrinking market.^{17,18}

Consistent with most global studies,^{2,3,8,10,14} but contrary to the Israeli study,¹⁵ middle aged males were most likely to engage in malpractice. Similarly, a majority of practitioners in metropolitan cities of Gauteng province were implicated. The high costs of living in metros fuels competition for scarce resources among OHPs.

This phenomenon is likely to encourage fraud and other forms of malpractice. These pressures are most observable among the males and middle aged OHPs. It was further observed that dental therapists committed exclusively non-clinical malpractice. This could be attributed to their limited scope of practice, and inexplicably low tariffs set for dentistry by medical insurance schemes.

Clinical malpractice

Clinical malpractice accounted for 22.2% of all counts of misconduct, involving, in a majority of cases, maxillo-facial and oral surgery 27.3% (12/44), endodontic therapy 22.7% (10/44) and prosthodontics 22.7% (10/44). This finding is consistent with data from the USA, Netherlands and Saudi Arabia.^{3,4,6-8} but contrary to that from Iran.¹⁰

The implicated clinical disciplines are characterised as being complex and highly technical, thereby requiring extensive clinical time and clinical skills.⁷ It is hence plausible to expect complications when these procedures are undertaken.

Outcome and penalty of the malpractice

Very few practitioners [3.4% (4/118)] were acquitted of malpractice by the HPCSA. The low rates of exoneration indicate the robustness of the internal processes at the preliminary stages. This process ensures that only serious cases meriting full investigation are referred to the practice conduct committees (PCC - MDB and PCC - DOH).

The HPCSA suspended 28.8% OHPs for varying duration of times, compared with small numbers in Iran (0.2%).¹⁰ This disparity in suspension rates is attributed to the nature of misconduct committed.

South African OHPs engage in fraud, which is regarded as serious, unethical and unprofessional, while Iranian practitioners tend to commit clinical misconduct that is not prosecutable if it is judged not negligent.

The results indicate extreme variation in the fines imposed on OHPs. The mean amount payable to the HPCSA was R13 147.06, with fines ranging between R1000 and R125 000.

This is consistent with the literature, which recorded a mean payment of \$2230 and a maximum of \$13,000¹⁰; and between €18,001 and €240,000.¹⁹ The variation can be attributed to the nature and severity of the offences.

CONCLUSIONS

Non-clinical malpractice is on the increase and this is reflective of the volatile environment under which OHPs are practising in South Africa.

Recommendations

There should be strong emphasis on ethics and practice management in order to capacitate OHPs to adhere to the Professional Code of Conduct. Relevant curricula and CPD courses must be developed to achieve this outcome.

To mitigate complication associated with complex procedures, it is imperative for OHPs to upskill, to invest in new technologies and to respect the patient's wishes and expectations. It is further recommended that an in-depth study be undertaken to explore factors that contribute to the increase in malpractice.

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4.

Cephalometric analysis: manual tracing of a lateral cephalogram

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P Hlongwa

ABSTRACT

Cephalometric analysis remains a preferred tool in the diagnosis and treatment planning of orthodontic and of orthognathic surgical cases. A cephalometric tracing can be prepared and analysed manually or by a computer using cephalometric tracing software.

A number of software programmes on cephalometric analyses have been introduced but their widespread use has been restricted by cost factors, especially in situations having a constraint on resources. This report will give a step-by-step procedure to enable the identification of cephalometric points and planes used in orthodontic diagnosis and treatment planning and to facilitate the manual tracing of a lateral cephalogram.

INTRODUCTION

Cephalometrics ...literally "head measuring"... is the recording and interpretation of measurements of the skull made on standardized radiographs of the living head.

Since the introduction of cephalometry by Broadbent and Hofrath in the 1930s,^{1,2} the cephalometric technique has been regarded as a most important tool for orthodontists and maxillo-facial surgeons engaged in studying dental malocclusions and the underlying skeletal discrepancies.

Applications for cephalometric analysis include case diagnosis, treatment planning, prediction of growth and the evaluation of treatment results.³ Manual tracing of cephalometric films is performed by identifying radiographic landmarks on acetate overlays and using these reference points to construct lines, planes and angles to enable the measurement of linear and angular values, using a millimetre scale and a protractor.

This manual process can be time-consuming and the measurements obtained may be subject to error. Whilst advances in computer science have led to the widespread application of computers in cephalometry,⁴ offering enhanced accuracy, nevertheless, the skills of manual analysis are still required.

AIMS AND OBJECTIVES

To enable the manual tracing of a cephalogram showing a true lateral view of the skull, and the identification of many of the cephalometric points and planes used in orthodontic diagnosis and treatment planning.

MATERIALS AND METHODS

Materials required for manual cephalometric tracing

- Acetate tracing paper: a sheet 210 mm x 160 mm.
- Viewing box
- Protractor
- 300 mm ruler
- Tracing template
- Adhesive tape
- Eraser
- HB lead pencil
- 4H lead pencil
- Blue, red and green coloured pencils

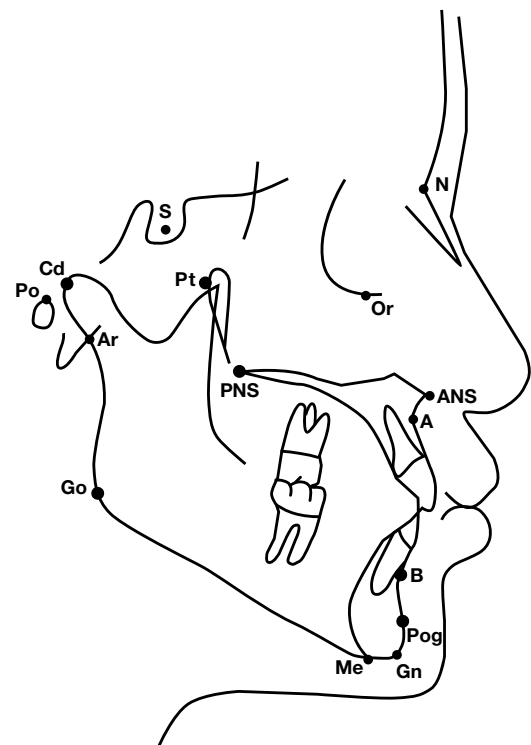


Figure 1. Cephalometric hard tissue landmarks: S - Sella; N - Nasion; Po - Porion; Cd - Condylion; Pt - Pterygomaxillary fissure; Or - Orbitale; Ar - Articulare; PNS - Posterior nasal spine; ANS - Anterior nasal spine; A - A point; B - B point; Pog - Pogonion; Gn - Gnathion; Me - Menton; Go - Gonion.

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Step-by step procedure

Step 1: Aligning the tracing paper on the lateral cephalogram radiograph

- 1.1. Draw two crosses about 3 cm apart on the top left hand corner of the radiograph.
- 1.2. Overlay the sheet of acetate tracing paper on the radiograph and attach the top edge with adhesive tape.
- 1.3. Trace the crosses onto the tracing paper for ease of subsequent superimposition of the tracing.
- 1.4. Write the patient's name, age and date of radiograph above the crosses on the tracing paper.

Step 2: Identify and trace hard tissue (HT) structures and identify the following hard tissue landmarks (Fig. 1)

- 2.1. Trace the cranial base.
- 2.2. Trace upper and lower central incisors, following the correct long axes.
- 2.3. Trace upper and lower first permanent molars in relationship to each other.
- 2.4. Trace the mandible and maxilla.
- 2.5. Sella (**S**): Mid-point of sella turcica.
- 2.6. Nasion (**N**): Junction of frontonasal suture.
- 2.7. Porion (**Po**): Top of external auditory meatus.
- 2.8. Orbitale (**Or**): Inferior border of orbit.
- 2.9. Pterygomaxillary fissure (**Pt**): most posterior and superior point on the outline of the pterygomaxillary fissure.
- 2.10. Condylion (**Cd**): Most superior point on the head of the condyle.
- 2.11. Articulare (**Ar**): a point on the posterior border of the ramus at the intersection with the basilar portion of the occipital bone.
- 2.12. Posterior nasal spine (**PNS**): Posterior point of bony hard palate.
- 2.13. Anterior nasal spine (**ANS**): Anterior point of maxilla.
- 2.14. **A**-point: Deepest point on the maxilla below ANS.
- 2.15. **B**-point: Most posterior point on the bony curve of the mandible above pogonion.
- 2.16. Pogonion (**Pog**): Most anterior point of bony chin.
- 2.17. Gonion (**Go**): Most posterior and inferior point on the outline of the angle of the mandible.
- 2.18. Gnathion (**Gn**): Most antero-inferior point on the bony chin.
- 2.19. Menton (**Me**): Lowest point on the symphysis of the mandible.

Step 3: Identify the soft tissue (ST) outlines and the following landmarks (Fig. 2)

- 3.1. Trace the soft tissue outline.
- 3.2. Soft tissue Glabella (**G'**) Most prominent point in the sagittal plane between the supraorbital ridges.
- 3.3. Soft tissue Nasion (**N'**) Deepest part of the soft tissue outline in front of Nasion.
- 3.4. Tip of Nose (**P**) - Pronasale.
- 3.5. Subnasale (**Sn**) Junction of nasal septum and upper lip in mid-sagittal plane.
- 3.6. Soft tissue A-point (**SLS**) Deepest midline point on outline of the Superior labial sulcus.
- 3.7. Labialis Superior (**Ls**) Most anterior point on outline of upper lip (vermillion border).
- 3.8. Stomium Superior (**Stms**) Lowest midline point on outline of upper lip.
- 3.9. Stomium Inferior (**Stmi**) Highest midline point on outline of lower lip.

- 3.10. Labialis Inferior (**Li**) - Most anterior point on outline of the lower lip (vermillion border).
- 3.11. Soft tissue B-point (**ILS**) Deepest midline point on outline of the Inferior labial sulcus.
- 3.12. Soft tissue Pogonion (**Pog'**) Most anterior point on outline of ST chin.
- 3.13. Soft tissue Menton (**Me'**) Lowest point on outline of soft tissue chin.

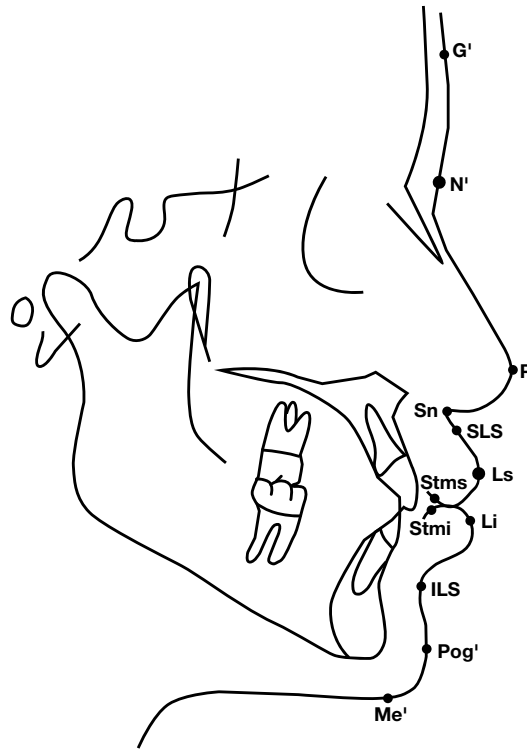


Figure 2. Cephalometric soft tissue landmarks: **G'** - Soft tissue Glabella; **N'** - Soft tissue Nasion; **P** - Pronasale; **Sn** - Subnasale; **SLS** - Soft tissue A point; **Ls** - Labialis superior; **Stms** - Stomium superior; **Stmi** - Stomium inferior; **Li** - Labialis inferior; **ILS** - Soft tissue B point; **Pog'** - Soft tissue Pogonion; **Me'** - Soft tissue Menton.

Step 4: Connect the following landmarks (Fig. 3)

- 4.1. Sella and Nasion – **SN** line.⁵
- 4.2. Porion and Orbitale (Frankfurt Horizontal plane – **FH**).³
- 4.3. Mesiobuccal cusp of maxillary first molar and cusp of the first premolar – (Occlusal plane).⁵
- 4.4. Straight line through Gnathion(**Gn**) and Gonion (**Go**) [**MP** - Mandibular plane].³
- 4.5. Sella and Gnathion (**Y**-axis).⁵
- 4.6. Nasion and A-point (**NA**-line).³
- 4.7. Nasion and B-point (**NB**-line).³
- 4.8. Nasion and Pogonion (**N-Pog**).^{3,5}
- 4.9. A-point and Pogonion (**APo**-line).⁶
- 4.10. Erect perpendicular lines from A point and B point to the Occlusal Plane. (Wits- lines).⁷
- 4.11. Draw short lines through the long axes of the upper and lower incisors, crossing NA (upper) and NB (lower).³
- 4.12. Draw a line perpendicular to FH line in front of the profile. Three lines are then drawn at 90° to this line from, respectively, Nasion, ANS and Menton.⁸
- 4.13. Connect soft tissue Pogonion and soft tissue Nasion, as well as soft tissue Pogonion and Labialis Inferius (H- angle).⁸

Step 5: Measure the following angles (Figures 3 and 4).

- 5.1. Angle between SN line and FH line.⁵
- 5.2. Angle between SN line and Occlusal plane.⁵
- 5.3. Angle between SN line and Mandibular plane.³
- 5.4. Angle between FH line and Sella – Gnathion (Y-axis).⁵
- 5.5. Angle between SN and NA line (SNA°).³
- 5.6. Angle between SN line and NB line (SNB°).³
- 5.7. Difference between SNA and $SNB = (ANB^\circ)$.³
- 5.8. Angle between FH and NPog line (Facial angle).^{3,5}
- 5.9. Angle between long axis of U1 and NA line.³
- 5.10. Angle between long axis of L1 and NB line.³
- 5.11. Angle between long axis of U1 and L1 (Intercisal angle).^{3,5}
- 5.12. Total facial angle (TFA) – G'-P-Pog': Angle formed by the intersection of the line soft tissue glabella-pronasale and the extended line soft tissue pogonion-pronasale to form the contained angle for measurement.⁸⁻¹⁰
- 5.13. Soft tissue angle of convexity (AC)–G'-Sn-Pog'- Angle formed by the intersection of lines subnasale- glabella and pogonion-subnasale extended (measured at the upper contained angle).⁸
- 5.14. Soft tissue facial angle (STFA) – N'-Pog' and FH: Angle formed by the intersection of the line soft tissue pogonion-soft tissue nasion and the Frankfort Horizontal plane, measured as the lower contained angle.⁸
- 5.15. Merrifield's Z angle (ZA) – Pog' to most protrusive lip, extended to FH: the angle between the "profile line" and the Frankfort horizontal plane.¹¹
- 5.16. Nasolabial angle (NA) – Cm-Sn-Ls: Angle between the intersection of lines tangent to the columella and upper lip.⁸⁻¹⁰
- 5.17. Pogonion-labial angle (PLA) – Li-ILS-Pog': Angle between the intersection of the line labialis inferior to inferior labial sulcus and a line tangent to the soft tissue pogonion, passing through labialis inferior.^{9,10}
- 5.18. Pogonion-menton angle (PMA) – Pog'-Me': Angle between the intersection of lines tangent to the soft tissue pogonion and soft tissue menton.^{9,10}
- 5.19. Holdaway angle (HA): Angle formed between the soft tissue facial plane line (soft tissue nasion-soft tissue pogonion) and the H line⁸ (soft tissue pogonion to labialis inferior).

Step 6: Measure the following linear measurements (mm) (Fig 3)

- 6.1. SN length.¹²
- 6.2. NB line to A-point (Convexity).⁶
- 6.3. Most anterior point of labial U1 to NA-line.³
- 6.4. Most anterior point of labial L1 to NB-line.³
- 6.5. APog-line to incisal edge of L1.³
- 6.6. Distance between A and B perpendicular points on the occlusal plane (Wits analysis).⁷
- 6.7. Upper lip length (ULL): Discrepancy in the vertical dimension, extent of upper incisor visibility in resting position.⁹ (upper stomium to ST subnasale).
- 6.8. Lower lip length (LLL): Discrepancy in the vertical dimension, extent of the lower lip curl, presence or absence of labio-mental fold.⁹ (lower stomium to ST pogonion).
- 6.9. Upper lip prominence (ULP-NB line): Protrusive/retrusive upper lip relative to the NB Line.⁹

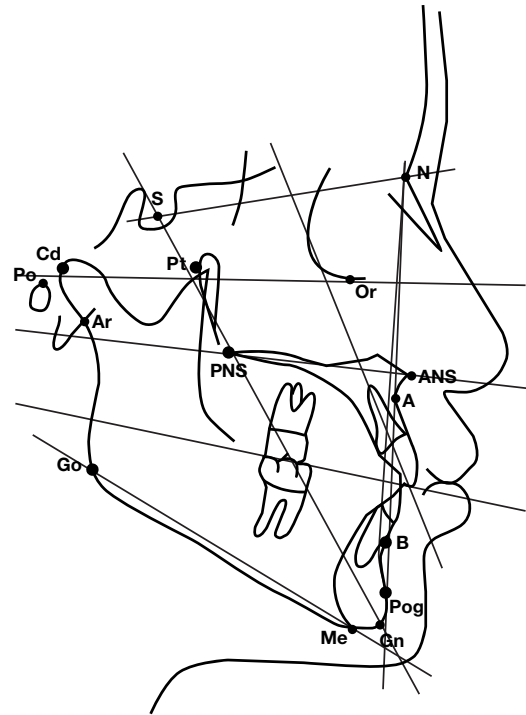


Figure 3. Cephalometric tracing: lines are constructed to join the landmarks for analysis of angular relationships.

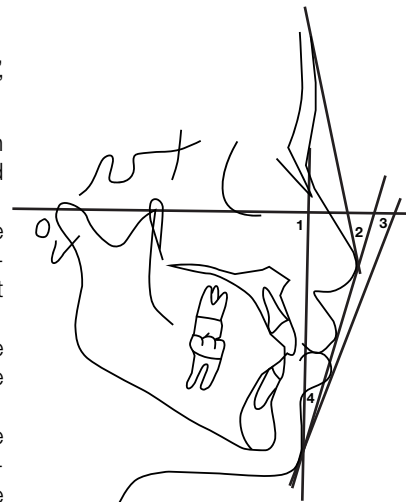


Fig. 4 (a)

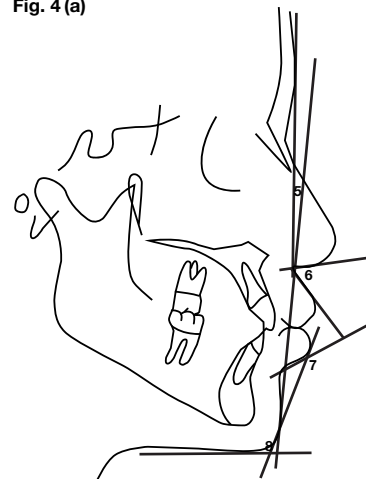


Fig. 4 (b)

Figure 4. Soft tissue angles: (a) 1 - Soft tissue facial angle; 2 - Total facial angle; 3 - Z angle; 4 - Holdaway angle; (b) 5 - Soft tissue angle of convexity; 6 - Nasolabial angle; 7 - Pogonion-labial angle; 8 - Pogonion-menton angle.

- 6.10. Lower lip prominence (LLP-NB line): Protrusive/retrusive lower lip relative to the NB Line.⁹
- 6.11. Lower lip position (LLP-H): Retruded or protruded lower lip relative to H line.⁹
- 6.12. Interlabial gap (ILG): The space between the upper and lower lips when they are relaxed, with the head in a normal upright position and the teeth in centric relation.⁸⁻¹⁰
- 6.13. Hard tissue pogonion to soft tissue pogonion (Pog-Pog'): Soft tissue thickness measured between the hard tissue pogonion and soft tissue pogonion.⁹
- 6.14. Hard tissue menton to soft tissue menton (Me-Me'): Soft tissue thickness measured between the hard tissue menton and soft tissue menton.⁹
- 6.15. Measure distance between upper facial height (Nasion to ANS) and lower facial height ANS to Menton).⁹
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Step 7: Place your values in the table on p393 (Table 1) and analyze your findings

DISCUSSION

Six steps have been presented in the manual completion of a cephalometric tracing. This tracing incorporates a number of cephalometric analyses.^{3,5-12} By comparison of angular measurements with reference norm³ values the clinician will interpret the results of the analysis to give a diagnosis of the presenting dento-skeletal soft tissue pattern. Comparison of the findings of the pre-treatment and post-treatment measurements will allow the clinician to assess the outcome of treatment.

CONCLUSION

Manual cephalometric tracing still has a role to play in orthodontic diagnosis as well as in undergraduate and postgraduate teaching and training in Orthodontics. Jackson et al.¹³ reported a high reproducibility of landmarks and measurements for both hand-tracing and digitized cephalometry. In financially constrained situations where computer cephalometric software is not affordable, manual tracing is still a useful tool. A cephalometric analysis template is proposed for easy documentation of the cephalometric measurements.

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Age estimation of the skeletal remains of a child

SADJ July 2019, Vol. 74 No. 6 p323 - p324

VM Phillips

CASE REPORT

I was requested by the Forensic Science Laboratory in Platteklouf, Cape Town, to examine the skull of juvenile skeletal remains which had been recovered in Graaf Reinet, Eastern Cape. The skull was delivered to me at the Oral Health Centre of the University of the Western Cape and receipt was signed to maintain the chain of evidence.

The skull and lower jaw of the child were skeletonized with no residual soft tissues. The mandible was fractured in the mid-line. There was a depressed fracture of the posterior skull (Figure 1). The mandibular segments were cemented with cyanoacrylate cement (Super-glue) to facilitate dental radiography (Figure 2).

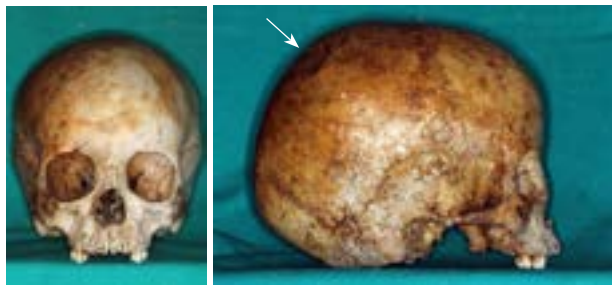


Figure 1. Frontal and lateral views of the skull of the child showing the mixed ethnic, predominantly Negroid, characteristics. The depressed fracture of the skull indicated (arrow).

Non-metric analysis of the skull of the child revealed mixed ethnic origin; with predominantly Negroid features (Fig. 1).



Figure 2. The maxilla and mandible, showing the loss of the deciduous front teeth and the underlying erupting permanent teeth, the post mortem loss of the left mandibular deciduous second molar (75) and the first permanent molar (36). The mandibular fracture is indicated (arrow).

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The maxilla showed the loss of the deciduous incisors and canines with underlying and erupting permanent teeth. Both the mandible and maxilla had partially erupted first permanent molars present, apart from the 36. The lower lateral incisors were starting to erupt lingually in the dental arch. There was a fracture of the anterior mandible in the region of right first incisor tooth and this tooth was missing (Fig. 2).

Periapical dental radiographs were taken of all the teeth in the upper and lower jaws (Fig. 3). These radiographic images were used in the determination of the dental developmental ages of the permanent mandibular teeth and thereby the estimated age of the child, using the Age Related Tables for South African children and juveniles (Table 1) (Tygerberg sample, Phillips 2009).¹

The table shows the mean age at which the particular stage of calcification is visible, with the standard deviation in brackets. The Ac stage is omitted for age estimation. Only teeth that have not fully developed are used to estimate the age of the individual.

RESULTS

The calculation of the dental age is shown in the Table 2.

The estimated dental age of the child was calculated from the averages of the developmental ages of the teeth in the mandible.

Age calculation

The sum of the average developmental ages for seven permanent teeth in the mandible was calculated and the mean determined:

Central incisor	I1	= 5.37 years
Lateral incisor	I2	= 5.27 years
Canine	C	= 5.30 years
Premolar 1	Pm1	= 5.16 years
Premolar 2	Pm2	= 5.30 years
Molar 1	M1	= 5.45 years
Molar 2	M2	= 5.42 years
Average estimated age		= 5.32 years

CONCLUSION

The skull and mandible of the child were assessed as being of mixed ethnic origin (mainly Negroid).

The dental age estimation of the child was 5.32 years (5 years 4 months) [SD = 6 months].

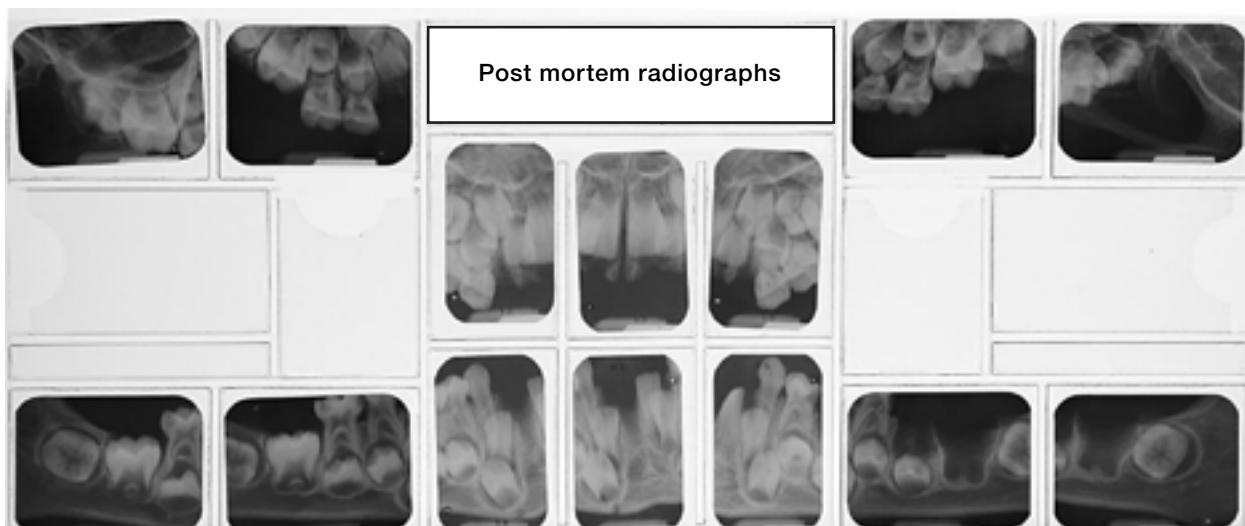


Figure 3. Full mouth periapical dental radiographs of teeth showing the various stages of calcification of the developing permanent teeth. The lower left permanent first molar is absent, due to post mortem desiccation of the tissues.

Table 1. Dental age related table for Tygerberg children (SD in years) (n = 1006).²

	I1	I2	C	Pm1	Pm2	M1	M2	M3
Fi								
F					4.44 (0.85)			8.85 (1.39)
Ci					4.74 (1.06)		4.13 (0.64)	9.29 (1.16)
Cco					4.97 (0.74)		4.74 (1.47)	10.40 (1.34)
Coc				3.26	4.78 (1.00)		4.75 (0.53)	10.98 (1.05)
Cr1/2			4.14	4.65 (0.65)	5.30 (0.80)		5.42 (0.82)	12.08 (1.12)
Cr3/4		3.96 (0.27)	4.70 (0.75)	5.16 (0.72)	6.21 (0.74)	3.26	6.28 (0.81)	12.62 (1.38)
Crc	4.06 (0.36)	4.74 (0.78)	5.30 (0.94)	6.29 (0.95)	7.39 (0.88)	4.04 (0.24)	7.56 (1.00)	13.38 (1.24)
Ri	4.53 (0.61)	5.27 (0.70)	6.11 (0.81)	7.13 (0.87)	8.23 (0.90)		8.29 (0.76)	14.18 (1.44)
Cli						4.70 (0.92)	8.77 (0.95)	15.09 (1.09)
R1/4	5.37 (0.65)	6.02 (0.60)	7.42 (0.94)	8.26 (0.90)	9.14 (1.17)	5.45 (0.86)	10.04 (1.00)	15.24 (0.96)
R1/2	6.07 (0.54)	6.78 (0.88)	8.52 (1.03)	9.63 (1.06)	10.45 (1.04)	6.25 (0.55)	11.05 (1.01)	
R3/4	6.89 (0.93)	7.35 (0.66)	10.00 (1.17)	10.50 (1.01)	11.09 (1.15)	7.25 (0.77)	11.73 (0.77)	
Rc	7.25 (0.58)	8.08 (0.70)	11.23 (1.10)	11.41 (0.83)	12.06 (1.02)	8.05 (0.76)	12.60 (0.91)	
A1/2	8.02 (0.68)	8.76 (0.78)	12.14 (0.96)	12.14 (0.77)	12.72 (1.16)	9.10 (0.85)	14.04 (1.06)	
Ac								

Table 2. Calculation of the dental age of the child from the dental age related table for Tygerberg children in years.²

	I1	I2	C	Pm1	Pm2	M1	M2	M3
Fi								
F								
Ci								
Cco								
Coc								
Cr1/2					5.30		5.42	
Cr3/4				5.16				
Crc			5.30					
Ri		5.27						
Cli								
R1/4	5.37					5.45		
R1/2								
R3/4								
Rc								
A1/2								
Ac								

The stages of development of the mandibular permanent teeth determined from the radiographic images of the child's teeth. The average estimated age (in years) for each tooth is indicated.

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Endodontic management of an unidentified foreign body in a maxillary central incisor of a HIV-positive patient

SADJ July 2019, Vol. 74 No. 6 p325 - p328

CH Jonker¹, PJ van der Vyver²

SUMMARY

The Human Immunodeficiency Virus (HIV) has been a focal point of investigation over the last few years. Consideration of endodontic treatment in an HIV-positive patient needs a calculated approach as the choice of materials and chemicals may influence the final result. A recent investigation showed that cases presenting with pre-operative pathology during examinations have a significantly lower prognosis after treatment. This clinical case report discusses the treatment approach of an upper left central incisor of an HIV-positive patient. The treatment approach and the outcome after a fifteen-month follow-up period are outlined.

INTRODUCTION

Foreign bodies are sometimes lodged inside the root canal system of teeth and can be fortuitously discovered during dental examinations. In reported cases, children are among the patients more often affected by this phenomenon.¹ The reality is that these foreign bodies are not sterile and act as a potential breeding ground for organisms, which have the ability to cause infections and complications in the future.¹

Once a foreign body is present inside a root canal system, proper root canal treatment can be compromised due to instrumentation difficulties and obstruction within the path of cleaning and shaping. Once those processes are affected and the root canal system only partially disinfected, the outcome of endodontic treatment can be unpredictable.¹ The Human Immunodeficiency Virus (HIV) has been a focal point of investigation over the last few years and the development of highly active antiretroviral treatment (HAART) has altered the status of the disease to that of a chronic medical condition.

ACRONYMS

HIV:	Human Immunodeficiency Virus
HAART:	Highly Active Antiretroviral Treatment
MTA:	Mineral Trioxide Aggregate
DOM:	Dental Operating Microscope
CEJ:	Cemento-Enamel Junction

The introduction of HAART therapy has also reduced the morbidity associated with the disease.² According to the available literature, endodontic prognosis in HIV-positive patients is determined by a single important factor, namely the presence of a pre-operative lesion.³ Aminoshariae et al. (2017)³ report in a very recent publication that cases presenting with pre-operative lesions during examination have a significantly lower prognosis. In these cases the presence of systemic disease (HIV) may play a substantial role.

Consideration of endodontic treatment in an HIV-positive patient needs a calculated approach as the choice of materials and chemicals may influence the final result. The use of Mineral trioxide aggregate (MTA) has been advocated as a very good material for the creation of an apical barrier during endodontic treatment due to its numerous advantages.⁴

The material has the unique ability to form apatite-like interfacial deposits during its maturation phase and will possibly fill voids that are present during obturation.⁵ These interfacial deposits may be responsible for the superior seal created by MTA if it is used as a regular obturation material for the repair of perforations.⁵

The case presented reports on endodontic management of a tooth affected by a foreign body in an HIV-positive patient.

CASE REPORT

Visit 1

A 13-year old female patient attended Sefako Makgatho Oral Health Centre for continuation of endodontic treatment of the upper left central incisor. Medical examination revealed that the patient was HIV-positive and on anti-retroviral drug therapy. Dental examination determined that emergency root canal treatment had been attempted approximately one year previously. The temporary restoration was lost soon after the visit, but the patient did not attend further appointments and endodontic treat-

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ment was not completed. The tooth was sealed at home by placing cotton pledgets into the access cavity. The pre-operative radiograph (Figure 1) revealed a large periapical lesion and a foreign object in the apical third.

Treatment consent was obtained before local anaesthetic was administered and the tooth irrigated under strict rubber dam isolation. Large amounts of cotton pledgets were removed from the root canal under examination using the Dental Operating Microscope (DOM) (Carl Zeiss, Oberkochen, Germany).

Length determination was done using an electronic apex locator. Due to previous attempts to clean and shape the canal, no glide path was indicated. The WaveOne Gold Large reciprocating instrument (45/05) (Dentsply Sirona, Ballaigues, Switzerland) was used for canal preparation and it was noted that the apex was wide open. It was decided to pack MTA (Dentsply Sirona, Ballaigues, Switzerland) in order to close the open apex.

The canal was dried with large paper points and calcium hydroxide placed in the canal (Calasept Plus, Nordiska Dental, Sweden) before the access cavity was closed with Ketac Molar (3M ESPE, Seefeld, Germany).

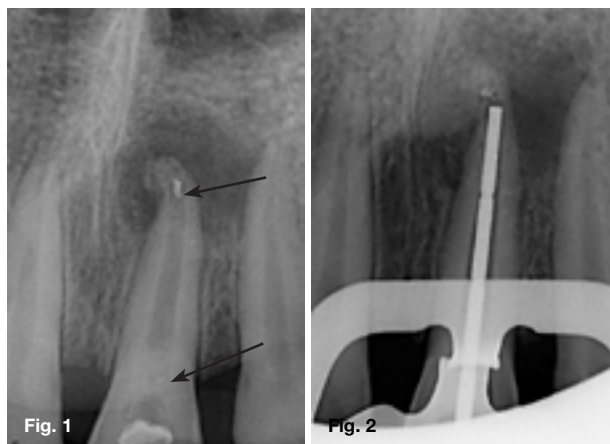


Figure 1. Pre-operative periapical radiograph illustrating foreign object in the maxillary central incisor. Note the large periapical area around the root tip.

Figure 2. Periapical radiograph confirming the fit of a Machtou plugger (Dentsply Sirona). Note that the foreign object moved apically into the periapical tissue.



Figure 3. Periapical radiograph showing the apical MTA plug and foreign body at the apex of the tooth.

Figure 4. Completed obturation of root canal system.

The patient was re-scheduled for completion of the treatment on a subsequent visit approximately four weeks later. A request was also made to obtain the latest blood results reporting a CD4 count and HIV viral load.

Visit 2

The patient reported no discomfort since the previous visit. Blood tests showed the following information:

1. CD45 + White Cell Count of $4.12 \times 10^9/L$;
2. CD4% 42.78%;
3. Absolute CD4 count of 976 cells/uL;
4. HIV viral load of lower than detectable limit.

The temporary restoration and cotton were removed. SmearClear, a 17% EDTA solution (Dental Discounts, Rivonia, South Africa) was used as a chelating agent in an effort to remove the smear layer.

The tooth was carefully irrigated with 3.5% sodium hypochlorite using the EndoActivator (Dentsply Sirona, Ballaigues, Switzerland) to activate the solution. No drainage was noted from the root canal space.

The fit of a Machtou plugger (Dentsply Sirona, Ballaigues, Switzerland) (Figure 2) was confirmed radiographically but it can be noted that the foreign object moved apically into the periapical tissue. The decision was made to leave the foreign object *in situ*, to incorporate it into the obturation material and to place the tooth under observation. An apical plug of approximately 5mm was created (Figure 3) and the remaining root canal was obturated using BioRoot RCS sealer (Septodont, Saint-Maur-des-Fosses, France) and heated gutta-percha (Obtura Spartan Endodontics, Algonquin, IL, USA).

The heated gutta-percha was placed in small increments and gently vertically compacted using Machtou pluggers and slight apical pressure. The final obturation was sealed with a glass-ionomer base (Vitrebond, 3M ESPE) at the level of the cemento-enamel junction (CEJ) and a semi-permanent restoration was placed for observation (Figure 4).

Follow-up visits

At a follow-up visit four weeks later the patient reported no discomfort. The decision was made to review the case again in six months. During this visit the patient was symptom-free with no visible swelling or mobility of the tooth. A periapical radiograph revealed early signs of bone regeneration (Figure 5). The patient was informed that apical surgery might be needed in the future if any foreign body reaction occurs or healing is incomplete. The next follow-up visit was scheduled for three months' time.

The patient was seen again at a nine-month follow-up visit and reported no discomfort. No mobility or swelling was noted. A periapical radiograph revealed good healing of the periapical pathology (Figure 6). The decision was made to schedule a further follow-up in six months to evaluate the healing process. The patient had no discomfort and the coronal restoration was intact.

A periapical radiograph was taken and it was noted that the periapical radiolucency has increased in size compared with the nine month follow-up periapical radiograph (Figure 7). There was also no history of trauma or untoward complications since the last visit.

The patient and parents were informed that healing was unsatisfactory and that a surgical procedure would be required to remove any foreign objects and investigate the apical region.

DISCUSSION

Root canals or pulp chambers can be obstructed by a number of foreign materials, which include endodontic files and obturation materials as well as foreign objects lodged inside a tooth by the patient him/herself.¹ Objects include pencil leads, darning needles, metal screws and many other items.⁶⁻⁸ In the case described it was not possible to determine the nature of the object and the patient and parent were unaware of the cause. Chand et al. (2013)¹ suggest that careful instrumentation is needed to avoid further apical movement of foreign objects.

During removal of cotton remnants in the presented case, the foreign object moved apically although care was taken in the process and careful instrumentation was used. It could be argued that the size of the particle played an important role in the apical movement. Further attempts to remove or dislodge the object increased the possibility of damage to the apical root anatomy and the creation of an irregular, open apex.

Once the decision was made to incorporate the foreign object into the obturation, proper irrigation was needed to create a sterile environment to encourage healing and bone formation. A recent study by Mancini et al. (2013)⁹ compared the efficacies of different irrigation systems for removal of the smear layer in the apical region of infected root canals.

They concluded that the EndoActivator (Dentsply Sirona) and EndoVac (Discus Dental, Culver City, CA) showed superior cleaning 3mm, 5mm and 8mm from the apex compared with other systems evaluated in the study.

Further, in an effort to create a sterile environment for the obturation phase, the calcium hydroxide intracanal medicament was left *in situ* for a period of approximately four weeks. Investigation of available literature indicates that a maximum period of four weeks is clinically acceptable before structural changes can be observed in root dentine, leading to possible root fractures.^{10,11}

Due to the superior qualities of MTA, the decision was made to use it as an apical plug instead of regular obturation techniques. A barrier of 5mm MTA was created apically according to suggestions in the literature.¹² MTA as an obturation material is claimed to have numerous benefits, which include superb biocompatibility, a biologically acceptable seal and reduced cytotoxicity.¹³

Bogen and Kuttler (2009)¹⁴ advocate the use of MTA as a suitable obturation material after cleaning and shaping and even as a complete fill of the root canal system, which might ultimately increase the long-term prognosis and retention of the tooth.

In this particular case, only a 5mm plug was created, with heated gutta-percha filling the remainder of the canal. The gutta-percha could be removed in the future to allow the creation of a proper coronal seal with advocated techniques. Restorability is further complicated by the patient's age, and the choice of restoration will eventually determine the long-term success of this particular case.

According to Siboni et al. (2017),¹⁵ the use of BioRoot RCS as an endodontic sealer offers numerous advantages during obturation.



Fig. 5



Fig. 6



Fig. 7

Figure 5. A periapical radiograph taken at six-month follow-up visit.

Figure 6. A periapical radiograph taken at nine-month follow-up visit showing good healing.

Figure 7. A fifteen-month follow-up radiograph showing an increase in size of the periapical pathology.

The material is well suited for single cone techniques and cold lateral condensation. The literature indicates that BioRoot RCS has the ability to stimulate the periodontal ligament cells to form angiogenic and osteogenic growth factors.¹⁶

The sealer can also reduce cytotoxicity and may increase the formation of hard tissue.^{17,18} Authors Arias-Moliz & Camilleri (2016)¹⁹ conclude that the sealer has anti-microbial qualities, which is a very important consideration for sterility and healing.

Limited information is available on the relationship between HIV infections and endodontics. HIV infection is characterised by a variety of symptoms and a fast-multiplying virus and, if left untreated, a severely compromised immune response can be expected.²⁰

The main targets of the HIV virus are the CD4 cells of the host. As discussed earlier, the presence of apical lesions plays a decisive role in the success of endodontic treatments in HIV-positive patients. Vital cases normally illustrate very good success rates.³

In the current case, the prognosis was complicated by the presence of a necrotic root canal system left open for a prolonged period, a large periapical lesion and a foreign object. There is also a high probability that other foreign objects had been extruded beyond the apical foramen by the patient herself.

Fortunately, the patient's HIV status is well controlled, with an absolute CD4 count within normal National Health Laboratory Service limits (530-1300 cells/uL) and the HIV viral load virtually undetectable.

The results obtained in this case are in line with reported findings that the prognoses of endodontically affected teeth are the same for HIV-positive and HIV-negative patients.^{21,22} Observation of the fifteen-month follow-up radiograph revealed that incomplete healing was present.

Although it can only be speculated on the reasons why, the radiographic finding is in line with the conclusions of Aminoshariae et al. (2017).³

These authors stated that affected teeth with periapical lesions prior to treatment have a reduced prognosis, therefore requiring further treatment.

CONCLUSION

The case illustrates a novel approach to the management of a necrotic tooth with a foreign object left *in situ* in the root, in an HIV-positive patient. The case presented numerous negative factors, contributing towards the final treatment outcome.

These factors were a large apical lesion, a root canal system left open for a long period of time, an HIV-positive patient and a foreign object lodged in the root canal system. The outcome after apical surgery and follow-up healing will be discussed in a future report.

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What's new for the clinician: excerpts from and summaries of recently published papers

SADJ July 2019, Vol. 74 No. 6 p329 - p332

Compiled and edited by V Yengopal

1. The use of immersive virtual reality for pain control in dentistry

SM Alshatrat, R Alotaibi, M Sirois, Z Malkawi. *Int J Dent Hygiene*. 2019; 17: 71-6.

Pain and anxious expectations about pain are known to be the primary reasons for avoidance of dental treatment and patients who experience pain may be more likely to avoid subsequent dental treatment.

Dental hygiene procedures such as scaling and root planing (SRP) are usually painful, unpleasant and traumatic for patients. Contact with the gingiva during dental hygiene procedures is the main reason for this discomfort and pain.

Pain management is an important element in addressing the patient's fears and/or needs. A number of techniques have been developed to assist in alleviating the procedural pain. These range from pharmacological intervention to behavioural intervention; yet, pain management is still one of the main challenges in establishing regular dental visits.

Used as a distraction technique during SRP, immersive virtual reality (VR) could possibly help dental hygienists make dental hygiene care less painful, thereby improving health outcomes. Virtual reality is defined as a human-computer interface that enables the user to be immersed in and interact with a computer-generated environment.

The most common applications of the VR are training simulators (flight simulators), entertainment (video games) and desensitization therapy (phobia treatment). Furthermore, VR is used in eating and body dysmorphic disorders, neuropsychological assessment and rehabilitation and as a distraction technique for painful procedures. Alshatrat and colleagues (2019)¹ reported on a study that sought to determine whether immersive virtual reality (VR) was an effective pain management technique for patients undergoing SRP.

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ACRONYMS

SRP: Scaling and Root Planing
VAS: Visual Analog Scale
VR: Virtual Reality

MATERIALS AND METHODS

Fifty adults (22 male and 28 female) who provided informed consent and met the following inclusion criteria were selected for this study: participants were 18 years or older, in good general physical and mental health, had generalized periodontitis, needed non-surgical periodontal treatment (scaling and root planing), and had at least five teeth per quadrant. Participants who have any of the following condition(s) were excluded from the study: a history of seizures or convulsive disorder, taking psychotropic drugs, history of serious vestibular abnormalities and musculoskeletal disorders.

A within-subject split-mouth design was used in this study. The participants of this study experienced two conditions: (a) without treatment condition (control/no distraction), or (b) with treatment condition (immersive VR application). All the procedures were performed by an oral hygienist who recorded probing depth, the depth of a sulcus or periodontal pocket, and calculated the clinical attachment loss.

The hygienist performed scaling and root planing procedures for each patient during a 1-hour appointment which involved supra and subgingival ultrasonic scaling and hand scaling on one-half of the mouth (right/left side) without using any type of anaesthesia while the participant used the immersive VR. The same procedures were performed on the second half of the mouth without the use of immersive VR.

Tossing a coin was used to randomly determine the side of the mouth that would initially be treated and the sequence of the treatment conditions: whether the right or the left side would be treated first, and whether or not immersive VR would primarily be used.

Baseline parameters recorded included patient demographics, and the blood pressure (BP) and pulse (PR) were measured after the first half of the treatment and again at the end of the treatment. The level of pain was measured with the Visual Analog Scale (VAS).

Additionally, the participants rated how much time they spent thinking about their pain during the session, how unpleasant the dental care was, how much their teeth and gums bothered them during the procedure, their worst pain and the average pain.

Participants gave ratings using 0-10 scales with cut points on the scale indicating (0) none, (1-3) mild, (4-6) moderate or (7-10) severe. Immediately after the VR treatment, participants were also asked three questions to assess presence, realism and nausea.

The presence has been defined as “the subjective experience of being in one place or environment even when you are physically located in another”. To assess the presence, this question has been asked: While experiencing VR, to what extent did you feel like you went into the virtual world?

Participants gave ratings using a 0-10 scale with cut points on the scale indicating that (0) “I did not feel like I went inside at all”; (1-3) “mild sense of going inside”; (4-6) “moderate sense of going inside”; or (7-10) “strong sense of going inside.”

To assess the realism, this question has been asked: How real did the objects in the virtual world seem to you? Participants gave ratings using a 0-10 scale with cut points on the scale indicating that (0) “completely fake”; (1-3) “somewhat real”; (4-6) “moderate real”; or (7-10) “very real”.

To assess the nausea, this question has been asked: “To what extent (if at all) did you feel nausea while experiencing VR?” Participants gave ratings using a 0-10 scale with cut points on the scale indicating that (0) “no nausea at all”; (1-3) “mild nausea”; (4-6) “moderate nausea”; or (7-10) “severe nausea”. In addition, the participants were asked to identify the preferred treatment conditions: no distraction or VR distraction.

RESULTS

All 50 patients completed the study. The mean age of the subjects was 36 ± 11.843 (ranging from 18 to 54 years). Most (88%) of the sample had mild periodontitis, 10% had moderate periodontitis and only 2% had severe periodontitis. More than half of the patients (56%) had received “above high school” education.

The Wilcoxon signed-rank test indicated that the time spent thinking about pain when using virtual reality (mean rank=11.29) was rated less than the time spent thinking about pain without virtual reality (mean rank=12.38).

In addition, the test indicated that the scaling and root planing session without virtual reality (mean rank=21.50) was rated more unpleasant than the session with virtual reality (mean rank=12.11). Also, the test showed that

the teeth/gums bothered the patient more during the session without the virtual reality (mean rank=14.50) than the session with virtual reality (mean rank=15.61).

A Wilcoxon signed-rank test indicated that the worst pain during the session without virtual reality (mean rank=13.00) was rated more than the session with virtual reality (mean rank=14.68). The Wilcoxon signed-rank test revealed that the VAS scores for the average pain perception were significantly lower during VR (mean rank=11.05) compared with without VR (mean rank=10.00).

On average, participants experienced significantly lower systolic BP after using VR than systolic BP after treatment without VR ($P=0.01$). There was no statistically significant difference between vital signs (diastolic BP and PR) when using VR or without using VR (within group comparison).

For the assessment of VR presence, realism and nausea, most of the participants (84%) felt like they went inside the virtual world, 82% of the participants felt that the virtual objects seemed real to them, and 94% did not feel nausea as a result of experiencing the virtual world. Of the participants, 98% preferred using VR during SRP.

CONCLUSIONS

The results of this study provide evidence of the feasibility and acceptability of immersive VR application as a pain management technique for patients undergoing SRP.

Implications for practice:

The use of technology (immersive VR) as an adjunct for pain control can only improve the patient experience especially for dental procedures that cause pain and discomfort for the patients. VR, like other distraction techniques such as music, etc. is just one more alternative available to practitioners to improve patient experiences in the dental setting.

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2. Effect of a single-tufted toothbrush on the control of dental biofilm in orthodontic patients: A randomized clinical trial

LD da Cunha, DC Peruzzo, LA Costa, ALP Pereira, BB Benatti. *Int J Dent Hyg.* 2018; 16: 512-8.

Orthodontic components can increase biofilm accumulation and present enormous challenges to patients in terms of maintaining a clean and healthy mouth.

This is especially difficult in areas in the “shadow” of the orthodontic arch, such as the mesial and distal surfaces of the brackets and cervical surface of the orthodontic bands.¹

An important aspect for motivating orthodontic patients is choosing the oral hygiene instruments that best meet individual needs.¹ Thus, different toothbrush models have been developed such as, for example, interdental toothbrushes and single-tufted toothbrushes.¹

Single-tufted toothbrushes are recommended for free surfaces and areas of the teeth that are not easily reached with other oral hygiene devices, such as areas of bifurcation, distal surfaces of molars, areas with rizectomy (removal of only the root of a tooth), surfaces with irregular gingival margins, dental crowding areas and proximal surfaces of a single tooth.¹

These toothbrushes are easily directed towards the gingival sulcus, providing greater efficiency in biofilm removal. However, the efficacy of this type of toothbrush for patients using conventional orthodontic appliances has not yet been studied.

Thus, da Cunha and colleagues (2018)¹ reported on a trial that sought to compare the effect of single-tufted toothbrushes, conventional toothbrushes and the combination of both for controlling bacterial biofilm formation in dentogingival areas of healthy subjects using fixed orthodontic appliances.

MATERIALS AND METHODS

Twenty-five patients above 18 years of both genders who were undergoing orthodontic treatment with mandibular and maxillary fixed orthodontic preadjusted edgewise brackets, attached to the buccal surface, were invited to participate in this trial. The inclusion criteria for volunteers were as follows: at least 20 teeth, good general and oral health [no caries, gingivitis (GBI<10%) or periodontitis (PS≤3mm)] and no use of anti-inflammatory and antibiotics three months before or during the study.

The exclusion criteria were as follows: smokers, pregnant women, diabetics, hypertensive patients with restorations or poorly fitted dentures, and those who had used single-tufted or conventional toothbrushes before the research.

This was a randomized, single-blinded, crossover, clinical trial with an analytical and quantitative approach.

ACRONYMS

GBI:	Gingival Bleeding Index
SPI:	Stained Plaque Index
VPI:	Visible Plaque Index

The first stage was pre-experimental, followed by three experimental periods using a single-tufted (Bitufo®) (G1) and a conventional toothbrush (G2), alone or in combination (G3). Randomization was performed by a computer-generated table that randomly distributed patients into the three experimental periods.

Three kits with different products (single-tufted toothbrush, conventional toothbrush and the third kit contained the two toothbrushes) were delivered by the examiner blinded to which experiment each patient received. Each kit also contained a toothpaste. At follow-up of the patient, the used kit was returned, and the patient received a new kit.

After selecting the volunteers, an oral clinical examination was performed to obtain the following initial clinical parameters:

- VPI (Visible plaque index) and GBI (gingival bleeding index), both represent dichotomous scores 0 and 1 for absence or presence of plaque and bleeding.
- The SPI (stained plaque index)- this method records the presence of plaque on an individual tooth surface, and is calculated by the number of surfaces containing plaque and the total number of surfaces available.

Both the indices were analysed for the buccal, lingual, mesial and distal surfaces of anterior and posterior teeth, excluding the maxillary and mandibular first molars due to variation of components (orthodontic bands and bonded tubes) among patients.

A single calibrated examiner collected the indices. The clinical parameters of 10% of the volunteers were evaluated in duplicate to obtain diagnostic confidence using the Kappa agreement test, whose intra-rater agreement was $k=0.86$.

Before the study began, patients received a scaling and polishing. Each patient then received the products (randomly selected), as well as specific instruction on how to use them.

Assessments were performed at the beginning of each experimental group, immediately before treatment with the toothbrushes, and right after completion of the 72-hour experimental period. Seven days after the pre-experimental stage, three 72-hour experimental periods were performed. In each experimental period, the volunteers were randomly assigned to one of the oral

hygiene regimens. An interval of 7 days (washout) was recommended between each period to prevent possible residual effects of treatment (carry over).

During the washout period, all volunteers used a conventional toothbrush, different from the one used in the experiment, toothpaste without antimicrobial agents and standard dental floss, provided by the researchers. During treatment, patients were instructed not to use any type of therapeutic mouthwash to aid hygiene.

At the beginning and completion of each experimental period, the same clinical parameters were assessed again. The hygiene instruments used by patients were placed in sequentially numbered sealed opaque packages and coded by another researcher to prevent identification of the product. The codes were not disclosed to the examiner before completion of the experimental stage.

RESULTS

Five volunteers did not complete the study because they needed to remove the orthodontic appliance before the end of the study. All subjects ($n=20$) with ages between 20 and 42 years (mean of 26.6 years; 6 men and 14 women) completed the three stages of the study. No adverse effects to the treatments were reported by any individual or by the examiner.

Comparing the variables VPI, SPI and GBI in G1, G2 and G3 at T0 and T72 hour no significant differences were found in the intragroup analysis for the parameters assessed in G1 (single tuft toothbrush) and G2 (conventional toothbrush). The variables SPI and VPI showed a statistically significant decrease after 72 hours in G3 ($P<0.05$). A statistically difference was found for the VPI in the intergroup analysis at T0 in G3 when compared with G2.

No statistical difference was found for any parameters measured among the groups after 72 hours. For delta analysis (T0-T72 hour), no significant differences were found in the intergroup analysis for the parameters assessed.

Comparing the anterior teeth in G1, G2 and G3 (combination of single tuft and conventional toothbrush) and the variables VPI, SPI and GBI at T0 and T72 hour no significant differences were found in the intragroup analysis for any of the parameters assessed in G2.

The VPI and SPI significantly decreased after 72 hours in G1, while only the SPI decreased in G3 ($P<0.05$). In the intergroup analysis, a statistical difference was found for VPI only in G1 when compared with G2 and G3 at T0. No statistical differences were found for any parameters measured among the groups after 72 hours.

When comparing the posterior teeth in G1, G2 and G3, and VPI, SPI and GBI at T0 and T72 hour, statistical reductions were found in the intragroup analysis ($P<0.05$) after 72 hours in G1 for VPI and SBI, in G2 for VPI and in G3 for GBI. In the intergroup analysis, a statistical difference was found for VPI only in G1 when

compared with G2 and G3 at T0. No statistical differences were found for any parameters measured among the groups at T72 hour.

When comparing the free tooth surfaces in G1, G2 and G3, and the VPI, SPI and GBI at T0 and T72 hour, statistical reductions were found in the intragroup analysis ($P<0.05$) in G3 for GBI after 72 hours. In the intergroup analysis, a statistical difference was found for VPI only in G1 when compared with G2 and at T0 and in G3 when compared with G1 and G2 at T72 hours.

When comparing the proximal tooth surfaces in G1, G2 and G3, and the VPI, SPI and GBI at T0 and T72 hours, no statistical differences were found in the intragroup analysis ($P>0.05$). At T0, a statistical difference was found for SPI in the intergroup analysis in G1 when compared with G2 and G3.

Moreover, a difference for GBI in G1 was found when compared with G2 and G3; however, no differences were found between G2 and G3. This difference could only be observed in the SPI in G3 when compared with G1 at T72 hours.

CONCLUSIONS

In this study, the combination of conventional and single-tufted toothbrushes (group G3) was more effective for controlling dental biofilm compared with the use of the isolated brushes (G1 or G2).

Implications for practice

Orthodontists should provide patients with special guidance on oral hygiene to prevent periodontal diseases. The use of a combination of conventional and specially designed toothbrushes for use in patients with orthodontic appliances seems more beneficial than using conventional methods only.

Reference

1. da Cunha LD, Peruzzo DC, Costa LA, Pereira ALP, Benatti BB. Effect of a single-tufted toothbrush on the control of dental biofilm in orthodontic patients: A randomized clinical trial. *Int J Dent Hyg.* 2018; 16: 512-518.

Ethics, values and practice

SADJ July 2019, Vol. 74 No. 6 p333 - p334

WG Evans



The Shorter Oxford English Dictionary carries four definitions of the concept of **Value**... firstly, that amount of some commodity which is considered to be the equivalent of something else. Secondly the material or monetary worth of a thing. Thirdly, the equivalent in material worth of a specified sum. And Fourthly... **Ethics**... that which is worthy of esteem for its own sake, having intrinsic worth.¹

The concepts of Ethics and Value are in this way occasionally used as though they are interchangeable but a deeper insight may perceive that they are indeed different.

Surbhi, writing on the distinctions, records that Ethics is a set of rules that determine the behaviour of a person, whilst Values are those beliefs “ for which a person has an enduring preference”.² Intriguingly, it may be helpful to consider that Ethics constrains, whilst Values motivate.

Accepting that concept implies that Ethics and Values exert rather different impulses on our lives. Surbhi lists what are considered to be the fundamental distinctions between the concepts.²

1. Ethics refers to the guidelines for conduct, that address questions of morality. Value provides the principles and ideals upon which judgement is made of what is more important.
2. Ethics is a system of moral principles, whilst Values stimulate thinking.
3. Ethics compel a person to follow a particular course of action, whilst Values affect the emotional state of mind, acting, as mentioned, as a motivator.
4. Ethics are consistent, affecting all equally. Values may differ between people... what is important for one may not be important for another.
5. Ethics guides decisions regarding what is morally correct or incorrect... but Values directs ambition... what we want to achieve.
6. Ethics determines right or wrong. Values define priorities in life.

These ethical principles reflect quite accurately the concepts which the profession espouses as determining whether we as practitioners conduct ourselves ethically.

Extending the principles to include the entire team in any dental practice opens wider considerations. For it is certain that an ethical practice can only be one in which the entire team is imbued with the sound ethical principles of the practitioner.

The Ethics Compliance Initiative recommends that when members of the team make a decision they should apply a set of filters which may be summarised as the PLUS group:³

P= Policies

Is the decision in accord with the practice policies, procedures and guidelines?

L= Legal

Is the decision acceptable under the applicable laws and regulations?

U= Universal

Does the decision conform to universal principles which the practice has adopted?

S= Self

Does the decision satisfy personal definitions of right, good and fair?



There is much to be said in support of according the last point dominance in any hierarchy. Ethics is so deeply engrained in our persona that any decision should yield to introspective judgement. A pithy definition of Ethics may be... “that which you would do when no one is watching.”

The question may then be raised again... what is the difference between Ethics and Values? So a pithy definition of Values may be “those beliefs that determine behaviour even when someone is watching”.

Values set the tone of behaviour, reflecting what is important to the individual. Values may be at the personal or cultural level but importantly may be at the practice level.

Values contribute to the Ethical status of the practice. The application of Ethics in a practice may be helped if the team agree on a process in decision making. Every member of the team has to make decisions, every decision may impact on the practice.

The Ethics Compliance Initiative³ provides guidelines which may be useful...

- First, define the problem. Paradoxically, this definition may be clarified by considering possible outcomes. If an outcome can be forecast the problem itself may be better understood.
- Second.. seek help.. colleagues in the practice can advise and guide, based on experience and differing outlooks.
- Thirdly, identify at least three and if possible five practical solutions to the problem. Try to avoid the two option situation which often implies opposing solutions.
- Fourthly, evaluate the alternatives. With especial care to ensure recognition is given to what is factual.
- Fifthly, make the decision! Apply the decision!
- Finally... evaluate the outcome.

If a practice can develop core VALUES, these will be a guide for the team. Those VALUES will depend upon the ETHICS of each individual in the pursuit of moral excellence. The concepts are indeed intertwined but each retains separate influence.

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1. The Shorter Oxford Dictionary 1970 Oxford University Press.
2. Strategic leadership and decision making: Values and Ethics. www.au.af.mil/au.awc/awcgate/ndu/strat-ldr-dm/pt4ch15.html.
3. Ethics Compliance Initiative. <https://www.ethics.org/resources/free-toolkit/decion-making-model/>.

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Maxillofacial Radiology 172

SADJ July 2019, Vol. 74 No. 6 p335

CJ Nortjé

Below are more images of articular disorders which may affect the functioning of the TMJ. Discuss the most important radiological features discernible and what is your diagnosis?



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

INTERPRETATION

Figures 1 & 2 show unilateral hyperplasia of the condylar process, while Figure 3 shows the condyle is enlarged in all directions. Condylar hyperplasia of the mandible is a unilateral progressing hyperplasia of the condyle due to previously accelerated, persistent, or resumed, activity of the precartilagenous cells of the condylar growth zone. The etiology is unknown. Enlargement of one mandibular condylar process may occur in isolation or in association with enlargement of part of the mandibular ramus and body. The condition, either as an isolated finding or as part of hemihyperplasia of the mandible, is usually a coincidental radiological finding. The widespread use of pantomography in dentistry, and to a slightly lesser degree in medicine has facilitated side to side morphological comparisons of the mandible. There is no apparent sex predilection.

The extent of hyperplasia determines whether it is clinically apparent. There are usually no associated symptoms and the patient is unaware of the situation, although temporomandibular joint dysfunction may present. The cardinal signs of hyperplasia of the condyle are: increased size of the condylar neck and head compared with the normal population or, in unilateral cases, compared with the contralateral side. Figures 4 & 5 are images of coronoid process hyperplasia. The lateral skull view (Fig. 4) shows major elongation of the coronoid process (closed arrow) well beyond the criteria for elongated process, 1 cm superior to the inferior border of the zygomatic arch (open arrow) and an inability to move the condyle to the crest of the articular eminence on opening the mouth. The occipitomental view (Fig. 5) also shows major elongation of the coronoid processes (green arrows). Coronoid process hyperplasia is very rare.

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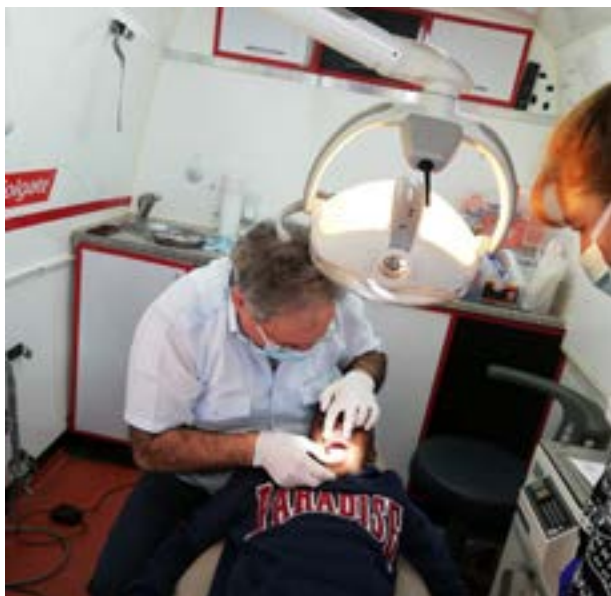
The South African Dental Association and Colgate dedicate 67 minutes on Mandela Day, 2019

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The South African Dental Association (SADA) in collaboration with Colgate and volunteering dentists, hosted by Nelson Mandela Children's Hospital, commemorated the life of former President Nelson Mandela by spending the whole day providing oral hygiene instruction and screening to the children in the hospital. The theme of the outreach project was '67 Teeth of Kindness'.

President Nelson Mandela's legendary love for children saw him using his influence to make life better for the little ones. To mark this year's Mandela Day, SADA and Colgate decided to visit Nelson Mandela Children's Hospital and spend time with the children in honour of Tata Mandela.

In South Africa, over 60% of primary school children suffer dental decay and more than 80% of these children remain untreated for the disease. The aim of this community outreach project was to educate the children about the importance of taking care of their oral health and to contribute to reducing the high percentage of children suffering from dental decay. Over 50 children were screened and given toothbrushes and toothpastes.



Issued by:

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As the South African Dental Association, we felt the need to fill the gap we identified in the Nelson Mandela Children's Hospital .. which, illogically, does not offer dental services.

While we understand that the hospital offers quaternary services, we still felt that oral health is important at every stage of treatment for any disease condition. In fact, good oral health practices may improve the prognosis of many disease states. Which is why we requesting our member dentists to volunteer.

We were pleased to see a resounding number of dentists who responded to our call and were more than willing to take time off their busy schedules to assist us in providing this much needed service.

We thank each and every one of our members who helped us commemorate the 10th anniversary of International Nelson Mandela Day. "We have now formed a link and a bond with the Hospital which will help us to ensure that we bring oral health services to the children on a continuous basis" said Dr Nthabiseng Metsing, Head of Professional Development at SADA.

In addition to the SADA outreach project, the Minister of Health, Dr Zweli Mkhize, visited the hospital as part of his 67 minutes for Mandela Day.

It was a privilege for the volunteering dentists, employees of SADA and Colgate to take time on Mandela Day to make a difference to the lives of these children.



CPD questionnaire

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

GENERAL

The antibacterial effect of herbal alternatives, Triphala and Turmeric, on *Enterococcus faecalis* – an *in vitro* study

- Identify the INCORRECT statement.
E. faecalis:
A. is the most common species in the root canals of failed endodontic treatment
B. embodies virulence factors which result in cell lysis
C. requires the presence of commensal bacteria to survive
D. is an enteric facultative gram positive bacterium
- Identify the INCORRECT statement.
Turmeric:
A. belongs to the ginger family Zingiberaceae
B. contains Curcumin, a yellow colored phenolic pigment
C. exerts anti-inflammatory, antibacterial, antiviral, antifungal and anti-diabetic actions
D. produces haemorrhagic effects
- Identify the INCORRECT statement.
Triphala is a well known herbal formulation which:
A. contains tannic acid as the most effective constituent
B. is a mixture of the powdered fruits of five medicinal plants
C. has been shown to have bacteriostatic or bactericidal effects on gram-positive and gram-negative pathogens
D. is safe to use in endodontics
- The study demonstrated that Triphala had better antimicrobial activity against *E. faecalis* compared with 0.5% and 1% NaOCl ($P < 0.05$).
A. True
B. False

Prevalence of peri-implant mucositis at single tooth bone level dental implants in a South African population

- Identify the INCORRECT answer.
Peri-implant mucositis:
A. is a highly prevalent disease
B. always progresses to peri-implantitis
C. is a reversible condition
D. maintenance programs can help decrease prevalence
E. all of the above

- Identify the CORRECT answer.
Studies on peri-implant diseases show a high variation in prevalence rates, most likely due to:
A. variations in case-definition
B. level of analysis (subject or implant)
C. follow-up time
D. population type
E. type of implant-supported restoration
F. all of the above
- In comparison with gingival tissues around natural teeth, peri-implant gingival tissues are more resistant to inflammation due to their anatomical characteristics, including better connective tissue attachment and vascular supply.
A. True
B. False

Prevalence of impacted third molars in the South African Indian population of the eThekweni Metropolitan Region

- Identify the INCORRECT statement.
A. The estimated prevalence of impacted molars amongst the population was 81%
B. The weighted mean prevalence calculated from international studies was 31%
C. The increased prevalence may be due to the sample being amongst younger people
D. The increased prevalence may be due to the majority of the sampled being males
- Identify the INCORRECT statement.
Possible reasons for the impaction of third molars include:
A. Incomplete rotation of the tooth during development
B. Equal growth of mesial and distal roots
C. Crowding, ectopic position of the tooth germs, supernumerary teeth
D. Unfavourable relationship of jaw size to the tooth size
- The germs of both the maxillary and mandibular third molars develop with their occlusal surfaces facing distally.
A. True
B. False

Dental malpractice cases in South Africa (2007-2016)

11. Identify the CORRECT statement.
During the study period:
- The HPCSA received 22000 complaints
 - 11% of the complaints were referred to the ombudsman
 - 26% of the cases were finalised at the preliminary enquiry stage
 - 1% of the complaints were referred to the Professional Conduct Committee
12. Identify the INCORRECT statement.
Endodontics recorded the second highest number of clinical negligence accusations, with the transgressions including:
- failure to diagnose root perforation during the performance of a root canal treatment
 - failure to diagnose surgical emphysema
 - failure to contact the patient on the day after the procedure
 - failure to take post-operative radiographs
 - omitting to inform the patient of a fractured endodontic file

Cephalometric analysis: manual tracing of a lateral cephalogram

13. Identify the CORRECT statement.
- Merrifield's Z angle (ZA):- Pog' to most protrusive point on nose, extended to FH: Measure the angle between the "profile line" and the Frankfort horizontal plane.
 - Nasolabial angle (NA) -Cm-Sn-Ls: Angle between the intersection of lines tangent to the columella and upper lip.
 - Pogonion-menton angle (PMA) -Pog'-Me': Angle between the intersection of lines tangent to the soft tissue pogonion and hard tissue menton.
 - Holdaway angle (HA): Angle formed between the soft tissue facial plane line (soft tissue nasion-soft tissue pogonion) and the H line (soft tissue pogonion to labialis superior).

Endodontic management of an unidentified foreign body in a maxillary central incisor of a HIV-positive patient

14. Very recent literature indicates that cases presenting with pre-operative lesions have:
- predictable prognosis
 - good prognosis
 - lower prognosis
 - none of the above
15. The maximum period calcium hydroxide can be left inside the root canal system before structural changes in the root dentine occur is:
- 10 days
 - 21 days
 - 3 months
 - 1 month

16. According to the literature, the minimum size of an apical barrier with MTA during mechanical a pexification is:
- 3.5 mm
 - 4 mm
 - 4.5 mm
 - 5 mm

Clinical Windows

17. In the Alshatrat et al. study, participants experienced significantly lower systolic BP after using VR than systolic BP after treatment without VR.
- True
 - False
18. In the Da Cunha et al. study, when comparing the proximal tooth surfaces in G1, G2 and G3, and the VPI, SPI and GBI at T0 and T72 hours, no statistical differences were found in the intragroup analysis.
- True
 - False

Maxillofacial Radiology 172

19. The etiology of condylar hyperplasia is unknown.
- True
 - False
20. Coronoid process hyperplasia is very rare anomaly?
- True
 - False

ETHICS

Ethics, values and practice

21. Identify the INCORRECT answer.
Ethics:
- is worthy of esteem for its own sake
 - acts as a motivator
 - constrains
 - has intrinsic worth
22. Identify the INCORRECT answer :
Values:
- may differ between people
 - determine the worth
 - set the tone of behavior
 - are set by a code of moral behaviour
23. Ethics affect the emotional state of mind, whilst Values compel a person to follow a particular course of action:
- True
 - False
24. When facing an ethical dilemma it is recommended that at least three alternative solutions are considered.
- True
 - False

25. Identify the INCORRECT answer:

To establish an ethical practice the following conditions should apply:

- A. Team members should ensure that the decision is in accord with the practice policies, procedures and guidelines
- B. Team members should ensure that the decision is in accord with the practice policies, procedures and finances
- C. The decisions of team members must satisfy personal definitions of right, good and fair
- D. Team members should rely on values which define priorities in life

The Continuous Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.



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

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Thank you for considering the submission of your work to the Journal for possible publication. We welcome papers which may be Original Research, Clinical Review, Case Reports, Letters or Notes.

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

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 bill.evans@wits.ac.za

Language

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

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

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Articles should adhere to the protocols of the Helsinki Declaration (<https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>).

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Clinical trials should conform to the Consort Statement (Consolidated Statements of Reporting Trials) and Reviews to the PRISMA checklist (Preferred Reporting Items for Systematic Reviews and Meta Analyses) (<http://www.equator-network.org>).

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1. Substantial contributions to the conception or design of the work or the acquisition, analysis or interpretation of data for the work AND
 2. Drafting the work or revising it critically for important intellectual content, AND
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To be kept as brief, clear and unambiguous as possible.

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The abstract shall consist of not more than 200 words.

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- Articles should be clear and concise.
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Continuing Professional Development

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

References

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- References should be inserted seriatim in the text using superscript numbers and should be listed at the end of the article in numerical order.
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- Names and initials of all authors should be given unless there are more than six, in which case the first three names should be given, followed by 'et al'. First and last page numbers should be given. Where it is applicable the page numbers should be abbreviated by omitting redundant numbers eg. pages 456 to 478 is recorded as 456-78, and 456 to 459 as 456-9, but 398 to 401 is recorded as 398-401.
- Notice that volume numbers are not given in bold, authors are not linked by 'and' or '&', and the date of publication appears after the name of the journal. No item should appear in italics except for foreign terms, eg *in vivo*.

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Smith NC, Haines A. The role of the dentist in public health promotion. *Br Dent J*. 1983; 298: 249-51.

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Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA, Smith RT, eds. *Pathologic Physiology: Mechanisms of Disease*. Philadelphia: WB Saunders, 1974: 457-72.

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Congress Programme

"From Start to Finish"

Friday 30 August 2019
Master Classes/Hands-On Tracks
(Please note the Master Classes/Hands-on tracks run concurrently)

Friday 30 August 2019		Track 1 Lasers & Snoring
07:15 - 08:00	Congress registration	
08:00 - 10:00	Lasers & Snoring: Effective non-surgical treatment modality alleviating snoring	<i>Dr Sofia Aravopoulou</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	(Repeat) Lasers & Snoring: Effective non-surgical treatment modality alleviating snoring	<i>Dr Sofia Aravopoulou</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:00	Practice management: Creating a quality practice	<i>Dr Raj Rattan</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	Practice management: Managing failures and human error	<i>Dr Raj Rattan</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 2 Digital Dentistry
07:15 - 08:00	Congress registration	
08:00 - 10:00	Digital Dentistry: Aesthetic excellence chairside with CAD/CAM	<i>Dr Murray Orr</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Digital Dentistry: Aesthetic excellence chairside with CAD/CAM (Continued)	<i>Dr Murray Orr</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:00	Digital Dentistry: Digital solutions for complex cases	<i>Dr Frank Spitznagel</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	Digital Dentistry: CAD/CAM in Implant Dentistry - Key to success	<i>Dr Johannes Boldt</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 3 Paedodontic Society of South Africa
07:15 - 08:00	Congress registration	
08:00 - 09:00	The 6 th sense of behaviour management	<i>Dr Nicoline Potgieter</i>
09:00 - 10:00	Management of the medically compromised patients	<i>Dr Nadia Mohamed</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 11:30	Paediatric Zirconia Crowns	<i>Dr Makul Jain</i>
11:30 - 12:30	Silver Diamine Fluoride and Paedo-Rotary Files	<i>Dr Makul Jain</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:00	Current trends in Paediatric Dentistry	<i>Prof Peet van der Vyver & Dr Martin Vorster</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	Glass ionomers from A to Z	<i>Dr Riaan Mulder</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Please Note: Programme subject to change.

Friday 30 August 2019		Track 4 Young Dentist's Council
07:15 - 08:00	Congress registration	
08:00 - 10:00	Endodontics - back to the future	<i>Dr Hussein Seedat</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 11:30	Implant failure – a microscopic perspective Update on oral and oropharyngeal carcinoma	<i>Prof Erich Raubenheimer</i>
11:30 - 12:30	Sugar, caries and all things nice	<i>Dr Hanif Laher</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:15	An introduction to dental implantology	<i>Dr Bradley Bredenkamp</i>
15:15 - 15:30	Tea break and tradeshow	
15:30 - 16:15	Problems & Solutions	<i>Dr Alasdair McKelvie</i>
16:15 - 17:00	From Start to Finish	<i>Mr Bruce Fordyce</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 5
07:15 - 08:00	Congress registration	
08:00 - 10:00	Ethics: Problems & solutions	<i>Dr Alasdair McKelvie</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Ethics: Problems & solutions	<i>Dr Kobus Barnard</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:00	Aesthetics: Cementation	<i>Dr Michael Dieter</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	Endodontics: Set your Endo on fire	<i>Dr Martin Vorster</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 6
07:15 - 08:00	Congress registration	
08:00 - 10:00	Restorative: How to create flawless impressions for indirect restorations	<i>Prof Peet van der Vyver</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Endodontics: Mastering Endodontic treatment on maxillary molars respecting the true anatomy	<i>Prof Peet van der Vyver</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:00	Aesthetics: Catherization of Ceramic Restorations	<i>Mr Tom Behaeghel</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	Orthodontics: Why restorative dentistry needs Orthodontics	<i>Dr Mark Bowes</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 7 Endodontics
07:15 - 08:00	Congress registration	
08:00 - 10:00	The basic golden rules in endodontics	<i>Dr Boela van der Merwe</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Fundamentals approaching challenging endodontic anatomy Technologies taking endodontics from darkness into the light	<i>Dr Grethé Koen</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:00	Predictability in Endodontics Clinical tips to better endodontics	<i>Dr Gavin Williams</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	Iotrogenic damage caused with Endodontics	<i>Dr Christo van Rensburg</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 8 Implantology
07:15 - 08:00	Congress registration	
08:00 - 10:00	Introduction to implant dentistry Implant engineering-geometry and implant-abutment connections	<i>Prof Andre van Zyl, & Team</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Applied anatomy for implants: a brief overview	<i>Prof Andre van Zyl, & Team</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:00	Hands-on/Practical training: Placement of a single posterior implant - from stent to provisional crown	<i>Prof Andre van Zyl & Team</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	Hands-on/Practical training: Placement of a single posterior implant - from stent to provisional crown (Continued) Demonstration of impression taking on a single posterior implant	<i>Prof Andre van Zyl & Team</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 9 Style Italiano
07:15 - 08:00	Congress registration	
08:00 - 10:00	State of the art anterior composite restorations	<i>Dr Walter Devoto & Dr Monaldo Saracinelli</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	State of the art anterior composite restorations (Continues)	<i>Dr Walter Devoto & Dr Monaldo Saracinelli</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:30	(Repeat) State of the art anterior composite restorations	<i>Dr Walter Devoto & Dr Monaldo Saracinelli</i>
15:00 - 15:30	Tea break and tradeshow	
15:30 - 17:00	(Repeat) State of the art anterior composite restorations (Continues)	<i>Dr Walter Devoto & Dr Monaldo Saracinelli</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

Friday 30 August 2019		Track 10 Dental Technician Plenary
07:15 - 08:00	Congress registration	
08:00 - 09:00	In Lab and the Connect Case Centre workflow	<i>Mr Leo Dingemans</i>
09:00 - 10:00	Back to basis - a reminder	<i>Mr Miha Skaza</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 11:30	One guide to all today's Zirconia solutions	<i>Mr Uwe Greitens</i>
11:30 - 12:30	Owning your financial future	<i>Ms Jacqueline Newton, Ms Ester Ochse & Mr Chris Nketiah</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 14:30	Implant denture frameworks and attachments	<i>Mr Shrikanth Mallem Kumar</i>
14:30 - 15:30	Red and white ceramic polymers in harmony	<i>Mr Richard Newman</i>
15:30 - 16:00	Tea break and tradeshow	
16:00 - 17:00	The quality of Vita teeth comparison with computer teeth	<i>Mr Tom Behaeghel</i>
18:00	Cocktail evening with <i>Barry Hilton</i> and German Oompah Band	

End of Day 1 - Continue to Day 2 on p4

Saturday 31 August 2019**Main Plenary**

(Please note the Plenary and Parallel tracks run concurrently)

07:15 - 08:00	Congress registration	
08:00 - 08:15	Opening (All Delegates)	
08:15 - 08:45	From start to finish	<i>Mr. Bruce Fordyce</i>
08:45 - 09:45	SADA Awards Ceremony	
09:45 - 10:15	The Dentist as Healthcare Provider	<i>Prof James Curtis</i>
10:15 - 11:00	Tea break and tradeshow	
11:00 - 12:30	Camouflage - The composite revolution in anterior teeth	<i>Dr Walter Devoto & Dr Monaldo Saracinelli from Style Italiano</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 14:15	Implants, abutments and the restorative platform	<i>Dr Michael Michael</i>
14:15 - 15:00	Aesthetics in the Digital Age	<i>Dr Michael Dieter</i>
15:00 - 15:45	CBCT - How it can benefit your practice	<i>Prof Peet van der Vyver</i>
15:45 - 16:15	Tea break and tradeshow	
16:15 - 17:00	Talking points in Dentistry	<i>Dr Kwindu, Dr Raj Rattan, Dr Alasdair McKelvie, & Mr KC Makhubele</i>
17:00 - 17:45	Back to the roots	<i>Dr Christof Zirkel</i>
19:30	Gala dinner at uShaka Marine World with the Beat Route band	

Saturday 31 August 2019**Parallel Tracks**

(Please note the Plenary and Parallel tracks run concurrently)

Saturday 31 August 2019		Oral Hygienist
07:15 - 08:00	Congress registration	
08:00 - 10:15	Join opening	
10:15 - 11:00	Tea break and tradeshow	
11:00 - 12:30	Periodontal Treatment, Periodontal Maintenance, and Periodontal Negligence - where are you?	<i>Mr Deepak Simkhada</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 14:15	Out with the old and in with the new...	<i>Ms Dirna Grobbelaar</i>
14:15 - 15:00	Burnout	<i>Dr Alasdair McKelvie</i>
15:00 - 15:45	How to bring balance in your life as a health professional	<i>Dr Ntombi Khumalo</i>
15:45 - 16:15	Tea break and tradeshow	
16:15 - 17:00	CADCAM for the modern dental auxiliary. The critical role these auxiliaries play in a productive and profitable dental practice and how valued they are	<i>Dr Murray Orr</i>
17:00 - 17:45	Decoding dental ethics: from theory to practice	<i>Prof Shenuka Singh</i>
19:30	Gala dinner at uShaka Marine World with the Beat Route band	

Saturday 31 August 2019		Dental Assistant
07:15 - 08:00	Congress registration	
08:00 - 10:15	Join opening	
10:30 - 11:15	Tea break and tradeshow	
11:15 - 12:00	CADCAM for the modern dental auxiliary. The critical role these auxiliaries play in a productive and profitable dental practice and how valued they are	<i>Dr Murray Orr</i>
12:00 - 12:45	What dental assistants need to know about laser procedures	<i>Mr Peter Doubell</i>
12:45 - 13:45	Lunch break and tradeshow	
13:45 - 15:15	Infection prevention and waste management	<i>Ms Tebatso Mutibi</i>
15:15 - 16:00	Recognise the signs and symptoms of chemical dependency	<i>Dr Jeanne Oosthuysen</i>
16:00 - 16:30	Tea break and tradeshow	
16:30 - 17:00	The importance of supporting your Dentist when placing and restoring Dental Implants	<i>Mr Victor Rickson</i>
17:00 - 17:30	How to bring balance in your life as a health professional	<i>Dr Ntombi Khumalo</i>
19:30	Gala dinner at uShaka Marine World with the Beat Route band	

Please Note: Programme subject to change.

Saturday 31 August 2019		Practice Manager/Receptionist
07:15 - 08:00	Congress registration	
08:00 - 10:15	Join opening	
10:30 - 11:15	Tea break and tradeshow	
11:15 - 11:45	Medical Office Management	<i>Ms Adele Pretorius</i>
11:45 - 12:15	Image is Everything	<i>Ms Adele Pretorius</i>
12:15 - 12:45	Troubleshooting Techniques	<i>Ms Adele Pretorius</i>
12:45 - 13:45	Lunch break and tradeshow	
13:45 - 14:30	Telephone Etiquette	<i>Ms Adele Pretorius</i>
14:30 - 15:15	Communication and Listening Skills	<i>Ms Adele Pretorius</i>
15:15 - 16:00	Understanding Medical Ethics	<i>Ms Adele Pretorius</i>
16:00 - 16:30	Tea break and tradeshow	
16:30 - 17:00	Confidentiality in the Practice	<i>Ms Adele Pretorius</i>
17:00 - 17:30	A compassionate mindset	<i>Ms Adele Pretorius</i>
19:30	Gala dinner at uShaka Marine World with <i>the Beat Route</i> band	

Saturday 31 August 2019		Dental Technician Plenary
07:15 - 08:00	Congress registration	
08:00 - 10:15	Join opening	
10:00 - 10:30	Tea break and tradeshow	
10:30 - 11:30	Digital implant workflow from planning to placement	<i>Mr Darron Chidrawi</i>
11:30 - 12:30	Partial dentures/CAD Designs and 3D Printing	<i>Mr Miha Skaza</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 14:30	Aesthetic considerations of anterior and posterior CAD/CAM restorations	<i>Dr Murray Orr</i>
14:30 - 15:30	Scan - design - print	<i>Mr Adriaan van der Spuy</i>
15:30 - 16:00	Tea break and tradeshow	
16:00 - 17:00	A functional, a predictable approach to aesthetic restoration	<i>Mr Michael Lazarevic</i>
19:30	Gala dinner at uShaka Marine World with <i>the Beat Route</i> band	

Saturday 31 August 2019		Dental Technician Master Classes/Hands-on - Track 1
07:15 - 08:00	Congress registration	
08:00 - 10:15	Join opening	
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Renfert occlusal compass and anatomy - Part 1 & 2	<i>Mr André Buys</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:30	Renfert occlusal compass and anatomy - Part 3 & 4	<i>Mr André Buys</i>
15:30 - 16:00	Tea break and tradeshow	
16:00 - 17:00	Renfert occlusal compass and anatomy - Part 5	<i>Mr André Buys</i>
19:30	Gala dinner at uShaka Marine World with <i>the Beat Route</i> band	

Saturday 31 August 2019		Dental Technician Master Classes/Hands-on - Track 2
07:15 - 08:00	Congress registration	
08:00 - 10:15	Join opening	
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Precision, power and control with digital Orthodontics - Part 1 & 2	<i>Ms Andrea Schepers</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 15:30	Sultra Ceram	<i>Mr Grant Peake</i>
15:30 - 16:00	Tea break and tradeshow	
16:00 - 17:00	Sultra Ceram	<i>Mr Grant Peake</i>
19:30	Gala dinner at uShaka Marine World with <i>the Beat Route</i> band	

Saturday 31 August 2019		The South African Society for Periodontology, Implantology and Oral Medicine	
07:15 - 08:00	Congress registration		
08:00 - 10:15	Join opening		
10:15 - 11:00	Tea break and tradeshow		
11:00 - 12:30	Principles of anticoagulation Drug-drug interactions: core knowledge for the dental specialist		<i>Dr Erick Decloedt</i>
12:30 - 13:30	Lunch break and tradeshow		
13:30 - 14:15	Clinical case discussions		<i>Dr Erick Decloedt</i>
14:15 - 15:00	New classification of periodontal disease		<i>Dr Shogan Govender</i>
15:00 - 15:45	CBCT - The role in digital dentistry		<i>Dr Khaleb Beshtawi</i>
15:45 - 16:15	Tea break and tradeshow		
16:15 - 17:45	SASPIO - AGM		
19:30	Gala dinner at uShaka Marine World with <i>the Beat Route</i> band		

Saturday 31 August 2019		The South African Society of Maxillofacial and Oral Surgeons	
08:00 - 08:30	Congress registration		
08:00 - 10:00	Join Opening		
10:15 - 11:00	Tea break and tradeshow		
11:00 - 12:30	Digital planning in maxillofacial surgery		<i>Dr Ebrahim Fakir</i>
12:30 - 13:30	Lunch break and tradeshow		
13:30 - 14:30	A practical approach to understanding and managing functional TMJ disorders		<i>Dr Jameel Desai</i>
14:30 - 15:30	The interface between Maxillo Facial Radiology and Surgery		<i>Dr Suvir Singh</i>
15:45 - 16:15	Tea break and tradeshow		
19:30	Gala dinner at uShaka Marine World with <i>the Beat Route</i> band		

End of Day 2 - Continue to Day 3

Sunday 1 September 2019**Main Plenary**

(Please note the Plenary and Parallel tracks run concurrently)

08:00 - 08:30	Congress registration	
08:30 - 09:15	Conflict in business ethics	<i>Dr Raj Rattan</i>
09:15 - 10:00	Aesthetic direct restorations in endodontically treated anterior teeth. Post or not Post: Amletic question?	<i>Dr Monaldo Saracinelli</i>
10:00 - 10:15	Tea break and tradeshow	
10:15 - 11:00	Implant restorations in a digital world	<i>Dr Murray Orr</i>
11:00 - 11:30	Comprehensive Dental Care Continuum	<i>Prof James Curtis</i>
11:30 - 12:15	Motivational Speaker	<i>Speaker to be announced</i>
12:15 - 13:15	Lunch break and tradeshow	
13:15 - 14:00	Unconventional pathways in contemporary prosthodontics	<i>Dr Johannes Boldt</i>
14:00 - 14:30	Back to the roots	<i>Dr Christof Zirkel</i>
14:30 - 15:15	New frontiers in removable prosthodontics	<i>Dr Frank Spitznagel</i>
15:15 - 15:30	Closure and Prize Draw	

Sunday 1 September 2019**Parallel Tracks**

(Please note the Plenary and Parallel tracks run concurrently)

Sunday 1 September 2019	Dental Technician Plenary	
08:00 - 08:30	Congress registration	
08:00 - 09:00	Interdisciplinary treatment - the Orthodontic component	<i>Dr Mark Wertheimer</i>
09:00 - 10:00	Topic to be announced	<i>Prof Peet van der Vyver</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 11:30	DD Contrast	<i>Mr Sebastiaan Cornelissen</i>
11:30 - 12:30	Topic to be announced	<i>Speaker to be announced</i>
12:30 - 13:30	Lunch break and tradeshow	
13:30 - 14:30	Anterior shade matching journey	<i>Mr André Buys</i>
14:30 - 15:30	Topic to be announced	<i>Mr Tom Behaeghel</i>
15:15 - 15:30	Closure and prize draw	

Sunday 1 September 2019	Dental Technician Master Classes/Hands-on - Track 1	
08:00 - 08:30	Congress registration	
08:00 - 09:00	Achieving predictability in the digital era	<i>Dr Murray Orr</i>
09:00 - 10:00	CADCAM post mill refinement, texture and lustre	<i>Dr Murray Orr</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 12:30	Precision, power and control with digital Orthodontics - Part 1 & Part 2	<i>Ms Andrea Schepers</i>
12:30 - 13:30	Lunch break and tradeshow	
15:15 - 15:30	Closure and prize draw	

Sunday 1 September 2019	Dental Technician Master Classes/Hands-on - Track 2	
08:00 - 08:30	Congress registration	
08:00 - 09:00	Galvanforming	<i>Ms Karin Schiffner</i>
09:00 - 10:00	Red and white ceramic polymers in harmony	<i>Mr Richard Newman</i>
10:00 - 10:30	Tea break and tradeshow	
10:30 - 11:30	Staining and glazing full monolithic milled restorations	<i>Mr Michael Lazarevic</i>
11:30 - 12:30	The full digital solution	<i>Ms Cherodene Bester & Mr Bryan Perkin</i>
12:30 - 13:30	Lunch break and tradeshow	
15:15 - 15:30	Closure and prize draw	

End of Day 3 and Programme

Please Note: Programme subject to change.

Delegate Registration Form

30 August 2019 - 1 September 2019

Online registration: www.sadacongress.co.za

Enquiries

Cell: +27 (0)83 339 8911

Email: mvdlinde@sada.co.za

Fax: +27 (0)86 680 7390

Office hours: Monday to Friday, 08:00 - 16:00

For online registration and payment go to: www.sadacongress.co.za



DENTAL & ORAL HEALTH
CONGRESS AND EXHIBITION

30 AUGUST - 1 SEPTEMBER 2019

Inkosi Albert Luthuli International
Convention Centre, Durban



SADA

If not registering online please complete the entire registration form, and submit with your credit card details for singular transaction processing. Send to SADA via Email: mvdlinde@sada.co.za

Section A: Personal Information

Note: Please print in block capitals.

Surname: First name:

ID Number: Initials: Title:

Name on Badge: HPCSA Reg No. (Not practice no.):

Name of Practice/ Academic Institution:

Postal Address: Code:

Telephone No. (W): Cellphone No.

Email Address: Company Vat No.

Accompanying Person

Surname: Initials: Title:

Section B: Registration Fees (Vat Included)

Registration Section

Note: Please mark the appropriate registration fee (with an X) according to your specific delegate category.

Delegate Category	Full Registration Fee: (3 Days) 30 August 2019 - 1 September 2019				Day Delegate Registration Fees Per Day							
	Early Bird before 30 June 2019	Mark X	Booked from 1 July 2019	Mark X	Early Bird before 30 June 2019	Fri 30 Aug	Sat 31 Aug	Sun 1 Sept	Booked from 1 July 2019	Fri 30 Aug	Sat 31 Aug	Sun 1 Sept
*SADA Core Member	R 4 840.00		R 5 540.00		R 1 940.00				R 2 220.00			
**SADA Educational Member	R 3 840.00		R 4 540.00		R 1 540.00				R 1 820.00			
SADA Non-Member	R 6 300.00		R 7 500.00		R 2 520.00				R 3 000.00			
Community Service Dentist/ 1st Year Qualified Dentist in Practice	R 2 900.00		R 3 325.00		R 1 165.00				R 1 330.00			
2 nd Year Qualified Dentist in Practice	R 3 000.00		R 3 440.00		R 1 200.00				R 1 375.00			
Dental Students (1 st - 5 th Year)	FREE		FREE		FREE				FREE			
Registrar/Post Graduate Student	R 1 920.00		R 2 300.00		R 770.00				R 920.00			
Emeritus (70+ Years)	R 2 000.00		R 2 500.00		R 800.00				R 1 000.00			
Dental Technician	R 2 750.00		R 3 500.00		R 1 200.00				R 1 320.00			
Dental Therapist	R 2 750.00		R 3 500.00		R 1 200.00				R 1 320.00			
Oral Hygienist	R 2 165.00		R 2 500.00		R 850.00				R 1 000.00			
Dental Assistant	R 1 700.00		R 2 000.00		R 700.00				R 800.00			
Receptionist/Practice Manager	R 1 700.00		R 2 000.00		R 700.00				R 800.00			
Exhibition Only Visitors	R 5 000.00		R 6 000.00		R 2 000.00				R 2 500.00			
Spouse Visitor	R 1 200.00		R 1 500.00		R 610.00				R 750.00			
	Total R				Total R				Total No. of Days			
Total Section B R												

Group Bookings - Qualify for great discounts
1 Dentist + 3 Auxilliary Staff
2 Dentists + 3 - 5 Auxilliary Staff
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For your discounted quote contact: Marilize van der Linde	
Cell: +27 (0)83 339 8911	Fax: +27 (0)86 680 7390
Tel: +27 (0)11 484 5288	Office hours: Monday to Friday, 08:00 - 16:00
Email: mvdlinde@sada.co.za	

*SADA Core Member: This member gets a preferential rate of R1460 less on the Annual SADA Congress full registration fee unavailable to SADA Non-Members.
**SADA Educational Member: This member who has purchased the Educational membership top-up package is entitled to a further discount of R1000 (total discount of R2460) on the Annual SADA Congress full registration fee to SADA Non-Members.

Section C

Programme Session Bookings

Due to lecture room limited seating all bookings are processed on a first come first served basis. If you do not indicate which lecture you wish to attend you will not be registered to attend the lecture on that day and your registration will not be accepted. Please indicate your option in the white spaces provided with an '✓'.

Friday 30 August 2019

Time	Track	✓
Master Classes / Hands-On		
Track 1 - Lasers & Snoring		
08:00 - 10:00	Lasers & Snoring: Effective non-surgical treatment modality alleviating snoring - <i>Dr Sofia Aravopoulou</i>	
10:30 - 12:30	(Repeat) Lasers & Snoring: Effective non-surgical treatment modality alleviating snoring - <i>Dr Sofia Aravopoulou</i>	
13:30 - 15:00	Practice Management: Creating a quality practice - <i>Dr Raj Rattan</i>	
15:30 - 17:00	Practice Management: Managing failures and human error - <i>Dr Raj Rattan</i>	
Track 2 - Digital Dentistry		
08:00 - 12:30	Digital Dentistry: Aesthetic Excellence Chairside with CAD/CAM - <i>Dr Murray Orr</i>	
13:30 - 15:00	Digital Dentistry: Digital solutions for complex cases - <i>Dr Frank Spitznagel</i>	
15:30 - 17:00	Digital Dentistry: CAD/CAM in Implant Dentistry: Key to success - <i>Dr Johannes Boldt</i>	
Track 3 - Paedodontic Society of South Africa		
08:00 - 09:00	The 6 th sense of behaviour management - <i>Dr Nicoline Potgieter</i>	
09:00 - 10:00	Management of the medically compromised patients - <i>Dr Nadia Mohamed</i>	
10:30 - 11:30	Paediatric Zirconia Crowns - <i>Dr Makul Jain</i>	
11:30 - 12:30	Silver Diamine Fluoride and Paedo-Rotary Files - <i>Dr Makul Jain</i>	
13:30 - 15:00	Current trends in Paediatric Dentistry - <i>Prof Peet van der Vyver & Dr Martin Vorster</i>	
15:30 - 17:00	Glass ionomers from A to Z - <i>Dr Riaan Mulder</i>	
Track 4 - Young Dentist's Council		
08:00 - 10:00	Endodontics - back to the future - <i>Dr Hussein Seedat</i>	
10:30 - 11:30	Implant failure - a microscopic perspective Update on oral and oropharyngeal carcinoma - <i>Prof Erich Raubenheimer</i>	
11:30 - 12:30	Sugar, caries and all things nice - <i>Dr Hanif Laher</i>	
13:30 - 15:15	An introduction to dental implantology - <i>Dr Bradley Bredenkamp</i>	
15:30 - 16:15	Problems & Solutions - <i>Dr Alasdair McKelvie</i>	
16:15 - 17:00	From start to finish - <i>Mr Bruce Fordyce</i>	
Track 5		
08:00 - 10:00	Ethics: Problems & solutions - <i>Dr Alasdair McKelvie</i>	
10:30 - 12:30	Ethics: Problems & solutions - <i>Dr Kobus Barnard</i>	
13:30 - 15:00	Aesthetics: Cementation - <i>Dr Michael Dieter</i>	
15:30 - 17:00	Endodontics: Set your Endo on fire - <i>Dr Martin Vorster</i>	
Track 6		
08:00 - 10:00	Restorative: How to create flawless impressions for indirect restorations - <i>Prof Peet van der Vyver</i>	
10:30 - 12:30	Endodontics: Mastering Endodontic treatment on maxillary molars respecting the true anatomy - <i>Prof Peet van der Vyver</i>	
13:30 - 15:00	Aesthetics: Catherization of Ceramic Restorations - <i>Mr Tom Behaeghel</i>	
15:30 - 17:00	Orthodontics: Why restorative dentistry needs Orthodontics - <i>Dr Mark Bowes</i>	
Track 7 - Endodontics		
08:00 - 10:00	The basic golden rules in endodontics - <i>Dr Boela van der Merwe</i>	
10:30 - 12:30	Fundamentals approaching challenging endodontic anatomy Technologies taking endodontics from darkness into the light - <i>Dr Grethé Koen</i>	
13:30 - 15:00	Predictability in Endodontics Clinical tips to better endodontics - <i>Dr Gavin Williams</i>	
15:30 - 17:00	Iotrogenic damage caused with Endodontics - <i>Dr Christo van Rensburg</i>	

Friday 30 August 2019

Time	Track	✓
Master Classes / Hands-On		
Track 8 - Implantology		
08:00 - 10:00	Introduction to implant dentistry Implant engineering-geometry and implant-abutment connections	
10:30 - 12:30	Applied anatomy for implants: a brief overview	
13:30 - 15:00	Hands-on/Practical training: Placement of a single posterior implant - from stent to provisional crown	
15:30 - 17:00	Hands-on/Practical training: Placement of a single posterior implant - from stent to provisional crown (Continued) Demonstration of impression taking on a single posterior implant - <i>Prof Andre van Zyl and Team</i>	
Track 9 - Style Italiano		
08:00 - 12:30	State of the art anterior composite restorations - <i>Dr Walter Devoto & Dr Monaldo Saracinelli</i>	
13:30 - 17:00	(Repeat) State of the art anterior composite restorations - <i>Dr Walter Devoto & Dr Monaldo Saracinelli</i>	
Track 10 - Dental Technician		
08:00 - 09:00	In Lab and the Connect Case Centre workflow - <i>Mr Leo Dingemans</i>	
09:00 - 10:00	Back to basis - a reminder - <i>Mr Miha Skaza</i>	
10:30 - 11:30	One guide to all today's Zirconia solutions - <i>Mr Uwe Greitens</i>	
11:30 - 12:30	Owning your financial future - <i>Ms Jacqueline Newton, Ms Ester Ochse & Mr Chris Nketiah</i>	
13:30 - 14:30	Implant denture frameworks and attachments - <i>Mr Shrikanth Mallem Kumar</i>	
14:30 - 15:30	Red and white ceramic polymers in harmony - <i>Mr Richard Newman</i>	
16:00 - 17:00	The quality of Vita teeth comparison with computer teeth - <i>Mr Tom Behaeghel</i>	

Saturday 31 August 2019

Time	Session	✓
08:00 - 17:45	Main Plenary	
08:00 - 17:45	Oral Hygienist	
08:00 - 17:30	Dental Assistant	
08:00 - 17:30	Practice Manager/Receptionist	
Dental Technician - Plenary		
10:30 - 11:30	Digital implant workflow from planning to placement - <i>Mr Darron Chidrawi</i>	
11:30 - 12:30	Partial dentures/CAD Designs and 3D Printing - <i>Mr Miha Skaza</i>	
13:30 - 14:30	Aesthetic considerations of anterior and posterior CAD/CAM restorations - <i>Dr Murray Orr</i>	
14:30 - 15:30	Scan - design - print - <i>Mr Adriaan van der Spuy</i>	
16:00 - 17:00	A functional, a predictable approach to aesthetic restoration - <i>Mr Michael Lazarevic</i>	
Dental Technician - Master Classes/Hands-on - Track 1		
10:30 - 12:30	Renfert occlusal compass and anatomy - Part 1 & 2 - <i>Mr André Buys</i>	
13:30 - 15:30	Renfert occlusal compass and anatomy - Part 3 & 4 - <i>Mr André Buys</i>	
16:00 - 17:00	Renfert occlusal compass and anatomy - Part 5 - <i>Mr André Buys</i>	
Dental Technician - Master Classes/Hands-on - Track 2		
10:30 - 12:30	Precision, power and control with digital Orthodontics - Part 1 & 2 - <i>Ms Andrea Schepers</i>	
13:30 - 15:30	Sultra Ceram - <i>Mr Grant Peake</i>	
16:00 - 17:00	Sultra Ceram - <i>Mr Grant Peake</i>	
The South African Society for Periodontology, Implantology and Oral Medicine		
08:00 - 17:45	The South African Society for Periodontology, Implantology and Oral Medicine	
08:00 - 15:30	The South African Society of Maxillofacial and Oral Surgeons	

Sunday 1 September 2019

Time	Session	✓
08:00 - 15:30	Main Plenary	
Dental Technician - Plenary		
08:00 - 09:00	Interdisciplinary treatment – the Orthodontic component - <i>Dr Mark Wertheimer</i>	
09:00 - 10:00	Topic to be announced - <i>Prof Peet van der Vyver</i>	
10:30 - 11:30	DD Contrast - <i>Mr Sebastiaan Cornelissen</i>	
11:30 - 12:30	Topic and speaker to be announced	
13:30 - 14:30	Anterior shade matching journey - <i>Mr André Buys</i>	
14:30 - 15:30	Topic to be announced - <i>Mr Tom Behaeghel</i>	
Dental Technician - Master Classes/Hands-on Track 1		
08:00 - 09:00	Topic to be announced - <i>Dr Murray Orr</i>	
09:00 - 10:00	Topic to be announced - <i>Dr Murray Orr</i>	
10:30 - 12:30	Precision, power and control with digital Orthodontics - Part 1 & 2 - <i>Ms Andrea Schepers</i>	
Dental Technician - Master Classes/Hands-on Track 2		
08:00 - 09:00	Galvanforming - <i>Ms Karin Schiffner</i>	
09:00 - 10:00	Red and white ceramic polymers in harmony - <i>Mr Richard Newman</i>	
10:30 - 11:30	Staining and glazing full monolithic milled restorations - <i>Mr Michael Lazarevic</i>	
11:30 - 12:30	The full digital solution - <i>Ms Cherodene Bester & Mr Bryan Perkin</i>	

Section D

Congress Social Functions

Indicate which functions you will attend by marking the appropriate block.
Note: There is no cost related to these functions. A cash bar will be available.

Thursday 29 August 2019: Pre-Registration & Welcome Function Venue: Durban ICC Foyer	Yes <input checked="" type="checkbox"/>	No <input checked="" type="checkbox"/>
Delegate		
Accompanying Person		
Friday 30 August 2019: Cocktail Evening with Barry Hilton and German Oompah Band Venue: Durban ICC	Yes <input checked="" type="checkbox"/>	No <input checked="" type="checkbox"/>
Delegate		
Accompanying Person		

Indicate whether you will attend the Gala Dinner by marking the appropriate block.
Note: The Gala Dinner costs R550 pp. A cash bar will be available.

Saturday 31 August 2019: Gala Dinner with the Beat Route Band (R550 pp) Venue: uShaka Marine World	Yes <input checked="" type="checkbox"/>	No <input checked="" type="checkbox"/>
Delegate		
Accompanying Person		

Section E

Dietary Requirements

- The food served at the venue is certified by HFSA (Halaal Foundation of South Africa) at no extra cost. Please indicate your choice below.
- If you require a Halaal menu option certified by SANHA (South African National Halaal Authority), a surcharge is applicable. Please indicate your choice below.
- If you require a Kosher menu option this is served at no extra cost. Please indicate your choice below.
- If you have any allergies, please indicate this below.

Special dietary requirements: Register by cut off date: 20/07/2019.
Please contact Marilize van der Linde at mvdlinde@sada.co.za in this regard.

Indicate your special dietary requirements if applicable:

	Standard Menu Requirement	HFSA Halaal Requirement	SANHA Halaal Requirement	Kosher Requirement
Delegate				
Accompanying Person				

*A surcharge is applicable for SANHA certified Halaal food.

Indicate your allergies if applicable:

	Nuts	Wheat	Gluten	Lactose
Delegate				
Accompanying person				
Indicate any other allergies you have				

Section F

Payment Details

R SECTION B + R SECTION D = R

Debit / Credit Card Payments Only: Please Fill In Details Below.
SADA does not store or record any card details.
You will be called on the telephone number you have indicated on page 1 of this registration form for card details to be processed.

Charge my Visa: Master: Amex: Diners:

Card Number:

Card Verification Value (CVV) on reverse of card:

Expiry date: Day Month Year

Surname:

Amount to be deducted: R

Terms and Conditions

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

Cancellations

- 25% Cancellation fee will be levied on cancellations on or before 30 June 2019.
- 50% Cancellation fee will be levied on cancellations between 1-31 July 2019.
- No refund for cancellation or non-attendance from 1 August 2019.
- Cancellation must be received in writing.
- If notification is not received in writing and confirmed by this office, you will be liable for the full registration fee.

Signature

I have read and understand the Terms & Conditions and Cancellation clause, as indicated above.

Title: First name:

Surname:

Date: DD / MM / 2019

SADA Banking Details

Account name: The South African Dental Association
Bank: Investec Bank Limited Branch: Sandton Branch Code: 58 01 05
Account Number: 10011847744 Swift Code: IVESZAJJ
Reference: Account no as it appears on invoice & name of individual/company

International Transfers

International Swift No.: IVESZAJJ
Address Details: 11 Diagonal Street, Newtown, Johannesburg, 2001

Section G

Accommodation Arrangements

Delegates are responsible for their own accommodation and travel arrangements, we have secured preferential rates for congress delegates at The Hilton Hotel, Durban.



The Hilton Hotel, Durban
www.hiltondurban.com
238 rooms
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Our quests must quote the group code to receive the special congress rate: **GSADA**

For a comprehensive list of more accommodation visit www.sadacongress.co.za

The South Africa Dental Association (SADA) and its representatives respect your rights to privacy and protection of your personal information. SADA is seeking your written permission to release your name and contact details to traders participating in the Congress. Please indicate your preference by ticking the appropriate box.	YES	NO
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For more information contact: Marilize van der Linde

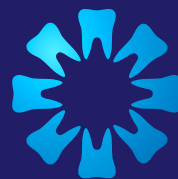
Cell: +27 (0)83 339 8911 Fax: +27 (0)86 680 7390
Tel: +27 (0)11 484 5288 Office hours: Monday to Friday,
Email: mvdlinde@sada.co.za 08:00 - 16:00
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