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Colophospermum mopane - Mopane tree. A source of chewing twigs used for tooth cleaning. The leaves are astringent and possibly antiseptic and are applied after extractions to promote healing, especially amongst the Herero of Namibia.

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Accredited by the Department of Education
SADJ is published 10 times a year by E-Doc cc on behalf of The South African Dental Association.
Did Eric Partridge have it wrong? In his seminal reference book, *Usage and Abusage*, the words Award and Reward are considered thus: “the latter is either a recompense or a recognition of merit; the former is a "judicial sentence, especially that of an arbitrator or umpire", hence: “that which is assigned as payment, penalty etc by the terms of the judge’s sentence or arbitrator’s decision” (The Oxford English Dictionary).

Context, as always, is critical. Let the umpire “award” an LBW decision, let the judge “award” costs to the litigant. But Funk and Wagnalls in their Standard Dictionary, at last make the acknowledgement, admittedly as a second meaning, that an award can be “bestowed, as a prize”.

The Association certainly conflates the two words, for The Awards Committee, in making deliberations and decisions, regards the Awards it makes as a type of Reward in recognition of merit. (Intriguingly, The Standard Dictionary does not include “conflates” but The Oxford English Dictionary does!! namely “to fuse together”.)

Research demands accurate usage, and that indeed is one of the criteria applied by the Panel of Judges appointed to consider papers submitted in competition for The Young Essayists Award. The purpose of the Award is succinctly stated: SADA seeks through this award to encourage promising young authors to submit original scientific essays of an international standard for publication in the Association’s Journal.

The central criterion is recorded as: Each paper will be assessed on whether it represents a substantial contribution to scientific progress and is presented with clarity that the reader can comprehend.

Of the eight eligible papers considered for the award, that authored by Dr KJ Ramphoma was adjudged as meeting the criteria most successfully. The award was presented on the occasion of the Gala Awards Dinner of the Association, held in Durban during the Annual Congress, 2015.

The paper was titled: “Knowledge, attitudes and practices of oral health care workers in Lesotho regarding the management of patients with oral manifestations of HIV/AIDS”, published in the SADJ: Volume 69, No.10.

Dr Ramphoma comments on her background and how the research developed:

“Growing up in Lesotho and having witnessed the poor and substandard dental health services provided, I knew that I wanted to go into Community Dentistry, with the hope that I would one day be able to reach the remote and rural villages of Lesotho and to provide the much needed dental health services. In August 2010, I was accepted for a MChD programme in Community Dentistry and graduated in September 2014 at the University of the Western Cape. I became interested in this particular topic because, as much as similar studies had been conducted in other African countries, it had never been done in Lesotho, specifically on oral health workers. Given that Lesotho has the third highest prevalence of HIV in the world, coupled with the gross lack of oral health workers, I realized the need for this particular study. Over and above that, there is a wealth of research on how oral health workers are playing a significant role in the diagnosis of oral lesions associated with HIV and I saw an opportunity to assist in this regard to achieve early detection of HIV and better management to prevent premature mortality of those infected with the disease.”

The project was supervised by Professor Su Naidoo (Deputy Dean of Postgraduate Studies and Research, UWC), who was the second author.

And yes, the Award was indeed also a Reward... in tangible terms there is a medal and a cash prize... but more importantly for the authors the reward is in the recognition that the research had merit and that the paper was indeed explicit. The Association also is in line for a reward, for it is to the recipients of the Young Essayists Award that we shall look for the researchers and authors of the future, as they take their turn in defining the cutting edges of dental research. Yes. Let us at once conflate the words “Award” and “Reward”... of course with due apologies to Eric Partridge!

Reference
Your skill set is unique. Just like your earning potential.

As a dentist, you have a set of skills that not many people have. You don’t just know the difference between orthodontic, prosthodontic and endodontic therapy – you give people the confidence to smile. Not everyone can do what you do – and earn what you earn. That’s why we’ve reinvented the PPS Sickness and Permanent Incapacity Benefit to offer you the flexibility you need to insure yourself comprehensively. After all, your skill set is unique. Your insurance should be too.

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PPS offers unique financial solutions to select graduate professionals with a 4-year degree. PPS is an authorised Financial Services Provider.
It was an inspired decision to escalate the Durban Congress Dinner to the elevated status of The Gala Awards Dinner. The prestige event was made more memorable as the Association, gathered in their finery, were able to applaud those whose outstanding service was recognised. The number of awards reflects the range and complexities of the Association, and in the achievement of each recipient every member can share in reflected lustre, for there is of course a reciprocal mechanism... the Association, its members, offer the challenges which have been so well taken up by our awardees! So it was an evening of rather special congratulations to all!

The Awards Committee have the mandate which is succinctly summarised in the Guidelines:

1. The South African Dental Association [SADA] through the Awards Programme of the Awards Committee acknowledges and seeks to give due recognition to the unique abilities and contributions of many outstanding members of the dental and allied professions.

2. The SADA Awards programme is a showcase for all the excellent work that is taking place in dentistry in South Africa. The programme seeks to recognise and reward the work of some of the best achievers in dentistry, celebrating their efforts and commitment to the dental profession.

3. The awards are presented primarily at major events of the Association and meetings in which the Association participates.

The Committee discharged that mandate with aplomb, as evidenced by the distinguished array of award recipients.

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

The President of the Association, Dr Vivesh Rughubar, presented Dr Vermeulen and Dr Khasa with The Service Excellence Award. Dr Roux Vermeulen is the outgoing Chairman of our Board of Directors, a demanding position of unrelenting pressure. Dr Zanemvula Khasa held the fort as Acting President of the Association from 2011 to 2012. The SADA Service Excellence Award is presented to an individual member of SADA for outstanding instances of service to the Association and its structures, or who renders distinguished and exemplary services over a period of time to the Association. The award is presented to a candidate who best exhibits the following characteristics:

- Unselfishness;
- Concern for SADA and the dental profession
- High moral character
- Commitment to and involvement in SADA affairs and a commitment to dentistry

The SADA Meritorious Service Award is presented to individual members of SADA in recognition of their significant contribution, long-standing, and meritorious service rendered to SADA at National level or to Branches of SADA. The award is presented to a person who best exhibits the following characteristics:

- Unselfishness;
- Outstanding service, dedication and devotion to the affairs of SADA and its Branches.
- Commitment to and involvement in SADA affairs:
- Demonstrates through activities and achievements a strong interest in the affairs of SADA and the dental profession.

The SADA Meritorious Service Award is presented to individual members of SADA in recognition of their significant contribution, long-standing, and meritorious service rendered to SADA at National level or to Branches of SADA. The award is presented to a person who best exhibits the following characteristics:

- Unselfishness;
- Outstanding service, dedication and devotion to the affairs of SADA and its Branches.
- Commitment to and involvement in SADA affairs:
- Demonstrates through activities and achievements a strong interest in the affairs of SADA and the dental profession.

To Dr Yvette Solomon and Dr Ian Erasmus went The SADA Meritorious Service Award.

Mrs M van der Linde - SADA Distinguished Award & Dr V Rughubar (SADA President).
in the affairs of SADA and the dental profession.
• continuously goes above and beyond the call of duty.

To our indefatigable—and ineffably elegant - Congress Convenor, Marilise van der Linde, went The SADA Distinguished Service Award, presented to individuals who are not members of the Association, in recognition of outstanding and exemplary contribution and service to the oral health profession and SADA.

The award is presented to a person who best exhibits the following characteristics:
• Distinguished themselves by outstanding service, dedication and devotion to the affairs of SADA and the oral health profession.
• Who through their actions and eminent service have promoted SADA and the dental profession.
• Demonstrates through activities and achievements a strong interest in the affairs of SADA and the dental profession.

The dental profession could not exist without the cooperative support and dedication of the Dental Traders. This year a special award went to SCiVision - The Dental Trader of the Year, an accolade determined by the choice of practitioners, whilst Sirona was awarded, The 2015 Trade Partner. Fitting recognition indeed of the close working relationship and mutual respect between Association and Dental Traders.

The awards are not only a recognition of excellence but also an expression of appreciation. The work of the Association, in all its multiple facets, is dependent upon the sustained contribution of these special people.
Comparison of preparation times of three different rotary glide path instrument systems

PJ van der Vyver¹, F Paleker², CH Jonker³

Introduction: This study aimed to compare the preparation times of three different glide path preparation methods using nickel-titanium files in a rotary motion with those achieved by manual stainless-steel K-files.

Materials and methods: ISO 15, 0.02 taper Endo-Training-Blocks (n = 80) were selected and randomly divided into four main groups (n = 20) for glide path preparations: Group 1: with the rotary ProGlider instrument; Group 2: with stainless-steel hand K-files; Group 3: with rotary PathFiles; Group 4: with rotary X-Plorer Navigation Files. The total time taken to prepare the glide paths was recorded. The times required to change instruments, irrigate, clean instruments, and for recapitulation and re-irrigation were not recorded. The data were statistically analysed using the ANOVA / Bonferroni test.

Results: Stainless-steel hand K-files recorded the longest preparation time (24.3s) (P<0.001). The ProGlider instrument was significantly faster at the task at 11.3 seconds compared with all the other test groups (P<0.001). There was no statistically significant difference between the mean glide path preparation times recorded for PathFiles and X-Plorer Canal Navigation Files (P>0.001).

Conclusion: PathFiles and X-Plorer Canal Navigation Files were more efficient than hand K-files. The ProGlider instrument achieved overall significantly shorter glide path preparation times.

INTRODUCTION
The preparation of a glide path prior to the introduction of rotary nickel-titanium instruments is a standard adjunct to ensure more safety during root canal instrumentation.¹ A glide path can be defined as a smooth, radicular tunnel from the canal orifice to the physiologic terminus of the root canal.² The purpose of a glide path in root canal preparation is to create a root canal diameter the same size as, or ideally a size bigger than, the first rotary instrument introduced.³,⁴,⁵ Varela-Patiño et al. (2005) found that fewer instrument fractures occurred when a wide and smooth-walled glide path was created and the canal was pre-fared before canal preparation with rotary files.⁴

The preparation of a glide path not only reduces the risk of instrument separation, but also conveys to the clinician an intimate knowledge of the tortuous anatomy of the root canal system. Various methods to create a glide path have been advocated. Initially, authors recommended the use of stainless-steel K-files for the task to reduce the failure rate of nickel-titanium instruments.³,⁶,⁷,⁸,⁹ Other authors advocate the use of a reciprocating hand piece in combination with stainless-steel K-files.¹⁰ This combination method reduces hand fatigue and cuts down considerably on clinical chair time, especially in cases with multiple, narrow root canal systems.¹⁰,¹¹,¹²

The most recent development in glide path preparation is the use of stainless-steel hand files in combination with rotary nickel-titanium instruments eg. PathFiles (Dentsply/Maillefer), G-Files (Micro-Mega), EndoWave Mechanical Glide Path Kit (MGP)(J Morita), Scout-RaCe Files (FKG), Race ISO 10 (FKG) and X-Plorer Canal Navigation NiTi Files (Clinician’s Choice Dental Products Inc.). The PathFile system consists of three instruments with square cross sections and 2% taper. PathFile no.1 (purple) has an ISO 13 tip size, PathFile no.2 (white), an ISO 16 tip size and PathFile no.3 (yellow) an ISO 19 tip size. The gradual increase in tip size facilitates progression of the files apically. The manufacturer suggests using the PathFile no.1 only after a size 0.10 K-file has been used to explore the root canal to working length.⁵,¹³

¹ PJ van der Vyver: BCCHD, Dip(Odont), MSc. Division of Endodontics, Department of Odontology, School of Dentistry, Faculty of Health Sciences, University of Pretoria, Gauteng, South Africa.
² F Paleker: BCCHD, Dip(Odont). Division of Endodontics, Department of Odontology, School of Dentistry, Faculty of Health Sciences, University of Pretoria, Gauteng, South Africa.
³ CH Jonker: BCCHD, Dip(Odont.), MSc. Division of Endodontics, Department of Odontology, School of Dentistry, Faculty of Health Sciences, University of Pretoria, Gauteng, South Africa.

Corresponding author
PJ van der Vyver:
Division of Endodontics, Department of Odontology, School of Dentistry, Faculty of Health Sciences, University of Pretoria, Gauteng, South Africa. Tel: 012 2443, E-mail: peetv@iafrica.com

ACRONYMS
DOM: Dental Operating Microscope
MGP: Mechanical Glide Path

SA DJ May 2015, Vol 70 no 4 p144 - p147
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Berutti et al. (2009) showed that the preparation of a glide path with hand files resulted in more irregularities and an over-enlargement of the canal curve compared with the use of rotary PathFiles. They also demonstrated that PathFiles could be safely used by inexperienced operators, who obtained superior results in creating a glide path with far fewer canal alterations than did expert operators using hand files. In a recent study it was demonstrated that glide path preparation with PathFiles increased the longevity of 25/08 WaveOne instruments when used to prepare simulated canals compared with how those instruments lasted when no glide path preparation had been effected or glide path preparation had been completed with stainless-steel hand K-files.14 The X-Plorer Canal Navigation NiTi File system (Clinician’s Choice Dental Products Inc., New Milford, USA) also consists of three instruments. The first X-Plorer file has an ISO 15 tip size and a 1% taper with a triangular cross section. The second X-Plorer file has an ISO 20 tip size with a 1% taper and a square cross section. The third X-Plorer file has an ISO 20 tip size with a 2% taper and a square cross section. The reduced taper increases flexibility and facilitates apical progression of the files.15,16

Cassim and van der Vyver (2013) compared the efficiency of modification of canal curvature and the incidence of canal aberrations after glide path preparation with stainless-steel K-files used manually, stainless-steel K-files used in a reciprocating hand piece, rotary NiTi PathFiles and X-Plorer Navigation Files.16 They concluded that there were no differences in efficacy between PathFiles and X-Plorer files for glide path preparation. Both these rotary systems performed better than stainless-steel K-files in the reciprocating hand piece, which again, performed better than stainless-steel K-files used manually.

Recently, a new single rotary glide path instrument, the ProGlider (Dentsply/Maillefer), was launched. This instrument is manufactured using M-wire technology, making it more resistant to cyclic fatigue.17 The M-wire alloy may also decrease the potential for file fracture and make it more resistant to cyclic fatigue.17 The M-wire alloy may also decrease the potential for file fracture and make it more resistant to cyclic fatigue.17

The aim of this in vitro study was to compare the preparation times associated with the use of three different rotary glide path instruments and with the conventional, manual, stainless-steel K-file system.

The ProGlider (Dentsply/Maillefer), was launched. This instrument is manufactured using M-wire technology, making it more resistant to cyclic fatigue.17 The M-wire alloy may also decrease the potential for file fracture and make it more resistant to cyclic fatigue.17

### MATERIALS AND METHODS

Eighty ISO 15, 0.02-tapered, Endo-Training-Blocks (Dentsply/ Mailfer, Baillauges, Switzerland) were selected for this study. A working length of 16.5mm for each training block was confirmed with a size 10 K-File (VDW, Munich, Germany) under 10X magnification using a Dental Operating Microscope (DOM) (Global, St Louis, USA). Specimens were randomly assigned to four different groups (n=20) and treated as follows:

**Group 1: Stainless-steel K-files by hand (control)**

Manual pre-flaring with stainless-steel K-files (VDW), in the following sequence: 0.10, 0.15 and then 0.20 to working length, using a quarter clockwise “turn and pull” motion.

**Group 2: Hand K-files followed by the ProGlider instrument**

A reproducible glide path was manually established with a size 10 stainless-steel hand K-file (VDW), before the glide paths were enlarged using the ProGlider instrument.

**Group 3: Hand K-files followed by rotary PathFile instruments**

A reproducible glide path was manually established with a size 10 stainless-steel hand K-file (VDW), before the glide paths were enlarged using the three rotary PathFiles.

**Group 4: Hand K-files followed by rotary X-Plorer instruments**

A reproducible glide path was manually established with a size 10 stainless-steel hand K-file (VDW), before the glide paths were enlarged using the three X-Plorer files (Clinician’s Choice Dental Products Inc).

The rotary ProGlider, PathFiles and X-Plorer files were used in an endodontic hand piece (X-Smart Plus, Dentsply/ Mailfer) operating at 300 rpm, and 4 Ncm torque. Glyde root canal lubricating gel (Dentsply/Maillefer) was used between the different instruments.

The time it took to prepare each of the twenty glide paths for each group was recorded with an electronic stop watch. The time it took to change instruments was not recorded. The data of the different parts of the project were collected and statistically analysed using the ANOVA / Bonferroni tests.

### RESULTS

The descriptive and comparative data are shown in Table 1. A one-way analysis of variance (ANOVA) showed that glide path preparation with the ProGlider instrument was significantly faster at 11.3 ± 2.2 seconds compared with all the other groups tested (P<0.001). The slowest preparation time was recorded with stainless-steel hand K-files (24.3 ±3.6 seconds) (P<0.001). ANOVA testing also showed that there were no statistically significant differences between the mean glide path preparation times of PathFiles and X-Plorer Canal Navigation Files (17.2 ± 2.6 and 18.5 ± 2.7 seconds respectively) (P>0.001), as is also suggested by the relative closeness of the respective coefficients of variation. Pairwise comparisons at the Bonferroni adjusted significance level of 0.017 demonstrated a statistically significant difference (P<0.001) in times between the group where the glide paths were prepared with stainless-steel hand K-files (control) compared with those prepared with PathFiles and X-Plorer Canal Navigation Files.

### Table 1: Mean glide path preparation time(s), standard deviation and coefficient of variance for the different methods

<table>
<thead>
<tr>
<th>Preparation Method</th>
<th>Mean Preparation Time (s)</th>
<th>Standard Deviation</th>
<th>Coefficient of Variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless-steel K-file</td>
<td>24.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.6</td>
<td>14.8</td>
</tr>
<tr>
<td>ProGlider Instrument</td>
<td>11.3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.2</td>
<td>19.5</td>
</tr>
<tr>
<td>PathFiles</td>
<td>17.2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2.6</td>
<td>15.1</td>
</tr>
<tr>
<td>X-Plorer Canal Navigation Files</td>
<td>18.5&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2.7</td>
<td>14.5</td>
</tr>
</tbody>
</table>

Values with the same letter were not statistically significant different at P<0.001
DISCUSSION
This study used Endo-Training-Blocks in tests designed to compare the preparation times achieved when using three different rotary glide path instruments systems with the times associated with manual glide path preparation using stainless-steel hand K-files. Simulated canals in Endo-Training-Blocks are often used to standardize experimental conditions for the evaluation of endodontic instruments.5,18,19

It is evident that manual glide path preparation by means of stainless-steel hand K-files resulted in the longest preparation time compared with the efficacy of the rotary glide path preparation instruments. A similar observation was noted in previous studies where glide path preparation with stainless-steel hand K-files was compared with rotary PathFiles preparation times.24,20

This is the first study to compare the mean preparation times achieved by the use of three different rotary glide path instruments. No comparative data for the X-Plorer Canal Navigation File and the ProGlider instrument was found in the literature. The PathFile and X-Plorer Canal Navigation File systems both make use of three rotary instruments, in contrast to the single ProGlider instrument, to enlarge the glide path, after a reproducible glide path has been established with a size 10 stainless-steel hand K-file. The fact that three different instruments had to be used to enlarge the glide path with PathFiles and X-Plorer Canal Navigation Files resulted in the statistically significant longer glide path preparation times for these two systems, when compared with the performance of the single ProGlider instrument. There were no statistically significant differences in the glide path preparation times for PathFiles and X-Plorer Canal Navigation Files.

It is relevant to note that this study did not record the time it took to change between the different instruments used for each group. Taking this into account, the single ProGlider instrument (after using the size 10 K-file) enlarges a glide path significantly faster compared with the multiple instruments used with the stainless-steel hand K-files (three instruments), PathFiles (four instruments) and the X-Plorer Canal Navigation Files (four instruments). Clinically, the use of the ProGlider instrument for glide path enlargement may result in a substantial reduction in clinical chairtime compared with the times required by the other systems tested in this study.

However, one should also consider the final apical preparation size and the taper of the simulated canals that were prepared by using the different glide path instruments. Several authors recommend creating a glide path to the same size, or ideally a size bigger than, the first rotary instrument introduced for root canal preparation.3,4,5 The final apical preparation sizes of the stainless-steel hand K-file group and the X-Plorer Canal Navigation Files were approximately ISO 0.2mm, followed by ISO 0.19 and ISO 0.16 for PathFiles and the ProGlider instrument, respectively. Stainless-steel hand K-files, PathFiles and the X-Plorer Canal Navigation Files will result in an approximately average canal taper of 2%. The ProGlider instrument entered the canal to its full length of 16mm (cutting flutes) and it can be expected that it left the simulated canal with a progressive taper ranging from 2% at the apex to 8.2% at the canal orifice. Although the ProGlider instrument showed the fastest mean glide path preparation time, it also resulted in the smallest apical preparation diameter and in the maximum coronal canal diameter. Although these parameters were not evaluated in this study, they could have an impact on further canal preparation with different sizes of rotary nickel-titanium preparation instruments.

CONCLUSIONS
Within the limits of this study, it can be concluded that the slowest glide path preparation time was recorded with stainless-steel hand K-files. Glide path preparation times with PathFiles and X-Plorer Canal Navigation Files were significantly faster compared with preparation with hand files. The single ProGlider instrument resulted in significantly shorter glide path preparation times compared with all the other methods evaluated.

Declaration: No conflict of interest declared

References
15. Nahmias Y, Cassim1, Glassman M. “Own the canal” – the importance of a reproducible glide path. Oral Health May 2013, 74-82.
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References:

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![Pre-brushing](image1)

![Post-brushing](image2)

![Post-acidic challenge](image3)

*In vitro SEM images of the tooth surface pre-brushing, of a reparative layer formed after twice-daily brushing for 4 days and of a reparative layer post a 5-minute acidic challenge.⁷*

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The hydroxyapatite-like layer formed binds firmly to the collagen in the patient’s dentine⁸–¹¹ and helps protect your patients from the chemical and physical oral challenges they encounter in their everyday lives.¹,²,⁸,¹⁰,¹²

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Effects of various parameters of alumina air abrasion on the mechanical properties of low-fusing feldspathic porcelain laminate material

ABSTRACT
Rationale: Alumina air abrasion is a commonly used surface treatment for porcelain veneers. This in vitro study determined the influence of various parameters of alumina air abrasion on the mechanical properties of porcelain.

Objectives: To ascertain the influence of alumina particle size, air stream delivery pressure and distance from the nozzle, on surface roughness, material loss and bi-axial flexural strength of low-fusing feldspathic porcelain and to determine the optimum combination of these factors.

Materials and methods: 95 specimens of feldspathic ceramic measuring 1mm in thickness by 15 mm in diameter were prepared. Alumina air abrasion was carried out with varying parameters viz three different particle sizes (50µm, 110µm, 250µm), two different pressures (20psi, 50psi) and three different distances (1cm, 2cm, 5cm).

Results: The various combinations which produced the greatest and the least effects on the test parameters were identified and the results were statistically analysed using the factorial ANOVA test.

Conclusions: The combination of 50µm alumina particle size, 20psi air stream pressure and either 2cm or 5cm distance between the nozzle and the ceramic surface produced optimum surface roughness with reduced impact on the flexural strength of the ceramic.

Keywords: Feldspathic ceramic, alumina air abrasion, surface roughness, material loss, flexural strength.

INTRODUCTION
Porcelain laminate restorations do not biologically compromise the tooth to any extent because the technique reduces the need for radical invasion into vital dentinal tissues. The materials commonly used for the fabrication of veneers (feldspathic as well as lithium disilicate) ensure good aesthetic qualities, reasonable flexural strength and acceptable surface hardness. The thin veneers achieve their full potential only when intimately bonded to the prepared tooth surface. Bonding of a well-fitting veneer is mediated through a resin. The resin binds with the internal surface of the veneer after appropriate surface roughening treatment has been effected,1,2 whether through acid etching3 or alumina abrasion.4 Hydrofluoric acid has inherent hazards which are associated with storage, use and its disposal.5 Many studies have shown that alumina particle abrasion provides a roughened surface adequate for the bonding of laminate veneers to the tooth structure.3,7,9

The factors influencing the effect of alumina air abrasion are alumina particle size, hardness and velocity, their morphology and angle of impact.10 The properties of the substrate, the pressure at which alumina particles are propelled and the distance between the ceramic substrate and the delivery nozzle all have a qualitative and quantitative impact on the porcelain. To optimize the abrasive quality, the alumina particle size should be controlled. Particles of the same size propelled in an air stream can behave differently under varying pressures rate. Surface roughness is desirable for it improves the bonding between the laminate and the resin. Roughening the surface should not reduce the flexural strength of the restoration to a clinically unacceptable level. Many studies have shown the negative effects of surface treatments on the flexural strength of porcelain.3,4,11

Information on all these variable factors has not previously been integrated, which is now the intention of this study.

MATERIALS AND METHODS
Ninety five feldspathic discs of 15mm diameter and a thickness of one mm were fabricated, using a vinyl polysiloxane (Affinis, Switzerland) mould (Figure 1). 0.99mg
of the Duceram feldspathic ceramic (Duceram-LFC, Dentsply, USA) was pre-weighed in an electronic balance and mixed with 0.33ml of distilled water to make each sample, the mix being compacted into the silicone mould. The excess moisture was absorbed by using an absorbent tissue paper. After removal from the mould, the specimens were placed in a porcelain-firing oven which was preheated to 650°C and then fired to approximately 940-960°C. Polishing was carried out using Noritake polishing paste (KurarayNoritake Dental Inc) and a rubber wheel.

All the specimens were dried, firstly with tissue paper followed by oil and water free hot air for one minute. The initial weight of each disc was determined with an analytical balance (ALC 6100, Acculab, USA) having a precision of 0.001 gm. Specimens were surface treated as tabulated in Table 1. F1 was the control group. Specimens F2 – F19 were alumina air-abraded in a sandblaster (Easyblast, BEGO, Germany) (Figure 2) using varying abrasion parameters. The distance between nozzle and surface was standardized with the help of a custom made tool (Figure 3). After surface treatment all the specimens were washed thoroughly in running water and then placed in an ultrasonic cleaner for 10 minutes. Each disc was dried with a tissue paper and hot air for one minute. The weight of each disc was measured after surface treatment with the analytical balance.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Particle size (µm)</th>
<th>Pressure (psi)</th>
<th>Distance (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Control, as fired</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>50</td>
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<tr>
<td>F3</td>
<td>50</td>
<td>20</td>
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<tr>
<td>F4</td>
<td>50</td>
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<td>5</td>
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<td>F5</td>
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<td>1</td>
</tr>
<tr>
<td>F6</td>
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<tr>
<td>F13</td>
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<tr>
<td>F19</td>
<td>250</td>
<td>50</td>
<td>5</td>
</tr>
</tbody>
</table>

Specimens were sequentially placed on a support with a span of 10mm for a ball on ring test to determine the flexural strength. A flexural load was applied at the midpoint of each supported specimen using a universal testing machine (Model 6025 Instron, UK) at a crosshead speed of 5mm per minute. The flexural strength was recorded in MPa.

**RESULTS**

**Alumina air abrasion and material loss**

The mean net weight loss of feldspathic specimens following alumina abrasion is given in Table 2. The highest material loss of 0.1055gm was observed in group F17 (particle size: 250µm, air pressure:50psi, nozzle distance:1cm) and the lowest material loss of 0.0382gm was observed in group F4 (50µm, 20psi, 5cm).

**Alumina air abrasion and surface roughness**

The mean surface roughness of feldspathic specimens following alumina abrasion is given in Table 3. Group F5 (50µm, 50 psi, 1cm) showed the highest surface roughness of 3.2935 µm and the lowest surface roughness of 1.8477 µm was observed in group F17 (250 µm, 50 psi, 1cm).
Alumina air abrasion and biaxial flexural strength
The mean flexural strength of feldspathic specimens following alumina air abrasion is given in Table 4. Highest flexural strength of 63.35 MPa was observed in group F4 (50µm, 20psi, 5cm) and the lowest flexural strength of 39.96 MPa was observed in group F17 (250µm, 50psi, 1cm).

STATISTICAL ANALYSIS
The data were statistically analyzed using a factorial ANOVA test. Multiple comparisons (post hoc-test) were carried out using the Bonferroni method to ascertain between which pairs or groups there existed a significant difference.

Alumina abrasion and weight loss (Table 5)
Particle size was found to be the most important factor influencing weight loss. The larger the particle size, the greater the weight loss. The differences in mean weight loss associated with the different particles were found to be statistically significant (P<0.001).

Air pressure variations also recorded a direct relationship to weight loss. A pressure of 50 Psi caused a higher mean weight loss compared to that resulting from 20 Psi and the difference between them was found to be statistically significant (P<0.001). The mean weight loss was found to be greater at a distance of 1cm followed by 2cms and 5cms distance respectively and the differences are statistically significant (P<0.001).

<table>
<thead>
<tr>
<th>Particle Size</th>
<th>Pressure</th>
<th>Distance</th>
<th>Mean</th>
<th>Std dev</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
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<td>0.0024</td>
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<td>2.79</td>
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<td>3.27</td>
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<td>0.28</td>
<td>2.32</td>
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<td>2.79</td>
</tr>
<tr>
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<td>1 cm</td>
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<tr>
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<td>50 Psi</td>
<td>1 cm</td>
<td>1.85</td>
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<td>1.76</td>
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<td>1.87</td>
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<td>0.01</td>
<td>2.10</td>
<td>2.08</td>
<td>2.10</td>
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</table>
Particle size was found to be the most important factor influencing surface roughness. The smaller the particle size, the greater was the surface roughness produced. The differences between the mean surface roughnesses recorded by the three particle sizes were found to be statistically significant (P<0.001). Slightly greater mean surface roughness was recorded at 50 Psi pressure compared with 20Psi pressure, but the differences were not statistically significant (P>0.05). Among the three distances tested, slightly greater mean surface roughness was recorded when nozzle distance was set at 1cm followed by the 2cms and 5cms settings respectively but the differences were not statistically significant (P>0.05).

Table 4: Results - Mean Flexural strength (MPa)

<table>
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<tr>
<th>Particle Size</th>
<th>Pressure</th>
<th>Distance</th>
<th>Mean</th>
<th>Std dev</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
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</thead>
<tbody>
<tr>
<td>50 µm</td>
<td>20 Psi</td>
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<td>2.16</td>
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<td>4.14</td>
<td>63.62</td>
<td>59.08</td>
<td>67.34</td>
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<td>110 µm</td>
<td>20 Psi</td>
<td>1 cm</td>
<td>48.43</td>
<td>3.67</td>
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<td>45.06</td>
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<td>250 µm</td>
<td>20 Psi</td>
<td>1 cm</td>
<td>50.54</td>
<td>4.18</td>
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<td>46.48</td>
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<td>46.09</td>
<td>43.48</td>
<td>47.10</td>
</tr>
</tbody>
</table>

Clinical success of bonded porcelain restorations is attributed to the intimate bond obtained between the restoration and the underlying tooth structure, mediated by an intervening resin. The bond has both chemical and physical dimensions. The ceramic-resin bonding is enhanced by improving the internal surface of the restoration by way of incorporating microscopic irregularities. Alumina abrasion and surface roughness (Table 6)

Alumina abrasion and flexural strength (Table 7)

Particle size was found to be the most important factor influencing flexural strength. The smaller the particle size, the less effect on the flexural strength. The difference in mean flexural strength recorded between the three particle sizes was found to be statistically significant (P<0.001). Between the two pressures, higher mean flexural strengths were recorded at 20Psi compared with 50 Psi and the differences were statistically significant (P<0.001). Among the three nozzle to surface distances, higher mean flexural strength was recorded at a distance of 5cms followed by 2cms and 1cm respectively. The differences in mean flexural strength were statistically significant (P<0.001).

DISCUSSION

Clinical success of bonded porcelain restorations is attributed to the intimate bond obtained between the restoration and the underlying tooth structure, mediated by an intervening resin. The bond has both chemical and physical dimensions. The ceramic-resin bonding is enhanced by improving the internal surface of the restoration by way of incorporating microscopic irregularities. For this, air abrasion using alumina particles and acid etching using hydrofluoric acid are commonly employed. By incorporating such irregularities, the surface area available to bind with the resin is increased. The shear bond strength of dental ceramics to bonding resins is also enhanced by surface treatment.

Table 5: Statistical analysis –Alumina abrasion and weight loss

<table>
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<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares (SS)</th>
<th>Mean SS</th>
<th>F</th>
<th>P-Value</th>
</tr>
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<tbody>
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<td>0.029</td>
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<td>&lt;0.001*</td>
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<td>59.114</td>
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<tr>
<td>Particle * Distance</td>
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Table 6: Statistical analysis – Alumina abrasion and surface roughness

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<td>1.812</td>
<td>0.025</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
It is a common practice in effecting surface preparation to use a sandblaster to propel alumina particles under air pressure. The surface modifications caused by sandblasting is dependent on the particle size, air pressure, hardness of particle, velocity, distance between the nozzle and the ceramic surface and the angle of impact. The properties of the substrate will be critical in determining the results of interaction. Air abrasion using alumina particles may preferentially chip the weaker glassy phase resulting in surface modification and material loss. This phenomenon has been shown to have a degrading effect on the flexural strength of low fusing feldspathic porcelain,3,4,11 borne out by the results of the present study.3

Alumina air abrasion and material loss (Figure 4) Of the three variables, namely particle size of the abrasive, air pressure employed and the distance between the nozzle and ceramic disc, particle size was found to be the most important factor influencing weight loss. The larger the particle size used, the greater was the weight loss. 250µm particle size caused the most weight loss followed by 110µm and 50µm particle size respectively. 50Psi caused a greater mean weight loss compared with that associated with 20 Psi. Higher pressure caused more weight loss. The mean weight loss was found to be higher at a distance of 1cm followed by losses seen at distances of 2cm and 5cm in decreasing order. Material loss is undesirable because of its effect on the strength profile.

The combination of 50µm, 20psi, 5cm seems to be the most desirable because it causes the least material loss. However this combination does not produce greater roughness.

It appears that no previous study has assessed the effect of various alumina abrasion parameters on material loss of ceramic material.

Alumina air abrasion and surface roughness (Figure 5) Particle size was found to be the most important factor influencing surface roughness after sandblasting. The smaller the particle size used for abrasion, the greater the surface roughness obtained. This could be attributed to the fact that in case of smaller size particles, greater numbers of particles acted on a given unit area whereas in the case of large sized particles, a lesser number acted on a given unit area. Particle size of 50µm caused a higher mean surface roughness at 50 Psi compared with that produced by a pressure of 20 Psi whereas particle size of 110µm and 250µm caused a higher mean surface roughness at 20 Psi compared with that effected by 50 Psi. The role of pressure differs with the particle size. Surface roughness increased with increase of pressure only with smaller particle size. With larger particle sizes, when the pressure was increased, surface roughness decreased. Particle size of 50µm caused a greater mean surface roughness at a nozzle distance of 1cm followed by 2cm and 5cm respectively. But particle size of 110µm caused a greater mean surface roughness at 2cm followed by 5cm and 1cm respectively. The mean surface roughness at 250µm was found to be slightly higher at 5 cm compared to 1cm and 2cm. Greater surface roughness was obtained at shorter distances with lower particle sizes. With particle sizes 110µm and 250µm, greater nozzle distances produced higher surface roughness. Therefore to obtain greater surface roughness with larger particle size, the nozzle to surface distance has to be increased. At 1cm and 2cm distances, a pressure of 20 PSI showed a greater mean surface roughness but at a distance of 5cms, a pressure of 50 PSI yielded a slightly greater mean surface roughness. When pressure and distance are related, it

![Table 7: Statistical analysis – Alumina abrasion and flexural strength](image)

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Sum of Squares (SS)</th>
<th>Mean SS</th>
<th>F</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle</td>
<td>2</td>
<td>5109.66</td>
<td>2554.83</td>
<td>467.52</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Pressure</td>
<td>1</td>
<td>260.49</td>
<td>260.49</td>
<td>47.670</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Distance</td>
<td>2</td>
<td>169.65</td>
<td>84.83</td>
<td>15.523</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Particle * Pressure</td>
<td>2</td>
<td>103.69</td>
<td>51.85</td>
<td>9.488</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Particle * Distance</td>
<td>4</td>
<td>298.38</td>
<td>74.59</td>
<td>13.651</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Pressure * Distance</td>
<td>2</td>
<td>26.03</td>
<td>13.01</td>
<td>2.381</td>
<td>0.100</td>
</tr>
<tr>
<td>Particle * Pressure * Distance</td>
<td>4</td>
<td>203.47</td>
<td>50.87</td>
<td>9.308</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Error</td>
<td>72</td>
<td>393.45</td>
<td>5.46</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

![Figure 4: Interaction plot for Weight Loss (gms)](image)

![Figure 5: Interaction plot for Surface Roughness (microns)](image)
was observed that when the distance increases a higher pressure has to be used in order to obtain more surface roughness. A higher pressure will ensure the reach of the particles to distant substrates. Ayad et al. found in their study that a mean surface roughness of 2.54µm obtained by alumina air abrasion improved the bond strength between the ceramic and the tooth structure. Curtis et al. also observed that increasing alumina particle size for abrasion resulted in a decrease in the prepared surface roughness of porcelain.

Alumina air abrasion and biaxial flexural strength (Figure 6) Increased weight loss had a weakening effect on the specimens, thus causing a reduction in the biaxial flexural strength of the porcelain discs. Particle size had the most influential role with air pressure having a supplementary role. The use of smaller particle sizes allowed for a decreased effect on alteration of the flexural strengths. Those specimens exposed to bombardment with particles of 50µm recorded a higher mean flexural strength after testing than did those abraded by 110µm and 250µm particles respectively, at different pressures as well as at different distances. Larger particle size resulted in greater material loss and a weakening of the ceramic. Abrasive particles blasted at 1cm distance caused greater material loss than that seen when blasting at 2cm and 5cm distances. Fleming et al. in their study found that with an increase in alumina particle size from 25µm to 110µm, the mean flexural strength decreased from 85MPa to 49MPa. In another study by Fleming et al., it was found that with increase in particle size from 25µm to 110µm, the mean biaxial flexural strength decreased from 94MPa to 54MPa. Bhamra et al. also observed a relative increase in the mean biaxial flexure strength when there was a decreased degree of coarseness of the bombarding silica particles.

CONCLUSIONS

The following conclusions were drawn from the present study:

a) Particle size was the main factor affecting the post-abrasive-treatment-effects of weight loss, surface roughness and flexural strength of feldspathic ceramic material.

b) Increase in particle size caused an increase in material loss, a decrease in surface roughness and a decrease in the flexural strength of the feldspathic ceramic material.

c) Increase in the pressure of the air blast caused an increase in material loss, an increase in surface roughness and a decrease in the flexural strength of the feldspathic ceramic material. It was only with the lower particle size that surface roughness increased with an increase in pressure. When the pressure was increased with larger particle sizes, the resulting surface roughness decreased.

d) Increased distances between the nozzle and ceramic surface reduced material loss and surface roughness with a relatively lesser effect on reduction in the flexural strength of feldspathic ceramic material.

e) The best combinations of alumina abrasion parameters which in this study produced optimum surface roughness with reduced loss of flexural strength of ceramic were 50µm alumina particle size, 20psi air stream pressure and 2cm distance between the nozzle and the ceramic surface or 50µm alumina particle size, 20psi air stream pressure and a 5cm distance between the nozzle and the ceramic surface.

Limitations of the study: The study is limited to only one type of ceramic. It cannot be assumed that other porcelain laminate material will show similar results due to possible differences in their composition and inherent properties. Further studies could evaluate the effects of hydrofluoric acid etching in comparison with those of alumina air abrasion.

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References

Progressive Systemic Sclerosis—an extensive manifestation of Scleroderma

SUMMARY
A 32 year-old male patient, who had previously presented with all the signs and symptoms of scleroderma, was referred to a dental clinic in 2013 for removal of a lower left canine tooth that was traumatising his lower lip. His face showed tight skin with loss of wrinkling resulting in the classical “mask-like” facies. Both the sclera and intraoral soft tissues were pale, suggestive of some form of anaemia. Telangiectasia was noted in the lower lip which, together with the soft palate, was fibrosed. Mild restriction of mouth opening was noted. The patient was fully dentate but exhibited poor oral hygiene. The lower left canine was labially displaced, non-carious and firm. A panoramic radiograph showed severe resorption of the ramus, angle and body of the mandible as well as of the roots of the posterior mandibular teeth. The condyles were relatively unaffected. Multiple carious teeth were noted. The periodontal spaces appeared relatively normal. Both submandibular glands showed calcification and it appeared that there were undisplaced bilateral pathological fractures distal to the wisdom teeth. Healing was uneventful.

INTRODUCTION
Scleroderma, a word of Greek origin derived from the words “scleros” meaning hard and “derma” meaning skin, is a chronic inflammatory sclerotic connective tissue disorder of unknown aetiology involving the skin, muscles, lungs, heart, kidneys and gastrointestinal tract. However, a major role is thought to be played by vascular injury autoimmune factors. Scleroderma is by no means an uncommon disease, and the purpose of this article is to present the radiographic features of a patient with progressive systemic sclerosis, a severe manifestation of scleroderma, characterised by advanced resorption of the body and ramus of the mandible together with the roots of posterior teeth. The condyles of the mandible in this case were preserved and the appearance of undisplaced bilateral fractures of the mandible distal to the wisdom teeth was noted.

CASE REPORT
A 32 year-old male patient was referred to a dental clinic in 2013 for relief of a lower left canine tooth that was traumatising his lip. He had presented at a medical clinic during 2009 with a complaint of stiffness of the neck muscles and painful swollen joints. He was diagnosed with scleroderma having presented with thickening of the skin, multiple contractures, arthritis and sclerodactyly.

The following special investigations had been carried out: Abdominal ultrasound showed perivascular thickening and fibrosis of the liver. Loss of differentiation between cortex and medulla in the kidneys was noted. Gastric endoscopy revealed a dilated oesophagus with decreased motility. Liver enzymes were deranged. The patient had a history of pulmonary tuberculosis complicated by a pyopneumothorax and had been on continuous home oxygen for interstitial lung disease. He was treated with mycophenolate mofetil, an immunosuppressant. More recently, however, he had been diagnosed with an iron deficiency anaemia.

Clinical examination by the dental specialist showed tight skin with loss of wrinkling, resulting in the classical...
“mask-like” facies. Both sclera and intraoral soft tissues were pale, suggestive of some form of anaemia. The patient experienced mild restriction of mouth opening (Figure 1A). Telangiectasia was noted in the lower lip (Figure 1B) which, together with the soft palate, was fibrosed. The lip, however, displayed no neurological fallout. The patient was fully dentate but exhibited poor oral hygiene. The lower left canine was labially displaced and was reported to be the offending tooth that was traumatising the lip.

A panoramic radiograph (Figure 2) showed severe resorption of the ramus, angle and body of the mandible as well as of the roots of the mandibular posterior teeth. Neither condyle however, was affected. Multiple carious teeth were noted. The periodontal ligament spaces in this instance were within normal limits. Calcification of both submandibular glands was noted as well as the appearance of undisplaced bilateral fractures distal to the wisdom teeth. The offending 33 was non-carious and non-mobile. The tooth was extracted.

**DISCUSSION**

Various radiographic features have been described in patients with scleroderma. These include widening of the periodontal space, resorption of the angle and ramus of the mandible, condylolysis and resorption of the roots of the teeth.

Widening of the periodontal space with intact lamina dura is believed to occur in 10% - 37% of cases with scleroderma. Increased deposition of collagen in the periodontal ligaments is thought to be the cause of the widening of the periodontal spaces. In patients where widening of periodontal spaces is the most prominent feature a differential diagnosis should include occlusal trauma as well as malignancies such as osteosarcoma.

Resorption of the ramus and angles of the mandible in scleroderma is thought to be caused by pressure from taut overlying skin, atrophic muscles and ischaemia of the bone due to vasculitis associated with progressive peripheral sclerosis. Severe resorption of the angle of the mandible often gives the radiographic impression of undisplaced bilateral pathologic fractures distal to the wisdom teeth. Resorption of roots is suggestive of long-standing pathosis.

Clinically patients present with aesthetic and facial dysfunctions which are followed by significant general and oro-facial manifestations. Raynaud’s phenomenon is the first presenting clinical sign followed by shortened, claw-like fingers that result from the resorption of the terminal phalanges and flexion contractions. Abnormal collagen deposition may result in ulceration of the finger tips. The skin is termed hide-bound as a result of its developing a diffuse hard texture which is difficult to pinch and has a smooth, taut surface with loss of wrinkling. Dark pigmentation of the skin over the extremities, face and trunk may occur with contrasting areas of hypo-pigmentation.

Oral and facial manifestations of scleroderma include para-oral and intra-oral features. Para-oral examination often reveals reduced or restricted mouth opening, “mask-like” facies and xerophthalmia. Another appearance, termed “mouse” facies is a pinched appearance of the nose that results from the nasal alae becoming atrophied. Microstomia may result from circumoral fibrosis or the lips may become pursed with radiating furrows. Telangiectasia may be present and the soft tissues around the temporomandibular joint may also be affected resulting in pseudoankylosis.

Intraoral examination often reveals that there is difficulty in maintaining oral hygiene. Rigidity of the tongue with reduced mobility together with loss of elasticity of the oral mucosa and soft palate may result in dysphonia and dysphagia. Generalized mild chronic periodontal disease, loss of attached gingiva and gingival recession is often present. Fibrotic strictures along the mandibular mucobuccal fold cause stripping of the attached gingiva. Other oral signs include mucosal pigmentation, xerostomia, increased dental decay and malocclusion.

Three types of scleroderma (also known as hide-bound disease) have been described:

- Generalized or progressive or diffuse cutaneous scleroderma results in tautness of the skin and involves the proximal and distal extremities, face, trunk, lung, heart, kidney, gastrointestinal tract and osteolytic changes in the skeleton.
- Localized or limited cutaneous scleroderma is limited to the distal extremities and face and also shows features of the CREST syndrome (Calcinosis, Raynaud’s phenomenon, Oesophageal dysmotility, Sclerodactyly and Telangiectasia).
- Acrosclerosis is a combination of scleroderma of the extremities and Raynaud’s phenomenon.

The incidence of scleroderma increases with age in all ethnic groups and is three times more prevalent in females.
than in males, with a peak incidence between the ages of 30 to 50 years.\(^1\) The increase in prevalence may be the result of improved methods of diagnosis and/or improvements in its management resulting in patient survival.\(^8\)

In the case of the patient described above, the offending 33 was extracted to relieve the patient of pain and discomfort and the extraction wound healed uneventfully. The less than severe restricted mouth opening was attributed to preservation to a large extent of the condyles and to minimal involvement of the muscles of mastication. This case highlights the loss of muscle tone resulting in displaced and mal-aligned teeth.

**Declaration:** No conflict of interest declared

**References**

Abnormality in the right mandibular angle and large swelling in the left facial area- an unusual case

ABSTRACT

A large swelling in the facial region of long duration generally suggests benign etiology. We report a case of large asymptomatic swelling in the left facial region which was clinically diagnosed to be a benign salivary gland tumour. The radiological investigations also suggested parotid gland tumour of benign etiology along with a fortuitous discovery of a Stafne bone defect in the right angle of mandible. The histopathological report however confirmed the tumour to be a case of acinic cell carcinoma of the left parotid gland. The patient underwent total parotidectomy and postoperative radiotherapy and has been disease-free for the past three years without any evidence of residual or recurrent lesion. The clinical, radiological, histopathological, and therapeutic aspects of acinic cell carcinoma and the radiological evaluation of the Stafne bone defect are analyzed along with literature review.

Keywords: acinic cell carcinoma; Stafne bone defect; CT; MRI

INTRODUCTION

Acinic cell carcinoma (ACC) is a rare malignant epithelial neoplasm of the salivary glands.1 It accounts for 1 to 6% of all salivary gland tumours and 15% of all malignant tumours in the parotid glands,2 which are the most commonly affected salivary glands (81% to 98%).3 A slowly enlarging mass in the parotid region is the typical clinical presentation.4 It was initially thought to be a benign disease entity until Foote and Frazell in the early 1950s first described it as a carcinoma in recognition of its properties of recurrence and of metastasis.5

Stafne's bone defect was first described by Edward Stafne in 1942.6 It most often appears as a unilateral, ovoid, radiolucent, corticated defect near the angle of the mandible below the inferior alveolar canal and is usually an incidental radiologic finding.7 The bony defect may contain salivary gland, lymphoid tissue, fat, connective tissue, muscle or blood vessels. Empty cavities have also been reported.8 The Stafne bone defect has a prevalence range from 0.1% to 0.48%, with a predilection for men between the age of 50 and 70 years.9

This paper reports a case of ACC of left parotid gland that appeared as a large asymptomatic mass on the left facial region along with a coincidently-discovered Stafne bone defect in the right angle region of mandible. The clinical, radiological, histopathological, and therapeutic aspects of acinic cell carcinoma along with radiological evaluation of Stafne bone defect are analyzed together with a review of the literature.

CASE REPORT

A 65-year-old male reported to our department with a chief complaint of a painless swelling on the left side of the face that had been enlarging progressively over the past six years. (Figure 1a) There was no history of local trauma, radiation, surgery, or infection on that side of his face and neck. The patient was positive for diabetes and hypertension. However the family history was unremarkable.

Physical examination revealed a firm, well circumscribed, lobulated superficial mass of 15cm in diameter in the left parotid region. The mass was movable and was independent of the jaw function. The left ear lobe appeared elevated (Figure 1b). There was no sign of paresthesia, facial nerve weakness or cervical lymphadenopathy. The overlying skin appeared normal in colour and texture. The

ACRONYMS

ACC: acinic cell carcinoma
CT: Computed Tomograph
FNA: fine needle aspiration
IV: Intravenous
MRI: Magnetic Resonance Imaging
STIR: short T1 inversion image
The patient was edentulous and no significant intra-oral findings were present (Figure 2).

On the basis of clinical findings a provisional diagnosis of benign salivary gland tumour was made. Differential diagnoses included pleomorphic adenoma, myoepithelioma or basal cell adenoma.

The pantomograph revealed cortical erosion near the left angle and ramus region, but also a well defined, corticated, oval radiolucency of size 1.5cm × 1.0cm near the right angle region below the inferior alveolar canal, suggestive of a Stafne bone defect (Figure 3). No significant related intraoral findings were evident and the patient had no specific complaints.

Ultrasound examination of the swelling demonstrated a well circumscribed lesion measuring 15cm × 10.5cm × 7.5cm on the left side of face, showing mild vascularity. The parotid gland was not visualized separately from the lesion. Left submandibular gland could be visualized separately, with the lesion abutting its lateral surface (Figure 4). The patient underwent fine needle aspiration (FNA) cytology. The smears showed tight clusters of small groups of cells with a micro-acinar arrangement. Cells were bland with round nuclei and moderate amount of...
A few stromal fragments were also seen. These features suggested a benign parotid gland tumour. Magnetic resonance imaging (MRI) was performed with a 1.5 T magnet using a dedicated neck coil. MRI and CT images of the left parotid region reveal a rounded, well-defined mass measuring 9.5cm x 11.7cm x 11.5cm, which appeared to be encapsulated and was arising from the superficial lobe of left parotid gland with no involvement of facial nerve. A slight heterogeneous enhancement was seen when contrast medium was used in one of the CT images, but, when used in one of the short T1 inversion images (STIR), the technique revealed a moderately heterogeneous enhancement, an effect often indicative of malignancy, although the features and extensions suggested benign neoplastic lesion of left parotid region. MRI and CT of the right angle region of the mandible showed a defect. It contained soft tissue that was continuous with the adjacent submandibular gland, and was identical in signal intensity to the gland on both sequences. A diagnosis of Stafne bone defect was made, and no further therapy was instituted (Figures 5 and 6).

Chest radiograph of the patient was also normal. All investigations related to left parotid region suggested a benign etiology. The patient was committed to surgery and, using a standard parotid incision, a total parotidectomy was performed, preserving the facial nerve. The tumour was totally excised (Figure 7) with safety margins and the tissue sent for histopathological examination.

Microscopy showed tumour cells arranged in sheets and nested arrangements separated by fibrovascular stroma. The cells had abundant granular cytoplasm and small central nuclei, with a few areas demonstrating cells with a moderate amount of eosinophilic cytoplasm and others with clear cytoplasm. Extensive necrosis and haemorrhage was a feature. The capsule was thick and collagenous. No evidence of vascular invasion was seen within the tumour, nor was there any indication of abnormal mitoses. The final histopathological diagnosis was acinic cell carcinoma of the left parotid gland (Figure 8).

Postoperative recovery was uneventful (Figure 9). The patient received 20 cycles of radiotherapy and remains in good health three years later without any evidence of residual or recurrent disease.
DISCUSSION

ACC is a rare malignancy. It affects women more frequently (58.8%) than men (41.2%). The median age at diagnosis is younger than for most other salivary gland cancers (52 years). The median tumour size is two centimeters. Metastasis (regional or distant), high grade, and large tumour size are all more common among patients older than 30. Despite the tumour in this case being large (15cm), no regional or distant metastasis was evident. Possible cause of ACC include previous radiation exposure, familial predisposition and hormonal disturbances. No such risk factors were identified. Facial nerve palsy (3.0%) and pain (7.5%) are reported infrequently. The patient in this instance was asymptomatic and no sign of facial palsy was present in spite of the large size of the lesion. Immunohistochemical staining of ACC is not specific and has an insignificant role in diagnosis. Acinic cell carcinoma are graded according to their malignant potential. Low-grade malignancies (Grade I) are completely encapsulated with no capsule invasion. Signs of capsule invasion are present in moderate (Grade II) malignancies. Infiltration of the surrounding tissues and papillary cystic zones are present in high grade (Grade III) tumours. Adjacent tissue invasion, regional lymphatic dissemination and distant metastasis (bone and lungs) are possible. Guimaraes et al classified ACC based on cellular pleomorphism and presence of necrosis and/or mitosis. Grade I tumours exhibit mild to moderate cellular pleomorphism without necrosis and/or mitosis. Grade II tumours demonstrate only focal necrosis and/or 1 to 9 mitoses per 20 high-power fields, independent of the degree of cellular pleomorphism present. Grade III exhibit massive areas of necrosis and/or more than 10 mitoses per 20 high-power fields regardless of the degree of cellular pleomorphism. Our case was rated as Grade I based on malignant potential and Grade III on the basis of necrosis and cellular pleomorphism. Histologically, acinic cell carcinoma are of four types; (a) solid (b) papillary cystic (c) follicular (d) microcystic. A combination of these patterns usually occurs with predominance of one group. The present case represented the solid lobular type of ACC.

Preoperative diagnosis of ACC of the parotid gland is difficult. FNA has a specificity of 86% to 96% and a sensitivity of 82% to 91% but it can also be deceptive. A CT scan usually exhibits slight contrast enhancement and may be necessary for evaluation of tumour size, the relationship to facial nerve and other structures, extension and distant metastasis. MRI scan usually demonstrates a nonspecific signal intensity pattern which can be similar to the signal produced by some benign salivary neoplasms. Treatment involves complete surgical removal of the tumour, by superficial or total parotidectomy. Recurrent, undifferentiated cases of ACC, positive margins, and advanced tumours with cervical lymph node spread may require postoperative radiotherapy. North et al recommended postoperative radiotherapy for all cases of salivary gland cancer except for those tumours staged as T1N0 or T2N0 with low-grade histology, which are successfully excised with negative margins. The treatment proposed in the present case was surgical excision and postoperative radiotherapy. ACC are distinctive neoplasms of typically unpredictable behaviour. Generally the five-year disease-specific survival is estimated to be around 91%, and at 10 years, 88%. The five-year survival rate for high-grade tumours, however, is only 33%.

Stafne bone defect, also known as static bone cyst, lingual mandibular bone defect, Stafne bone cavity, idiopathic bone cavity, and lingual mandibular bone depression is the only described bone lesion that is highly localized, non-progressive and yet non-healing. They may account for an extraosseous course of the mandibular neurovascular bundle. The size of the defect may range from 5mm to 90mm. Radiographically, the cortical outline of the bone defect is thicker and denser than that of odontogenic cysts. Intraoral dental films or pantomograph, although sufficient for diagnosis, may not be definitive in atypical lesions (e.g., incompletely corticated, lobulated, multiple, or in an uncharacteristic location). Confirmatory testing is warranted in these situations, as the differential diagnosis for mandibular radiolucencies includes periapical cyst, traumatic bone cyst, odontogenic keratocyst, dentigerous cyst, fibrous dysplasia, ameloblastoma, vascular malformation, nonossifying fibroma, focal osteoporotic bone marrow defect etc. Stafne bone defects have revealed salivary tissue on most CT evaluations. However exposure and possible contrast reactions are drawbacks of CT. The diagnosis of a Stafne bone cavity without intravenous contrast material is feasible on the basis of the inherent soft-tissue contrast on both CT and MRI studies. Some authors advocate MR imaging as the primary diagnostic technique. MRI evaluation on both proton density and T1-weighted sequences showed the mandibular defect in this case to contain soft tissue continuous and isointense with the submandibular gland, thus confirming salivary tissue within the defect. Surgery is not required for the treatment of Stafne bone defect.

Biopsy or surgical exploration should be conducted in atypical cases or other suspected lesions. The bone defect of our patient was asymptomatic and the possibility of any other bone lesions, such as cysts and tumours was excluded because there were no apparent signs of inflammatory or malignancy changes. Therefore, surgery was not considered. The patient was followed for three years. No remarkable changes of the defect was seen during the follow-up period; thus justifying the accuracy of the initial diagnosis of Stafne bone defect. This association of Stafne bone defect and acinic cell carcinoma has been reported for the first time in literature. The pathogenesis of these entities may have a role to play in their occurrence. Long term follow up is mandatory in such cases.

Declaration: No conflict of interest declared

References
This elderly man (Fig. A) presents with a history of a painful slow growing soft tissue swelling in his right jaw. The patient also reported paraesthesia of the right lower lip as well as paroxysms of intense general bone pain. During clinical examination of the oral cavity a very large soft tissue swelling was observed in the right angle and body of the mandible. You decide to take a panoramic radiograph of the jaws. What is your diagnosis?

**INTERPRETATION**

A soft tissue mass (Fig. B) with an underlying multilocular bone lesion is discernible. There is also destruction of the superior border of the cortex. Due to the presence of paraesthesia a provisional diagnosis of a malignancy was made. Histological diagnosis confirmed the presence of a metastatic prostate carcinoma. Secondary or metastatic carcinoma is the commonest malignant tumour in bone. Notwithstanding the frequency with which bone is involved in metastatic disease, the jaws are rarely affected. The unsolicited complaint of numbness or paraesthesia is the main symptom, and it is very striking how frequently it occurs and yet is neglected. The most frequent sites of metastasis to bone are areas occupied by red bone marrow. Most carcinomas that occur in the jaws from metastasis often arise in the central portion of the jaws, an area richest in red marrow. Metastases may occur anywhere in either jaw, but there seems to be a preference for the third molar region of the mandible. Fig. C is a case of metastatic adeno-carcinoma of the lung, showing a well circumscribed but uncorticated lytic lesion while Fig. D (red arrow) is a metastatic carcinoma of the uterus which presented after a loose tooth was extracted. Note the irregular “moth-eaten” rarefaction adjacent to first molar and second premolar teeth of a metastatic carcinoma of the breast (Fig. F). Metastases in bone show two main radiographic appearances, firstly, frank destruction of an area of bone without new bone formation within the lesion or adjacent bone. In this instance, the lesion is considered to be relatively slow growing and less aggressive than other malignant presentations, such as moth-eaten and infiltrative patterns. The second radiographic appearance of the lytic or radiolucent type of metastasis in the jaw has considerable resemblance to some manifestations of osteomyelitis, characterized by the presence of many areas of bone destruction, some of which may not be more than 2 mm in diameter. Generally, osteomyelitis presents a moth-eaten pattern only. Pathologic fracture may be seen in the area of rarefaction, although this is very uncommon. Metastatic disease is more common in older age groups, with a mean age in the mid-fifties.

**References**


**Note:** Permission has been granted to reproduce the photograph of the patient.
Maxillo-facial radiology case 131

The radiographic images display the different radiographic features that may be found in osteosarcoma of the jaws. Osteosarcoma is a malignant neoplasm of bone that is rare in the jaws compared to the incidence in long bones. The malignant osteoblasts found in osteosarcoma produce osteoid. These lesions occur in all racial groups, and occur most often in the third and fourth decades. The most common symptoms are swelling, pain, tooth mobility, paraesthesia and nasal obstruction. The radiographic features of osteosarcoma may vary. Localised widening of the periodontal ligament spaces and loss of lamina dura is in most cases the earliest sign. As the tumour progresses it may produce an osteolytic, osteoblastic or mixed pattern. The production of reactive bone to form sunray appearance is seen in only 25% of cases. The imaging tool which most accurately demonstrates the degree of bone involvement is CT.

Fig. 1A is a panoramic radiograph of a 27 year old male. An osteosarcoma is present in the body of the left mandible in the area of tooth 37 and 38. Note the widened periodontal ligament spaces (arrows), loss of lamina dura and the loss of bone around tooth 37 and 38 resulting in an osteolytic pattern. Fig. 1B and 1C is a reconstructed panoramic CBCT view and coronal view respectively from the same patient seen in 1A. The widened periodontal ligament space can clearly be observed at the mesial root of tooth 38. A change in the trabecular bone pattern mesial of the 37 and in the inter-radicular area between the roots of the 37 is also seen. The coronal slice in figure 1C demonstrates the loss of cortical bone in the superior aspect of the mandible and the change of the trabecular bone pattern. Fig. 1D is a sagittal CBCT view of the symphysis area of the mandible of a 44 year old female with an osteosarcoma. Destruction of cortical bone with a periosteal reaction at the periphery forming a sunray or speculated periosteal reaction is present. Fig. 1E is a coronal view of the left mandibular ramus of a 23-year-old female patient with an osteosarcoma. The internal structure of the lesion has a mixed radiolucent-radiopaque appearance. The normal osseous architecture within the lesion is destroyed and buccal expansion is present.

Lesions that may present with similar radiographic features include osteomyelitis, metastases, chondrosarcoma, and Ewing sarcoma. These lesions should be included in differential diagnoses. In those cases where the only radiographic sign is localised widening of the periodontal ligament, the differential diagnoses should include traumatic occlusion and periapical pathology. It is due to these early signs that the oral health professional can make an early diagnosis, which should result in a better prognosis.

References
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Oral medicine case book 69: Burkitt lymphoma of the oral cavity

CASE REPORT

A 25-year-old female was referred to the Haematology Unit at Tygerberg Hospital for further management of a rapidly expanding and large submandibular mass which on fine needle aspiration was suggestive of lymphoma (Figure 1). Five months earlier she had been diagnosed with pulmonary tuberculosis and was confirmed to be HIV positive with a CD4 count of 17. She was placed on anti-retroviral (ARV) and antituberculous therapy (the ARV therapy included efavirenz, emtricitabine and tenofovir). Her CD4 count, at the time of the current consultation, was 204 and the viral load was suppressed. Lumbar puncture was normal. Significant clinical findings were a large right submandibular mass and right cervical and axillary lymphadenopathy. The submandibular mass was removed and submitted for histological examination.

Macroscopic examination revealed a 62 gram, homogenous firm whitish-yellowish mass with areas of myxoid consistency. The size of the mass was 100 x 80 x 50 mm and, on cross section, neither necrosis nor haemorrhage was seen (Figure 2). Microscopic examination showed that the lesion was lymphoid in nature with relatively monomorphic cells with blue cytoplasm and nuclei that contained 3-5 nucleoli. High mitotic and apoptotic activity were seen as well as the presence of prominent scattered tingible body macrophages (ie. macrophages containing phagocytized, apoptotic cells in various states of degradation: “tingible” meaning stainable) (Figures 3 and 4). A panel of immunohistochemical markers was done to type the lymphoma (Figure 5 and 6). The cells were positive for the following markers: CD45 (leukocyte common antigen, confirming the lymphoid nature of the neoplasm); the B-cell antigen, CD20 (confirming that the lymphoma is of B-cell origin); and germinal centre B-cell

ACRONYMS

ARV: Antiretroviral
FISH: Fluorescent in situ hybridization
HIV: Human immunodeficiency virus
CNS: Central nervous system
CT: Computerized tomography
EBV: Epstein Barr Virus

Figure 1: The patient presented with a swelling in the right submandibular region. She also had trismus, which made intraoral examination very difficult but despite this, an intraoral exophytic soft tissue mass can be seen.

Figure 2: The tissue mass removed from the submandibular region showed a homogenous gelatinous consistency in cross section.

Corresponding author
WP Dreyer:
PO Box 1285, Sedgefield, 6573; E-mail wpd@sun.ac.za

1. E Mosalleum: BDS, MCHD, FCPath(SA). Division of Oral Pathology, Faculty of Dentistry, University of the Western Cape; National Health Laboratory Services, Tygerberg Hospital.
2. N Mohamed: MBChB, MMed(Anat Path). Division of Anatomical Pathology, Stellenbosch University; National Health Laboratory Services, Tygerberg Hospital.
3. F Bassa: MBChB, FCPath(Haem), MMed. Division of Clinical Haematology, Department of Medicine, Faculty of Health Sciences, Stellenbosch University.
4. WP Dreyer: BDS, HDipDent, PhD, FCDSA/OMP. Division of Oral Medicine and Periodontics, Faculty of Dentistry, University of the Western Cape; Professor Emeritus, Stellenbosch University.
antigens, CD10 and Bcl6 (confirming that the B-cell lymphoma derives from the lymphocytes in the germinal centre of the lymphoid follicle). The cells showed a 100% proliferative activity as illustrated by the Ki67, which is an immunohistochemical antibody that targets the tumour cells that are dividing or in a mitotic stage.

The morphology of this case is typical of Burkitt lymphoma and, in order to confirm this provisional diagnosis, molecular confirmation of translocation (8;14) involving c-myc gene was requested. The molecular investigations using fluorescent in situ hybridization (FISH) showed the presence of that translocation (8;14), thus confirming a diagnosis of Burkitt lymphoma. Staging CT scan revealed Ann Arbor stage IV disease with extensive lymphadenopathy involving the right submandibular, mediastinal, para-aortic, porta-hepatic and iliac nodes as well as splenic and hepatic involvement. There was no evidence of bony involvement. The patient received intensive combination chemotherapy together with continuation of ARV therapy. At the time of publication of this report, she had received four cycles of chemotherapy and showed an excellent interim response.

**DISCUSSION**

Lymphomas are neoplasms that affect the lymphoid system. They are divided into two major categories; Hodgkin and non-Hodgkin lymphoma. The non-Hodgkin lymphomas are further sub-classified into B-cell and T-cell lymphomas with B-cell lymphomas showing a high level of morbidity in HIV positive patients. Burkitt lymphoma is a very aggressive high grade non-Hodgkin B-cell lymphoma that is derived from germinal centre lymphoid B cells. This neoplasm is the third most common malignancy in African children, preceded only by Wilms’ tumour (a rapidly developing malignant mixed tumour of the kidneys) and brain tumours. Burkitt lymphoma is named after Dennis Parsons Burkitt, a surgeon who first described the tumour in 1958 while working in equatorial Africa.1-3

Burkitt lymphoma is classified into three variants:4-10

- **Endemic variant** (also referred to as the African variant), most commonly occurring in the jaws of children living in malaria endemic regions of the world (eg. equatorial Africa, Brazil and Papua New Guinea). The endemic form of Burkitt lymphoma accounts for 30-40% of malignancies in children living in equatorial Africa.4
  Interestingly, the distribution of the neoplasm in these areas corresponds to the distribution of endemic malaria, hence the term endemic Burkitt lymphoma. It is thought that chronic malaria reduces resistance to infection with the Epstein-Barr virus (EBV), a known oncogenic virus associated with endemic Burkitt lymphoma.4 The common age of presentation is 4 to 7 years and the most common clinical presentation
is as a jaw mass (58%), or abdominal mass including involvement of the ileum, kidneys and ovaries. The bone marrow and the central nervous system may also be involved.1,3,4,6

• Sporadic variant (also referred to as the non-African variant), a variant not restricted to areas of endemic malaria and, although the tumour cells have a similar appearance to the endemic form, this tumour is rarely associated with EBV infection and is less commonly found in the jaws. It mainly involves the abdomen (88%), with rare involvement of the head and neck. There is no specific geographic association with this variant of Burkitt lymphoma, however, it is usually seen in European populations.1,3,4,6

• Immunodeficiency associated subtype of Burkitt lymphoma is frequently seen in Aids patients with a CD4 count below 200 cells/µL and can also be found in patients on immunosuppressive drugs following organ transplantation. It is considered to be one of the conditions signalling an underlying HIV infection.4,6 Similar to the sporadic form, the immunodeficiency associated Burkitt lymphoma can be found in extranodal sites such as this case presented above. The abdomen is also commonly involved and abdominal pain, vomiting, bowel obstruction and gastrointestinal bleeding constitutes the usual clinical presentation. In 13-17% of patients the brain is involved.6

All forms of Burkitt lymphoma share the same morphological and it is almost impossible to differentiate these three variants on microscopic features alone. The chromosomal rearrangement associated with c-myc oncogene expression is the hallmark of the molecular alterations in Burkitt lymphoma and this leads to the disturbance in germinal centre B-cell proliferation and differentiation. As could be expected, most of the cases seen in South Africa fall in the sporadic or HIV-associated variants.1

Histopathology, genetic features and pathogenesis

The morphology and the immunohistochemistry of Burkitt lymphoma support an origin from the follicular centre B-lymphocytes. The tumour forms sheets of small to intermediate monomorphic lymphocytes with basophilic cytoplasm and central nuclei containing 3-5 nucleoli. High proliferative activity is reflected by the tumour cells and the scattered associated tingible body macrophages give rise to the characteristic picture of a starry sky appearance.4,7 The immunodeficiency phenotype of Burkitt lymphoma is consistent with a B-cell lineage. The cells are reactive for CD20, CD19, CD22, and CD79a, which are antibodies that detect surface antigens of B lymphocytes. They also express germinal centre antibodies, such as can be demonstrated by immuno-staining for Bcl6 and CD10.5

The ability of EBV to transform the B-lymphocytes in Burkitt lymphoma is said to be amplified by malarial parasitaemia.4 This is why the endemic form of this lymphoma is common in the so-called lymphoma belt; an area between 10° south and 10° north of the equator, roughly corresponding to the area of endemic malaria.1 However, additional mutations are required for the development of this lymphoma beside the involvement of EBV. These mutations generally involve chromosome 8 and 14 and, at times, chromosome 2 and 8.4,6,7

Treatment and prognosis

Chemotherapy is the primary treatment modality for patients with Burkitt lymphoma. The neoplastic cells are very sensitive to cytotoxic therapy and intensive multi-agent chemotherapy regimens are recommended in Burkitt lymphoma patients who are HIV negative. In HIV positive patients, these protocols are modified in order to reduce toxicity particularly in patients who are ARV therapy naïve.4,7,11 Involvement of the central nervous system (CNS), bone marrow and HIV infection indicate a less favourable outcome and therefore CNS chemoprophylaxis is advocated.4,7 A recent study in a Korean population showed that the two-year survival rates are lower in patients with bone marrow and CNS involvement, however, involvement of other extra-nodal sites had no effect on the prognosis.6 Therefore, a good understanding of the pathogenesis associated with the different subtypes is essential for the development of new chemotherapeutic therapeutic strategies.7

CONCLUSION

Burkitt lymphoma is a very aggressive fast growing non-Hodgkin lymphoma. The importance of early diagnosis and treatment cannot be overemphasized as treatment success is dependent on the extent of disease. Burkitt lymphoma is one of the human cancers that highlight the role of viruses in the carcinogenic process and, as a consequence, it is one of the lymphomas that develop in persons who are immunodeficient, either as a result of HIV infection or subsequent to organ transplantation. Knowledge about the clinical presentation, usual extra-nodal involvement and the subtypes of this lymphoma is essential for making an early diagnosis and therefore can make a significant difference in the prognosis of the afflicted patient.

Declaration: No conflict of interest declared

References

Avoiding perverse incentives

S Naidoo

A general dental practitioner was approached by a friend and colleague, a maxillo-facial surgeon, who had recently taken up rooms near his practice. He offered incentives to her for any surgical referrals she could provide. Furthermore, he said that since he was participating in a pharmaceutical research clinical trial, he could increase the incentive if she referred patients who were eligible for inclusion in the trial. Should the specialist’s offer raise ethical concerns?

Dentistry is first a profession, but the practice of dentistry usually involves financial compensation for professional services. Such compensation necessitates, by its very nature, some form of business structure to accommodate these transactions. Conflict of interests, whether actual or perceived, are common since dentists are in a position to gain financially from their professional recommendations. The patient is the beneficiary of the dentist’s services. If the dentist is being compensated for professional services, then the dentist is also technically a “beneficiary” of his or her recommendations. Professional decision-making involves many factors, but financial gain to the dentist should not be a consideration in any of the dentist’s professional recommendations. Professionalism is the quality of conduct and character that accompanies the use of superior knowledge, skill, and judgment, to the benefit of another, prior to any consideration of self-interest.

Integrity is generally defined as the adherence to moral and ethical principles; soundness of moral character and honesty. The Health Professions Council of South Africa (HPCSA) requires that health care practitioners should at all times act in the best interests of their patients and regard the clinical needs of their patients as paramount. Practitioners should therefore always try to avoid potential conflicts of interest and maintain professional autonomy, independence and a commitment to the relevant professional and ethical rules and policies applicable. Any conflicts of interest, incentives or forms of inducement that threaten such autonomy, independence or commitment to the professional and ethical rules or that do not prioritize the best interests of the clinical needs of patients, are unacceptable. Professional integrity could easily be ruined by involvement in arrangements where financial or other kinds of inducement are offered or accepted with the aim of influencing your professional behaviour, or that of others. Such arrangements often involve financial and other inducements being paid in return for the referral of patients, or for expressing/promoting certain views. Professional judgement should not be compromised or influenced by the subject on which a decision is about to be made.

HPCSA guidelines regarding over servicing, perverse incentives and related matters are applicable to health care practitioners in both the public and private sectors: “It is an offence either to offer a perverse incentive or to accept one. The HPCSA may take in terms of other legislation that governs the health professions, at its own discretion and where it believes such action is warranted, lay a charge against any person, or corporate body or other legal entity in terms of the Corruption Act (Act No. 94 of 1992), should the actions or omissions of such person, body or other legal entity be in breach of the provisions of that Act.”

“Improper financial gain or other valuable consideration” is defined by the HPCSA as... “money, or any other form of compensation, payment, reward or benefit which is not legally due or which is given on the understanding, whether express, implied or tacit, that the recipient will engage or refrain from engaging in certain behaviour in a manner which is either: (i) illegal; and/or (ii) Contrary to ethical or professional rules; and/or (iii) Which, in the opinion of the HPCSA, may adversely affect the interests of a patient or group of patients, in order to procure some direct or indirect advantage, benefit, reward or payment for the person offering or giving the said money, compensation, payment, reward or benefit.”

Perverse Incentive has the same meaning.

Dental practitioners may be tempted to engage in various acts or omissions that are not permissible nor ethical, including inappropriate referrals, over-servicing, using rental contracts as perverse incentives, paying or receiving commissions and inappropriate charging or receiving of fees.

Dentists are obliged to refer patients, when appropriate, during the course of clinical care to ensure the patient is provided with the best care. Patients are entitled to the dentist’s best professional judgement when treatment is recommended, including appropriate referrals to specialists who have the requisite skills, knowledge and experience. Practitioners shall not accept commission or any financial gain from any person in return for recommending or referring patients. Practitioners should avoid any solicitation or business practice that undermines this principle. Being offered incentives might encourage an inappropriate decision in referring that may not be in the patient’s best interest. Furthermore, dentists shall not charge a fee or receive any financial gain for referring patients for participation in drug trials or other research trials of a similar nature. Importantly, fees should not be charged nor received for services not personally rendered by either the health care professional himself or herself nor by an unregistered person in his or her employ, except for services rendered by another health care practitioner or person registered in terms of the Health Professions Act (Act No. 56 of 1974), that regulates the particular profession with whom the health care practitioner is associated as a partner, shareholder or locum tenens. In the case of self-referrals, the HPCSA states that health care practitioners “may only refer their clients or patients to any health establishment in...
which such health care practitioner or a close family member or business associate has a financial interest or a potential conflict of interest if such interest has been declared to and approved by the HPCSA and on condition that such interest is discussed and agreement reached with the patient prior to the referral for the patient’s consent.1

In dentistry, there are many services that are provided on a regular basis that can be viewed as over-servicing. Over-servicing includes the provision of unnecessary, inappropriate, excessive or fraudulent treatment or referrals. The HPCSA defines it as “the supply, provision, administration, use or prescription of any treatment or care (including diagnostic and other testing, medicines and medical devices) which is medically and clinically not indicated, unnecessary or inappropriate under the circumstances or which is not in accordance with the recognised treatment protocols and procedures, without due regard to both the financial and health interests of the patient”.2 With regard to over-servicing, health care practitioners shall not: (i) Provide a service or perform or direct certain procedures to be performed on a patient that are neither indicated nor scientific or have been shown to be ineffective, harmful or inappropriate through evidence-based review and (ii) Refer a patient to another health care practitioner for a service or a procedure that is neither indicated nor scientific or has been shown to be ineffective, harmful or inappropriate through evidence-based review.1

Hartshorne and Hasegawa3 suggested that the following questions should be asked prior to treatment planning: Is the chosen treatment necessary? Is the treatment based on good evidence? Will the treatment benefit the patient? If the treatment is omitted, will it cause the patient harm? Am I treating the patient or my pocket? Has the patient given informed consent?

In line with the obligations described above, South Africa has passed various anti-corruption legislation. The main anti-corruption law is the Prevention and Combating of Corrupt Practices Act 2004 (“PACCA”).2 PACCA creates a general offence of corruption that is extremely broadly defined. It also criminalises certain specified corrupt activities. PACCA applies to both the public and private sector. Generally speaking, a person is guilty of an offence in terms of PACCA if he or she directly or indirectly obtains or offers to accept a gratification from another person, or gives or agrees to give a gratification to any other person for his benefit, or that of another. The giving or acceptance must be done in order to induce the other party to act in an improper manner, in the performance of that individual’s duties. The underlying principle is that guilt will be determined by intention. The test is a subjective one which takes into account all surrounding circumstances, the particular conduct of the parties, and any other relevant information to decide the intention. The fact that the corrupt activity was unsuccessful is not relevant. It is sufficient that there is merely a threatened infringement of an interest. How far the corruption has extended for the parties to reach accord, the performance and the performance of their colleagues.4

To avoid rental contracts being misconstrued as perverse incentives, practitioners should avoid (i) “Paying rentals in lease agreements between health care practitioners and health establishments that are not market related or are at preferential rates; (ii) Enter into lease agreements with health establishments or services that wish to rent their consulting rooms at rates conditional on the health care practitioner achieving a certain turnover or targets such as admission of a specific number of patients at a private health care facility and (iii) Renting consulting rooms from health establishments or services under financial arrangements that are not openly available to other similarly qualified health care practitioners.”1

While PACCA is the primary anti-corruption legislation in South Africa, there are a number of other pieces of legislation dealing with corruption and crimes of dishonesty. These include the Financial Intelligence Centre Act (FICA), the Prevention of Organised Crime Act (POCA), the Public Finance Management Act (PFMA), the Municipal Finance and Management Act (MFMA), the Protected Disclosures Act (PDA), and the Companies Act. There is significant South African Legislation relevant to combating corruption and includes: The Prevention and Combating of Corrupt Activities Act, the Promotion of Access to Information Act, the Promotion of Administrative Justice Act, the Prevention of Organised Crime Act, the Financial Intelligence Centre Act, the Protected Disclosures Act, the International Cooperation in Criminal matters Act, the Criminal Procedure Act, the Public Finance Management Act, the Municipal Finance Management Act, the New Companies Act and the Protection of State Information Bill.

CONCLUDING REMARKS

Professionalism encompasses the conduct, aims, and qualities that characterize a professional or a profession. It relates to the behaviour expected from the professional and embodies positive habits of conduct, judgment, and perception on the part of both individual professionals and professional organizations and gives priority to the well-being and self-determination of the patients they serve. Professional integrity is a measure of the degree to which professional reputation and credibility remain intact. Anything which has the potential to reduce a professional person’s reputation undermines professional standing. Professional integrity can be impugned not only because of a proven misdemeanour, but also by inappropriate acts or omissions. Professionalism does not rely on the guidelines, standards, policies and rules of professional bodies alone, but is intimately linked with self-regulation, where individual dentists develop and internalize their own guiding principles and values. True self-regulation occurs at a personal level where dentists take responsibility for their own performance and the performance of their colleagues.4

Acknowledgement: The author would like to thank Mr Punkaj Govan, Legal Advisor, South African Dental Association, for his erudite and insightful comments

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2. Ethics, values and the law. DPL Dental Ethics Module 3: Professionalism and Integrity. 2009
The precise determination of the extent of a local tumour in oral cancer patients is crucial for therapy planning and prognostic stratification.1 Bone invasion is present in 12–56% of all oral cancer patients and often requires radical surgery with wide resection which can significantly reduce the quality of life and increase morbidity and mortality of affected patients.1

Standard preoperative staging consists of clinical examination and non-invasive imaging, including computed tomography (CT) or magnetic resonance imaging (MRI), to detect loco-regional metastasis and to determine the extent of the primary tumour and infiltration into adjacent structures. Other available options include bone scintigraphy (BS), which visualizes the bone metabolism of the whole body, and is a highly sensitive imaging method, cone beam computed tomography (CBCT) and panoramic radiography (PR). Linz and colleagues (2015)1 reviewed a cohort of 197 patients with confirmed diagnoses of oral cancer and compared CBCT with other imaging technologies (PR, CT, MRI, and BS) in predicting bone invasion.

**MATERIALS AND METHODS**

This German study consisted of 352 patients with a suspected diagnosis of oral cancer. The standard CT or MRI was performed in all of the patients for the assessment of cervical lymph nodes and the extent of the local tumour. A total of 197 of these 352 patients underwent additional BS and CBCT and were therefore included in the study. Medical history, tumour localization, and recent interventions in the oral cavity, e.g., tooth extraction or probe sampling, were documented and accounted for in image interpretation. The imaging findings were validated by histopathology after either a rim or segmental bone resection or a clinical follow-up of at least six months.

For the PR and CBCT two experienced maxillofacial surgeons evaluated the images in consensus using Sidexis XG software, version 2.56 (Sirona Dental Systems Inc.). The diagnosis was first made on the basis of the reconstructed panoramic view. The absence or presence of bone invasion was judged. Osseous tumour invasion was considered to be present when at least cortical bone erosion or degradation was observed.

For bone scintigraphy, images were evaluated by two experienced nuclear physicians. Bone tissue invasion was suspected if (focally) increased radiotracer uptake in comparison to the surrounding bone tissue or the contralateral bone structures was evident and was observed adjacent to the primary cancer.

For CT and MRI, the scans were evaluated by two radiologists who assessed the extent of the local tumour and cervical lymph node metastasis. If both CT and MRI were performed in the same patient 10/197 patients (5.1%), the presence of bone invasion was primarily assessed using CT.

Following surgical resection, the tissue samples were submitted to Pathology for further macroscopic and microscopic examination, especially to determine the tumour stage and grade.

The results of the different imaging modalities were compared with the histopathology or follow-up data results. The sensitivity, specificity, accuracy, negative and positive predictive values, and false-positive and false-negative values were obtained for each imaging modality. The results of the imaging methods were compared using McNemar’s test.

**ACRONYMS**

- **BS**: bone scintigraphy
- **CT**: computed tomography
- **CBCT**: cone beam computed tomography
- **MRI**: magnetic resonance imaging
- **PR**: panoramic radiography

**For the clinician**


The precise determination of the extent of a local tumour in oral cancer patients is crucial for therapy planning and prognostic stratification.1 Bone invasion is present in 12–56% of all oral cancer patients and often requires radical surgery with wide resection which can significantly reduce the quality of life and increase morbidity and mortality of affected patients.1

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**MATERIALS AND METHODS**

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2. Surgical versus non-surgical treatment of mandibular condylar fractures: a meta-analysis

Chrcanovic BR

Approximately 30–40% of all mandibular fractures (MFs) are fractures of the mandibular condyle.1 Most are not caused by direct trauma, but follow indirect forces transmitted to the condyle from a blow elsewhere. Consequently, mandibular condylar fractures (MCFs) are those most commonly missed.2 There are two principal therapeutic modalities for these fractures: non-surgical (functional) and surgical. Historically, non-surgical treatment of MCFs by means of maxillomandibular fixation (MMF) followed by physiotherapy was the standard practice.1

With the development of improved materials for fixation and the refinement of surgical techniques, open reduction and internal fixation (ORIF) has gained higher acceptance by surgeons for the management of MCFs.1 The ORIF technique provides stable three-dimensional reconstruction, promotes primary bone healing, shortens the treatment time, and eliminates the need for early release of the MMF. There has been considerable controversy regarding the treatment of MCFs, in particular whether they should be treated conservatively or surgically. Chrcanovic (2015)1 undertook a systematic review and meta-analysis of studies published in the literature up to and including February 2014

RESULTS

The mean age of the patients (n = 197) at the time of surgery was 63.7 years (range 40–92 years; standard deviation (SD) ±8.8 years). The imaging findings were validated by histopathology in 114 of 197 patients (57.9%), confirming bone invasion in 66 (57.9%) and excluding it in 48 (42.1%). Due to the absence of clinical signs of bone invasion in the remaining 83/197 patients (42.1%), no bone resection was performed. In these cases, at least six months of follow-up (mean 22.3 months, range 6.0–66.3 months, SD ±14.4 months) confirmed the absence of bone invasion, resulting in an overall presence of bone invasion in 33.5% (66/197) of the patients.

CBCT was significantly better than PR (p = 0.002), with a sensitivity of 87.9% (58/66), specificity of 83.2% (109/131), and corresponding accuracy of 84.8% (167/197). The negative predictive value was 93.2% (109/117) and the positive predictive value was 72.5% (58/80).

The sensitivity of BS was 95.5% (63/66) and the specificity was 86.3% (113/131), resulting in an accuracy of 89.3% (176/197). The negative predictive value was calculated as 97.4% (113/116) and the positive predictive value as 77.8% (63/81). Significantly better results were observed for BS compared to PR (p= 0.000). The accuracy of CBCT (p=0.188) was not significantly different.

The sensitivity of CT/MRI was 66.7% (44/66), the specificity was 91.6% (120/131), and, accordingly, the accuracy was 83.2% (164/197). With CT/MRI, the achieved accuracy was lower than with CBCT or BS (p = 0.771 and p = 0.058, respectively) and significantly different from PR (p = 0.020). All of the results are summarized in Table 1.

CONCLUSION

The authors concluded that CBCT and BS showed the highest accuracy for the detection of bone invasion and showed better performance than PR and CT/MRI.

IMPLICATIONS FOR PRACTICE

Regarding the evaluation of bone invasion, CBCT and BS might be the modalities of choice. However, CT and/or MRI remain essential for lymph node staging and for the detection of soft tissue involvement. Clinicians should note that each method has certain advantages and the setting, context and patient circumstances should be considered when choosing the type of imaging to aid diagnosis and therapy planning for patients with oral tumours.

Reference


Table 1: Comparison of PR, CBCT, CT, MRI & BS for 197 patients

<table>
<thead>
<tr>
<th>Method</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Accuracy</th>
<th>FNR False negative rate</th>
<th>FPR False positive rate</th>
<th>NPV Negative predictive value</th>
<th>PPV Positive predictive value</th>
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<tr>
<td>PR (n = 197)</td>
<td>59.1% (59/66)</td>
<td>81.7% (107/131)</td>
<td>74.1% (146/197)</td>
<td>40.9% (27/66)</td>
<td>18.3% (24/131)</td>
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<tr>
<td>CBCT (n = 197)</td>
<td>87.9% (58/66)</td>
<td>83.2% (109/131)</td>
<td>84.8% (167/197)</td>
<td>12.1% (6/55)</td>
<td>16.8% (22/131)</td>
<td>93.2% (109/117)</td>
<td>72.5% (58/80)</td>
</tr>
<tr>
<td>CT/MRI (n = 197)</td>
<td>66.7% (44/66)</td>
<td>91.6% (120/131)</td>
<td>83.2% (164/197)</td>
<td>33.3% (22/68)</td>
<td>8.4% (11/131)</td>
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<td>CT (n = 108)</td>
<td>63.6% (28/44)</td>
<td>85.9% (55/64)</td>
<td>76.9% (83/108)</td>
<td>36.4% (16/44)</td>
<td>14.1% (9/64)</td>
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<td>MRI (n = 99)</td>
<td>75.0% (18/24)</td>
<td>97.3% (73/75)</td>
<td>91.9% (91/99)</td>
<td>25.0% (6/24)</td>
<td>2.7% (2/75)</td>
<td>92.4% (73/79)</td>
<td>90.0% (18/20)</td>
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<tr>
<td>Bone scintigraphy (n = 197)</td>
<td>95.5% (63/66)</td>
<td>86.3% (113/131)</td>
<td>89.3% (176/197)</td>
<td>4.5% (3/66)</td>
<td>13.7% (18/131)</td>
<td>97.4% (113/116)</td>
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The sensitivity of CT/MRI was 66.7% (44/66), the specificity was 91.6% (120/131), and, accordingly, the accuracy was 83.2% (164/197). With CT/MRI, the achieved accuracy was lower than with CBCT or BS (p = 0.771 and p = 0.058, respectively) and significantly different from PR (p = 0.020).

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All the imaging modalities were accurate in the detection of bone invasion and the negative predictive value was 93.2% (109/117) and the positive predictive value was 72.5% (58/80).

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<td>81.7% (107/131)</td>
<td>74.1% (146/197)</td>
<td>40.9% (27/66)</td>
<td>18.3% (24/131)</td>
<td>79.9% (107/134)</td>
<td>61.9% (39/63)</td>
</tr>
<tr>
<td>CBCT (n = 197)</td>
<td>87.9% (58/66)</td>
<td>83.2% (109/131)</td>
<td>84.8% (167/197)</td>
<td>12.1% (6/55)</td>
<td>16.8% (22/131)</td>
<td>93.2% (109/117)</td>
<td>72.5% (58/80)</td>
</tr>
<tr>
<td>CT/MRI (n = 197)</td>
<td>66.7% (44/66)</td>
<td>91.6% (120/131)</td>
<td>83.2% (164/197)</td>
<td>33.3% (22/68)</td>
<td>8.4% (11/131)</td>
<td>84.5% (120/142)</td>
<td>80.0% (44/55)</td>
</tr>
<tr>
<td>CT (n = 108)</td>
<td>63.6% (28/44)</td>
<td>85.9% (55/64)</td>
<td>76.9% (83/108)</td>
<td>36.4% (16/44)</td>
<td>14.1% (9/64)</td>
<td>77.5% (55/71)</td>
<td>75.7% (28/37)</td>
</tr>
<tr>
<td>MRI (n = 99)</td>
<td>75.0% (18/24)</td>
<td>97.3% (73/75)</td>
<td>91.9% (91/99)</td>
<td>25.0% (6/24)</td>
<td>2.7% (2/75)</td>
<td>92.4% (73/79)</td>
<td>90.0% (18/20)</td>
</tr>
<tr>
<td>Bone scintigraphy (n = 197)</td>
<td>95.5% (63/66)</td>
<td>86.3% (113/131)</td>
<td>89.3% (176/197)</td>
<td>4.5% (3/66)</td>
<td>13.7% (18/131)</td>
<td>97.4% (113/116)</td>
<td>77.8% (63/81)</td>
</tr>
</tbody>
</table>
in order to verify whether there was a significant difference in the clinical outcomes and post-treatment complications between the surgical and the non-surgical treatment of unilateral or bilateral MCFs, in patients of any age or gender.

MATERIALS AND METHODS

An electronic search without time or language restrictions was undertaken in February 2014 in the following databases: PubMed, Web of Science, and the Cochrane Oral Health Group Trials Register. A manual search of selected journals on the subject was also performed and the reference lists of the identified studies and relevant reviews on the subject were also scanned for possible additional studies. Eligibility criteria included clinical human studies—randomized controlled trials (RCTs), controlled clinical trials (CCTs), or retrospective—comparing the clinical outcomes between surgical and non-surgical treatment of MCFs, and reporting the incidence of post-treatment complications. The following were excluded: case reports, technical reports, animal studies, in vitro studies, and reviews papers.

The titles and abstracts of all reports identified through the electronic searches were assessed. The full text was obtained for studies appearing to meet the inclusion criteria and for studies for which there were insufficient data in the title and abstract to make a clear decision.

A quality assessment was performed using the recommended approach for assessing the risk of bias in studies included in Cochrane reviews. The classification of the risk of bias potential for each study was based on the following four criteria: sequence generation (random selection in the population), allocation concealment (steps must be taken to secure strict implementation of the schedule of random assignment by preventing foreknowledge of the forthcoming allocations), incomplete outcome data (clear explanation of withdrawals and exclusions), and blinding (measures to blind study participants and personnel from knowledge of which intervention a participant received). Incomplete outcome data was also considered addressed when there were no withdrawals and/or exclusions. A study that met all the criteria mentioned above was classified as having a low risk of bias. A study that did not meet one of these criteria was classified as having a moderate risk of bias. When two or more criteria were not met, the study was considered to have a high risk of bias.

The following data were extracted (when available) from the studies included in the final analysis: year of publication, study design, number of patients, patient age range and/or mean age, follow-up period, number of MCFs, associated MFs, fixation methods, surgical approach, length of operation, post-treatment MMF, use of antibiotics and/or chlorhexidine, inclusion criteria for patients, post-treatment radiological assessment, and post-treatment complications. Authors were contacted via e-mail to request missing data if possible.

The I² statistic was used to express the percentage of the total variation across studies due to heterogeneity, with 25% corresponding to low heterogeneity, 50% to moderate heterogeneity, and 75% to high heterogeneity. The estimates of an intervention for dichotomous outcomes were expressed as the risk ratio (RR) and for continuous outcomes as the mean difference (MD) in millimeters, both with a 95% confidence interval (CI). Only if there were studies with similar comparisons reporting the same outcomes were these meta-analyses attempted. A funnel plot to assess publication bias was done. The data were Analysed using the statistical software Review Manager (version 5.2.8).

RESULTS

From the initial 400 “hits” identified in the search strategy, a total of 36 publications were included in the review. In total 1982 patients were enrolled in the 36 studies, with 1094 MCFs in the surgical treatment group and 1307 MCFs in the non-surgical treatment group. The presence of associated MFs was reported in 19 studies, but only seven studies reported the precise location of the fractures. The most prevalent associated MF was fracture of the symphysis/parasymphysis region, with 78.3% (227/290) of the reported associated MFs of known location. The maximum follow-up period varied between 3 months and 13 years.

All 36 studies were judged to be at high risk of bias.

When considering only the dichotomous outcomes, there was heterogeneity among the studies for the outcome TMJ pain (I² = 53%, P = 0.009), but not for infection (I²=0%, P=0.99), malocclusion (I² = 11%, P = 0.30), lateral deviation during maximum inter-incisal opening (MOI) (I² = 24%, P = 0.21), or TMJ noise (I² = 0%, P = 0.41). There was a statistically significant effect on the outcome of post-treatment malocclusion (RR 0.46, 95% CI 0.34–0.62, P<0.00001) and lateral deviation during MIO (RR 0.56, 95% CI 0.43–0.74, P < 0.0001) favouring surgical treatment, and of post-treatment infection (RR 3.43, 95% CI 1.10–10.75, P = 0.03) favouring non-surgical treatment. There was no statistically significant effect on the outcome TMJ pain (RR 0.81, 95% CI 0.48–1.42, P = 0.46) or TMJ noise (RR 1.44, 95% CI 0.78–2.65, P = 0.24) in favour of surgical treatment. Only three studies provided information on malunion and non-union, with no cases reported. Thus, an analysis of these outcomes was not performed.

The test for overall effect revealed a statistically significant advantage for surgical treatment when the incidence of all post-treatment complications (dichotomous outcomes) was considered (RR 0.70, 95% CI 0.54–0.90; P = 0.006). The cumulative RR was 0.70, meaning that surgical treatment in the management of MCFs decreases the risk (relative risk reduction—RRR) of these events (post-treatment complications of dichotomous outcome) by 30%.

When only considering the continuous outcomes, there was heterogeneity among the studies for the outcomes
MIO (I²=95%, P < 0.0001), laterotrusion (I²=61%, P<0.0001), and protrusion (I² = 59%, P = 0.004), but not for lateral deviation during maximum inter-incisal opening (MIO) (I²=31%, P=0.18). There was a statistically significant effect on the outcome of protrusion (MD 0.68, 95% CI 0.14–1.22, P = 0.01), laterotrusion (MD 0.53, 95% CI 0.05–1.01, P=0.03), and lateral deviation during MIO (MD −0.75, 95% CI −1.23 to −0.27, P = 0.002) favouring surgical treatment. There was no statistically significant effect on the outcome of MIO (MD 2.24, 95% CI −0.70 to 5.19, P = 0.14) in favour of surgical treatment.

The test for overall effect revealed a statistically significant advantage for surgical treatment when the incidence of all post-treatment complications (continuous outcomes) was considered (MD 1.17, 95% CI 0.50–1.84; P = 0.0006).

Concerning the length of operation, only one study provided information on the mean operation time, with a mean time of 132 min for the surgical treatment group and 72 min for the non-surgical treatment group. Thus, a meta-analysis was not possible.

The funnel plot for the dichotomous outcomes did not show asymmetry, indicating an absence of publication bias. The funnel plot for the continuous outcomes showed asymmetry, indicating the possible presence of publication bias.

CONCLUSION
The results of this meta-analysis suggest that the surgical treatment of MCFs provides a better clinical outcome with regard to post-treatment malocclusion, protrusion, laterotrusion, and lateral deviation during maximum inter-incisal opening in comparison with non-surgical treatment. However, patients are more affected by post-treatment infection when a surgical treatment is performed. There were no statistically significant differences in post-treatment TMJ pain, TMJ noise, or MIO when the two techniques were compared.

IMPLICATIONS FOR PRACTICE
As more refined surgical techniques are introduced, the option of surgical versus non-surgical management of MCFs seems to favour the surgical approach.

Reference

3. Immediately loaded non-submerged versus delayed loaded submerged dental implants: a meta-analysis

Chrcanovic B.R, Albrektsson T, Wennerberg A

Historically, the original Brånemark protocol for placing dental implants prescribed a two-stage surgery with a submerged healing period of at least three months in the mandible and six months in the maxilla, allowing the implant to osseointegrate without being exposed to external forces. After bone healing, a second surgery is performed to connect a healing abutment.

Over time, the concepts of implant placement in fresh extraction sockets, immediate loading, and non-submerged implants were introduced, focusing on shorter and less invasive procedures. To reduce the treatment time and offer the patient early function and aesthetics, a one-stage surgical procedure and loading of the implants as soon as possible are recommended. In the one-stage surgical approach (non-submerged implant), the coronal part of the implant is positioned above the gingiva level in the case of single-part implants, or transmucosal healing abutments are placed in the case of two-part implants. In the one-stage surgical approach, the implant can be loaded immediately or not.

Inserting implants in one stage has several advantages. Only one surgical intervention is required, which is convenient for the patient, especially for the medically compromised patient. In addition, there is a considerable cost-benefit advantage. The prosthetic phase can start earlier because there is no wound-healing period related to a second surgical procedure. Although immediate loading of implants shortens the treatment duration and also provides patients with an acceptable aesthetic appearance, there is concern that immediate loading may increase the risk of implant failure.

Chrcanovic et al (2015) undertook a systematic review with meta-analysis to compare the survival rate, postoperative complications, and marginal bone loss of non-submerged immediately-loaded dental implants with those of submerged delayed-loaded implants.

MATERIALS AND METHODS
An electronic search without time or language restrictions was undertaken in March 2014 in the following databases: PubMed, Web of Science, and the Cochrane Oral Health Group Trials Register. A manual search of selected journals covering dental implant research was also done and the reference lists of the studies identified and relevant reviews on the subject were also scanned for possible additional studies.

Eligibility criteria included clinical human studies, either randomized or not, comparing implant failure rates in any group of patients receiving submerged versus immediately loaded implants.
loaded non-submerged dental implants. Only the studies immediately loading all non-submerged implants were considered.

The titles and abstracts of all reports identified through the electronic searches were read independently by the three authors. For studies appearing to meet the inclusion criteria, or for which there were insufficient data in the title and abstract to make a clear decision, the full report was obtained. Disagreements were resolved by discussion between the authors.

The quality assessment was performed using the recommended approach for assessing risk of bias in studies included in Cochrane reviews. The classification of the risk of bias potential for each study was based on the four following criteria: sequence generation, allocation concealment, incomplete outcome data and blinding. A study that met all the criteria mentioned above was classified as having a low risk of bias, a study that did not meet one of these criteria was classified as having a moderate risk of bias, and when two or more criteria were not met, the study was considered to have a high risk of bias.

The following data were extracted from the studies included in the final analysis, when available: year of publication, study design, single centre or multi-centre study, number of patients, patient age, follow-up, days of antibiotic prophylaxis, use of mouth rinse, implant healing period, failed and placed implants, and postoperative infection. Contact was made with authors to obtain missing data, if possible.

Implant failure and postoperative infection were the dichotomous outcome measures evaluated. Weighted mean differences were used to construct forest plots of marginal bone loss, a continuous outcome. The statistical unit for the outcomes was the implant. Whenever outcomes of interest were not clearly stated, the data were not used for analysis. The I² statistic was used to express the percentage of the total variation across studies due to heterogeneity, with 25% corresponding to low heterogeneity, 50% to moderate and 75% to high. In the case of statistically significant (p<0.10) heterogeneity, a random-effects model was used to assess the significance of treatment effects. Where no statistically significant heterogeneity was found, analysis was performed using a fixed-effects model. The estimates of an intervention were expressed as the risk ratio (RR) and as the mean difference (MD) in millimetres for continuous outcomes, both with a 95% confidence interval (CI). Statistical significance was set at P < 0.05. Only if there were studies with similar comparisons reporting the same outcome measures was a meta-analysis to be attempted.

A funnel plot (plot of effect size versus standard error) was used to assess publication bias. The data were analysed using the statistical software Review Manager (version 5.2.8).

RESULTS
The search strategy resulted in identified 1328 papers, of which 28 were included in the review. In the 28 studies comparing the procedures, a total of 3918 dental implants were non-submerged and immediately loaded, with 263 failures (6.71%), and a total of 7194 implants were submerged, with 446 failures (6.20%). There was no implant failure in three studies. Twenty-three studies were judged to be at high risk of bias, whereas one study was considered at moderate risk of bias and four studies at low risk of bias.

In this study, a random-effects model was used to evaluate implant failure in the comparison between the procedures, since statistically significant heterogeneity was observed (P < 0.00001; I² = 76%). The insertion of dental implants through the two different techniques statistically affected the implant failure rate in favour of the submerged procedure (P = 0.02). The RR of 1.78 (95% CI 1.12–2.83) implies that failures are 1.78 times more likely to happen when implants are immediately loaded than when implants are submerged. Thus, the relative risk reduction (RRR) is −78%. The RRR is negative, i.e. immediately loaded non-submerged implants increase the risk of implant failure by 78%. The number needed to treat (NNT) to prevent one patient having an implant failure is 50 (95% CI 25–100).

The funnel plot showed asymmetry when the studies reporting the outcome ‘implant failure’ were analysed, indicating the possible presence of publication bias.

CONCLUSION
The difference between immediately loaded non-submerged dental implants and delayed loaded submerged implants statistically affected the implant failure rate (failures were 1.78 times more likely to happen when implants were immediately loaded than when implants are submerged). No statistically significant effects on the occurrence of postoperative infection or on marginal bone loss were observed between the two different techniques.

IMPLICATIONS FOR PRACTICE
This systematic review with meta-analysis provides good evidence that the traditional delayed loading of implants resulted in significantly less implant failure than with the immediately loaded non-submerged dental implants.

Reference
CPD Questionnaire

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

GENERAL

**Progressive Systemic Sclerosis – an extensive manifestation of scleroderma (p156)**

1. Although scleroderma literally means “hard skin” it can affect muscles, lungs, heart, kidneys and gastrointestinal tract.
   a. True
   b. False

2. Radiological signs of scleroderma may include:
   a. widening of the periodontal space
   b. resorption of the angle and ramus of the mandible
   c. condylolysis
   d. resorption of the roots of the teeth
   e. all of the above

3. Raynaud’s phenomenon is a late clinical sign in scleroderma.
   a. True
   b. False

4. Despite the contractions of fibrous tissue, speech and swallowing are not affected in scleroderma.
   a. True
   b. False

**Comparison of preparation times of three different rotary glide path instrument systems. (p 144)**

5. Berutti et al. (2009) showed that the preparation of a glide path with hand files resulted in more irregularities and an over-enlargement of the canal curvature compared with the use of rotary PathFiles.
   a. True
   b. False

6. Preparing a glide path with hand instruments has been shown to produce a smoother path than did rotary instrumentation.
   a. True
   b. False

7. Which of these advantages is NOT offered by the use of PathFiles?
   a. could be safely used by inexperienced operators,
   b. increased the longevity of 25/08 WaveOne instruments,
   c. elimination of the need for further instrumentation
   d. avoidance of over-enlargement of the canal curvature

8. Which of these attributes offered by the ProGlider instrument is NOT correct?
   a. substantial reduction in clinical chairtime
   b. resulted in the smallest coronal canal diameter
   c. enlarges a glide path significantly faster
   d. resulted in the smallest apical preparation diameter

**Abnormality in the right mandibular angle and large swelling in the left facial area (p 159)**

9. Stafne’s bone defect is most frequently found as a unilateral, ovoid, radiolucent, corticated defect:
   a. in the coronoid process
   b. near the angle of the mandible
   c. in the symphysis
   d. ascending ramus

10. Stafne”s bone defect is always filled with adipose tissue
    a. True
    b. False

11. Acinic cell carcinoma (ACC) is:
    a. Readily diagnosed clinically
    b. Immunohistochemical staining of ACC is not specific
    c. Microscopy may be the definitive diagnostic process
    d. Fine needle aspiration is the definitive diagnostic process

**Maxillo-Facial and Oral Radiology (p 164)**

12. The main complaint in metastatic disease of the jaw is numbness of the jaws.
    a. True
    b. False

13. Metastatic carcinoma is the most common malignant tumour of bone.
    a. True
    b. False

**Oral Medicine case 69: Burkitt lymphoma of the oral cavity (p 168)**

14. All variants of Burkitt’s lymphoma are associated with EBV infection.
    a. True
    b. False

15. All variants share a common morphological profile
    a. True
    b. False.
Clinical Windows (p 173)

16. In the Linz et al trial, the images were compared to the “gold standard,” which was histopathology.
   a. True
   b. False

17. In the Linz et al trial, the image with the highest accuracy (see Table 1) was:
   a. CBCT
   b. BS
   c. PR
   d. MRI
   e. none of the above

18. In the mandibular condylar fractures review, an I² statistic score of 25% implied high heterogeneity.
   a. True
   b. False

19. The findings of the mandibular condylar fractures (MCF) review suggest that the surgical treatment of MCFs provide a better clinical outcome in comparison to non-surgical treatment.
   a. True
   b. False

20. In the implant review, it was found that failures are 1.78 times more likely to happen when implants are immediately loaded than when implants are submerged.
   a. True
   b. False

ETHICS

Avoiding perverse incentives (p 171)

21. Over-servicing includes the provision of treatment that is:
   a. unnecessary
   b. inappropriate
   c. excessive non-disclosure of the information represents a serious threat to public health.
   d. fraudulent
   e. all of the above

22. Improper financial gain or other valuable consideration means that money, or other forms of compensation, payment, reward or benefit has been provided.
   a. True
   b. False

23. Professional integrity is a measure of the degree to which professional reputation and credibility remain intact.
   a. True
   b. False

24. To avoid improper financial gain, dentists should not engage in or refrain from behaviours that are:
   a. illegal
   b. contrary to ethical or professional rules
   c. may adversely affect the interests of a patient or group of patients
   d. construed as perverse incentives
   e. all of the above

25. Fees can sometimes be charged for services not personally rendered by either the health care professional himself or herself or by an unregistered person in his or her employ.
   a. True
   b. False

Readers will note that we have reduced the number of General Questions to twenty whilst retaining five Ethics based questions. Our allocation of CPD points remains unchanged. There is optimism that this section will continue to provide members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure Continuing Education.

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   b. as a record of communication regarding the patient and other health care providers.
   c. to protect the legal interests of all parties involved.
   d. for billing, quality assurance, and other administrative functions.
   e. all of the above.

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Initial(s) and Surname ........................................................................................................ Signature ...................................................................................................................... Date
Karel Viviers
Tel: 011 745 6000
E-mail: karel.k.viviers@gsk.com

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

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

Georgina Harpur
Tel: 011 253 4274
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