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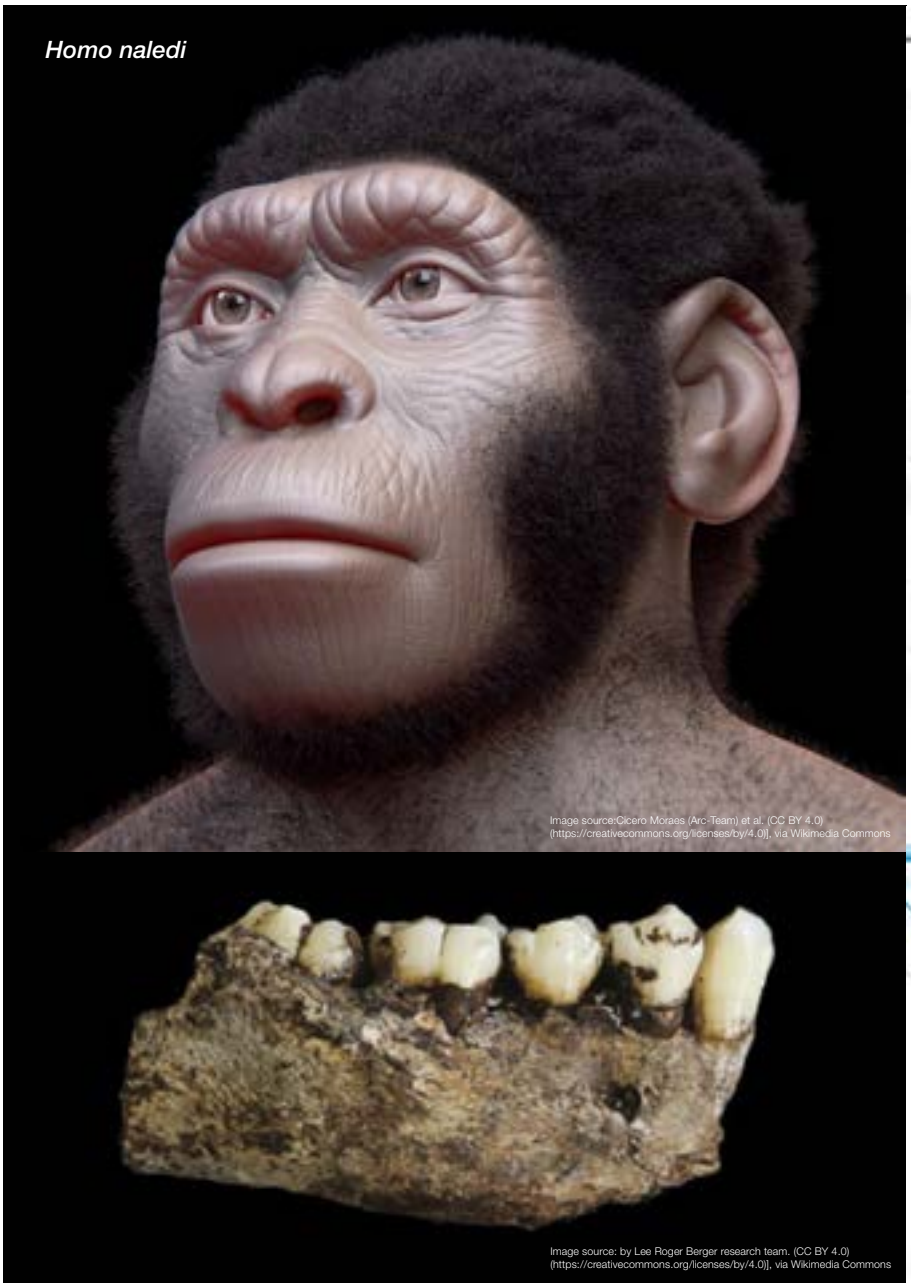

RESEARCH

Homo naledi: Lived somewhere between 335,000 and 236,000 years ago. Their chipped teeth point toward their using the anteriors as tools, and the posteriors as confirmation of a mixed diet, including tubers which still had adherent grit.

Source: Lee Burger report.The Conversation, Google: Chipped teeth suggest a unique diet.

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Bamboozled... or bamboo?

SADJ November 2018, Vol. 73 No. 10 p594

WG Evans

There is a simple device which, if properly used, can reduce or even avoid the onset of a disease which may otherwise cause untold agony, terrible embarrassment and create social outcasts. The disease is second in prevalence only to the common cold.

No prizes for the answer... the simple device has been around for a long time, has many different designs.. but basically remains THE TOOTHBRUSH! The disease…Caries. It seems that the ancient Babylonians and Egyptians may have been the first humans to have felt the need for clean mouths and teeth. Primitive tooth-brushing tools have been found dating back to 3500 BC… the tooth stick, on which chewing produced a tuft of bristles… and similar developments came from China in about 1600BC. The Chinese appear to have been the first to use actual bristles... from the neck of a pig... to produce a custom-made brush. The use of tooth sticks is common through Africa, the popular source being the Mustard tree (*Salvatore persica*), which intriguingly contains an antibacterial substance, benzylisothiocyanate... a dual purpose tooth cleaning and infection control!

Brushes have become more sophisticated, latest developments being "smart " brushes which can record the stroke pressure, analyse oral hygiene habits and offer data which may enhance the cleansing effects. Toothbrushes now come in a bewildering variety of designs, colours, sizes, bristles, manual or powered. The first electric toothbrush was developed in Switzerland... in 1939, although the innovation was not marketed until 1954. An oral hygiene device called the Piezoelectric multi-morph transducer evolved into the Sonicare toothbrush, introduced in 1992. Latest versions have a brush head which vibrates at 31,000 strokes per minute, a long way from *Salvatore persica*!

Surely, given the considerable effort to improve toothbrushes, we should all enjoy the benefit of sparkling, clean teeth... healthy and devoid of blemish. The relevant words, however, bear repeating... if the device is used properly!

The device has of course been strikingly effective in controlled circumstances. In the pages of this issue of the Journal we learn of the success of a toothbrushing campaign carried out in South Africa.

Teacher-supervised tooth brushing programmes implemented and closely monitored by oral health professionals may be effective in the South African public school set-up, if combined with oral health education in socially deprived communities. This targeted population approach resulted in significantly reduced caries in the intervention group compared with the control group.

A substantial reduction in dental treatment needs in children could be achieved if the findings in this study could be translated to the population at risk in South Africa.

So, this modest household item may hold the key to prevention of the second most common disease. But... and perhaps there is always a BUT... toothbrushes are commonly constructed from plastic, and constitute a real environmental hazard!! Are we bamboozled? Start at the beginning and recognise that plastic manufacturing relies on oil products... and oil is a non-renewable resource. Consider that once used, toothbrushes are simply discarded... to the extent of one billion toothbrushes per year in the United States alone! Add Asia, China, Africa, Europe... the figures are astronomical! Further understand that those discarded brushes do not graciously fade into the background... their components, plastic, rubber, nylon... are not biodegradable. Landfills are favourite haunts for those billions of brushes... but many reach the oceans, where a real threat is posed to marine life. Many fish consume the plastic pieces... and there is photographic evidence of a bird trying to regurgitate a toothbrush to feed to its hungry fledging! Just think, it is entirely possible that a fish on your table has ingested some plastic from a toothbrush previously used in some far-away place.. and now it is your turn to ingest!

The question is truly paradoxical.. the very essence of our efforts to control caries may be contributing to what could be a global catastrophe. Many believe that bamboo may be the answer.. the fibres which may be used in forming the handle of the brush may later readily be incorporated as reusable content into packing material. And in any event bamboo IS biodegradable! The campaign to replace plastic handles has begun in earnest.

Bamboo may be set to replace *Salvatore persica!* And we may yet win against the second most common disease!

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WG Evans: Managing editor, **Email:** bill.evans@wits.ac.za

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No.1 DENTIST RECOMMENDED BRAND FOR SENSITIVE TEETH[6]

References: 1. Addy M. *Int J Dent.* 2002;**52**:367–375. **2.** GSK Data on File 207211. May 2017. **3.** Accepted for presentation at IADR 2017, Abstract no: 2635085. **4.** Parkinson CR *et al. Am J Dent.* 2015 Aug;**28**(4):190-196. **5.** GSK Data on File RH01897. **6.** Touchstone research December 2016. For any product safety issues, contact GSK on +27 745 6001 or 0800 118 274. **Date of preparation:** May 2017. CHZAF/CHSENO/0027/17

Statistics and supervision… the role of The Medical and Dental Professions Board

SADJ November 2018, Vol. 73 No. 10 p596

The end of the year approaches and examinations loom large in the minds of our undergraduate and postgraduate students. Those examinations and the courses on which the assessments are based, are subject to the final approval of the HPCSA, under the auspices of That Board carries a significant responsibility to the public and to practitioners and it may then be pertinent to publish the guidelines under which this most influential body operates... supervising education and training, practice and service, ethics and legal process.

The following is an excerpt taken from the Bulletin of the Health Professions Council, 2017.

The Medical and Dental Professions Board registers practitioners falling under the professions medical, dental, medical science and clinical associates, ensuring effective communication with stakeholders. The Board also ensures compliance to standards of education and training and ethical conduct, while facilitating professional matters of decision making.

The Board consists of 45 members who are serving a five-year term from 2015 to 2020. Two clinical associates were co-opted to serve as members of the Board until the regulations were amended to include clinical associates as part of the composition of the Board.

- The following strategic goals have been defined for the term of the Board:
- To ensure the effective and efficient functioning of the Board.
- Regulating and guiding the profession.
- Protecting the public.
- Advisory and advocacy for the profession and stakeholder engagement.
- The Board developed a Vision and Mission statement for the Board as follows.

Vision
To provide quality and equitable healthcare through public protection, professional regulation and advocacy.

Mission
The mission of the Medical and Dental Professions Board is to:
- Ensure appropriate education and training standards.
- Regulate and ensure compliance for professional registration.
- Promote and regulate professional as well as ethical practice.
- Guide the relevant professions and to protect the public.
- Maintain and enhance the dignity and integrity of the health profession and professionals.
- Advocate for the promotion of the health of the population.
- Commit to improved stakeholder engagement.
- Advise Council and the Minister of Health in the development of strategic policy frameworks.

Values
The Board has committed to deliver on its mandate through:
- Expecting honesty and integrity from its members.
- Acting with respect, fairness and transparency to all.
- Regulating consistently and decisively.
- Functioning effectively and efficiently.
- Ensuring accountability for its actions.

A strategic plan has been developed which will reflect performance levels of the Board for the term until 2020, and will serve as a tool for planning for future activities and to assess the Board in terms of performance.

The Board included detailed statistics in their 2017/2018 Annual HPCSA report, data which may be relevant as the profession prepares to welcome newly qualified dental practitioners. In April 2018, the Council recorded:

1214 Oral Hygienists and 400 Oral Hygiene students.
732 Oral Therapists and 205 Oral Therapy students.
6433 Dentists and 1338 Dental students.
and just for contrast: 45,503 Medical practitioners and 13,024 Medical students.

The Board added 227 Dentists as new registrants in 2017/2018.

The Board is responsible for the registration of 138 different categories of Health Workers, a total at April 2018 of 16481 practitioners. That represents a reduction from the 2016/2017 total which was 19121. Specialist registrations also dropped from 597 in 20126/2017 to 448 in 2017/2018.

There is no doubt that the Board carries a considerable load... of concern is that it appears that the load is becoming lighter as the total number of registrations drops. It will then be with acclaim that the Dental Profession will welcome new Dental Registrants at the end of this year. Every best wish to all students!

The orthopantomograph as an indicator of vertical jaw relations

SADJ November 2018, Vol. 73 No. 10 p597 - p603

MF Suliman[1], SM Dawjee[2]

SUMMARY

Introduction

Lateral cephalometry is important in the orthodontic diagnosis of jaw relationships, in treatment planning, and prediction of growth but also in the evaluation of different facial forms. Little research has evaluated the orthopantomograph for these purposes.

Aim

To compare the data taken from orthopantomographs and lateral cephalograms in the investigation of vertical jaw relationships and to assess correlation between measurements.

Materials and Methods

The gonial angle, ramus height and condyle angle were measured for each patient on the two radiographs and these data compared for the three different facial growth types, dolichofacial, mesofacial and brachyfacial.

Results

In subjects with normal (meso-) or horizontal (brachy-) growth patterns, there were no significant differences between the mean and median values for the gonial and condyle angles, but the ramus heights showed significant differences.

The data of the vertical (dolicho-) growth pattern patients recorded significant differences only between the data for the gonial angles and the ramus heights.

Significant correlations were found between the gonial angles and the condyle angles for all three growth patterns, but not for ramus heights.

Conclusion

in comparing the data from the two radiographs, the angular measurements showed high correlation and predictability whilst linear measurements showed inconsistency.

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Keywords

Orthopantomograph, lateral cephalogram, facial growth.

INTRODUCTION

The diagnosis of the vertical facial dimension is a complex problem. It may be simplified by studying a face and applying common sense diagnostic tools to ascertain whether the lower face is relatively long or relatively short.

Vertical Facial Dysplasias are to some extent the result of growth that was programmed in that direction, but their expression is influenced by the interactions of both form and function. The clinician must make a careful differential diagnosis for each patient who seeks his or her care. The diagnosis must analyze all three morphological components of malocclusion namely, facial, dental and skeletal.

Orthodontic treatment encompasses more than the correction of the dental malocclusion; but also includes the diagnosis and treatment of facial and skeletal problems, upper airway obstruction, temporomandibular dysfunction, and abnormal myofunctional habits. Each aspect must be carefully studied and understood to enable the correct diagnostic decisions to be made so as to effect a successful treatment plan. Faces are specific to the individual. Orthodontists have the ability to perceive exceedingly subtle differences in the shape, size, and proportions of both the hard and soft tissue components and also minute variations in the topographic contours amongst them. Three vertical forms exist for the shape of the face:

- the vertical, hyperdivergent - long and narrow, dolichofacial form
- the horizontal, hypodivergent - wide and short, brachyfacial form
- the normal – which is the mesofacial form

These facial patterns are also described as Leptoprosopic (thin), Mesoprosopic and Euryprosopic (broad).[1] Each has characteristic, and varied, vertical facial relationships. Clinicians have long been interested in the multitude of differences in the diagnosis, treatment, and the treatment responses between these hyperdivergent or dolichofacial types and hypodivergent or brachyfacial types.[2]

Radiographs are important diagnostic tools in the assessment of these different facial types. Lateral cephalometry serves as the gold standard in orthodontic diagnosis of the vertical jaw relationships, treatment planning, prediction of growth and the evaluation of facial forms.

However, cephalometric analysis has limitations, the major sources of error include image magnification, superimposition of the images of structures and errors in landmark identification, tracing and measuring.

Although the orthopantomograph is not itself free of possible errors, it is feasible that using that radiograph for the assessment of particular cranial features may effect some compensation for the limitations of lateral cephalograms.

AIM

This study aims to compare measurements taken from the orthopantomograph with those recorded from the lateral cephalogram for the investigation of the vertical jaw relationship patterns of individuals, and to assess the degree of correlation between these data.

MATERIAL AND METHODS

The sample comprised 90 patients, all adults over the age of 20 years. The sample size was determined on the Central Limit Thereom.[3] There was no race or gender distinction. Patients who had received orthodontic treatment were excluded. Every patient had had a lateral cephalometric film and a panoramic film taken for routine examination. The identity of the subject was not revealed and patient anonymity was fully respected. The records were randomly numbered and documented.

Printed pictures, having a ratio of 1:1, of the lateral cephalograms and the orthopantomographs were used for the measurements (Figures 1 and 2).

Figure 1. Lateral cephalogram.

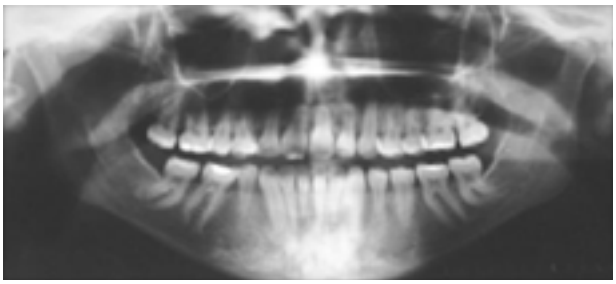

Figure 2. Orthopantomograph.

Three groups of 30 patients each represented the different growth patterns, namely dolichofacial, mesofacial and brachyfacial. The cephalogram was used as the gold standard for identification of the three categories. The cephalometric criteria on which the growth patterns were determined were:

- Upper anterior facial heights were measured as the distance in mm from the nasion to the anterior nasal spine and lower facial heights were measured as the distance in mm from the anterior nasal spine to the menton on the cephalogram. The ratio was determined as that between the upper and lower measurements (mean 45% to 55%).[4]
- The Y-Axis was drawn from the midpoint of the sella to the gnathion point and the contained angle between the axis and the line SN was measured on the cephalogram (mean 59,4, SD 3,82).[4]

Measurements

Measurements of the gonial angle, condyle angle and ramus height were made on both the lateral cephalograms and orthopantomographs of these patients (Figure 3) and these data were documented and statistically compared.

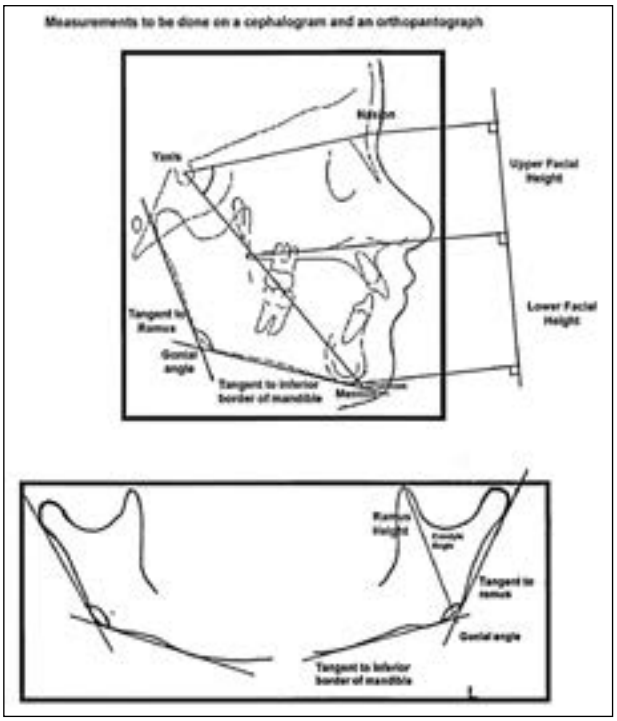

Figure 3. Measurements that were documented from the Cephalogram and the Orthopantomograph.

Standardization was done on every fifth tracing and every third measurement was repeated by an independent investigator to ensure accuracy.

RESULTS

The data were analyzed using the SAS program, Release 92, running under Microsoft Windows for a personal computer. A total of 90 orthopantomographs and 90 cephalometric radiographs were obtained, 30 for each of the three different growth types. Mean values were compared by the two-sample t test. Median values were compared by the non-parametric Wilcoxon rank sum test. P values ≤ 0.05 were considered significant.

Comparisons were made of the means, standard deviations and the median values of the gonial angle, the ramus height and the condyle angle, measured in the three different growth types, namely mesofacial, brachyfacial and dolichofacial. The measurements of the cephalogram were identified as "C" and those of the orthopantomograph as "O".

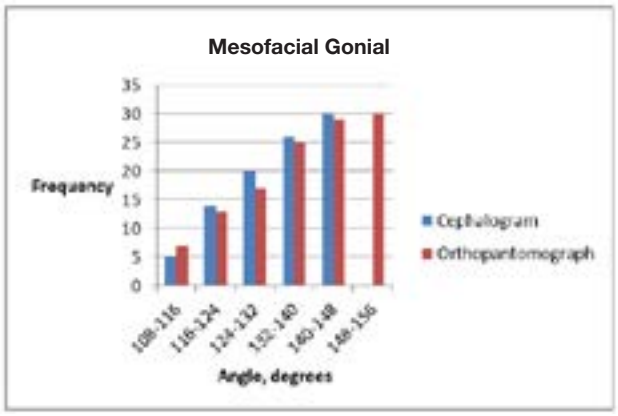

Figure 4. Mesofacial Gonial.

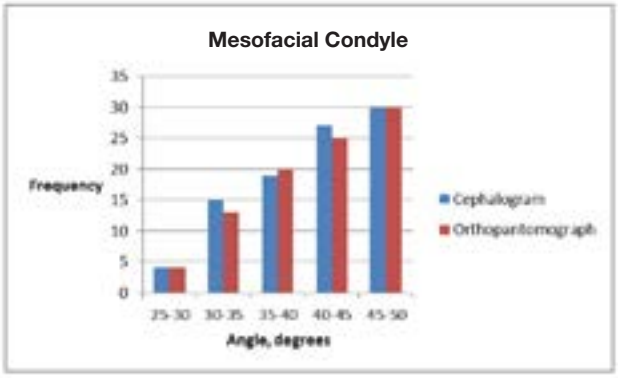

Figure 5. Mesofacial Condyle.

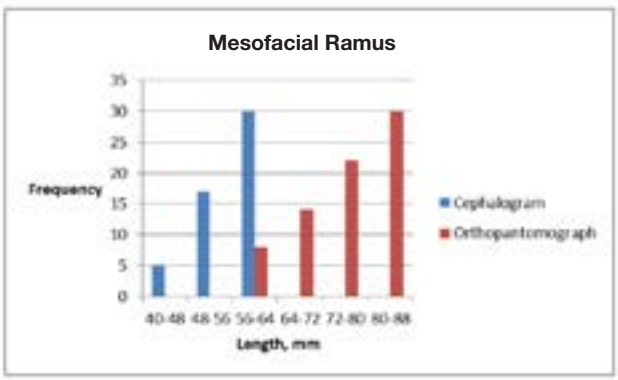

Figure 6. Mesofacial Ramus

Data from the three facial types were subjected to the statistical tests and the elements and findings are presented in Tables and Graphs below.
P5 = percentile 5 of the distribution of values for the variable concerned, and...
P95 = percentile 95 of the distribution of values for the variable concerned.
Therefore 90% of the values occurred in the interval P5 – P95.

Mesofacial growth pattern

Table 1. Descriptive statistics

	Cephalogram	Orthopantomograph	P Value
Gonial angle, degrees			
N	30	30	
Mean	127.6	128.2	0.832*
Standard deviation	10.58	12.41	
Median	126	129	0.935**
P5 – P95	112 - 146	110 - 147	
Minimum / Maximum	111 / 147	110 / 149	
Correlations	Pearson correlation = 0.533		0.002
	Spearman correlation = 0.527		0.003
Condyle angle, degrees			
N	30	30	
Mean	37.1	37.5	0.822*
Standard deviation	6.38	6.16	
Median	35.5	36.5	0.853**
P5 – P95	27 – 47	30 – 47	
Minimum / Maximum	27 / 47	29 / 49	
Correlations	Pearson correlation = 0.098		0.605
	Spearman correlation = 0.119		0.530
Ramus, mm			
N	30	30	
Mean	54.9	72.8	< 0.001*
Standard deviation	5.35	9.25	
Median	55.5	75.5	< 0.001**
P5 – P95	46 – 63	59 – 87	
Minimum / Maximum	45 / 63	59 / 88	
Correlations	Pearson correlation = 0.363		0.049
	Spearman correlation = 0.376		0.041

* Two-sample t test
** Wilcoxon rank sum test

Mesofacial growth

- The mean as well as the median values of the gonial angles from the lateral cephalograms and orthopantomographs do not differ significantly.
- The mean as well as the median values of the condyle angles from the lateral cephalogram and orthopantomograph do not differ significantly.
- The mean as well as the median values of the ramus height from the lateral cephalogram and orthopantomograph differ significantly
- The P5 – P95 intervals vary noticeably for C Ramus and O Ramus, in contrast to the overlap between the lateral cephalogram and orthopantomograph bars for the gonial and condyle angles. This indicates a significant and positive correlation for the measurements of the condyle and gonial angles between the two radiographs. However, there is no correlation between the data from two radiographs in respect of the ramus height. The strong correlation is for angular measurements, while linear measurements do not show a correlation.

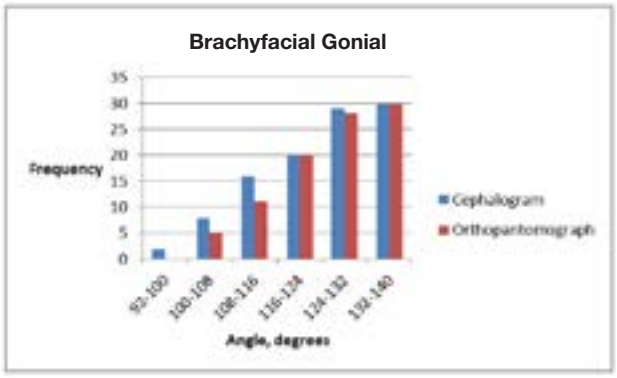

Figure 7. Brachyfacial Gonial.

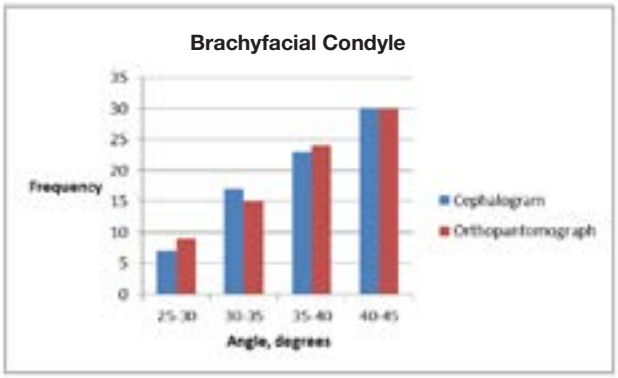

Figure 8. Brachyfacial Condyle.

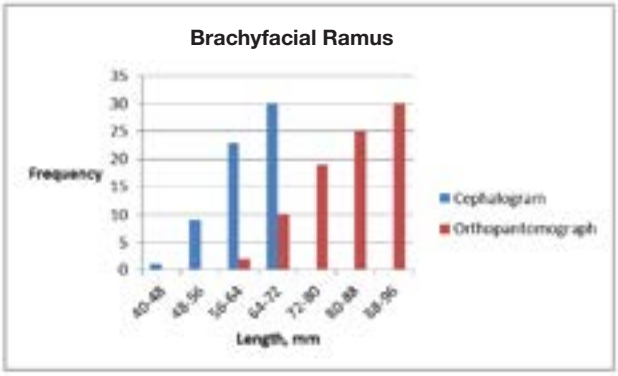

Figure 9. Brachyfacial Ramus

Brachyfacial growth pattern

Table 2. Descriptive statistics

	Cephalogram	Orthopantomograph	P Value
Gonial angle, degrees			
N	30	30	
Mean	116.9	118.8	0.456*
Standard deviation	10.54	9.35	
Median	116	120	0.506**
P5 – P95	100 – 132	105 – 133	
Minimum / Maximum	99 / 133	102 / 134	
Correlations	Pearson correlation = 0.575		0.001
	Spearman correlation = 0.567		0.001
Condyle angle, degrees			
N	30	30	
Mean	34.7	34.8	0.904*
Standard deviation	5.40	5.20	
Median	35	35.5	0.929**
P5 – P95	27 – 43	26 – 42	
Minimum / Maximum	27 / 43	26 / 42	
Correlations	Pearson correlation = 0.820		< 0.001
	Spearman correlation = 0.810		< 0.001
Ramus, mm			
N	30	30	
Mean	59.1	77.1	< 0.001*
Standard deviation	6.09	9.05	
Median	58.5	77.5	< 0.001**
P5 – P95	49 – 69	63 – 90	
Minimum / Maximum	45 / 69	62 / 93	
Correlations	Pearson correlation = 0.509		0.004
	Spearman correlation = 0.519		0.003

* Two-sample t test
** Wilcoxon rank sum test

Brachyfacial growth

- The mean as well as the median values of the gonial angles from the lateral cephalogram and orthopantomograph do not differ significantly.
- The mean as well as the median values of the condyle angles from the lateral cephalogram and orthopantomograph do not differ significantly
- The mean as well as the median values of the ramus heights from the lateral cephalogram and orthopantomograph differ significantly.

- The P5 – P95 intervals do not match closely for C Ramus and O Ramus, in contrast to the overlap between the lateral cephalogram and orthopantomograph bars for the gonial and condyle angles. Thus, significant and positive correlations between the data from the two radiographs were found for the gonial angles and the condyle angles. With regards the ramus measurements, no correlation was found.

Dolichofacial growth pattern

Table 2. Descriptive statistics

	Cephalogram	Orthopantomograph	P Value
Gonial angle, degrees			
N	30	30	
Mean	125.7	120.7	0.023*
Standard deviation	6.87	9.53	
Median	125	120	0.043**
P5 – P95	117 – 137	106 – 136	
Minimum / Maximum	110 / 143	105 / 136	
Correlations	Pearson correlation = 0.749		< 0.001
	Spearman correlation = 0.759		< 0.001
Condyle angle, degrees			
N	30	30	
Mean	35.7	35.6	0.977*
Standard deviation	4.16	4.56	
Median	35	35.5	0.947**
P5 – P95	29 – 42	27 – 43	
Minimum / Maximum	28 / 43	27 / 44	
Correlations	Pearson correlation = 0.938		< 0.001
	Spearman correlation = 0.936		< 0.001
Ramus, mm			
N	30	30	
Mean	55.5	72.1	< 0.001*
Standard deviation	5.02	6.15	
Median	56	73	< 0.001**
P5 – P95	46 – 61	65 – 82	
Minimum / Maximum	39 / 64	57 / 90	
Correlations	Pearson correlation = 0.635		< 0.001
	Spearman correlation = 0.422		0.020

* Two-sample t test
** Wilcoxon rank sum test

Dolichofacial growth

- The mean as well as the median values of the gonial angles from the lateral cephalogram and orthopantomograph differ significantly
- The mean as well as the median values of the ramus height from the lateral cephalogram and orthopantomograph differ significantly
- The mean as well as the median values of the condyle angles from the lateral cephalogram and orthopantomograph do not differ significantly
- The P5 – P95 intervals for C Ramus and O Ramus are noticeably different, in contrast to the overlap between the lateral cephalogram and orthopantomograph bars for the gonial and condyle angles. Again, significant and positive correlations between the data from two radiographs were found for the gonial angles and the condyle angles. For the ramus measurements, no correlation was found.

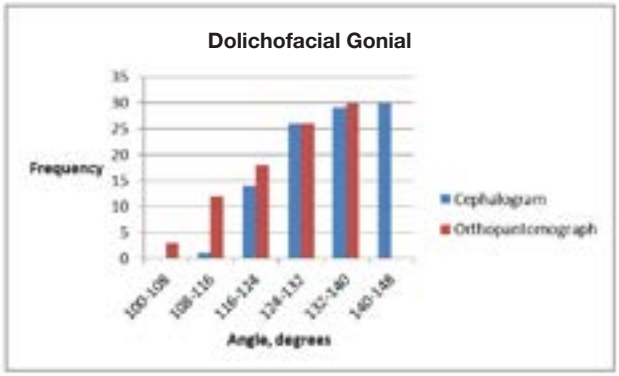

Figure 10. Dolichofacial Gonial.

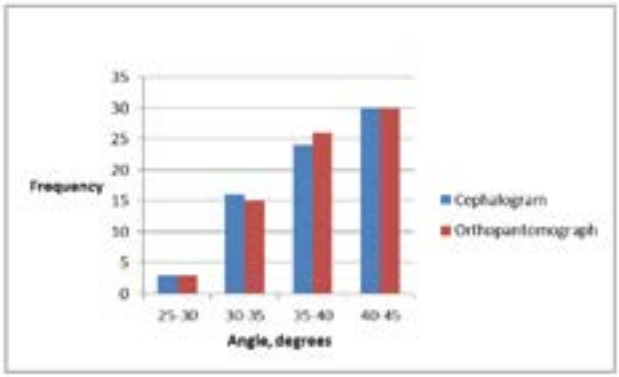

Figure 10. Dolichofacial Condyle

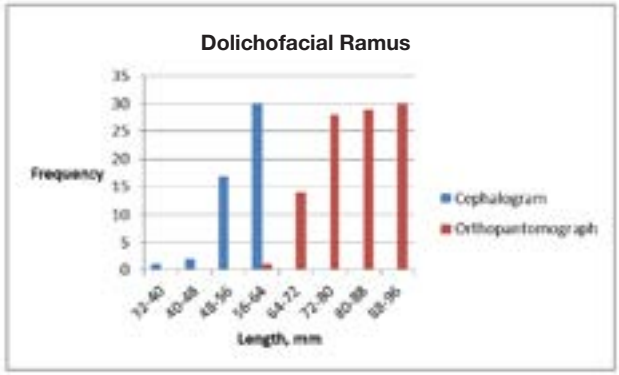

Figure 10. Dolichofacial Ramus

RESULTS

The orthopantomograph is a panoramic view, demonstrating the right and left landmarks for bilateral structures. In addition, it displays many anatomic landmarks with enough detail to indicate the possibility of mandibular asymmetries. Therefore, the panoramic radiograph is a valuable orthodontic screening tool and is useful in the formulation of a treatment plan. However, the orthopantomograph has some limitations such as image magnification, geometric distortion and superimposed images. This limits accuracy.[5]

Studies have been undertaken to evaluate the use of orthopantomographs for dentoskeletal measurements.[6,7] Some studies have shown that vertical and horizontal linear measurements in orthopantomographs are unreliable. Van Elslande et al., (2008), claimed that although vertical linear measurements were more accurate than horizontal linear or angular measurements, they were not true representations of the real objects to which they corresponded, and therefore caution is advised when using conventional or digital panoramic images to assess linear markers of mandibular asymmetry.[8] Larheim and Svanaes (1986), found acceptable reproducibility for vertical linear and angular variables on panoramic radiographs that did not exceed 1% of the total variance, however, horizontal linear variables were less reliable.[7] For this reason, many studies have focused only on angular measurements.[5]

In 1993, Levandoski was one of the first to introduce a method of orthopantomograph analysis for evaluating facial asymmetry.[9] In these cases of asymmetry, it was especially challenging to achieve reliable skeletal measurements owing to interferences presented by superimposition of images on the lateral cephalogram.[9,10] Since then, few studies have been conducted which have investigated the possibility of enhancing the application of orthopantomographs in the evaluation of changes in craniofacial morphology in comparison with the data gleaned from lateral cephalograms.[11]

With regards to orthodontics, dimensional measurements made on an orthopantomograph can involve considerable methodological error. One major limiting factor in the clinical use of orthopantomography is its inability to confirm whether the dimensions of structures shown on radiographs correspond to the real dimensions of the structures. The orthopantomographic image is affected by both magnification errors and displacement.

Horizontal distances are particularly unreliable as a result of non-linear variation in the magnification at different object depths, whereas vertical distances are relatively reliable. Distortion, displacement and in a special way, magnification, can cause changes in the dimensions of the images of structures on radiographic films in comparison with those of the actual structures.[12,13]

Cephalometric radiography is an essential tool in the diagnosis and treatment planning of dental malocclusions and underlying skeletal discrepancies. The use of serial cephalograms makes it possible to study and predict growth, orthodontic treatment progress and the outcome of dentofacial deformity surgical treatment.[14]

However, the inconsistency in landmark identification is still an important source of random errors in both computer-aided digital cephalometry and in manual cephalometric analysis. Last, but not least, both methods are time-consuming, although to a different extent.[15]

For these reasons there have been efforts to automate cephalometric analysis with the aim of reducing the time required to obtain an analysis, improving the identification and reducing the errors due to clinician subjectivity.

The main source of errors includes technical measurements, radiographic acquisition and identifying landmarks. The lateral cephalometric radiograph has become a standard tool in orthodontic assessment and treatment planning. The need for lateral cephalometric radiographs in certain patients has always been controversial.

Many authors are of the opinion that study models alone provide adequate information for treatment planning, and the incremental addition of other diagnostic records make minimal difference.[16] More recently, studies have noted that, for most patients, the clinical examination, supplemented with study models and photographs, provided adequate information for orthodontic treatment planning. It should be stressed that individually based selection criteria should be used for radiographic examination. Pae et al., (2001) stated that the lateral cephalometric radiograph might influence treatment planning in patients with bimaxillary protrusion and Class II division 2 malocclusion, however cephalometrics does not appear to influence orthodontic treatment planning for Class II division 1 adolescents.[17]

The popularity of the orthopantomograph stems from the simplicity of the operation, its low radiation dosage when compared with a conventional lateral cephalogram and full mouth periapical radiographs, and the wide field of visible projected structures with reduced superimposition of the investing tissue.[18,19]

Orthopantomography is a very popular and widely accepted technique of panoramic radiography of the oral region, producing a single image of the facial structures that include both maxillary and mandibular arches with the temporomandibular joints and their supporting structures. It has a wide variety of uses, including the screening of patients before prosthetic treatment for evidence of roots, cysts, foreign bodies, and neoplasms.

Furthermore, it helps in the evaluation of the resorptive and the osteopenic processes of the jaws. In addition, orthopantomography plays an important role in implantology, in as much as it offers information about the vertical dimension of the bone and the locations of certain anatomic structures in the orofacial region.

Therefore, it seems that an orthopantomograph, a simple, inexpensive and a potentially comprehensive diagnostic tool, can be investigated and studied more extensively for determination of angular as well as linear measurements as an indicator of vertical jaw relations.

Based on the findings of our study it can be seen that angular measurements from the two radiographs can be correlated between for all three growth patterns.

There was no significant difference between the angles measured in the groups. The findings also showed that there were no statistically significant differences between the angular measurements of the two radiographs in the normal and horizontal growth patterns. This however this did not apply to the vertical growth pattern. Larger samples may possibly show a different result. The angular distortion in both the images is within the acceptable range and if the images are prepared perfectly and without technical errors, they could be used for clinical measurements.

However, the linear measurements taken from an orthopantomograph and that of a lateral cephalogram radiograph showed little consistency.

CONCLUSION

Angular measurements of both the gonial angle and the condyle angle from the orthopantomograph can be used to assess the dentoskeletal pattern of the patient.

Although a correlation was observed for the angular measurements, further investigations should be undertaken to establish a formula to create norm values to determine the vertical dimension from the orthopantomograph.

Limitation

The study conducted was not race or gender specific. Future studies could be undertaken to investigate these variables.

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The effectiveness of a tooth brushing programme for children in the Ehlanzeni district of Mpumalanga

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SUMMARY

Purpose

To evaluate the effectiveness of a tooth brushing programme in a community trial in the Ehlanzeni district, Mpumalanga.

Methodology

Two samples of 250 children, 8-10 years old and in grade 3, were randomly selected from schools in the district. The intervention group comprised children who had taken part in the brushing project since it was incepted in 2012. The control group comprised children who had not participated. Caries was scored according to WHO Criteria (1997) and odontogenic infections using the PUFA/pufa index. These data and the treatment needs of the two groups were compared statistically.

Results

The prevalence of dental caries (primary and permanent teeth) was 57.2%, intervention group and 74.8%, control group. The intervention group recorded DMFT of 0.15 and a dmft of 1.82, whilst the control group recorded 0.38 and 2.50 respectively.

Odontogenic infections occurred in 22% of the intervention group (mean 0.40), compared with 36% in the non-intervention group (mean 0.82). The intervention group presented with 30.8% less dental caries and 63.6% less odontogenic infections than the control group.

Conclusion

The results of the study show that this targeted population approach resulted in significantly less caries in the intervention group than in the control group.

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ACRONYMS

PUFA/pufa:	**P/p:**	Visible Pulp Involvement
	U/u:	Ulceration Caused by Dislocated Tooth Fragments
	F/f:	Fistula
	A/a:	Abscess
PUFA:		Permanent Teeth
pufa:		Primary Teeth
UTN:		Unmet Treatment Need Index

Keywords

Dental caries, prevention, tooth brushing programmes, effectiveness.

Role played by each author

M. van der Walt: Drafting of proposal and final report, overall supervisor of the planning and execution phase of the project, examiner, data analysis.
P.J. van Wyk: Assisting with the planning of the project, calibrator and trainer, assisting with data analysis and final drafting of proposal and report.
P.J. Becker: Statistical analysis.
J.K. Bester: Assisting in drafting of proposal, examiner.

INTRODUCTION AND BACKGROUND

Dental caries and gingivitis are the most common oral diseases among children with 60-90 % of children being affected globally.[1] The results of the last National Children's Oral Health Survey, conducted in South Africa between 1999 and 2002, indicated that 39.7% of the 6-year-old children were caries free, which was below the goal of 50% set by the Department of Health and WHO for the year 2000.[2,3]

Dental caries is a progressive disease and if left untreated can negatively affect the quality of life of affected children. Pain resulting from decayed teeth, can compromise a learner's concentration and participation in school activities, hampering their development and denying them the full benefit of schooling.[4]

Although dental caries in South Africa reduced significantly during the last three decades as indicated in data obtained from three National Oral Health surveys, the high levels of untreated caries in all age groups is an alarming cause for concern.[5,6] More than 80% of caries in children are untreated according the Unmet Treatment Need Index.[3]

The World Health Organisation emphasizes the importance of public health approaches for the prevention of dental caries through the effective use of fluorides, including implementation of water fluoridation.[7] Fluoridated drinking water has been shown to be the most common method for systemically applied fluoride and to be effective in reducing the severity of dental decay in entire populations.[8]

To this day, water fluoridation has not been implemented in South Africa, with the local authorities expressing concern in the past regarding cost of implementation and effectiveness of such an intervention.[9] A study conducted in 2012 concluded that water fluoridation in South Africa remains a viable option to prevent and reduce the prevalence of dental caries.[9]

There is a global consensus that regular use of fluoride toothpaste is critical in child dental health. Most experts are of the opinion that the dramatic decline in caries during the last decade of the 20th century is due to the use of fluoride toothpaste.[10]

Health promotion programmes that involved tooth brushing have been among the most successful educational programmes in caries prevention.[11,12]Cross-sectional surveys, clinical trials and experiments related to tooth brushing research studies involving populations of 1450-1545 children have found that tooth brushing twice a day resulted in increased tooth retention.[11]

South Africa is unique as its health care system needs to provide services to a wide spectrum of the population, ranging from poor, historically disadvantaged, groups to sections of the population with a high socio-economic status.[13] There is little evidence that caries in children is addressed adequately through efforts of policy and of service provision.[14]

Due to persistent inequalities in the access to oral health care, the public sector is under constant pressure to deliver equitable, cost effective primary oral preventive services.[15] Prevention through the use of fluoride is suggested to be the most cost effective way of reducing this public health burden.[16]

In the absence of water fluoridation schemes in South Africa, the introduction of tooth brushing programmes with fluoridated toothpaste in schools located in low socio-economic neighbourhoods could be a realistic way of preventing the high incidence of untreated dental caries. Although several studies have indicated that caries prevalence and severity can be reduced by brushing programmes, very little is known about the effectiveness of such an intervention in the South African public school set up.

LITERATURE REVIEW

The benefits of fluoride in caries prevention have generally been accepted by researchers. The effect is achieved in at least three ways: remineralization of early damage to enamel caused by acid produced by the plaque bacteria; improving the chemical structure of enamel and therefore rendering it more resistant to acid; reducing the ability of plaque bacteria to produce acid.[17]

Schools are considered as important settings for health education programmes, directed at controlling the growing burden of oral diseases and promoting oral health.[18]

As children spend a considerable proportion of their lives in education, schools can play a significant role in promoting both general and oral health of their pupils.[19] The World Health Organization strongly recommends that children's oral health should be promoted through schools.[20]

Several studies indicate that daily tooth brushing using fluoride toothpaste reduces tooth decay if adopted early, becoming a routine. A longitudinal study conducted in Jordan aimed at testing the efficacy of a school-based caries preventive programme, which compared the dental caries status of two groups, where the experimental group received intensive sessions of oral hygiene instruction and where daily tooth brushing using fluoridated tooth paste was supervised.

The control group received only oral hygiene instruction sessions. After four years, the caries status of the children in the experimental group was lower than that of the control group. The difference was statistically significant (P-value<0.001).[21]

A study on children in the London Boroughs of Kensington, Chelsea and Westminster showed that a programme of daily teacher-supervised tooth brushing with fluoride toothpaste can be effectively targeted into socially deprived communities and that a significant reduction in dental caries can thereby be achieved, especially among caries-susceptible children.

A total of 517 children with a mean age of 5.63 years participated in the study that was conducted over 21 months. All the schools in the study had catchments areas from socially deprived neighbourhoods. The study coordinator visited the schools twice a term to ensure the programme is carried out as prescribed.[22] The intervention group brushed daily at school with commercially available toothpaste containing 1,450 ppm fluoride while the control group did not participate in the brushing programme.

Reduction of caries prevalence was higher in primary dentition compared with permanent dentition. Significant reduction ($p<0.01$) was noticed in the decayed, missing and filled components of the proximal surfaces with a non-significant effect noticed on the occlusal and smooth surfaces.[22]

A recent study in Thailand confirmed the positive effect from the usage of fluoride toothpaste administered by schoolteachers in a brushing programme undertaken as part of an enhanced school oral health programme, with up to 34% reduction in caries for all schools participating and up to 41% for the most cooperative schools.

The study involved 3 706 children in 15 schools over a period of two years. There was significant less plaque reported in the intervention group. Teachers continued to encourage their new pupils to brush daily even after the project finished and indicated after completion of the project that they felt more confident in providing children with oral health education.[23]

A two-year study conducted on 534 Scottish children (mean age 5.3) in deprived areas reported a significant reduction in caries among high caries-risk children after they had participated in a supervised tooth brushing programme with fluoridated toothpaste at schools. Twelve schools participated.

Children were also issued with toothbrushes and toothpaste for home use. Each school had one randomly selected intervention class that participated in the daily brushing and a parallel control class that did not participate. Significantly less caries developed in the first permanent molars in the intervention group compared with the control group with reductions ranging between 32% to 56%.

It is noteworthy that the mothers were trained in infection control procedures and record keeping and served as the brushing activity supervisors rather than teachers. The mothers were financially compensated for the one hour per school day during which they undertook supervision.[11]

The Colgate Bright Smile Bright Future tooth brushing programme was introduced in low socio-economic areas in the Ehlanzeni district of Mpumalanga for children in grades R to 3 in June 2012. This provided an ideal opportunity to evaluate the effectiveness of a tooth brushing programme in primary schools (community trial) in the South African public school setup. Children were provided with toothbrushes and toothpaste and were allowed to brush their teeth once a day, after break, during the school week, under supervision of a teacher. Due to a lack of oral health human resources the supervising oral health professional only visited the school every four to six weeks. The execution of the tooth brushing programme was therefore not entirely under the control of the oral health professional.

The objective of this study was to evaluate the effectiveness of this programme as a community trial in the Ehlanzeni district of Mpumalanga and to assess the impact on the incidence of dental caries by comparing the caries status of children who had taken part in the trial since 2012, with the caries status of a comparable group of children from the same district who had not taken part in the brushing programme in the three years prior to the survey.

MATERIALS AND METHODS

A quasi-experimental comparison group post-test-only design was used to achieve the objectives of the study.[24]

Two samples of 300 children each, aged 8-10 years, were randomly selected from children in grade 3. The first sample was drawn from six schools whose pupils had taken part in the brushing project since the commencement of the project in 2012.

The second sample was drawn from children in six schools, in the same district and in close proximity to the intervention schools, who had not participated in the programme. Within each of the schools (both samples), a list of all children in grade three was obtained. The children in each list were numbered consecutively and the required number of children per school was drawn randomly by using a table of random numbers.

The required number of children per school was based on the proportion of children per school who were in grade three. Consent for the examination of each child was obtained from the parent or legal guardian, and assent from the child concerned as well as consent from the Principal of the school were confirmed. The protocol as well as the relevant annexures were submitted to the Ethics Committee of the Faculty of Health Sciences of the University of Pretoria, for approval, which was granted (Protocol 342/2015).

Two dental examiners, two record clerks and a dental assistant to assist with sterilisation procedures were involved in the study. The examiners are employees of the Mpumalanga Health Department and the survey was conducted under supervision of author MvdW.

Data were collected using the DMFT/dmft (permanent and primary dentition) index according to the WHO guidelines.[25] Data for odontogenic infections was collected by making use of the PUFA/pufa index and was used according to the standard procedure.[26] PUFA/pufa is an index used to assess the presence of oral conditions and infections resulting from untreated caries in the primary (pufa) and permanent (PUFA) dentition.

Various WHO forms were combined into a single form for the collection of the demographic, dental caries and PUFA/pufa data. The examiners were trained and calibrated prior to the survey and only those who achieved the reliability of a Kappa value of 0.6 and higher were allowed to take part in the survey.

During the survey 10% of the sample was re-examined to test for intra- and inter examiner reliability.

The data were captured using Excel. During data analysis the results of the study groups (intervention and control) were compared and the level of significance was set at 0.05.

RESULTS

Sample realization and sample description

After capturing the data, the composition of the samples of the intervention and the control groups were compared and it was observed that there was an over representation of eight-year-old children in the intervention group and an over representation of nine-year-old children in the control group.

To address this issue, both samples were reduced to 250. This was done by systematically removing every third eight-year-old in the intervention group and every third nine-year-old from the control group. In order to regain the proportional distribution per school, the sample was weighted using school size divided by sample from school.

The age and gender distribution of the final realized samples of the intervention and control groups were compared and no statistically significant differences were observed. The 12 schools that participated in the study were all located in low socio-economic areas. According to the school quintile system, schools are annually classified

according to poverty levels of the specific geographical area into one of five quintiles. Quintile 1, 2 and 3 schools are classified as no fees schools which children may attend without payment.[27] All the schools that participated in this study were quintile 2 or 3 schools and were therefore comparable in terms of socio-economic factors.

Reliability of the data

As indicated in the study methodology, 10% of the sample were re-examined to test for inter- and intra-examiner reliability, using Kappa statistics. Values for inter- and intra-examiner reliability were 0.76 and 0.96 respectively.

Effectiveness of tooth brushing

The prevalence of caries in the two groups

The prevalence of dental caries (primary and permanent teeth) in the intervention group was 57.2% and in the control group, 74.8%. The difference between the two groups was statistically significant ($p<0.05$). The results of the study show that the intervention group presented with 30.8% less dental caries than the control group.

The severity of caries in the two groups

The severity of dental caries, expressed as the DMFT and the dmft, of the two groups is shown in Table 1.

Table 1. The severity of dental caries expressed as the dmft and the DMFT, together with components of the indices

	Intervention group (n=250)		Control group (n=250)	
	Mean	Standard deviation	Mean	Standard deviation
d	1.68	2.09	2.34	2.08
m	0.11	0.49	0.16	0.79
f	0.02	0.15	0.00	0.00
dmft	1.82	2.28	2.50	2.31
D	0.13	0.45	0.35	0.85
M	0.01	0.13	0.03	0.19
F	0.01	0.09	0.00	0.00
DMFT	0.15	0.48	0.38	0.92

The mean DMFT's (permanent teeth) of 0.15 and 0.38 obtained in the intervention and control groups respectively were low compared with the matching dmft's (primary teeth) of 1.82 and 2.50. The mean DMFT and dmft of the intervention group were significantly lower than those of the control group. P-values of <0.05 were recorded for both comparisons.

The mean number for missing teeth due to caries was higher in the control group (m = 0.16, M = 0.03) than in the intervention group (m = 0.11, M = 0.01) for both primary and permanent teeth (Table 1). The mean number of filled teeth was negligible for all the age groups with no restorations recorded in the primary or permanent teeth of the control group (Table 1).

The Unmet Treatment Need Index (UTN) is expressed as a percentage calculated by dividing the D(d) component by the DMFT (dmft) value.

The UTN ranged from 86.7% for permanent teeth in the intervention group to 93.6% for primary teeth in the control group. For all children in the study more than 85% of all caries went untreated.

The severity of dental caries expressed as the DMFT and components of the DMFT on the **first permanent molars** are shown in Table 2.

Table 2. Severity of dental caries expressed as the DMFT and components of the DMFT on the first permanent molars

	Intervention group (n=250)		Control group (n=250)	
	Mean	Standard deviation	Mean	Standard deviation
D	0.12	0.41	0.33	0.80
M	0.01	0.13	0.02	0.18
F	0.01	0.09	0.00	0.00
DMFT	0.14	0.45	0.36	0.86

If the mean DMFT of dental caries on the first permanent molars of the intervention (0.14) and the control groups (0.36) (Table 2) are expressed as a percentage of the mean DMFT of the intervention group (0.15) and control group (0.38) (Table 1), the results show that caries on the **first permanent molars** constitute more than 93% of all caries present in the **permanent teeth** of children in this age group.

Of the caries on the permanent molars, 64% occurs on the mandibular first permanent molars. First permanent molars can therefore be regarded as very vulnerable teeth at this stage and although tooth brushing may provide valuable protection, additional measures are necessary.

The prevalence and severity of odontogenic infections in the two groups

PUFA/pufa is used to assess the presence of oral conditions and infections resulting from untreated caries in the primary (pufa) and permanent (PUFA) dentition. The PUFA score for the permanent dentition was very low and PUFA and pufa were therefore combined into one score, PUFA/pufa. The prevalence and severity of the PUFA/pufa scores is shown in Table 3.

Table 3. The prevalence and severity of the PUFA/pufa scores in the two groups

	Intervention group (n=250)	Control group (n=250)
Prevalence	22	36
Prevalence	0.40 (SD: 0.93)	0.82 (SD: 1.38)

Odontogenic infections as reflected in the PUFA/pufa index were lower in children of the intervention group, twenty-two per cent of whom presented with odontogenic infections (mean 0.40) compared with 36% of children in the control group (mean 0.82).

When comparing the differences in the PUFA/pufa-scores between the intervention group and control group, the independent sample t-test yielded a P-value of 0.00, which is highly significant.

Treatment needs

The treatment needed for children in the intervention group and control groups are indicated in Table 4.

Table 4. Total treatment needed in the intervention and the control groups

	Intervention group		Control group	
Treatment needed	**% of children needing treatment**	**Mean number of teeth needing treatment (SD)**	**% of children needing treatment**	**Mean number of teeth needing treatment (SD)**
Fissure sealants	25.6	0.87 (1.56)	53.6	1.84 (1.84)
Arresting care	1.6	0.02 (0.20)	4.8	0.05
1 surface filling	22.8	0.36 (0.78)	32.8	0.52 (0.92)
2 or more surface fillings	45.2	1.0 (1.40)	61.2	1.43 (1.61)
Crown and veneer	0	0	0	0
Pulp care	13.6	0.22 (0.64)	18	0.26 (0.62)
Extractions	10.4	0.2 (0.69)	26.8	0.56 (1.17)
Preventive care	26	0.9 (1.58)	55.6	1.9 (1.84)
Extractions and restorations	56.4	1.8 (2.18)	74.8	2.79 (2.36)

The proportions of children in need of two or more surface restorations were noticeably high in both the intervention (45.2%, mean 1.0) and control groups (61.2%, mean 1.43). In relative terms, the number of children in need of one surface restorations were low in both the intervention (22.8%, mean 0.36) and control groups (32.8%, mean 0.52). Two or more surface fillings therefore constitute 66.5% and 58.8% of the restorative treatment needed in the intervention and the control groups respectively. Treatment needs as specified in Table 4 were higher in all categories of children in the control group compared with children in the intervention group.

The need for extractions (26.8%, mean 0.56) in the control group was higher than the need for pulp care (18%, mean 0.26), while in the intervention group, pulp care (13.6%, mean 0.22) was needed more than extractions (10.4%, mean 0.2). The need for fissure sealants in the control group (53.6%, mean 1.84) was considerably higher than in the intervention group (25.6%, mean 0.87). Overall the combined need for extractions and restorations was still higher than the need for preventative care in both groups.

Treatment needed in the permanent dentition of the total group of children (intervention and control group combined)

The distribution of treatment needs (number of teeth) on the first permanent molars of the total group of children (intervention and control groups combined) expressed as a percentage of the distribution of treatment needs (number of teeth) in the permanent teeth of the total group (intervention and control group combined) is shown in Table 5.

The results presented in Table 5 show that although the four first permanent molars constitute only 33.3% of the permanent teeth present in the mouth in this age group (four mandibular incisors, four maxillary incisors and four first permanent molars) they require more than 92% of the curative treatment and more than 99% of the preventive services needed on permanent teeth.

In contrast to the total treatment need (Table 4) where two or more surface fillings constitute 66.5% and 58.8% of the restorative treatment needed in the intervention and the control groups respectively, the results of Table 5 show that one surface fillings constitute 76.9% of the restorative care needed for the permanent teeth.

In addition to the large percentage of one surface fillings needed in the permanent dentition, 660 first permanent molars (33% of the total number of first permanent molars) were also identified as teeth needing fissure sealants.

Table 5. Distribution of treatment needs (number of teeth) of the first permanent molars of the total sample of children (intervention and control groups combined) expressed as a percentage of the distribution of treatment needs (number of teeth) of the permanent teeth of the total sample (intervention and control groups combined)

	Treatment needed in the permanent teeth of the total group expressed as the number of teeth	**Treatment needed on the first permanent molars of the total group expressed as the number of teeth**	**Treatment needed on the first permanent molars expressed as a percentage of the treatment needed in the permanent teeth of the total group**
Fissure sealants	664	660	99.4
Arresting care	19	19	100
1 surface filling	97	88	90.7
2 or more surface filling	29	16	55.2
Crown and veneer	0	0	0
Pulp care	4	4	100
Extractions	8	8	100
Preventive care	683	679	99.4
Extractions and restorations	138	127	92.0

DISCUSSION

Oral health habits, attitudes, and behaviour are best established during childhood. The Colgate Bright Smile Bright Future tooth brushing programme was introduced in low socio-economic areas in the Ehlanzeni district of Mpumalanga for children in grades R to 3, in June 2012. This programme provided an ideal opportunity to evaluate the effectiveness of a supervised tooth brushing programme in primary schools (community trial) in a rural area in the South African public school set-up.

Several studies indicate that daily tooth brushing using fluoride toothpaste reduces tooth decay if the practice is commenced early and becomes a routine.[11,21-,23] All the analyses (Tables 1-4) demonstrated the effectiveness of the of the intervention programme. Children who brushed once daily at school during the school term, had significantly less caries and odontogenic infections than children in the control group for whom there was no such intervention. Treatment needs in the intervention group was also lower than treatment needs in the control group (Table 4). Ideally, tooth brushing should begin at home, under parental supervision, with the eruption of the first tooth. However, children from socially deprived backgrounds are more likely to commence tooth brushing later in life and to brush less frequently than children from more affluent backgrounds.[22]

An alarmingly large amount of caries goes untreated as indicated by the Unmet Treatment Need Index (UTN). The UTN percentages for primary and permanent teeth of both groups ranged from 86.7% in permanent teeth of the intervention group and from 93.6% in primary teeth of the control group. This high percentage of untreated dental caries is consistent with other studies conducted in South Africa.[3,6,28] This might be due to the inadequacy of resources including dental facilities and oral health professionals and/or the lack of awareness about oral health and available dental services amongst the majority of the population.[3]

In contrast to the total treatment need (Table 4) where two or more surface fillings constituted 66.5% and 58.8% of the restorative treatment needed in the intervention and the control groups respectively, the data of Table 5 show that one surface fillings constituted 76.9% of the restorative care needed for the permanent teeth.

This observation, combined with the finding that 33% of the total number of first permanent molars present also need fissure sealants, indicates that the placement of fissure sealants should be part of any caries preventive programme.

A significant finding of the study was that the need for extractions (26.8%, mean 0.56) in the control group was higher than the need for pulp care (18%, mean 0.26) while in the intervention group the need for pulp care (13.6%, mean 0.22) was more than that for extractions (10.4%, mean 0.2). This could possibly indicate that teeth in the intervention group were not that extensively decayed and could still be restored by performing some form of endodontic treatment.

Due to persistent oral health inequalities in access to care, the South African public health sector is under pressure to deliver effective primary oral health preventive services. Oral health promotion programmes are not implemented and distributed uniformly and appear to be fragmented with lack of evaluation. Facilities conducting primary oral health care are focusing mainly on emergency relief of pain and sepsis.[29,30] This was confirmed in this study when analyzing statistics of the extremely low number of children receiving dental treatment. This indicates that by far the majority of dental carious lesions are untreated and that extractions were the treatment of choice if provided.

Studies indicated that the treatment of dental caries is expensive for governments[31,32] and that the approach to eradicate disease still remains largely curative and delivered at an individual level. Oral health care service delivery is depending on expensive and sophisticated technology resulting in many South Africans being denied access to oral health services.

As discussed previously the lack of oral health personnel and dental facilities and limited knowledge of available dental services amongst the general population are contributing factors to the situation that many South Africans are denied access to care.[6] Researchers found that an unrealistic high number of personnel and a substantial amount of time to perform treatment is required, if the current backlog of dental caries for children under the age of 15 is to be addressed.

Such a programme will be financially astronomical and is clearly unaffordable.[6] Preventing dental diseases will be financially more beneficial. This study confirmed the suggestions of other researchers that caries in South African children is not adequately addressed through current policies and service provision.[14]

The brushing programme for this project was implemented and monitored by dentists due to a lack of other oral health professionals employed at primary health care facilities such as Community Health Centres in Mpumalanga, together with a severe shortage of oral hygienists and dental therapists in the Province. This type of intervention ideally should be introduced and monitored by district based oral hygienists and also funded at district level.

The National Human Resource Audit recognized oral hygienists and dental therapists as important members of the oral health team. They advised an urgent need for additional training of oral hygienists and dental therapists.[33]

The White Paper for Transformation of the Health System in South Africa also suggested that oral health services should be transformed through the primary health care approach. It advised focusing on equitable preventive services integrated with primary care services. It also suggested a minimum package of services which could be delivered by oral hygienists and dental therapists.[34]

As the oral health professional cannot be at the school full time, the importance of school principals and teachers should not be underestimated in ensuring that a preventive

programme be successful. Great care should especially be taken in selecting the correct teacher to be the oral health school coordinator as he/she will play a pivotal role in the execution of the programme at ground level. Oral health school coordinators should be a responsible and motivated individual who is respected by other teachers and has the well-being of learners at heart. Such a person should be identified after consultation with the school principal who can advise the correct candidate, who in most cases for this study, was the head of the foundation phase.

The researchers observed that constant motivation of all parties involved (principals, coordinators, teachers and children) is crucial for the programme to succeed over an extended period of time.

Random checks by requesting classes to demonstrate how they conduct the brushing activities were found to be very effective as teachers do not want to be exposed as uncooperative. In general, learners found the daily brushing a fun event in which to participate and did not need as much motivation as did the teachers.

Modern dentistry had become very isolated from other elements of the health service.[35] Many oral health programmes are developed and implemented in isolation from other oral health programmes, leading to duplication of efforts. Oral health programmes tend to concentrate on individual behaviour change and largely ignore the influence of socio-political factors as key determinants of health.[36]

A holistic approach should be considered to improve oral health of school children by developing healthy lifestyles and creating healthy environments. To achieve sustainable lifestyles oral health education should involve the active participation of children, parents and "significant others" such as school teachers.[37] Policies at national level should be encouraged to provide a framework for environmental change as is the case with water fluoridation.[38]

CONCLUSIONS AND RECOMMENDATIONS

This study showed that teacher supervised tooth brushing programmes implemented and closely monitored by oral health professionals may be effective in the South African public school set-up, if combined with oral health education in socially deprived communities.

This targeted population approach resulted in significantly reduced caries in the intervention group compared with the control group. A substantial reduction in dental treatment needs in children could be achieved if the findings in this study could be translated to the population at risk in South Africa.

This study provide additional evidence, as previously observed by other researchers, that caries as a disease in South African children is not adequately addressed through current policies and service provision.[14] It is suggested that policies and strategies should focus on reducing the burden of oral diseases through prevention and need to be integrated with other health programmes to be successful.[1]

As the White Paper for Transformation of the Health System in South Africa suggested, oral health services should be transformed through a primary health care approach with equitable preventive services integrated with the primary health care services.[34]

With dental inequality, and access to care still a huge obstacle, the focus should move away from relief of pain and sepsis and limited curative services to the provision of preventative services through an integrated primary oral health care approach, together with improving the living standards of the population with an emphasis on the most disadvantaged groups.

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The perception of patients of the professionalism of dental students at a Tertiary Oral Health Centre, South Africa

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ABSTRACT

Introduction

Professionalism in the healthcare setting refers to the standards a patient can expect from his/her healthcare practitioner (HCP). Appearance, behaviour, attitude and communication skills are all attributes of professionalism.

Aim

To assess the perceptions of patients of the professionalism of oral health students at an South African Tertiary Oral Health Care Centre (SA-OHC).

Methods

A cross-sectional, analytical study was conducted using an interviewer-administered questionnaire. Photographs depicting various dress codes were included in the questionnaire given to patients.

Results

A total of 118 patients with a mean age of 44 years (sd-18.16) were interviewed. The majority (n=76; 65%) were previously booked patients; 72% female; 53% black; and 85% in the earning category of up to R3000 p/m. The Cronbach alpha score was good at 0.7. 96% of patients agreed that the students looked professional in lab coats (79.5%), then surgical gowns (55.9%) and thirdly scrubs (50.9%) although not in formal wear (66%. In terms of communication skills and behaviour, students were highly rated (91%-99%). Payment classification, education level and gender influenced patient perceptions ($p<0.05$).

Conclusion

Students were highly regarded by patients generally, and patients perceived lab coats and surgical gowns to be more professional than formal garb.

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ACRONYMS

HCP:	Healthcare Practitioner
SA-OHC:	South African Tertiary Oral Health Care Centre

INTRODUCTION

Professionalism in health care can be defined as "the standard to which a patient can and should expect from their health care practitioner".[1] The Health Professions Council of South Africa (HPCSA) considers professionalism to be “a relationship of mutual trust between patients and health care practitioners”.[2] Professionalism also entails the application of scientific knowledge to clinical skill, communication skills between patients, staff and the practitioner and maintaining current and new relationships built on trust with the patient.[3,4] Professionalism is a complex overlap between behaviour, skill, communication and appearance.

Professionalism in dentistry is important because the physical appearance and behaviour of the dentist often have an effect on the first impression of a patient and on subsequent interpersonal relationships.[5] First impressions are rendered even more important in the dental setting due to the anxiety, fear and vulnerability of patients.[6]

There are various studies in the literature that have assessed professionalism across many professions, especially in the field of Health Science.[3,6,7] However, the majority of these studies have been performed in the developed world.[3,7-9] Published literature in South Africa concerning professionalism is centred on the medical profession.

The physical appearance of health-care practitioners is vital in terms of first impressions, in developing rapport with patients and influencing their willingness to disclose personal details.[10] Professionalism is therefore an “image that will promote a successful relationship with the patient”.[3] That image is a result of first impressions, based the physical appearance of the professional.[3,7] Furnham et al (2014) showed that for the development of a relationship, their respondents preferred a white coat or formal suit to informal dressing styles.[7] These authors attributed the rapport to the fact that more formal attire gave an "air of credibility". Deshmukh and colleagues (2013) stated that white lab coats have become a symbol of authority. The study also found that patients had a higher preference for white lab coats - without necessarily considering the dentists themselves.[8] Older age (>60 years) was associated with a preference for dentists

wearing the lab coats.[8] In contrast, Mistry and Tahmassebi (2012) in their study of the attitudes of children and their parents towards the attire of student dentists, found that children preferred casual attire.[10]

Other studies have reported similar results concerning the expectations of patients of white lab coats and general attire as measures of professionalism.[10,11] A study performed in the United States of America on ten academic centres found that the white lab coat remained the most favourable choice of attire. In addition to dress code, the research found that patients preferred their dentists to have good teeth themselves.[11]

Empathy, initiative, and organizational skills are also considered ideal professional attributes.[12] Zijlstra-Shaw et al (2013) showed that behaviours like trustworthiness and awareness of others are essential in dealing with patients.[13] The behaviours that people perceive as professional are those that confer trust and reliability.[12,13] In addition, non-verbal communication is of the utmost importance regarding its effect on first impressions and interpersonal relationships.[14]

This study aimed to assess the perceptions of patients of the professionalism of dental students at a South African Tertiary Oral Health Centre (SA-OHC).

METHODS

A cross-sectional analytical study was performed on new and booked patients to yield information regarding perceptions of the professionalism of students. The study site was a tertiary teaching hospital located in the central business district of the city and patients either walk in for services or are referred by secondary and primary oral care centres. The study participants, aged 18 years and above, were recruited over a period of six weeks and all patients who agreed to participate formed the study sample.

Following ethical recruitment and granting of written informed consent, patients were then interviewed after they received treatment in one of the five dental school clinics. These included maxillofacial and oral surgery, periodontology, prosthodontics, oral rehabilitation, oral hygiene and radiology. The wide selection of clinics enabled a broader view of the patients, as well as of the students. The Human Research Ethics Committee granted permission (ethical clearance number M160101).

The dental students managing patients during data collection were not aware of the study. The hospital management was informed when data collection was in process. Interviews were based on an adapted questionnaire by Brosky and colleagues in 2003.[3] The 17-item questionnaire comprised of socio-demographic data, physical appearance, behaviour, attitude and communication skills. A five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.) was used to rate the students on their behaviour, and their interpersonal and physical appearance. Additionally, patients were required to identify, without references, which outfits they deemed most professional from pictures, none of which announced professionalism.

Data analysis

The data from the questionnaires were captured on Microsoft Excel, exported to Stata version 13 and the Shapiro-Wilk W test was used to test for normality. Univariate descriptors such as socio-demographics were summarised using means and medians for skewed data. Bivariate analysis; chi-squared tests and Fischer Exact Test were used to determine the significances of differences between groups.

Preliminary analysis showed only a few options selecting scores 1 and 5. The categories "strongly agree" and "agree" were then combined to form the category "agree", and the categories "strongly disagree" and "disagree" were combined to form the category "disagree". Thus, three categories of responses (agree, neutral and disagree) were used in the results. Binary logistic regression was performed to analyse the predictors of the perceptions of the patients.

Table 1. Socio-demographical characteristics of all patients

Characteristic		Frequency	Percentage
Age (mean; SD)	44 years SD -18.16		
Age categories			
	19-30 years	39	33.05
	31-40 years	18	15.25
	41-50 years	14	11.86
	51-60 years	21	17.80
	>60 years	26	22.03
Sex			
	Male	33	27.97
	Female	85	72.03
Home language			
	English	54	45.76
	Sesotho (all)	12	10.17
	isiZulu	26	22.03
	isiXhosa	6	5.08
	Afrikaans	8	6.78
	Other	12	10.17
Classification of patients by individual income			
	H0: Pensioner	28	24.78
	H1: R0 - 35999 p/a	68	60.18
	H2: R36000 - R71999 p/a	9	7.96
	H3: > R80000 p/a	7	6.19
	Private	1	0.88
Patients' education level			
	Primary school	30	25.42
	Matric	42	44.92
	In-training	13	11.02
	Tertiary education	33	27.97
Patient appointment status			
	Booked patient	76	64.96
	New patient	41	35.04

RESULTS

Socio-demographics

A total of 118 patients responded to the invitations to the interviews; their mean age was 44 years (SD-18.16) with an age range of 19-82 years. Other socio-demographic characteristics are described in Table 1.

Seventy-seven (65%) were patients who had had prior visit/s to the facility and were thus booked for dental appointments whilst (n=41) 35% were first time users of the facility. Ninety-two percent of the patients were treated by dental students and the remaining eight percent were treated by oral hygiene students.

Patient perceptions

The perceptions of the patients regarding the physical appearance, behaviour and communication skills of students were assessed. The questionnaire showed good internal consistency with a Cronbach-alpha of 0.7.

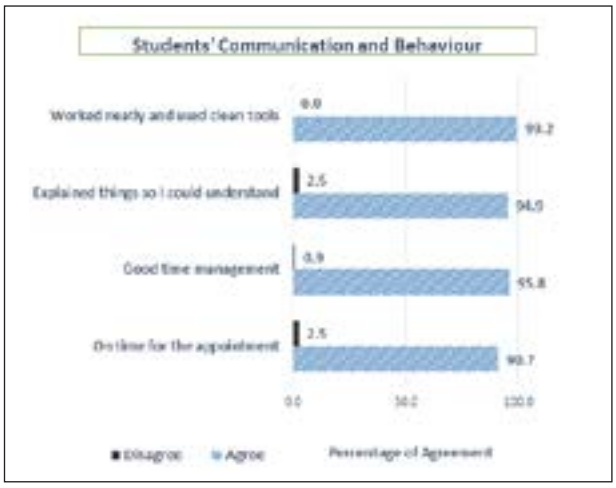

Figure 1. The students' behaviour and communication skills.

Figure 2. Photographs used for ranking of professionalism by patients.

Table 2. Findings of patient perceptions on students' physical appearance

Physical appearance items and responses	Disagree		Neutral		Agree	
	n	%	n	%	n	%
1. I believe the dental student looked professional	4	3.9	1	0.85	113	95.76
2. Dental students should wear a white lab coat rather than surgical gowns or scrubs	57	48.31	29	24.58	32	27.12
3. The student's hairstyle affected my confidence in him/her	92	77.97	7	5.93	19	16.10
4. The student's facial hair and/or makeup affected my confidence in him/her	97	82.91	5	4.27	15	12.82
5. The student's jewelry affected my confidence in him/her	97	82.91	13	11.11	7	5.98
6. Formal clothes (trousers, collared shirts, skirts and blouses) should be required for dental students	65	55.08	19	16.10	34	25.81
7. Casual clothes (takkies, jeans, t-shirts) should be allowed for dental students	54	45.76	10	8.47	54	45.76
8. All jeans should be considered casual	37	31.62	13	11.11	67	57.26
9. The dental student's appearance/clothing changed my feelings about the care I will receive in the future	86	72.88	8	6.78	24	20.34
10. The dental student's appearance/clothing changed how comfortable I felt	73	61.86	8	6.78	37	31.36
11. The dental student's appearance/clothing changed how scared I felt	92	77.97	10	8.47	16	13.55
12. My confidence in the dental student was affected when I first saw them	73	61.87	5	4.24	40	33.9

The students were generally perceived positively by patients in most aspects. As regards the physical appearance of students (Table 2), 96 percent of the patients agreed that the students looked professional.

Almost half of the patients (48%) voted against students wearing a white labcoat instead of surgical gowns or scrubs, while a quarter remained neutral. In addition, about a third (34%) of patients reported that their 'confidence in the dental student was affected when I first saw them'.

Student communications and behaviour skills were highly rated by patients, 95-99 percent agreeing that the students displayed good attributes in these categories (Figure 1).

The working attire of students was assessed by requesting patients to rank their preferences of different clothing depicted in photographs (Figure 2).

Figure 3 records that 80% of the patients considered lab coats as the most professional with surgical gowns considered the second (56%) while scrubs were held to be a third choice in professionalism (36%).

It may have been expected that casual wear would be considered by patients to be the least professional, 91% of whom did record that opinion, However, it was unexpected that formal smart wear would also be dismissed as hardly professional (69%).

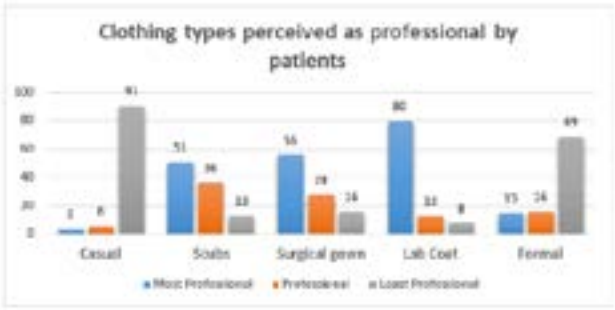

Figure 3. Clothing types perceived as professional by patients.

Factors influencing the patients' perceptions

The characteristics of patients influenced their perceptions of the professionalism of students. Factors such as household income, which determined which category of fee schedule was applied, was associated with the choice of lab coat versus surgical gown (p=0.05).

Those patients with lower income (categories H0 and H1) preferred lab coats rather than surgical gowns. All hospital users are also routinely categorized according to race. The study found that black African patients preferred students to wear lab coats rather than surgical gowns.

Sex was another factor that influenced perceptions; female patients thought scrubs were more professional than did male patients (p=0.05). The younger age group were more inclined than the older age group of patients to prefer scrubs. Race was also associated with the perception of formal wear being not professional (p=0.02); most black Africans thought it the least professional.

DISCUSSION

The study aimed to assess professionalism of dental students from the perspectives of the users of the health facility at a Tertiary Teaching Oral Health Centre.

Student training entails the teaching of professionalism and more often assessment and evaluation of professionalism is based on the content of the teaching module and the context of practice by the teaching staff. It is advantageous to have input from the patients in order to indirectly assess the standard of teaching. As an add-on, the assessment provides feedback about quality assurance for provision of services.

The demographics of the patients were typical of public facility users where the majority are female (72%), and of a lower income category with ± R3000p.m (85%); but the distribution was atypical in South African public utilization, for nearly half of the users (47%) were non-black patients. In the nationally representative household survey, Harris et al (2011) reported an 80% utilization by black Africans of the public health facilities in South Africa.[15]

Perceptions of the professionalism of dental students were measured by their attire and physical appearance, behaviour and communication skills. The students' physical appearance was rated exceptionally high by patients, as 96% favourable. These results are comparable with a study on patient perceptions of professionalism in Dentistry at a university in Minnesota, America; the findings reported that 94% of patients agreed that students were professional.[3]

However, Brosky and co-authors (2013) reported the opposite when their sample were asked whether the dental student's appearance/clothing *'changed my feelings about the care I will receive in the future.'* About 80% of those patients agreed that appearance affected their feelings regarding care. In contrast, 74% disagreed with that reaction in the current study.[3]

The patients in this study seemed not to be worried by physical features such as hairstyle, facial hair, makeup and jewelry. None of these considerations affected their confidence in the student nor influenced the degree of anxiety they experienced (Table 2).

Dress code is an important part of physical appearance. A 2007 study in Edinburgh on patient preferences for dental clinical attire found that 62% of patients agreed it is important, and[16] 76% of participants preferred white coats.[16]

Other investigators concur.[7,8,10,11] Only 27% of the patients in the study under report agreed that students should wear a white lab coat in preference to scrubs or surgical gowns, whilst 24% remained ambivalent.

Perspectives on attire were also influenced by whether children or adults were responding. Findings from the Paediatric Dental Department in Leeds, UK, revealed that parents opted for commonly expected attire like white coats, formal suits and shirts and tie, and yet the children preferred the dental students to be in casual attire.[10]

Likewise, it was expected in the current study for patients to prefer a more formal appearance, as seen in papers by other authors.[3,9,16] Instead, it was found that 55% of patients disagreed that students should be required to wear formal clothes. In fact, in the photographic ranking, forma l wear was considered most professional by only 15% of patients. Time trends and context seem to surface in the modern day preference for professional dress code.[13] It seems the users of the facility in the current study are still conservative which, together with income levels, influenced the preference of the traditional white coat over other forms of wear.

However, there did appear to be a leaning towards 'change in looks' as approximately a third preferred a relaxed scrub look as opposed to the traditionally crisp clean white coat. The evidence, admittedly weak, suggests a modern-day trend which may be influenced by the media and the portrayal of health professionals in ready and comfortable attire. This trend will accommodate a more relaxed, scrubs wearing-look in the workplace. However, relaxed does not mean casual attire, as patients still prefer the 'official' relaxed look in the form of scrubs as opposed to casual clothes, ranked significantly most unprofessional. Younger age groups in the study preferred scrubs to lab coats in echoing the current social-media sentiment accessible to mostly young people. Female patients were more inclined to prefer a 'scrub look,' shown in this and other studies.[16] Perhaps females are more accommodating and accepting of the new.

Behavioural and communication aspects included punctuality, time management during appointments, communicating and explanation of treatment modalities to patients, as well as cleanliness of the work space and of instruments used during appointments. The students in the current were rated exceptionally highly at 91-99% on all those aspects. Brosky et al had similar results, with the majority of patients agreeing to behavioural and communicative aspects of the practitioners.[3] The current findings provide an external evaluation of the training institution at this Dental School. The Institute imposes stringent training of students, especially with regards to infection control and time management. The assessment of students is linked to these competencies which encourage the practice of professionalism for the future. This is a positive feedback for this important exit level competency.

Limitations

The cross-sectional nature of the study and low sample numbers may have limitations. A larger sample would have made it possible to improve the statistical margin of error.

CONCLUSIONS AND RECOMMENDATIONS

Despite the limitations, the current study gave insights on the way in which students are perceived by the patients at the Tertiary Training Oral Care Centre. The results provide an important feedback to the training institution. Specifically, the results have implications for the professionals qualifying from the training institution. The dynamic nature of professionalism and the fact that context can shape the practice and conduct of professionals are highlighted; professionalism does not function in a vacuum. It is recommended that policies related to dress codes should be dynamic and should accommodate the perspectives of patients, including the student's comfort, professional look, infection control concerns and overall better quality of service delivery. A users' awareness programme on the reasons behind the preferences for specific attire such as scrubs will serve to explain the concepts of professionalism and may lead to enhanced confidence in the profession.

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Effect of aging in artificial saliva on the shear bond strength of resin composite

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ABSTRACT

Introduction

Artificial saliva as an *in vitro* aging medium may be an effective method of simulating the clinical degradation of resin composite restorations. The composition and desirable properties of artificial saliva are not yet standardised. Incorporation of oral bacteria may more closely approximate the intra-oral effect of saliva on composite restorations. Surface deterioration on an old broken restoration repaired with fresh composite may result in a weak adhesive interface, measureable, *in vitro*, by a shear bond strength test.

Aim of the study

To evaluate whether artificially aged composite affects the shear bond strength of the adhesive interface with fresh composite.

Materials and methods

A silicone mould was used to fabricate 240 composite cylinders. 120 were aged in a solution of artificial saliva for 28 days. The remainder served as controls. The specimens were divided into seven groups of twenty, each group being subjected to a different repair protocol. Shear bond strength testing was then carried out on the repaired composite blocks.

Results

Aging in artificial saliva resulted in a reduction of 15.04% to 21.1% in shear bond strengths compared with un-aged composite.

Conclusion

Composite samples aged in artificial saliva had a significantly weaker repair interface compared with non-aged samples.

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ACRONYMS

RBC:	Resin Based Composite
SBS:	Shear Bond Strength
TEGMA:	Triethylene Glycol Dimethacrylate

INTRODUCTION

Following clinical placement of the restoration, resin based composites (RBC) undergo significant changes intraorally that result in a gradual deterioration of the material. This degradation almost always results from a combination of chemically-induced or mechanistic processes.

Chemically induced degradation occurs following the action of moisture, salivary enzymes and solvents present in food on the restoration.[1] Mechanical degradation may be as a result of micro-cracks developing within the restoration, wear of the surface and static fatigue.[2] The extent and rate of deterioration are dependent on the nature of monomer making up the resin matrix, degree of monomer conversion, structure of the filler particles and the integrity of the silane coupling between the filler and resin matrix.[1] *In vitro*, one consequence of aging in artificial saliva is the degeneration of one or possibly all of the components of the RBC: resin matrix, filler particles, silane and initiators.[3]

Thus, old, degraded and defective composite restorations often require some type of repair. Based on available evidence from laboratory and clinical studies, repair of composite restorations may prolong their lifespan while at the same time conserving enamel and dentine.[4] Repair of the RBC usually involves surface preparation of the old composite, application of an intermediate adhesive followed by addition of the fresh composite onto the prepared surface.[5]

Artificial aging of composites

In order to simulate *in-vitro* the clinically degraded restoration, laboratory aging of composite substrate is necessary. A number of methods have been used for this purpose, including thermocycling, immersion in distilled or deionized water, boiling or even *in vitro* exposure to citric acid and sodium chloride solutions.[4]

Thermocycling continues to be one of the most commonly used methods of aging the RBCs.[4,6] However, there exists no standardization as to the number of cycles or the duration of time for which the substrate should be thermally cycled.[6] In addition, concerns have been raised as to the actual clinical relevance of thermocycling when it is used as the sole aging method.[6,7]

In order to more accurately simulate the behaviour of composite restorations within the oral environment, a number of different investigators have used artificial saliva to age composite specimens. The composition of artificial saliva used in these studies varies widely. In some instances, commercial preparations of artificial saliva have been used for this purpose[8] while other investigators manufactured unique solutions incorporating a variety of ingredients specifically for the purpose of aging RBCs.[9,10] Moreover, the pH of these formulations of artificial saliva has been reported to vary between 6 and 6.7.[9,11,12] Addition of oral bacteria and fungi into the artificial saliva may result in solutions that more closely approximate the role of human saliva in the intraoral degradation of composite restorations.[13]

Hahnel et al.[12] compared the aging of five brands of composite using three different aging media; 96% ethanol, distilled water and artificial saliva. In that study, it was determined that aging in distilled water and ethanol was associated with a significant reduction on the Vickers hardness and Flexural strength of the composites. In contrast, aging in artificial saliva was shown to result in a significant increase on the surface roughness of all five composites with little effect on the Vickers hardness. Conversely, Yap et al.[14] reported dissimilar effects on the mechanical properties when composites were aged in artificial saliva. In three of four brands of composite tested, the surface hardness was found to have increased following storage in a solution of artificial saliva for seven days. At the same time, following examination of sectioned samples with a stereomicroscope, surface degradation was found to occur in all four composites.[14]

A method in which composite blocks were aged in a mixed-species biofilm was recently reported by Rinastiti et al.[13] This particular biofilm was formulated according to the Zürich biofilm model proposed by Guggenheim et al.[15] and included a variety of organisms, *Streptococcus oralis*, *Actinomycesnaeslundii*, *Fusobacterium nucleatum* and *Candida albicans*, together with 5% foetal bovine serum.

In this case, scanning electron microscope scans showed that composite surfaces exposed to this medium were degraded in a manner similar to that seen on composite blocks left intraorally for eight weeks within a palatal appliance.

It is important to note that the use of artificial saliva simulates only the hydrolytic degradation of composite.[3] The effect of temperature variation may be tested using thermocycling, while exposure to citric acid reflects attempts to mimic the action of acids within foods.[4]

The cyclic loading of composite from repeated chewing is more difficult to reproduce and is not factored in with these types of aging. The aim of the present study was, therefore, to compare the effect of aging composites in artificial saliva on the shear bond strengths (SBS) between fresh and artificially aged composite. The null hypothesis stated that aging of the composite cylinders in artificial saliva had no effect on the shear bond strength of repaired composite samples.

MATERIALS AND METHODS

The materials used for this study are listed in Table 1.

Two hundred and forty composite cylinders were made with the aid of a silicone matrix using Filtek Supreme XTE, with each cylinder having a diameter of 5mm and height of 5mm.

To fabricate these samples, composite was applied into the silicone matrix and cured incrementally to depths of 2mm until the full height of the sample was achieved.

The curing was carried out using a light-emitting diode (LED) light with a power output 1000mW/cm^2 (Ellipar Freelight 2, 3M ESPE, St. Paul, MN, USA). The output of this light was verified prior to use with a Cure Rite Light Meter (Dentsply Caulk, Milford, USA) and confirmed after fabrication of every 10 composite cylinders. All the composite cylinders were prepared by a single operator.

One hundred and twenty samples were randomly selected and allocated to the 'non-aging' (group A) while the remainder (n=120) were allocated to the 'aging' (group B).

The samples for aging were then immersed in a solution of artificial saliva which had been manufactured according to the method described by van der Bijl & de Waal[16] and inoculated with *Streptococcus mutans* (1 X 10^6 CFU) and *Lactobacilli acidophilus* (1 X 10^6 CFU). The components of the artificial saliva solution are listed in Table 2.

Table 1. List of materials used in the study

MATERIAL	DESCRIPTION	MANUFACTURER
Filtek Supreme XTE, shade A3 Body (A3B)	Nano-filled restorative composite	3M ESPE, St. Paul, MN, USA
Tetric N-Ceram, shade A3	Nano-hybrid restorative composite	Ivoclar Vivadent, Schaan, Liechtenstein
AdperScotchbond 1XT Adhesive	Etch-and-rinse adhesive	3M ESPE, St. Paul, MN, USA
Scotchbond Universal Adhesive	Single-bottle universal adhesive	3M ESPE, St. Paul, MN, USA
Tetric N-Bond Univeral	Single-bottle universal adhesive	Ivoclar Vivadent, Schaan, Liechtenstein
Ultra-Etch	Phosphoric acid etchant	Ultradent Products Inc., South Jordan, UT, USA
COJET Sand	Silicatized abrasive particles	3M ESPE, St. Paul, MN, USA

Table 2. Components of the artificial saliva

Component	Weight in grams or volume in mL
Carboxymethylcellulose	9.0g
Potassium chloride	1.2g
Sodium chloride	0.84g
Magnesium chloride hexahydrate	0.06g
Calcium chloride dihydrate	0.16g
Dipotassium phosphate	0.34g
Sorbitol solution (70%)	42.80g
Methyl p-Hydroxybenzoate	2.0g
Solution of egg yellow (1%)	2.0g
Alcohol	2.5ml
Oil of lemon	0.4g
Distilled water	1000ml

The pH of this solution before inoculation with the bacteria was 6.7. The 120 samples were then stored in an incubator for 28 days at 37° C. The non-aged composite cylinders were stored at room temperature in a dry and dark storage area for 48 hours before repair.

All the composite cylinders within each of the two groups were embedded in acrylic resin within small sections of PVC pipes. They were then divided into twelve different sub-groups representing six different surface preparation protocols in each group (A1-A6 consisting of the non-aged composite cylinders and B1-B6 consisting of the aged cylinders). Thus, each of the 12 sub-groups had 20 composite cylinders. The six surface preparation protocols are described below.

1. Roughening with a medium-grit diamond bur (MANI Inc., Tochigi, Japan) and application of a single layer Scotchbond 1XT onto the roughened surface.

2. Roughening with a medium-grit diamond bur what type (MANI Inc., Tochigi, Japan), application of 35% phosphoric acid (Ultra Etch) for 20 seconds, cleaning and drying with a water and air spray. Application of a single layer of Scotchbond 1XT using a microbrush after surface was completely dry.

3. Cleaning of the surface with a water and air spray for 5 seconds. Application of a single layer of Scotchbond Universal onto the dried surface using a microbrush.

4. Surface cleaning with a water and air spray. Application of a single layer of Tetric N-Bond Universal onto the dried surface using a microbrush.

5. No surface treatment. For group A with the non-aged samples, this set represented the positive control while in group B (aged samples) it was used as the negative control.

6. Cleaning of the surface with an air-water spray. Application of COJET Sand for 5 seconds with the tip of the microblaster (Rocatec Junior, 3M ESPE) oriented perpendicular to the composite surface at a distance of 2mm. The pressure of the microblaster was set at 2 bar in conformity with the instructions from the manufacturer of COJET Sand (3M ESPE).

In all the samples within groups 1, 2, 3, 4 and 6, the respective adhesives were first applied in a single layer using a microbrush, gently air-dried for 5 seconds and then cured for 20 seconds using an LED curing light (Ellipar Freelight 2, 3M ESPE, St. Paul).

After the test samples were subjected to their respective surface treatments, "repair" of all two hundred and forty specimens was carried out using fresh composite. Within each subgroup of 20 samples (A1 to A6 and B1 to B6), 10 samples each were "repaired" by the addition of Filtek Supreme XTE and the remaining 10 samples with Tetric N-Ceram.

All the repair composites were applied and cured in 2mm increments using a silicon mould of 3mm diameter in the exactly the same manner by which the original composite blocks were prepared. The repair interface was therefore standardized to a bonded surface area of 3mm diameter to the bottom composite base, with a height of 4mm for the repair composite.

The samples were then mounted on a jig and a shear bond test of the repair interface carried out using a universal testing machine (Zwick Roell International, Germany). For the purpose of the shear bond test, the blade was oriented perpendicular to the long axis of the composite block as close to the repair interface as possible.

A force was then applied onto the blade at a crosshead speed of 0.5mm/minute until fracture of the composite occurred. The shear bond test was carried out in accordance with the recommendations on bond strength testing by Heintze.[17]

Data acquisition and analysis

The force at breaking point was measured in megapascals (MPa) for each sample and recorded on a data collection sheet. The data obtained were then subjected to statistical analysis using computer software, IBM SPSS Statistics version 20 (IBM Corporation, Armonk, U.S.A.).

The effects of each preparation protocol on the shear bond strengths were compared using a one-way Analysis of Variance (ANOVA). Post hoc testing was used to determine where the specific differences between the groups lay. The significance level was set at 0.05.

RESULTS

The mean SBS values from the aged and non-aged composite samples are shown in Tables 3 and 4 respectively. In five of the six groups of composite repaired with Filtek Supreme XTE, the mean SBS of the non-aged samples was higher than that found in the corresponding aged composites (Figure 1). Only in group 6 (COJET Sand + Scotchbond Universal) was the mean SBS of the aged samples (19.71 MPa) greater than that of the corresponding non-aged composite (18.20 MPa).

Overall, it was found that the combined mean SBS of the aged composites in the six groups repaired with Filtek Supreme XTE (14.36MPa) was 21.1% lower than that of the non-aged composites. These differences were all found to be statistically significant (p=0.01).

A similar pattern was observed in the composites repaired with Tetric N-Ceram, where, in four out of the six groups, the aged composites showed a lower SBS than their corresponding non-aged samples (Table 4).

Table 3. Mean SBS values of non-aged and aged samples, repaired with Filtek Supreme XTE

Repair protocol		Mean	Std. Deviation	N
Bur roughening + Scotchbond 1XT	Non-aged	18.59	4.82	10
	Aged	14.17	1.28	10
Bur roughening + PA + Scotchbond 1XT	Non-aged	15.85	4.67	10
	Aged	14.75	1.87	10
Scotchbond Universal	Non-aged	19.05	2.70	10
	Aged	15.45	1.39	10
Tetric N-Bond Universal	Non-aged	18.16	4.58	10
	Aged	15.55	3.06	10
No surface preparation or adhesive	Non-aged	19.45	3.57	10
	Aged	6.52	2.08	10
COJET Sand + Scotchbond Universal	Non-aged	18.02	3.70	10
	Aged	19.71	3.10	10
Combined mean SBS	Non-aged	18.20		60
	Aged	14.36		60

Table 4. Mean SBS of non-aged and aged samples, repaired with Tetric N-Ceram

Repair protocol		Mean	Std. Deviation	N
Bur roughening + Scotchbond 1XT	Non-aged	16.67	3.17	10
	Aged	14.83	1.11	10
Bur roughening + PA + Scotchbond 1XT	Non-aged	16.81	2.18	10
	Aged	15.09	1.93	10
Scotchbond Universal	Non-aged	17.74	1.65	10
	Aged	17.83	2.06	10
Tetric N-Bond Universal	Non-aged	21.55	2.46	10
	Aged	17.35	1.49	10
No surface preparation or adhesive	Non-aged	18.26	2.7	10
	Aged	6.89	2.32	10
COJET Sand + Scotchbond Universal	Non-aged	18.24	3.4	10
	Aged	20.83	2.87	10
Combined mean SBS	Non-aged	18.21		60
	Aged	15.47		60

In group 3, the SBS of the aged composites (17.83 MPa) was higher than that of the non-aged group (17.74 MPa) though this difference was not statistically significant.

In group 6 (COJET Sand + Scotchbond Universal), there was a marked difference between the SBS from the aged (20.83 MPa) and the non-aged groups (18.24 MPa). This difference was statistically significant ($p = 0.021$).

As was the case with the samples repaired with Filtek Supreme XTE, the combined mean of the aged composites (15.47 MPa) was 15.04% lower than that of the non-aged specimens (18.21 MPa).

It was also noted that in both sets of samples repaired with either FiltekSpreme XTE or Tetric N-Ceram, there was a narrow range in the SBS values recorded from the non-aged samples (Figures 1 and 2). This contrasts with the aged samples where a greater variation and range of SBS values was observed.

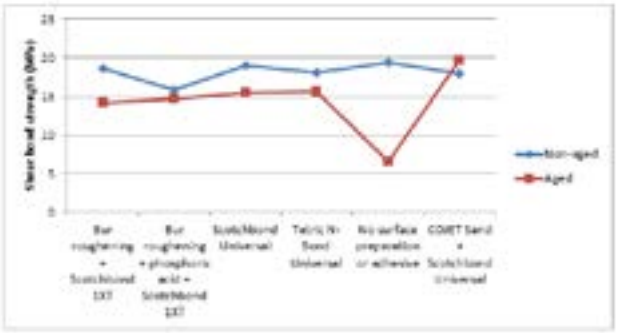

Figure 1. Effect of aging on the mean shear bond strength of composite repaired with Filtek Supreme XTE.

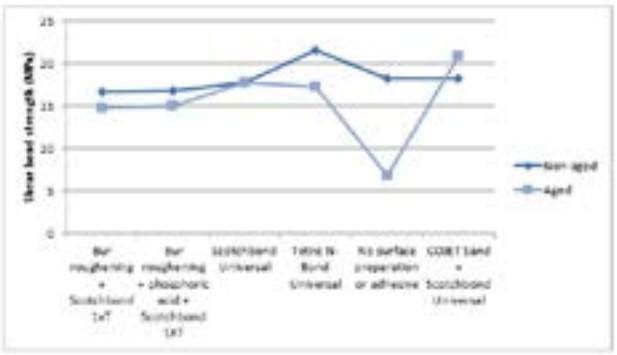

Figure 2. Effect of aging on the mean SBS of composite after repair with Tetric N-Ceram.

DISCUSSION

In this study, it was found that in general, the bond strength of the repair interface on aged samples was less than that of the corresponding non-aged composites except in the COJET Sand groups, regardless of the repair composite used. When repaired with Filtek Supreme XTE, the mean SBS was 21.1% lower in this group than in the corresponding non-aged composites.

Similarly, the aged samples repaired with Tetric N-Ceram showed a comparative reduction of 15.04% in the SBS. The null hypothesis was therefore rejected. The decreased bond strength may be as a result of changes in the surface morphology and chemical composition of the composite following aging in artificial saliva.[13]

The negative control was used to isolate the effect of the aging medium and repair protocols on the SBS of the repaired composite. On the other hand, use of the positive control highlighted the repair SBS in relation to the cohesive strength of the RBC.

Irrespective of the repair composite used, four repair methods in the aged samples produced SBS's that were significantly lower than the cohesive strength of the non-aged composites. In contrast, repair with COJET Sand and Scotchbond Universal was associated with a bond strength equivalent to the cohesive strength of the material.

The effectiveness of this repair method may be due to the technique, for sandblasting the COJET Sand particles onto the composite surface results in the silica coating being anchored onto the restoration to a depth of about 15 µm. When a silane-containing adhesive, such as Scotchbond Universal, is applied onto this composite surface a much stronger micro-mechanical and chemical bond is created that resembles the filler-silane-resin bond within the body of the composite.[18]

Exposure to moisture has been shown to induce hydrolytic degradation in the resin matrix of RBCs.[3] In a process known as chain scission, the highly crosslinked polymer chains are broken down into shorter fragments. This, coupled with oxidation of the functional groups within the polymer, leads to eventual inactivation of the resin.[1] As such, the surface of the composite will present a less suitable surface for bonding.

In addition, water sorption may lead to dissociation of the silane-filler bond in the RBC which lowers the mechanical properties of the material and renders its surface more susceptible to degradation. In this process, water uptake into the body of the composite causes the material to become plasticized and lose its fracture strength and elastic modulus.[19]

Hydrophilic monomers such as TEGDMA are responsible for the bulk of water sorption; and as such, RBCs with a high content of these monomers have an increased susceptibility to hydrolytic degradation.[20]

In addition, acids produced by bacteria in the artificial saliva may induce softening and surface swelling of the composite with a subsequent reduction in surface roughness.[21]

Artificial saliva as an aging medium

Many studies investigating composite repair have used plain water as an aging medium, with or without thermocycling.[4] Citric acid has also been used in artificial aging of RBCs to simulate the effect of acid in foods and beverages.[22] However, these two aging methods do not reliably mimic the clinical effect of the oral environment on the composition and surface topography of the RBC.[6,22]

Rinastiti et al.[13] used a biofilm of artificial saliva to age composite samples and compared their surface characteristics with composite specimens worn intraorally in a palatal appliance for 180 days.

They reported that examination with scanning electron micrographs showed a similar pattern of surface degradation for both groups of composites. It therefore seems logical, in a laboratory study which sets out to determine the effect of different repair protocols, to age the composites in artificial saliva first, followed by the routine of the repair protocol as that sequence more accurately simulates the clinical situation.

Thus, the solution of artificial saliva employed in this study was formulated in such a way as to mimic the composition of saliva and its effect on the composite restoration.

Despite the fact that aging composite in artificial saliva appears to reproduce the clinical degradation of composite restorations, there is no standard formula for preparation of this aging medium.

As such, it is difficult to compare results from different studies with confidence. It would therefore be of benefit to have investigators employ solutions of artificial saliva that have been standardized both in composition and manufacturing process.

Additionally, it has been suggested that composites be immersed in artificial saliva immediately after curing.[11] This reduces the risk of the composite undergoing water sorption from atmospheric air. Furthermore, the temperature, relative humidity, duration of curing[11] as well as the pH should be reported to aid in comparison between different studies.

This study evaluated only one aspect of the chemical degradation of composite restorations i.e. the effect of saliva inoculated with bacteria. The effects of temperature variation and acids present in food were not considered in this study. Also, within the oral environment, the restoration is subjected simultaneously to both mechanistic and chemical degradation.[23]

These two factors work in tandem to contribute to the breakdown of the restoration but the effects of this complex interaction were not taken into account when conducting this investigation.

CONCLUSION

Within the limitations of this study, it may be concluded that composite samples aged in artificial saliva exhibited a significant reduction in bond strength of the repair interface compared with the non-aged samples. The reduction may partly be attributed to a degradation of the bonding surface of the aged composite.

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Maxillofacial Radiology 166

SADJ November 2018, Vol. 73 No. 10 p623

CJ Nortjé

The images below are of two male patients, who presented to the Department with the main complaint of tender soft tissue swellings of the mandible, developed over 12 months. Discuss the radiological features. What is your differential diagnosis?

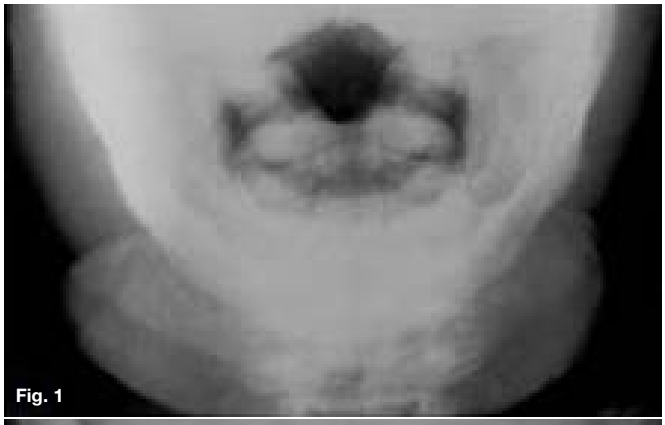
Fig. 1


Fig. 2


Fig. 3

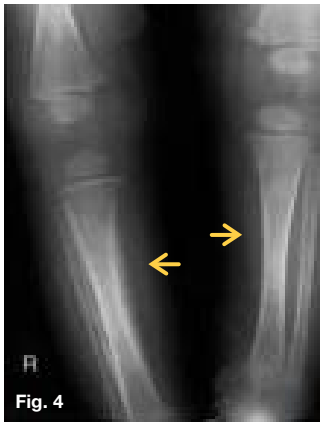
Fig. 4


Fig. 5

INTERPRETATION

Posterior-anterior view (Fig.1) showing soft tissue swelling and new periosteal bone formation in the anterior mandible. Lateral skull projection (Fig.2) showing cortical hyperostosis affecting both jaws. Another patient (Fig.3) showing hyperostosis of the mandible. Fig.4, same patient as Fig.1, showing cortical hyperostosis of long bones: note periosteal reaction with maintenance of original cortical outline deep to the lesion (yellow arrows). Fig.5 (same patient as Fig.3) showing cortical hyperostosis of the fibula. Diagnosed as Caffey's syndrome, an unusual cortical thickening occurring in the bones of infants (Infantile Cortical Hyperostosis, Caffey–Silverman's syndrome, or Smith's syndrome). Characterized by irritability, mild fever, soft tissue swelling and radiographic evidence of periosteal reaction, particularly of the mandible. The etiology is obscure, but infection may be responsible. In the vast majority of infant sufferers, onset is from two to four months of age, but it has been observed radiographically as early as five weeks prenatally and as late as seven years. Initially characterized by a tender, soft tissue swelling over the face, thorax or extremities; which often undergoes remission and exacerbation. The facial swelling is symmetric, located over the body and ramus of the mandible and is so striking that clinical diagnosis is made with considerable assurance. The most commonly affected bones are the mandible and ribs, less so the clavicle, tibia, ulna, femur, rib, humerus and fibula. There is slight periosteal thickening and a considerable increase in the width of bone due to subperiosteal new bone formation. The new bone undergoes resolution slowly and, although clinical improvement occurs within a few months, radiographic evidence may persist for years. Histologically, the pathologic process involves the overlying soft tissues as well as bone and periosteum.

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Triple antibiotic paste in the treatment of a necrotic primary molar: a case report

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Declarations of interest

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Approval from institution

Approval has been granted by RESCOM, School of Dentistry, University of Pretoria.

SUMMARY

This paper reports a case of an eight-year-old male who presented with a primary molar which had previously undergone a pulpotomy. Subsequently pulpal necrosis, internal resorption and mobility of the tooth occurred, complicating the case. A repeat pulpotomy was performed together with the use of triple-antibiotic paste (TAP). At the 10-month follow-up no clinical signs of disease were found. Complete healing of the furcal radiolucency was demonstrated, with bony infill, no mobility and resolution of the previous widening of the periodontal ligament. It appears that TAP may be a viable treatment modality to enable retention of necrotic primary teeth with a poor prognosis.

Keywords

Pulpotomy, pulpectomy, triple antibiotic paste.

INTRODUCTION

In cases of symptomatic pulpal involvement and/or necrotic pulps of primary teeth, pulpectomy and canal obturation with resorbable paste systems is the standard treatment modality.[1] Pulpectomy is however a very complex procedure with a high risk of iatrogenic complications.

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ACRONYM

TAP: triple antibiotic paste

Required are: rubber dam isolation, canal working length determination, cleaning and shaping of canals, irrigation and obturation of dry canals.[1,2]

Due to the complex nature of pulpectomies, clinicians often instead choose the option of extraction and space maintenance. It is generally accepted, however, that best practice is to attempt to maintain a deciduous molar in the arch for as long as realistically possible.[2–4] It is in the patient's prime interest that an endeavour is made to salvage the tooth until natural exfoliation.

In recent years, triple antibiotic paste (TAP), developed by Sato et al[5], has been shown to be effective when used in regenerative endodontic procedures on permanent teeth, including necrotic pulp cases.[6,7] The body of evidence regarding the effectiveness of TAP used in the treatment of teeth has proven it to be safe for dental use and has demonstrated that the procedure can be used for pulpotomy and pulpectomy in selected deciduous cases.[2,4,8]

CASE REPORT

An eight-year-old male with non-contributory medical history presented with a main complaint of a fractured restoration on a lower left second primary molar (75) and pain during mastication. The tooth had previously been treated with a pulpotomy (Figure 1).

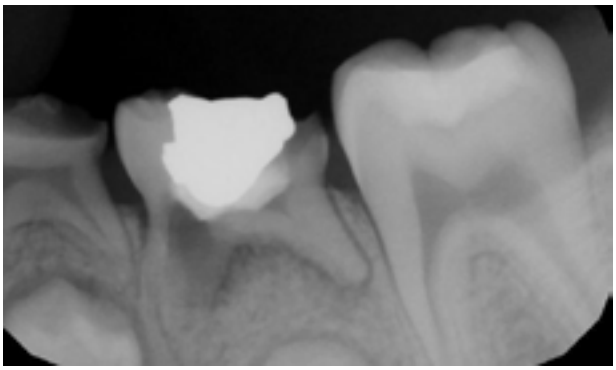

Figure 1. Pre-operative radiograph.

A diagnosis of pulpal necrosis, chronic periapical periodontitis and internal resorption with associated tooth mobility was made, based on the symptoms and radiographic evidence.

Conventional treatment options including pulpectomy or extraction with placement of a space maintainer were discussed with the caregiver. The decision was made to treat the tooth with a repeat pulpotomy-type procedure and the placement of TAP as a compromise. Consent and assent were obtained.

Treatment performed

First Appointment

Following local anaesthesia, the fractured restoration and caries were removed and access to the pulp chamber obtained. A #10 K-file with RC Prep (Premier, Philadelphia, USA) was used to scout the coronal 5mm of the canals. Irrigation was performed with 1% sodium hypochlorite. TAP was mixed to a ratio of 1:1:1 (using clindamycin, metronidazole and ciprofloxacin) with propylene-glycol as a carrier. The mixture was placed on the pulpal floor and at the canal orifices. A base layer (Kalzinol, Dentsply Detrey, Germany) and final restoration (Permite, SDI, Victoria, Australia) were placed.

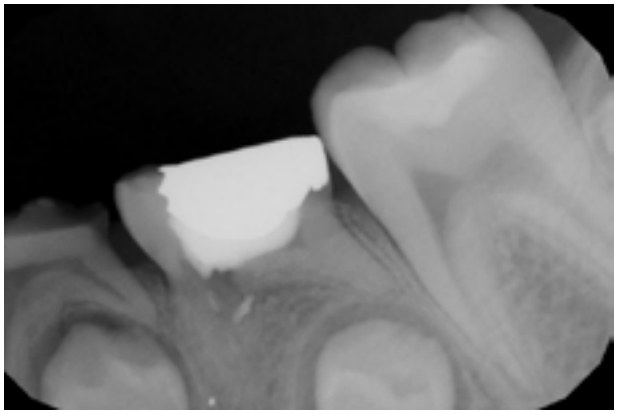

Figure 2. Ten-month follow-up radiograph.

Ten-month follow-up appointment

At the ten-month follow-up, the tooth was asymptomatic, with no signs or symptoms of any active disease clinically or radiographically and the tooth was no longer mobile.

DISCUSSION

TAP is made by mixing equal parts of metronidazole, minocycline and ciprofloxacin.[5] Tablets are ground to a powder or capsules are opened and the contents are mixed to a paste with propylene glycol as a carrier.[2]

TAP works by incorporating antimicrobials that are effective against both aerobes and anaerobes.[9] The most notable and widely recognised use of TAP includes pulp regeneration and revascularisation of immature permanent incisors, in an attempt to stimulate revitalisation and continued root formation.[6,7] During revascularisation, TAP is used as an interim medicament which is removed at a second appointment.

In contrast to revascularisation procedures, the use of TAP in deciduous teeth involves placement of the paste at the orifice level and/or into the root canals, followed by the placement of a permanent restoration at the same visit.[6,8] The TAP remains *in situ* until exfoliation of the deciduous tooth.

Despite its effective antimicrobial action, possible complications and adverse effects of TAP such as tooth discolouration and theoretical antibiotic resistance have been contemplated.[7,10]

Thibodeau suggested replacing the tetracycline antibiotic in TAP with Cefaclor or omitting it totally to avoid possible tooth discolouration.[11] Additional research is needed to provide clarity on the issue of antibiotic resistance.

TAP has been shown to be effective when used for pulpal treatment in primary teeth. A study comparing pulpectomies to TAP pulpotomies found the 12-month clinical success rate of these procedures to be similar. The clinical success rates of TAP pulpotomies and pulpectomies in this study were 100% and 96% respectively at both six and 12-month intervals.[2]

A recent study comparing two different methods of performing TAP pulpotomies showed success with either method, with instrumentation of the coronal pulp being more successful than the non-instrumentation group.[12]

Another study demonstrated the use of TAP *without mechanical instrumentation* of the canals of necrotic primary teeth to be less effective than traditional pulpectomy.

This study demonstrated that 82.7% of teeth treated with this procedure presented without clinical symptoms at the two-year mark.[8] Lower radiographic success rates specifically with non-instrumental TAP pulpotomies after two years (36.7%) were found. Instrumentation of the coronally accessible pulp tissue therefore appears to be an important factor.

Several authors agree that treatment with TAP should be considered in cases where children are uncooperative and pulpectomy is not possible for clinical reasons or if finances do not allow.[2,4,12,13]

CONCLUSION

The TAP pulpotomy procedure could allow for retention of a primary molar with a poor prognosis which may otherwise have required extraction and the placement of a space maintainer.

This case illustrates the successful treatment of a necrotic primary molar with a very poor prognosis, using a pulpotomy-type procedure with TAP. While the authors could find no standardised protocol for the TAP pulpotomy, the procedure is simple, not technique sensitive and can easily be adopted in general dental practice. Further research on the subject is required as literature on the use of TAP for primary teeth is sparse.

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The jaw muscles and central sensitization in migraine

SADJ November 2018, Vol. 73 No. 10 p627 - p628

E Shevel

Conflict of interest

No conflict declared. There was no funding nor was there institutional support.

ABSTRACT

Sensitization of the trigeminal subnucleus caudalis (Vc) is an important process in the generation of migraine pain. The role in migraine of afferent input from the jaw muscles in the sensitization of the Vc is discussed.

INTRODUCTION

This article investigates the evidence for jaw muscle involvement in central sensitization. The importance of central sensitization in migraine has been well-documented.[1,2] Although it is widely believed that sensitization of meningeal nociceptors is fundamental to the generation of migraine headache,[3,4] this does not exclude the possibility that migraine pain may originate from other anatomical structures as well. Sensory signals that originate from many structures in the head are processed by Vc neurons. These structures include not only the meninges, but also jaw muscles, facial skin, cornea, hair follicles, and intra- and extra-cranial blood vessels.[4] It follows therefore that input from any of these structures may enhance the sensitivity of the Vc. There is extensive convergence of afferent nerves, including from the jaw muscles, on Vc neurones.[5] A considerable proportion of the wide dynamic range (WDR) and the nociceptive specific (NS) neurones in the Vc have afferent inputs from the jaw muscles,[6] and can be excited by jaw muscle afferent stimuli.[7] The Vc is especially important in pain perception of the jaws and face,[8] including from convergent cutaneous and jaw muscle afferents.[9] It is a critical element in the activation of masticatory muscles.[10,11] Sessle et al demonstrated that stimulation of jaw muscle afferents excites neurons in the Vc,[5] and that nociceptor afferent impulses from muscles produce a long lasting central sensitization.[12]

DISCUSSION

The first suggestion that sensitization of the Vc may be important in the pathophysiology of migraine was made by Strassman et al in 1996.[13] Subsequent research has validated this hypothesis.[14-18] Sensitization of the Vc is now widely accepted as important in the generation of migraine pain, particularly in the later stages of the acute attack and in the development of chronic migraine.[19] Sensitization of the Vc is important not only in the maintenance and exacerbation of acute migraine attacks,[14,20-22] but it is also thought to contribute to migraine becoming chronic.[23]

Myofascial trigger points are hyper-irritable spots in skeletal muscle, that are painful on compression.[24] They are a common finding in migraineurs, and in most cases, compression of the trigger points elicits pain which exhibits typical migraine features.[25] Trigger point palpation provoked a full blown migraine attack in 29.6% of migraineurs and the number of individual migraine trigger points was found to be directly related to both the frequency of migraine attacks and the duration of the disease.[25]

Nociceptive inputs from trigger points produce continuous afferent bombardment of the Vc and activation of the trigeminovascular system, contributing to the initiation and perpetuation of migraine pain.[26,27] It has been shown that during a migraine attack, 100% of patients have sensitivity to palpation of the pericranial muscles, which include the jaw muscles.[28]

The Vc plays a crucial role in craniofacial nociceptive transmission, including receiving stimuli from convergent cutaneous and jaw muscle afferents,[9] and from muscle nociceptor afferents which produce a longer-lasting central sensitization than do those that innervate skin[12] or dura.[29] Sensitization of muscle nociceptors leads to a lowering of the mechanical threshold into the innocuous range, and hyperexcitability of dorsal horn neurons, resulting in prolonged neuronal discharges, increased responses to noxious stimuli, and expansion of the receptive field.[30-32]

Treatment of migraine with intra-oral appliances designed to reduce muscle tension in the craniomandibular muscles has been shown to be effective in reducing the severity and frequency of migraine attacks, often eliminating them altogether.[33-36]

CONCLUSION

The evidence suggests that jaw muscle afferent input contributes to central sensitization of the Vc in migraine.

ACRONYMS

NS:	Nociceptive Specific
Vc:	Trigeminal Subnucleus Caudalis
WDR:	Wide Dynamic Range

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What's new for the clinician – excerpts from and summaries of recently published papers (November 2018)

SADJ November 2018, Vol. 73 No. 10 p629 - p632

Compiled and edited by Prof V Yengopal, Dept. of Community Dentistry, School of Oral Health Sciences, Faculty of Health Sciences, University of the Witwatersrand

1. Retention rates and caries-preventive effects of two different sealant materials: a randomized clinical trial

RN Cabral, J Faber, SAM Otero, et al.
Clin Oral Invest. 2018; 22: 3171- 3177.

Despite all efforts at controlling dental caries, the disease continues to affect billions of people worldwide.[1] At a tooth level, the occlusal surfaces are the most susceptible areas for caries lesion development, and caries risk is higher during the first years after tooth eruption. According to the literature, up to 90% of all carious lesions in school-aged children occur on occlusal surfaces. [1]Particularly vulnerable are the newly erupted first permanent molars, since proper cleaning is difficult as the teeth are not yet in occlusion.

Sealants were introduced in the 1960s as a caries-preventive measure for avoiding caries occurrence and/or progression and, consequently, reducing treatment costs. Sealants have been shown to be a highly effective strategy for preventing the development and progression of caries lesions on occlusal surfaces. Sealants are recommended for children where the targeted teeth are the occlusal surfaces of healthy deciduous molar teeth or the non-cavitated occlusal surfaces in permanent molars.

With regard to the selection of sealant materials, two different materials have been used—resin-based and glass-ionomer-cement-based (GIC) materials. Both types of sealants provide a barrier between the tooth and the oral environment.[1] Evidence suggests that resin-based materials present a higher retention rate compared with GIC.[1] However, resin-based sealants require perfect moisture control during placement, which might be difficult to achieve in all children and in community based settings such as schools. Conversely, GIC-based materials are more tolerant to moisture during the application procedure, which eases the operative process, mainly for non-cooperative patients. Although the retention rate of resin-based sealants is higher than that of GIC sealants, the caries-preventive effects of the materials are similar.[1] This might be due to the fact that the caries-preventive effects of GIC sealants are related not only to the retention of the material, but also to its biologic properties.[1]

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ACRONYMS

GIC:	Glass-ionomer-cement-based
ICDAS II:	International Caries Detection and Assessment System

Cabral and colleagues (2018)[1] reported on a trial that sought to compare the retention rates and the caries-preventive effects of a modified GIC (Clinpro™ XT Varnish) and a high-viscosity GIC (FUJI IX GP FAST – GC Co.) in newly erupted first permanent molars. The null hypothesis tested was that there would be no difference between the performances of the materials after 6-, 12- and 24-month follow-up periods.

MATERIALS AND METHODS

Initially, 298 children aged 5–7 years old were examined by one trained and calibrated examiner. Caries status was recorded based on ICDAS II (International Caries Detection and Assessment System), and parents were interviewed regarding their children's general health, diet and oral hygiene habits. The information obtained from parents was used to complete a data form which enabled the classification of children as being of low, moderate or high risk for caries.

Children who were classified as moderate or high risk were re-examined, and those with their four first permanent molars not in occlusion, with occlusal deep fissures (ICDAS 0) and/or presenting with incipient caries lesions (ICDAS scores 1–3) were included in the trial. Children whose parents did not sign the informed consent, those with special needs and those not presenting all four first permanent molars were excluded.

All children included in the randomised clinical trial received an oral hygiene kit containing a toothbrush, a fluoridated dentifrice and dental floss. They were instructed how to use the devices and were encouraged to brush their teeth twice daily. Additionally, they also had access to fluoridated water (0.7 ppm).

Of the 298 children, 56 were included in a split-mouth randomised clinical trial, randomized by means of a computer-generated program, with the unit of randomisation being the side of the mouth. This procedure guaranteed that all children had the four permanent molars sealed with either Clinpro XT Varnish (maxillary and mandibular first permanent molars in one side of the mouth) or Fuji IX GP FAST (maxillary and mandibular first permanent molars on the contralateral side). The same trained operator placed all sealants, in accord with the manufacturer's instructions. The cases were followed over 24 months.

A dental office located inside the school was used for the placement of all sealants in the trial, with the children sitting on a conventional dental chair under optimal lighting and with the operator being assisted by a dental assistant. Prior to placement of the sealants, the teeth were cleaned with a rotation brush. Cotton rolls and a suction device were used for moisture control.

For placement of the Clinpro XT Varnish (CXT), the occlusal surface was conditioned with 37% phosphoric acid for 15 s, rinsed with water for 60 s and dried gently with an air syringe. Immediately thereafter, an explorer was used to place the material into the pits and fissures, where it was light-cured for 30 seconds.

The FUJI IX GP FAST (FJ) is an encapsulated glass-ionomer. When this material was to be placed, the occlusal surface was dried with cotton wool pellets, and the cavity conditioner was then applied with a cotton wool pellet for 15 seconds. Thereafter, the surface was washed with cotton wool pellets soaked in water, then dried with cotton wool pellets.

The capsule was activated, placed in an amalgamator and triturated for 10 seconds. The capsule was then loaded into the capsule applier, and the material was immediately extruded onto the tooth and firmly pressed for 10 seconds by a gloved finger coated with petroleum jelly.

For both procedures, the patient's bite was checked with carbon paper, and excess CXT or FJ material was removed with rotatory and hand instruments. Thereafter, the sealants from the FJ group were protected with a resin-based coat and light-cured for 30 s.

For the follow-up evaluation periods (6, 12 and 24 months), the development of dentine caries lesions and the retention of sealants were clinically evaluated by the same calibrated and independent evaluator using ICAS II to evaluate sealant retention.

The occlusal surfaces of the first permanent molars were divided arbitrarily into three sections for mandibular teeth and into two sections for maxillary teeth. Thereafter, the survival of sealants was assessed for two different categorisations: one traditional and one modified.

For the traditional categorisation, fully and partially retained sealants were considered a success. However, if the main pits and fissures were partially visible in any of the sections (partially retained sealants) of the sealed occlusal surface, the sealant was judged as a failure according to the modified categorisation. Thus, for the occlusal surface, fully retained sealants were considered successful, and partially retained and completely lost sealants were considered failures.

RESULTS

The sample population comprised 56 children (34 girls and 22 boys) with a mean age and standard deviation of 7.06 ± 0.56 years. At baseline, 224 molars were sealed (4 per children). The percentage dropouts during the study was 17.9%.

Regarding caries frequency, 100% of the sample presented enamel caries lesions and 80.35% presented dentine caries lesions. The frequency of dentine caries lesions on the buccal surfaces of first permanent molars was 2.67%. Considering the occlusal surfaces that were sealed, the distribution of ICDAS scores was as follows: for CXT and FJ groups, 66.96% and 72.32% (ICDAS 0); 23.21% and 16.07% (ICDAS 1); 8.03% and 8.92% (ICDAS 2); and 1.78 and 2.67% (ICDAS 3).

The retention rates after six and 12 months were not statistically significant when groups were compared under the traditional categorisation. However, for the modified categorisation, FJ sealants survived longer than CXT sealants. After 24 months, FJ sealants presented statistically significantly higher retention rates in comparison with CXT sealants, regardless of the retention categorisation used.

In relation to caries-preventive effect, there was no statistically significant difference between the two types of sealants. With regard to the failures, it was observed that two teeth per group developed cavitated dentine lesions (ICDAS 5). For the CXT group, at baseline, one tooth was scored ICDAS 0 and the other ICDAS 2, whilst for the FJ group, the occlusal surfaces were initially recorded as ICDAS 1 and ICDAS 2, respectively.

CONCLUSION

The two materials were equally effective in preventing the development of cavitated dentine lesions, although sealants prepared with high-viscosity GIC survived longer than those prepared with modified GIC.

Implications for practice: Both materials were moisture tolerant and performed equally well as regards the main outcome which was caries prevention. Thus the choice of material in this case could be based on clinical preference, cost and ease of use.

Reference

Cabral RN, Faber J, Otero SAM, et al. Retention rates and caries-preventive effects of two different sealant materials: a randomised clinical trial. Clin Oral Invest. 2018; 22: 3171- 3177.

2. Evaluation of teeth in line of mandibular fractures treated with stable internal fixation

KO Bang, PK Pandilwar, SR Shenoi, et al.
Journal of Maxillofacial & Oral Surgery 2018;17:164-168.

The mandible is the largest and the main bone of the lower part of the face. Anatomic parts of the mandible are the symphysis, parasymphysis, body, angle, ramus, coronoid process, condyle, and alveolus. Inherent weak sites of mandible which are liable to fracture include the angle of mandible (especially when third molar is impacted), the socket of the canine tooth and the condylar neck. Mandible fractures in maxillofacial trauma occur more commonly due to the prominence of mandible and comparative lack of bony and soft tissue support. Mandibular fractures are the second most common fracture of the face after the nose and the 10th most common fractured bone in the human body.[1]

The teeth in line of a fractured mandible are considered open and are always in communication with oral cavity because of presence of periodontal ligament. With the advent of open reduction internal fixation in the management of fractures, obtaining anatomic reduction and three- dimensional fixation is easily achieved, which has seen radical transformation in the management of fractures with teeth in line of fractures.[1] Bang and colleagues (2018)[1] reported on a trial that sought to determine whether retention or removal of teeth in line of mandibular fractures affects the incidence of postoperative complications. Additionally, the researchers sought to evaluate the fate of teeth retained in mandibular fractures based on location of fracture line in relation to apical foramen and lateral periodontium of retained tooth.

MATERIALS AND METHODS

51 mandibular fracture sites in 39 patients were selected as study sample. Teeth in the line of the fracture were removed if there was extensive caries, excessive mobility of tooth, or root fracture.

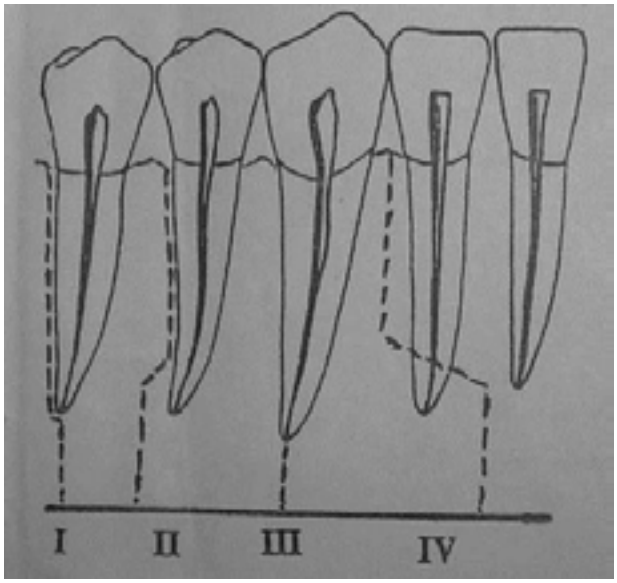

Figure 1. Schematic representation of fracture types based on relationship of fracture line to tooth apex and periodontium.

Patients were divided into two groups, group I tooth removed (15 sites) and group II tooth retained (36 sites). Teeth retained in line of fracture were classified as per Kamboozia's classification based on position of the fracture in relation to apical foramen and the lateral periodontium of involved tooth estimated from preoperative panoramic radiograph into four types (see Fig. 1).[2]

Kamboozia's classification is as follows:

- Type I: Fracture line which follows the root surface from apical region to gingival margin with denudation of root surface.
- Type II: Fracture line which follows the root surface from gingival margin but does not cross apical region.
- Type III: Fracture line passing only through apical region.
- Type IV: Fracture line crossing the root without passing through apical region or without producing denudation of root surface.

From this classification, it is clear that the apical foramen is involved in Types I and III fractures but not involved in Types II & IV.

The clinical and radiological examination protocols and treatment were the same for all cases. Open reduction and internal fixation (ORIF) using stainless miniplates and monocortical screws via intraoral or extraoral approach under suitable anaesthesia were done.

Intermaxillary fixation was done in some cases for one to four weeks to obtain greater stability and to treat concomitant condylar fractures. A standard regimen of anti-microbial and anti-inflammatory drugs was administered postoperatively. Chlorhexidine mouth wash was prescribed for maintenance of oral hygiene. Periodic follow up was carried out for one year during which the patient was assessed clinically and radiographically. Teeth which were symptomatic i.e. showing presence of mobility, tenderness or radiographic changes were subjected to further treatment, either root canal treatment or extraction.

RESULTS

Out of 36 fracture sites in which teeth were retained, five (13.89%) showed postoperative complications, and out of 15 fracture sites in which teeth were removed three (20%) showed postoperative complications. Hence, the percentage of postoperative complications was higher in teeth removed fracture sites compared with teeth retained fracture sites, though the difference was not statistically significant ($p > 0.05$).

Out of 36 fracture sites in which the tooth was retained, three cases showed the fracture line passing through two adjacent teeth. Thus, of the 39 teeth in the fracture line, 26 required no treatment, nine were subjected root canal treatment and four teeth required extraction.

In observing the association between the relationship of fracture line to teeth and the fate of teeth, none of the Type II relationship cases required extraction, whereas two cases in each Type I and Type III needed extraction. Teeth not necessitating any treatment were more in Type II (83.33%), followed by Type III (63.64%) and Type I (40%). Thus Type II relation teeth were found to have a better prognosis followed by Type III and Type I. However there was no significant statistical association between the relationship of fracture line to teeth and the fate of teeth.

CONCLUSION

The researchers found that there was an increased risk for postoperative complications when a tooth is removed, though this was not statistically significant. Evaluation of the fate of retained teeth showed better prognosis of teeth in Type II cases than Type III and Type I cases. However these relations were also statistically not significant.

Implications for practice

The results of this study indicate that teeth associated with mandibular fractures need not be removed on a prophylactic basis. Non-infected sound teeth in line of fracture can be preserved. However retained teeth should be followed for at least one year and should be treated endodontically if this is indicated. Conservation of dentition as an adjunct to the surgical treatment of mandibular fractures can benefit many patients.

Reference

1. Bang KO, Pandilwar PK, Shenoi SR et al. Evaluation of teeth in line of mandibular fractures treated with stable internal fixation. Journal of Maxillofacial & Oral Surgery 2018; 17: 164-8.
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http://dx.doi.org/10.17159/2519-0105/2018/v73no10a9

Cervical restorations useful when assessing gingival and periodontal health

SADJ November 2018, Vol. 73 No. 10 p633 - p634

A Volchansky

"Once a Periodontal Patient, always a Periodontal Patient".

This comment could be describing the affliction of Chronic Periodontitis or Refractory Periodontitis which refer to the periodontal status of patients who require monitoring over extended periods and who demonstrate severe attachment loss (derived from Parameters of Care: Journal of Periodontology, 2000[1]).

The progression of periodontal diseases is assessed by the extent of gingival recession, the severity of clinical attachment loss, and the probing depths of pockets. Periodontal disease is generally described as a slow and continually progressive condition.[2] It may well be important that a fixed reference point is available to ensure repeatability when these measurements are recorded. The landmark habitually used is the cemento-enamel -junction (CEJ). The *normal* gingival margin position is 0.5 – 2.0 mm coronal to the CEJ. Gingival recession is defined as the increase in the location of the gingival margin apical to the CEJ.[4]

A cervical restoration is one that is placed adjacent to the CEJ or the gingival margin (G V Black (1902[3]). The margins of such a restoration are clearly visible adjacent to the gingival attachment and the location may approximate the cervical line / cemento-enamel junction of the tooth.

It may be suggested that a point on the apical or gingival margin of a conveniently placed cervical restoration could be used as a measuring point in relation to the determination of gingival or periodontal health, should the CEJ not be visible or be obscured by a restoration, as seen in Figure 1.

The preferred proximity of the restoration, and/or the margin of a synthetic crown, to the periodontal structures is debatable.

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ACRONYM

CEJ: Cemento-enamel-junction

Figure 1. Cervical restorations on 13; 14, obscuring the CEJ.

There are three options, supragingival, equigingival and subgingival. Much has been written about the importance of the restorative margin, its location, the materials and the contours of any restoration in relation to periodontal health.[5,6]

Supra-gingival placement is recommended as the location of choice for all restorative margins to avoid iatrogenic periodontal disease.[7,8] However, the circumstances determining the placement of a cervical restoration may dictate the final location of the margins. This may be influenced by the reasons for the placing the filling ...for example the extent of decay, for aesthetics or to control sensitivity.

Figure 1 shows a cervical restoration[2] on the buccal aspect of tooth 13, obscuring the CEJ, while the CEJ and gingival margin are clearly visible on the adjacent crown of tooth 12.

CLINICAL CASE

This case demonstrates the use of the apical margin of a cervical restoration as a fixed point for the measurement of gingival recession and as an indicator of the extent of attachment loss.

Figure 2 is of a patient seen at the initial consultation, where marked gingival inflammation was noted distal to tooth 43. The adjacent tooth has a cervical restoration and any gingival recession for this tooth could be measured from the apical aspect of the restoration to the gingival margin. Periodontal treatment was advocated. However, the patient re-appeared four years later, not having had any periodontal care (Figure 3).

Figure 2. Initial consultation.

Figure 3. Four years later.

The inflammation distal to tooth 43 appeared to be slightly reduced. Of relevance was the measurement of recession on the adjacent tooth, recorded as recommended using the apical aspect of the restoration as a fixed reference point. Patently an increase had occurred in that dimension.

DISCUSSION

The case illustrates the use of a landmark provided by a restoration as a fixed point for the measurement of gingival recession and offers an indication of the progress of attachment loss.

CONCLUSION

Where the CEJ is obscured, the apical margin of a cervical restoration may provide a practical solution to a clinical problem.

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1. Parameters of Care. Refractory Periodontitis. 2000. Journal of Periodontology: 71: 9SUPP) 859-60.
2. Burt BA. Periodontitis and aging: reviewing evidence. J Am Dental Assoc. 1994;25:273-9.
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http://dx.doi.org/10.17159/2519-0105/2018/v73no10a10

Dealing with healthcare waste… a waste of time?

SADJ November 2018, Vol. 73 No. 10 p635

Dr Brown was proud of his practice and never tired of showing patients around to view the latest equipment he had installed. No expense had been spared and he was in possession of a Cone Beam radiographic unit and the most advanced sterilization facilities. The dental chairs incorporated every advanced feature. He was particularly conscious of the special arrangements he had made for the storage and disposal of used hypodermic needles which, using artery forceps to avoid needle sticks, were carefully placed into a glass jar which was securely closed by a screw-on lid. The jar was labelled in red and when full was placed into the waste bins for collection by the municipal refuse organization.

Although extractions in his practice were infrequent, those that he had removed were also placed into the same glass jar for disposal.

Dr Brown may well have had the most up to date equipment and practised the most advanced Dentistry but of course... the practice was guilty of gross mishandling of waste. Booklet Number 12 of the HPCSA Guidelines dealing with Ethical issues, presents a Motivation for the Booklet: "The HPCSA views the proper disposal of healthcare waste by healthcare practitioners as an essential element of good professional practice. These Guidelines are issued to remind practitioners of their ethical and professional obligations to their patients and to the community."

The Council defines a wide range of waste as hazardous, listed below:

Infectious waste, pathological waste, including body fluids, secretions and surgical specimens, sharps, especially contaminated sharps, pharmaceutical waste, chemical waste, heavy metals, radioactive waste, genotoxic waste, cytotoxic agents, pressurised containers.

Should the waste fall into one of those categories, special arrangements must be made for handling the material.

The problems of unsafe handling of sharps may be relatively obvious... there will be a danger of needle stick injuries and the risk of the transmission of infectious agents. What may be the problems if healthcare waste is dumped into municipal landfill sites? Not only will there be potential physical injuries but also exposure to infection suffered by formal landfill workers and by informal scavengers of the rubbish. Contamination of groundwater could readily result in the spread of *E Coli*. Even the burning of healthcare waste is not recommended as the environment is polluted, with the formation of dioxins. Incineration may overcome these dangers.

Good ethical practice demands that a set of guidelines for the management of healthcare waste should be respected and effected by every practitioner. The HPCSA emphasizes a number of requirements which are deemed essential to ensure effective and ethical management of healthcare waste.

Paramount amongst these is the dictate that every practice should utilise a healthcare waste disposal system that meets the requirements of the relevant South African National Standards code (Code of Practice of the South Africa Bureau of Standards on the Handling and Disposal of Waste Material within HealthCare Facilities SANS 10248 1 2008).

Such a system should provide for the minimization of waste, for the segregation, packaging, labeling, storage and removal of the material under circumstances that do not pose a threat to human health or the environment. There are service providers handling healthcare waste disposal who will satisfy these requirements. An audit trail should be recorded to provide evidence of this arrangement.

All medical sharps, whether contaminated or not, are hazardous and should be disposed of in appropriate specific containers which cannot be punctured or broken, should be stable and resistant to impact. They must not be filled over capacity.

It is the responsibility of health care practitioners to ensure that, if necessary, they should keep up to date with the latest scientific knowledge on the safe management of healthcare waste by undergoing further training in waste management. Further, that should a practitioner become aware of evidence of unsafe disposal of waste by any person or institution, it is incumbent upon him/her to report that delinquency to both the HPCSA and to the Department of Health.

Failure to adhere to these guidelines will be considered to be unethical and unprofessional conduct on the part of the healthcare practitioners concerned.

The management of healthcare waste is a serious issue, unfortunately overlooked by Dr Brown.

Reference

Guidelines for the management of healthcare waste. Booklet 12: Guidelines for Good Practice in the Healthcare Professions. Health Professions Council of South Africa. 2016

Continuous Professional Development Questionnaire

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

GENERAL

The orthopantomograph as an indicator of vertical jaw relations

1. Identify the CORRECT answer. In this study, the term "brachyfacial" refers to a face that is:
   a. Short and narrow
   b. Narrow and long
   c. Short and wide
   d. Broad and deep

2. As regards accuracy in measuring structures on an orthopantomograph, horizontal distances are particularly unreliable as a result of non-linear variation in the magnification at different object depths, whereas vertical distances are relatively reliable.
   a. True
   b. False

3. Identify the INCORRECT statement. The orthopantomograph has several advantages, including:
   a. simplicity of the procedure
   b. high accuracy in the vertical dimension
   c. relatively low radiation dosage
   d. reduced superimposition of structures

The effectiveness of a tooth brushing programme for children in the Ehlanzeni district of Mpumalanga

4. Identify the INCORRECT answer. The benefits of fluoride in caries prevention are achieved by:
   a. exerting an antimicrobial action, killing all the bacteria which produce acid
   b. remineralization of early damage to enamel caused by acid produced by the plaque bacteria
   c. rendering enamel more resistant to acid
   d. reducing the ability of plaque bacteria to produce acid

5. Teacher-supervised tooth brushing programmes combined with oral health education have been shown statistically to be effective in socially deprived South African communities.
   a. True
   b. False

Effect of aging in artificial saliva on the shear bond strength of resin composite

6. Identify the INCORRECT statement. The rate of degradation of a composite restoration depends on all the following factors:
   a. Degree of monomer conversion within the resin
   b. Structure of the filler particles
   c. Concentration of acid etching agent used on the tooth surfaces being restored
   d. Nature of the monomer making up the resin matrix
   e. Integrity of the silane coupling between the filler and matrix

7. Identify the INCORRECT statement. Mechanisms involved in the hydrolytic degradation of the resin matrix within composite restorations include all of the following:
   a. Scission of the polymer chains
   b. Oxidation of the functional groups within the polymer
   c. Dissociation of the silane-filler bond
   d. Breakdown of the filler particles
   e. Reduction in surface hardness of the composite

8. Identify the CORRECT statement. The single most important factor that influences the integrity of the composite repair interface is the:
   a. Use of an intermediate adhesive
   b. Application of phosphoric acid on the surface of the old composite
   c. Type of composite being repaired
   d. Curing time of the repair composite
   e. Application of a silane onto the surface of the old composite

9. Identify the CORRECT statement. Bacterial acids present in saliva induce deterioration of a composite restoration by the mechanism of:
   a. Erosion of the filler particles
   b. Softening of the resin matrix
   c. Increased crosslinking of the polymer chains
   d. Increase in surface hardness
   e. Elimination of the oxygen inhibited layer

10. Identify the CORRECT statement. The use of artificial saliva for the *in-vitro* aging of composites:
    a. is the most clinically relevant aging method
    b. produces identical aging patterns regardless of the composition of the artificial saliva solution
    c. mainly simulates the hydrolytic degradation of composite restorations
    d. can be used to effectively test the effect of temperature variation on the restoration
    e. cannot be used in conjunction with other aging methods

The jaw muscles and central sensitization in migraine

11. Identify the INCORRECT statement. It is suggested that muscle tension leads to sensitization of muscle nociceptors which results in:
    a. a lowering of the mechanical threshold into the innocuous range
    b. hyperexcitability of dorsal horn neurons
    c. intermittent neuronal discharges
    d. increased responses to noxious stimuli

12. It has been recorded that all patients suffering migraine have sensitivity to palpation of the masticatory muscles.
    a. True
    b. False

Triple antibiotic paste in the treatment of a necrotic primary molar: a case report

13. Identify the CORRECT answer. Pulpectomy is a very complex procedure with high risk of iatrogenic complications. It requires:
    a. rubber dam isolation
    b. working length determination
    c. cleaning, shaping, irrigation and obturation of canals
    d. all of the above

14. Triple antibiotic paste (TAP) can be used in regenerative endodontic procedures in the permanent dentition.
    a. True
    b. False

15. Identify the CORRECT answer. TAP is made by mixing equal parts of antibiotic with propylene glycol. Traditionally the paste contains the antibiotic:
    a. amoxicillin
    b. co-amoxiclav
    c. minocycline
    d. clindamycin

16. Non-instrumental TAP pulpotomies have shown lower success rates. Instrumentation of the coronally accessible pulp tissue is therefore important.
    a. True
    b. False

Maxillofacial and oral radiology case

17. The etiology of Caffey's disease is obscure.
    a. True
    b. False

18. The new periosteal bone undergoes very fast resolution.
    a. True
    b. False

What's new for the clinician – summaries of recently published papers (November 2018)

19. In the fissure sealant trial, after 24 months, FJ sealants presented statistically significantly higher retention rates in comparison with CXT sealants.
    a. True
    b. False

20. In the Bang et al trial, the percentage of postoperative complications was significantly higher in teeth-removed fracture sites compared with teeth-retained fracture sites ($p < 0.05$).
    a. True
    b. False

ETHICS

21. Containers into which sharps are to be discarded should be transparent so that waste disposal workers may identify the hazard.
    a. True
    b. False

22. The quantity of healthcare waste that is generated is not relevant and it is not ethically required to minimize the amount.
    a. True
    b. False

23. Identify the CORRECT answer. Should a healthcare worker become aware of poor waste disposal systems, the appropriate ethical action is:
    a. to ignore the situation as it is of little concern to the community
    b. to report the matter to the HPCSA and the Department of Health
    c. to express concern to the culprit but to take no other action
    d. to submit an article to the local newspaper

24. The ethical practitioner will ensure that he/she is always cognizant of the latest methods of healthcare waste management.
    a. True
    b. False

25. Healthcare practitioners can burn their own healthcare waste and need not engage an accredited waste service provider.
    a. True
    b. False

Instructions to authors

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To be kept as brief, clear and unambiguous as possible.

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

References

References should be set out in the Vancouver style and only approved abbreviations of journal titles should be used (consult the List of Journals Indexed in Index Medicus for these details at: http://www.nlm.nih.gov/tsd/serials/lji.html). References should be inserted seriatim in the text using superscript numbers and should be listed at the end of the article in numerical order. Do not list them alphabetically. It is the author's responsibility to verify each reference from its original source. Please note that an article may be rejected if the referencing is inaccurate.

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

Journal references should appear thus:

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

Book references should be set out as follows:

- Terblanche N. Principles of Periodontology, 4th ed. London: Butterworth, 1985: 96-101.
- Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA, Smith RT, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974: 457-72.
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