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Homo habilis was named by Richard Leakey as the “handy man” - hands and feet were functionally adapted for example, stone tools have been found with the fossil remains... and the big toe lay parallel to the other toes indicating bipedal locomotion for this hominid who lived some 1.6 to 2 million years ago. The teeth resemble those of modern humans in that the premolars are more elongated than in earlier species.

Source: Wikipedia and LWL Museum für Archäologie, Herne, German
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A dwarf becomes a giant.

Ensconced in this issue is a paper detailing the application of microsurgical techniques in Endodontics. The authors deal comprehensively with the armamentarium, the method and the results and debate the merits and possible disadvantages. It is in all a comprehensively valuable paper. Why should this be a focus of our interest? After all, the use of microscopes in Dentistry is well established and many patients have benefitted considerably as a result of the greatly enhanced view of the operating field and the accompanying increased accuracy of treatment rendered. Perhaps the relevance lies in the horizons which are opened as we gaze into a future in which we are going to deal with ever smaller and smaller things!

Predicting the future is fraught with problems.. but remember Jules Verne, science fiction writer supreme (1828 -1905) who accurately forecast submarines, airplanes, skyscrapers, and space travel. All have come true and his books were written well before any reasonable technology was available to substantiate his imagination. Then consider the film Fantastic Voyage… a 1966 epic which described the injection of a minisub into the arteries of a living person (in fact, two). The sub , manned by miniaturised people, was directed to trouble spots in the body, there to effect repairs and treatment. Coming true?

Now welcome the word “nano” into our discussion. The etymology is Greek, from “nanos” meaning small…a dwarf. And small it is, a nano being one billionth of a millimetre... 10^-9 ... that is minute. But nanotechnology is an integral part of medical and dental research and indeed it is possible to confidently forecast the development of nanorobots which may be applied in treatment of disease. These will not be miniaturised versions of our current instruments.. not the reduced submarine of Fantastic Voyage.. but will be based on structures already present in the body.. such as mitochondria. Aimed specifically at an identified problem, they will bring a new level of precision to treatment.

And in Dentistry.. and in Orthodontics .. Israeli scientists have developed an "enzyme blade" to replace our trusted scalpel. A rather grandiloquent term, we may remark. But the technology is sound, for the approach is based on collagenase packaged into liposomes which are used as nano vesicles to carry the enzyme to the periodontal membrane of teeth destined to be moved. The enzyme leaks out from the carrier liposome, works its effect on the collagen fibres and presto, the tooth is released to undergo more rapid orthodontic movement. The technique is forecast to replace the involved procedure of Periodontally Accelerated Osteogenic Orthodontics in which incisions are made into the cortical bone over teeth which are to be moved. So in truth the scalpel may be replaced by an enzyme blade! The researchers are confident the technique will be available within a few years. How far will this possibility develop.. can we foresee a time when no scalpels are needed at all??

A crucial message is contained in this description of developments in nano-technology... there is always the need for all practitioners not only to be alert to new technology but also to be prepared to consider the merits and possibilities.. even when the approach may be radically different from our accepted modalities. Most definitions of the word “meme” describe it as: An element of as culture or system of behaviour that may be considered to be passed from one individual to another by non- genetic means, especially by imitation. That may well apply to these advances, but there is another definition offered .. a meme is an idea-concept in evolutionary contest with other ideas. Both are relevant in our consideration of the awesome advances which are in the offing.

The Dwarf of nano technology may well become the Giant of innovation in health care.

Come to the Congress .. we may learn a small thing that could make a huge difference in our practices!
An annual general meeting (AGM) is a mandatory yearly gathering of a company’s interested shareholders. *Investopedia.*

An AGM is a meeting that an organization holds annually to review developments of the year just past, to elect new officers, and to vote on major organizational policies. *Merriam Webster.*

Yes, the AGM may well be a mandatory event which organisations such as our Association are obliged to hold every year, but it is an occasion when members can network, interact, exchange thoughts and experiences, and, importantly, have a say in the conduct of their Association… and of course enjoy it’s hospitality.

A reader may deduce that our Association is endeavouring to attract more members to attend the AGM!! Correct!! A Head Office communique “strongly encouraged” attendance at the Association’s 2018 Annual General Meeting (AGM) and acknowledged that the office is also working on ways to attract more people to participate in the AGM in the future. We are making plans to employ technology to reach a bigger number of our Association. There is no doubt that technology platforms are the way of the future.

The laws that governs the Association prescribe that some major resolutions can only be passed at the AGM by a quorum of 65% of all voting members including proxies. In all common sense, that is a difficult number to achieve, in actual fact we have not achieved it for many years, given that membership is distributed country wide and the cost and inconvenience of travel is a barrier. The regulations prescribe for most of the resolutions that they can be passed by the majority of a duly constituted and quorate AGM. The next provision allows for an adjourned AGM within a week at which the attendance, whatever the number, is construed as satisfying the quorum. At that meeting the resolutions on several financial issues are tabled and considered. So the affairs of the Association can proceed apace. BUT have many members not then enjoyed the opportunity to record their vote? Once again, the Constitution has provided a mechanism, the proxy voting system. Members may nominate a person who will be attending the AGM to vote on their behalf. A sound solution to an otherwise challenging dilemma.

The March AGM this year was attended by 34 members, and a total of 64 proxy votes were recorded – this is by far not a good number! It was a meeting which was most ably conducted by Dr Roux Vermeulen, outgoing President of the SADA, well supported by Dr Yvette Solomons, Chairperson of the Board. The reports were delivered with expertise and clarity and the attending members had the benefit of an explicit description of the activities and financial status of the Association over the year 2016/2017. Management presented the financial report and the process of auditing the financials was explained by Ms Jeanine Nellmapius–Clarke, who represented our auditors (Sizwe Ntsaluba Gobodo). The highly encouraging news was that the organisation is on a sound financial footing, having not only met but surpassed the budget.

The report by our representative on the PPS Board was a most positive message, encouraging all members to take advantage of PPS cover. Dr Faizel Mansoor was elected as our new representative to the PPS Board. As CEO, I am expecting a lot to come from having placed Dr Mansoor at PPS. We expect some focus in the service offering to dentists to improve, new lines to be developed and cost to be preferential. A fitting tribute was paid to Dr Amaidas, outgoing Chair of DDFT. He ran the Trust in a manner that makes everyone proud. He served this Trust for many years and with great dedication and distinction.

Highlighted in the report of the Board Chairperson were activities of central import… such as…

- Membership fees being kept to a minimal increase of only 3%
- Planning for the 2018 Congress was well advanced and the Association will descend in force on Times Square, Pretoria in October. (Registration is opened and filling fast!)
- The Board had finalised the SADA Business plan which has 10 pillars.
- Continuous work on the development of the Relative Value Unit
- SADA is in good financial status with solid governance structures.

The reports were well received with members expressing confidence in the Association and the manner in which it is managed.

The National Council met on 16th 17th March. An early decision was the election and appointment of Dr Pusetso Moipolai as the new President of the Association. Our new leader received her primary degree, BChD, from Leeds University in 1991, specialised in Prosthodontics at Wits,
graduating MDent (Pros) in 2000 and then developed her expertise as an academic by reading toward the degree Med at Wits, which she received in 2012. Pusetso has been involved with Association activities for several years and was the incumbent Vice President of the Association at the time of her elevation to the Presidency. She brings vitality, commitment and determination to her post. Her Vice President is Dr Paul Mathai, another Wits graduate who entered dental politics as a President of the Young Dentists Council. It is worth repeating the words spoken by Dr Moipolai on accepting office: “I am very privileged to be given the task of taking over from giants such as Dr Roux Vermeulen. It is an honour for me to be the President of this Association which was formally established in 1998 yet it has over 120 years of history in its various forms and formation in the profession. The task ahead will only be achieved with the help from all national councillors. There is an African saying, “If you want to go fast, go alone. If you want to go far, go together” I certainly will rely on you to help me to perform my duties. Dr P Mathai as Vice Chairman, with his experience from The Young Dentist Council (YDC), will work closely with me”.

To both, sincere wishes for a most happy and productive period of office.

Looking again at the acronym AGM we find a long list of usages, amongst these are Autonomous Guided Missile, Attack Guided Missile, Angle Grinder Man… lets stick with the original … Annual General Meeting….. see you there next year!

Dr Pusetso Moipolai, President, South African Dental Association, 2018
ABSTRACT

Introduction:
Cancer is a significant cause of morbidity and mortality among HIV infected individuals, but information is lacking in South Africa regarding Head and Neck AIDS-defining cancers (ADCs).

Aim
To profile head and neck cancers (HNC) in HIV-positive patients in the Department of Oral Pathology, Wits Oral Health Centre over a five year period.

Methods and data analysis: A records-based retrospective descriptive study with an analytic component. Archived records (2009 to 2013) in the Department of Oral Pathology were reviewed. HIV serology results, CD4+T-cell counts and the viral load were verified from National Health Laboratory Service archived records. IBM SPSS 23.0 was used for data analysis.

Results
1605 cases of HNC were recorded, with 389 (24.2%) confirmed HIV-positive (mean age of 38 ± 11.0 years), of whom 52.3% were females. The likelihood of patients with HIV infection to be diagnosed with Kaposi Sarcoma (KS) and Non Hodgkin’s Lymphoma (NHL) was significantly greater at 35.7% and 34.2% respectively with a p value < 0.05, compared with any other cancer type.

Conclusion
KS and NHL, both ADCs, were the two most common HNCs diagnosed among HIV-positive patients. Third was Oral squamous cell carcinoma (OSCC), a Non Aids Defining Cancer (NADC).

Keywords
Head and neck cancer; AIDS-defining cancer; Non-AIDS-defining cancer; Kaposi sarcoma; Non-Hodgkin’s lymphoma; Oral squamous cell carcinoma.

ACRONYMS
ADC : AIDS-defining cancer
AIDS : Acquired Immuno-deficiency Syndrome
ANC : ante-natal clinics
CDC : Centres for Disease Control
HAART : Highly Active Anti-retroviral Therapy
HNC : Head and neck cancer
ICC : invasive cervical cancer
IRIS : Immune Reconstitution Inflammatory Syndrome
KS : Kaposi sarcoma
NADC: Non-AIDS-defining cancer
NHL: Non-Hodgkin’s lymphoma
OSCC : Oral squamous cell carcinoma
SGT : Salivary gland tumour
WOHC : Wits Oral Health Centre

INTRODUCTION
The human immunodeficiency virus (HIV) is an RNA retrovirus belonging to the Lentivirus subfamily. It is the cause of HIV infection. Since its discovery, HIV infection has spread at an alarming rate, more so in the resource-poor countries. In South Africa (SA) the number of people living with HIV was estimated at 6.4 million during 2013 with 500 000 being new infections. By 2015 this figure had increased...
To 7 million, with a prevalence rate of 19.2% in adults aged 15 – 49 years. The most advanced stage of HIV infection is acquired immuno-deficiency syndrome (AIDS). AIDS is diagnosed when an individual has a CD4+ T-cell count of < 200 cells/mm³ and suffers opportunistic infections because of a suppressed immune system. AIDS still remains the number one cause of deaths in Africa and the second among young people globally. Oral lesions are a common finding in people infected with HIV and are often the presenting feature, and may predict a deteriorating immune system and a poor prognosis for the individual. The occurrence of these lesions may also predict HIV infection and herald a progression of HIV disease to AIDS. Cancer is another significant cause of morbidity and mortality in people infected with HIV, and is one of the recognised manifestations of the infection and progression of the individual to AIDS stage.

There are cancers that are recognized to affect people infected with HIV, and are referred to as AIDS-defining cancers (ADCs) by the Centres for Disease Control (CDC). These cancers include Kaposi sarcoma (KS), non-Hodgkin’s Lymphoma (NHL) and invasive cervical cancer (ICC). There are however, other types of cancers that appear more among HIV infected people compared with the general population but were not previously associated with HIV infection. These cancers are referred to as non-AIDS-defining cancers (NADCs) i.e. anal, lung, liver, kidney, testicular, Hodgkin’s lymphoma (HL) and some head and neck cancers (HNC). Studies conducted mainly in resource-rich countries have demonstrated an increased incidence of NADCs among HIV infected individuals and a decline in ADCs, mainly after the introduction of antiretroviral therapy. For poorly resourced countries however, the same conclusion cannot be made because the incidence of ADCs is still high, even after antiretroviral therapy was introduced.

This study aimed to identify and characterise the types of Head and Neck cancers (HNCs) histologically diagnosed in HIV-positive patients in the Department of Oral Pathology, Wits Oral Health Centre (WOHC), from 2009 to 2013. This was a period after the roll-out by state institutions in SA of highly active anti-retroviral therapy (HAART) to people infected with HIV who had CD4+ T-cell counts ≤ 350 cells/mm³.

**MATERIALS AND METHODS**

**Study design**

This was a records-based retrospective descriptive study with an analytical component, conducted at the Oral Pathology Department, Wits Oral Health Centre (WOHC). Permission to undertake the study was granted by WOHC and ethical clearance was obtained from the Human Research Ethics Committee of the University of the Witwatersrand (Ethical Clearance number: M140655).

**Study population and sample**

The study population consisted of all histologically diagnosed cases of HNC retained in the archives of the Oral Pathology Department from January 2009 – December 2013. A total sample of 1605 HNC cases was gathered. Confirmation of HIV seropositivity for the subjects was obtained from records of the National Health Laboratory Services (NHLS) of South Africa.

**Statistical analysis**

Data analysis was done using the IBM SPSS 23.0. Descriptive statistics of the measurements of central tendencies were used to determine the frequency, mean and standard deviation. Inferential statistics of binary and multinominal logistic regression were applied to determine the association between the independent variables (age, gender and HIV status) and the dependent variable (cancer diagnosis or type). Since the study sample size was already determined from the retrospective nature of the study, power calculations were done to minimize Type 2 errors when making comparisons. Statistical significance was inferred at p <0.05 for all analyses.

**RESULTS**

Of the 1605 recorded cases, 389 (24.2%) were confirmed as HIV-positive. The demographic characteristics of these cases are outlined in Table 1. From the remaining 1216 cases, 229 (14.3%) were confirmed HIV-negative and 987 (61.5%) were unknown/unconfirmed cases. The mean age of the HIV-positive patients was 38±11 years with 46.1% lying in the 36 – 55 years age group. For the confirmed HIV-negative patients, the mean age was 52.1±16.9 and for the unconfirmed/unknown group, the mean age was 51.6±16.1. More females (52.3%) than males (47.7%) were confirmed as HIV-positive. HIV infection was notably higher among black patients (91.3%).

Head and neck cancers which were histologically diagnosed among HIV-positive patients included Kaposi sarcoma (KS), non-Hodgkin’s lymphoma (NHL), Hodgkin’s lymphoma (HL), Salivary gland tumours (SGTs), Oral squamous cell carcinoma (OSCC) and other types (nasopharyngeal cancer, basal cell carcinoma etc.). The most common HNC’s diagnosed amongst HIV-positive cases were KS (35, 7%), NHL (34, 2%), and OSCC (19, 8%) (Figure 1). Hodgkin’s lymphoma was diagnosed in 2.6% of HIV-positive cases and SGTs in only 1.0%.

![Figure 1: Categories of HNCs related to HIV status](image1)

The oral cavity was the most common anatomical site for head and neck cancer diagnosis (16.4%) followed by the larynx (15.3%), tongue (11.3%), jaws (11.2%), the palate (10.3%), neck (9.9%), the nasal cavity (7.5%), the lips (5.3%), the pharynx (4.6%), salivary glands (2.3%), ears (2.1%) and forehead (0.1%) (Figure 2). In some individuals the HNC’s affected multiple sites (2.6%). The anatomical location was not specified in 0.8% of the cases.

![Figure 2: Anatomical distribution of HNC diagnosed in this cohort](image2)
Univariate multinomial regression analysis of the data of the morphological type of cancer showed that the likelihood of patients with HIV infection to be diagnosed with KS and NHL was significantly higher at 35.7% and 34.2% respectively, with a p<0.001, compared with any other cancer type (Table 2).

Multinomial regression analysis of cancer diagnosis showed a significant association with CD4+T-cell count in KS and NHL. The odds of a diagnosis of KS and NHL in HIV-positive patients with CD4+T-cell count > 200 cells/mm3 were increased by 0.19 and 0.25 respectively when compared with people with CD4+T-cell count < 200 cells/mm3 (p<0.001) (Table 3). Oral squamous cell carcinoma was found not to be an ADC.

**DISCUSSION**

This study aimed at identifying and characterizing HNCs which had been histologically diagnosed in the Department of Oral Pathology among patients infected with HIV.

Of the total number of cases sampled, 389 (24.2%) were confirmed HIV-positive. The remainder were either HIV-negative (14.3%) or diagnostically unconfirmed (61.5%) cases, even after an extensive search of the NHLS database.
The reasons for the excessive number of cases with an unknown HIV status are multifactorial, and these may be as follows: the lack of proper medical details for patients provided by the requesting clinicians, patients opting to go to the private sector or to public health facilities outside of their respective provinces for testing so as to remain anonymous and avoid stigmatization, older people presenting to public clinics only after becoming symptomatic and including socio-economic factors and the level of education affecting the community. More females (52.3%) were confirmed HIV-positive than males (47.7%) in this study. The high prevalence observed in women was also reported in other cohort studies conducted here in South Africa. One of the suggested reasons for this is the fact that women in general, and especially those of child-bearing age (15 – 49 years), have a higher participation in the free HIV counselling and testing (HCT) offered at state facilities than their male counterparts. Poverty also plays an important role especially when it comes to young women contracting the disease because of sexual interaction with older men in exchange for monetary gain. Women are also biologically more susceptible to HIV infection than males.

Infection with HIV was notably higher in individuals younger than 35 years of age compared with those aged 36 to 55 years. Many reasons have been cited for this age group having such a high incidence, e.g.: most have “a higher level of education, reside in urban areas vs. rural areas and the fact that most females in this age group are in committed relationships and at child-bearing age, and are therefore frequent attenders at ante-natal clinics (ANC) and are regularly screened for HIV infection.”

Kaposi sarcoma (35.7%), non-Hodgkin’s lymphoma (34.2%) and oral squamous cell carcinoma (19.8%) were the three most frequently diagnosed HNCs amongst HIV-positive patients in this sample. These results are similar to those of other studies carried out previously in Sub-Saharan Africa, indicating the elevated risks for KS and NHL among individuals diagnosed with HIV. KS and NHL are ADCs, according to the 1993 Centers for Disease Control classification (CDC). They are often associated with infections of oncogenic viruses; human herpes virus (HHV-8) for KS and Epstein-Barr virus (EBV) for NHL. Kaposi sarcoma was common in sub-Saharan Africa and South Africa even before HIV was discovered, and to a lesser extent was also seen in the Mediterranean countries like Italy, Greece and the Middle East. In SA the incidence of KS increased almost threefold between 1988 and 1996 and continued to rise as the HIV epidemic grew. Studies conducted in RSA and Rwanda found a definitive association between HIV infection and the development of KS with odds ratios (ORs) ranging from 21.9 to 47.1. KS is strongly linked with immunodeficiency, which means that the lower the CD4+T-cell count of an individual, the higher the risk of developing KS, although its occurrence remains a risk even in people with well-preserved cell counts. However, in this study the OR of an HIV-positive individual diagnosed with KS was found to be increased by 0.19, with a CD4+T-cell count of > 200 cells/mm³ compared with those with lower CD4+T-cell counts. A study conducted in KwaZulu-Natal, RSA, found similar results with 21% of the patients diagnosed with KS in their sample recording CD4+T-cell counts of > 200 cells/mm³ compared with those with lower CD4+T-cell counts. The reason behind these conflicting results, demonstrated between resource-rich against resource-poor countries, is not clearly understood. In the USA, Kaposi sarcoma incidence is associated with a declining CD4+T-cell count of < 200 cells/mm³, but in Africa it appears this is not necessarily true. Severe immune suppression is possibly not a prerequisite for the development of KS in African populations infected with HIV, given the early age at which the infection with HHV8 occurs in these regions.

After the introduction of HAART in resource-rich countries, KS cases declined immediately. In SA however, KS

### Table 2: Association between cancer diagnosis and HIV infection.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Univariate</th>
<th>Multivariate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>OSCC</td>
<td>0.59</td>
<td>0.33-1.04</td>
</tr>
<tr>
<td>KS</td>
<td>187.12</td>
<td>24.54-1426.71</td>
</tr>
<tr>
<td>NHL</td>
<td>35.81</td>
<td>12.82-100</td>
</tr>
<tr>
<td>HL</td>
<td>2.24</td>
<td>0.72-6.96</td>
</tr>
<tr>
<td>Salivary gland tumour</td>
<td>1.08</td>
<td>0.26-4.41</td>
</tr>
</tbody>
</table>

Multivariate regression analysis was adjusted for age and gender
Reference category was HIV negative cases
CI : Confidence interval
OR : Odds ratio

### Table 3: Association between cancer diagnosis and CD4+ count.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Univariate</th>
<th>Multivariate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>OSCC</td>
<td>1.58</td>
<td>0.63-3.92</td>
</tr>
<tr>
<td>KS</td>
<td>0.19</td>
<td>0.08-0.49</td>
</tr>
<tr>
<td>NHL</td>
<td>0.25</td>
<td>0.10-0.60</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Multivariate regression analysis was adjusted for age and gender
Reference category CD4+ T-cell count < 200 cells/mm³
prevalence among HIV-positive people remains high, despite the introduction of HAART to HIV-positive people with a CD4+T-cell count of < 200 cells/mm3 by state institutions across different provinces in April 2004.13,15 This study also found KS to be the most frequently diagnosed cancer (35.7%) amongst HIV infected people who had higher CD4+T-cell counts. Whether this high incidence of KS can be attributed to a possible immune reconstitution inflammatory syndrome (IRIS) or failure of HAART in these patients is not clear because the type of HAART regimen, the level of infection (CD4+T-cell count and RNA viral load count) as well as the time-frame between HIV diagnosis and the introduction of HAART to the patients could not be verified, leading to inconclusive results.

NHL was the second highest diagnosed cancer among HIV infected patients (34.2%). NHL is associated with a suppressed immune system in an individual. In one study three factors were significantly associated with the development of NHL in an individual namely: the age, the CD4+ T-cell count and no prior HAART.11 Studies conducted in Johannesburg, South Africa, found a strong association between HIV infection and NHL (OR = 5.0, 95%, CI = 2.7-9.5).17,18 Lymphoma cases studied from 2002-2009 in the Tygerberg area of the Western Cape, SA, were reported to be associated with HIV infection.19 The OR level at which an HIV infected person was associated with a diagnosis of NHL in this study was 0.25. Twenty-five of the 133 cases already on HAART had a CD4+T-cell count of > 200 cells/mm3. The increasing prevalence of cancer in resource-poor countries has been ascribed to the lack of sufficient HAART coverage in the population at risk for cancer, the type of HAART regimen provided or available in resource-poor countries and the higher prevalence of oncogenic viruses in these settings. These are possible reasons for the reduced impact that HAART has had in decreasing the rates of NHL and KS in Africa.20

OSCC (19.8%) was the third most commonly diagnosed cancer among HIV-positive patients in this study, but there was no significant correlation between that diagnosis and the CD4+T-cell count levels. Pro-oncogenic virus-related cancers and tobacco or alcohol-related cancers are common among HIV infected individuals because of the impaired immune surveillance.21,22,23,24 Missing information in the archives made it not possible to clarify how many of the OSCC cases in the current study were HPV-related or had a history of tobacco or alcohol usage. Only 5.4% of the HIV-infected individuals had a confirmed history of smoking and only 0.8% had a history of alcohol ingestion prior to diagnosis of the OSCC. The risk factors for developing OSCC among HIV infected individuals and the general population are the same and for this reason, OSCC has never been considered to be an ADC.25 In our study, OSCC was also not found to be an ADC.

The most involved sites for HNC in HIV-positive individuals were the larynx (19.2%) followed by the palate (16.5%) and the tongue (15.7%). In another study in South Africa laryngeal cancers were found only among 5.4% of HIV infected individuals.26 In Kenya, however, the larynx was reported as the most common site for HNC followed by the tongue, similar to the findings of the current study.38 The reasons for the varying anatomical sites from studies conducted in different regions of the continent are not clearly understood. Geographical location as well as socio-cultural practices among people from these regions could possibly explain the dissimilarity in location of the cancer in the head and neck area.29

More studies are indicated to evaluate why the incidence of KS and NHL is not decreasing in SA; and there is a strong need for a wider, more effective distribution of HAART therapy. Better surveillance systems as well as population-based cancer registries are vital for this to happen and should be integrated with established HIV programs in South Africa and sub-Saharan Africa as a whole. It would be wise, as strongly indicated by knowledgeable and scientifically sound opinion, to ensure that HIV tests with CD4+ T-cell counts and viral loads are secured with informed consent from suspected HIV infected patients, wherever they are treated. This will assist with future studies in this particular field and will also improve the quality of services aimed at controlling and reducing the number of cancer cases and resultant deaths among HIV infected people.

LIMITATIONS OF THE STUDY

The limitations of the study were related to missing data, particularly the serology results for confirmation of the HIV status of the case subjects. Also, it was not possible to ascertain the temporal relationship between the histologic diagnoses of HNC and the tests/results for CD4+ T-cell count, including the RNA viral load.

CONCLUSION

Despite HAART being available from SA state institutions, the most commonly occurring HNCs in this region among the HIV-positive patients from 2009 to 2013 were still Kaposi sarcoma and Non-Hodgkin’s lymphoma, both confirmed ADCs. These ADCs were diagnosed in patients with CD4+T-cell counts > 200 cells/mm3. The OSCC was found to be a NADC, and in this study was the third most commonly diagnosed cancer.

References


INTRODUCTION
Oral squamous cell carcinoma (OSCC) is a malignancy or cancer of the epithelial cell layer. The World Health Organisation (WHO) has defined cancer as the abnormal growth or division of cells beyond their normal anatomical boundaries, leading to invasion of other bodily compartments or organ systems, a progression known as metastasis. Two thirds of all OSCC cases documented in the world today present in advanced stages of the disease. Local recurrence of the disease is said to occur in up to 30% of cases; 10% of cases will experience regional recurrence and up to 20% of cases will experience distant metastasis.

In 2012 as many as 690 000 new OSCC cases were documented worldwide, 375 000 of these cases proving fatal, making up approximately 46% of total cancer mortality worldwide. Oral squamous cell carcinoma is considered the fifth most common malignancy known to man. Tobacco smoking and alcohol consumption form the two major causative factors in the development of OSCC. This disease shows a global prevalence for older Caucasian males over the age of 45 years. OSCC of the lip, tongue, oral mucosa and gingiva presents as a major health problem. Whilst the incidence, mortality and the site may vary widely from one geographical region to the next, the tongue remains the most commonly affected site.

Identifying risk factors such as betel quid chewing, chronic exposure to sunlight or chemical pollution within our population group, may provide an idea of their contribution to the occurrence of OSCC.

Current literature indicates that OSCC of the lip has a 95% five-year survival rate with the prognosis of lateral/ventral tongue lesions being half as good with a 45% five-year survival rate. Over the past several years there has been a significant decrease in the occurrence of OSCC in the USA and Canada and a marked increase in regions such as Portugal, France, Hungary, South America and South-east Asia. One may possibly attribute this effect to more stringent tobacco and alcohol laws implemented in the US and Canada as well as heightened awareness of risk factors. In contrast, many Eastern European countries have experienced steadily increasing tobacco and alcohol sales. There has been a marked rise in young smokers and in binge drinking since the 1980s, which is postulated to have played a significant role in the development of OSCC. Indeed, Eastern Europe has been shown to have an increased number of new OSCC cases compared with Northern and Southern Europe.

This figure is closely followed by the incidence in South American populations, particularly Brazilian, Argentinean and Uruguayan males, who have the third highest prevalence for OSCC than do Greeks. The literature shows that 25% of all new OSCC cases worldwide originate in India. This figure is closely followed by the incidence in South American populations, particularly Brazilian, Argentinean and Uruguayan males, who have the third highest prevalence for OSCC after India and France. South-east Asia and India together contribute well over 100 000 cases of OSCC per year, this being from amongst a population of over one billion citizens, all of whom are exposed to similar risk factors. A Libyan epidemiological study showed a mean occurrence of OSCC in males in the fifth and sixth decades of life, with the floor of the mouth being mostly affected. Africa has produced sparse literature on the prevalence of OSCC. A publication on the occurrence of OSCC in Sudanese civilians, however, showed a high prevalence rate.

Two thirds of OSCC cases occur in developing countries, which may have conditions and problems not shared in many First World settings. As one of the leading African countries, South Africa should be basing health care protocols on local occurrences and...
statistics rather than those obtained from other countries which may have vastly differing dynamics. Accordingly, it would be wise to redirect efforts to achieve goals specific to the needs of the country. Understanding socio-economic, epidemiologic and pathognomonic parameters of disease patterns in our population will ensure a distinct advantage in dealing with major health care problems such as oral cancer.

This study was conducted to address the relative paucity of information in South Africa. Characterization of OSCC in the country will provide information as to who is most at risk, and that data could then inform intervention policies at all levels.

**MATERIALS AND METHODS**

**Study design and sample**

This research was designed as a retrospective study which reviewed data held within the Department of Oral Medicine and Periodontology, University of the Witwatersrand, South Africa. One hundred and seven archived files from the years 1990 -2010 were analysed.

**INCLUSION CRITERIA**

All cases of patients having histologically confirmed OSCC lesions between 1990 and 2010 were included.

**ETHICAL CONSIDERATIONS**

Ethical clearance was granted by the Wits Human Ethics Research Committee Number: M140654.

**METHOD**

A retrospective review of archived OSCC cases files between 1990 and 2010 was performed. Demographic, clinical and histological data such as age, gender, race, anatomical site of occurrence, alcohol consumption, smoking as a habit, snuff use, systemic diseases, lymph node involvement, size of lesion and histological differentiation were obtained. Anatomical sites of the lesion were classified as described by the International Statistical Classification of Diseases, which covers cancer of the tongue, gingivae, floor of the mouth, palate, and other unspecified parts of the mouth as well as related health problems.

The degree of histological differentiation was classified as well differentiated (WD), moderately differentiated (MD), or poorly differentiated (PD), according to the guidelines of the World Health Organization (WHO). 

**DATA COLLECTION**

The data were collected utilizing prepared record sheets and were tabulated prior to entering them onto an Excel spreadsheet, severally categorized as age, gender, smoking, alcohol consumption, snuff use, dietary deficiencies, site and lymph node involvement. Two other categories were added for statistical benefit which included ‘incomplete available clinical data’ and ‘no identifiable risk factors’. Given the relatively small sample size anticipated for the study, it was decided that the focus should be on descriptive analysis. Univariate statistics such as the mean, standard deviation, median, interquartile range for continuous variables, percentages and frequency distributions for categorical variables were to be calculated for all key variables.

For further analysis, continuous variables (e.g. age, size of lesion) were organised into clinically meaningful categories of five-year periods to analyse trends: The mean age of the patients was 56.3 years (SD 11.9y; range 24-79y; median 57.5y, interquartile range 50-64.5y).

The number of patients presenting with OSCC appeared to have increased in the last decade of the study period.

Males dominated the study group at 73.8% and the majority of the patients (60.0%) were black (Fig. 1). 

**Figure 1:** A graphical representation of the percentage of patients presenting with OSCC as a function of race.

**Risk Factors:**

It was noted that 45.0% of the patients reported alcohol use (Fig2I).

**Figure 2:** A graphical representation of percentage of patients presenting with OSCC as a function of alcohol use.

A considerable majority of the patients (72.5%) admitted to being current smokers. This variable was categorised as light smoking (<10 per day) or heavy smoking (>= 10 per day), the latter comprising 53.5% of cases. One patient (1.3%) reported snuff use. Low calorie intake was reported in 5.0% of the study group (within the limitations of a record review). In 41.2% of the sample, systemic abnormalities or diseases were noted.

**PRESENTATION / CHARACTERISTICS:**

The greater proportion of patients in the sample had one (43.8%) or two (38.8%) affected sites. The floor of the mouth was most frequently involved in 60.0% of cases (Fig. 3). (Note that percentages do not sum to 100% since some patients had more than one site affected.)

The majority of patients (70%) had moderately differentiated lesions (Fig4).
In 43.8% of the patients, lymph node involvement had occurred. The submandibular lymph node was most frequently affected (91.4% of patients) (Fig. 5). (Note that percentages do not sum to 100% as some of the patients had more than one site affected.)

**DISCUSSION**

Oral squamous cell carcinoma is considered the fifth most common malignancy known to man. Tobacco smoking and alcohol consumption are the two major causative factors especially in Caucasian males over 45 years old. The tongue remains the most commonly affected site.

This study set out to analyse and compare the data captured from patient files over a 21 year period from 1990-2010 in an effort to characterise the patients who had presented to the Department of Oral Medicine and Periodontology with OSCC. This information is essential to the understanding of the demographics of this geographical region and will assist in improving current management. Comparison will be enabled with documentation of the disease in the rest of the world.

This study found the average age of the sample to be 56.3 years, confirmed that the most affected individuals are males (73.8%) with the majority of lesions occurring on the floor of the mouth (60%). These data concur with global figures quoted by Ferlay et al. 2012 and by Scully et al. 2009.

Contrary to the findings published by Boudewijn et al. in 2014, the current study concluded that the most typical race affected was Black and not Caucasian. This may have been expected, considering the population ratio in the region. The fact that alcohol and smoking were implicated in 45% and 72.5% of cases in the two groups respectively, reiterate their significance as risk factors in the aetiology in OSCC development and aligns this study with similar views held by Jaber et al. in 1998 and by Scully et al. 2009.

The mean size of the lesion found on initial presentation was 915 mm² (30x30mm). Since two thirds of all lesions reported worldwide presented in advanced stages, as observed by van der Waal 2013 and by Bodner 2014, it is not unexpected that the majority of cases in this study were rather large moderately differentiated tumours (70%). There was lymph node involvement in 43.8% of cases, with the submandibular lymph node being the most commonly implicated (91.4%). It may be relevant that 43% of cases presented with a single site of involvement, whereas 38.8% of cases were found to have two or more sites involved. These sites may have been independent OSCC tumours or, more likely, secondary field tumours.

The proportion of small lesions decreased over time, while that of lesions sized between 101 and 1000 mm² increased (Fig. 6).

The proportion of small lesions decreased over time, while that of lesions sized between 101 and 1000 mm² increased over the 21-year period. This finding may be associated with poor access to health care facilities causing patients to allow lesions to increase in size before the condition clamoured for attention and treatment was sought. Another possibility may be the implication of HIV in OSCC progression. Oral squamous cell carcinoma is already classified as an HIV associated malignancy along with Kaposi’s sarcoma and lymphoma. Further research is required to accurately assess the influence of HIV on OSCC progression in South Africa.
Of relevance may be the fact that this study revealed that 5% of the patients reported low calorie intake. Whilst this may have been caused by an underlying issue it may have been a secondary outcome of an inability to consume food effectively due to pain or tumour size. Malnourishment, as stated by Pavia et al.\textsuperscript{16} plays a major role in OSCC development. Although the incidence of specific systemic diseases was not measured in this study, 41.2\% of cases presented with one or more systemic disease or abnormality. These ranged from acquired to genetically predisposed congenital conditions which may or may not have affected the development of OSCC in this population group. This study found that OSCC occurrence increased with age (Fig. 7). Similar findings have been reported in the literature, a study carried out in Rio de Janeiro reporting that approximately 50\% of all the cases assessed were in age categories above 60-years old.\textsuperscript{19}

**CONCLUSIONS.**

This study suggests that there is delayed recognition of the condition, possibly because the medical and dental professionals in our region are not adequately addressing the progressive disease process in OSCC and/or patients are ignoring the early signs and taking longer to present to health care facilities, which may be compounded by a lack of patient education. As clinicians we are obligated to introduce regular and thorough screenings for OSCC. More research is required into the exact contributory role of HIV/AIDS and other systemic diseases on the rate of progression and increased lesion size of OSCC. These findings may direct management protocols in health care clinics as the results of the study speak strongly to the need for early diagnosis and a rapid transition to the management/treatment phases of intervention to improve outcomes.

**References**

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Epidemiology of maxillofacial fractures at two maxillofacial units in South Africa

ABSTRACT

Aim
To compare epidemiologic characteristics of maxillofacial fractures seen in patients presenting at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) with those seen at Polokwane – Mankweng Hospital Complex (PMHC).

Objective
To compare the patterns; aetiology and incidence of maxillofacial fractures between the two units.

Materials and Methods
Cross sectional study of 194 patients with 226 maxillofacial fractures reported and treated at either CMJAH or PMHC between December 2013 and August 2014. Variables recorded include: age; sex; socioeconomic status; population group; aetiology; time of injury; identity of assailant (if known), the site of the fracture and associated injuries.

Results
Of the total number of patients (194), 82% were male. The majority (75%) were in the age group of 20-39 years with a peak frequency in the 3rd decade. Assaults were by far the leading cause of maxillofacial fractures (60.3%), followed by road traffic accidents accounting for 17.5%. Most (65.5%) were sustained at night. The mandible was the most frequently fractured facial bone (73.0%), followed by the zygoma.

Conclusion
Interpersonal violence is by far the leading cause of maxillofacial fractures in both units. The general pattern of maxillofacial fractures was the same in both settings, and the differences in numbers reflect the relative population sizes.

INTRODUCTION
Maxillofacial fractures are frequently encountered because of the prominence and accessibility of the face in situations of violence. In almost all instances of this mishap, the attention of maxillofacial surgeons is sought. The global incidence of maxillofacial fractures is related to a variety of factors such as sex, age, level of industrialisation, socioeconomic status, geographical location and seasonal variations. Several studies have reported the peak age for the incidence of maxillofacial fractures to be 20-39 years, whilst others found the peak age to be in the fourth decade of life. There are numbers of reports in the literature regarding multi-system trauma and facial fractures. Injuries to other parts of the head are commonly associated with facial fractures, which can also be markers for brain injury. A survey conducted in Kaduna, Nigeria, by Ajike et al. (2005) found an 8.5% concomitance of head injuries and that of these, orthopaedic injuries accounted for the majority (67.10%).

The reported causes of maxillofacial trauma include assaults, motor vehicle accidents, falls, gunshot wounds, sport related injuries, industrial injuries and animal attacks. Interpersonal violence is the most common cause of maxillofacial injuries, and there is a decrease in injuries caused by motor vehicle accidents. However, studies on paediatric maxillofacial trauma report falls as the most common cause of maxillofacial injuries. In contrast Van As et al. reported that falls accounted for 19% of facial fractures of 107 children treated at the trauma unit, an incidence closely equal to the 22.3% reported by Ajike et al. Aetiologic factors may differ within the same country. Boffano et al. showed that in Oslo (Norway) assault-related maxillofacial fractures were the most common while in Bergen (Norway) they were the least frequent.

Most studies showed that maxillofacial fractures are more common in males than in females. The highest reported male-to-female ratio is 6:18 while the is lowest 1:6.1 Women in developed countries participate directly in social activities and are thus more susceptible to traffic accidents and urban violence. Facial injury rates in these women are more common than those in developing countries,
showing that certain socioeconomic conditions contribute to a high rate of maxillofacial fractures.¹⁵,¹⁸,¹⁹

International trends show that mandible is the most commonly affected facial bone,²³⁴,¹⁰,²² although a Portuguese study found the naso-orbito-ethmoid complex to be the most affected region (67.46%) followed by the maxilla (57.42%).¹³ These findings are, however, in contrast with those reported by Gupta et al. who recorded the zygoma as the most affected maxillofacial bone, followed by the mandible.² Schneider et al. agreed that zygomatic fractures were the most common, with orbital and mandibular fractures occurring less frequently.²³ The mandible was identified by Bofano et al. as heading the list, with condylar, then angle and body fractures being found in decreasing frequency.²¹ The site of mandibular fracture is related to the different aetiological agents responsible for causing the fractures. Violence accounts for mainly body and angle fractures, whereas motor vehicle accidents incur mostly symphyseal and parasymphyseal fractures.²¹,²²

There have been a number of epidemiological studies of maxillofacial fractures, mostly completed in metropolitan cities of South Africa,⁶,¹¹,²² but no similar studies have been conducted in the rural provinces. The aim of this study is to analyse and compare the epidemiologic characteristics of maxillofacial fractures amongst affected patients presenting at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH), which is in Johannesburg, compared with those presenting at Polokwane-Mankweng Hospital Complex (PMHC), which is in the mainly rural province of Limpopo.

MATERIAL AND METHODS

This is a cross-sectional study of patients who presented with maxillofacial fractures to the Maxillofacial Units of CMJAH and of PMHC. The study was conducted from December 2013 to August 2014. In both units the patients were assessed clinically and radiographically by consultants. Variables recorded on the data collection sheet were: age; gender; socioeconomic status (i.e. employed or unemployed); population group; cause of trauma; time of injury, identity of assailant (if known) and relationship with the patient. The anatomic sites of the fractures and associated injuries were recorded. Patients were not included in the study if they were not willing to participate, presented with maxillofacial fractures secondary to pathological lesions or had isolated soft tissue injuries.

Data was analysed with Statistica (version 12.5). Frequencies and percentages were used to describe categorical variables while continuous variables are presented as means and standard deviations. The Student t-test was used to assess any differences between means. Differences in proportions and relationships between categorical variables were assessed using the Chi-squared test. The significance level of the tests was a p-value less than 0.05.

Ethical clearance (M130842) for this cross sectional study was obtained from the Human Research Ethics Committees (Medical) of both the University of the Witwatersrand and the University of Limpopo, Polokwane Campus. Informed consent was obtained from each patient for their inclusion in the study.

RESULTS

Demographic data

In a period of nine (9) months, data from a total of 194 patients with 226 fractures from both units were recorded and analysed. Of these patients, 128 (66.0%) patients with 155 (68.6%) fractures were from CMJAH and 66 (34.0%) patients with 71 (31.4%) fractures were from PMHC (Fig 1).

One hundred and fifty nine (82.0%) patients were males and 35 (18.0%) were females, giving an overall male to female ratio of 4.5:1. Of the 159 male patients, 107 (67.3%) were from CMJAH, and 52 (32.7%) were from PMHC, constituting 78.8% of patients from that unit. Thirty five patients were females, twenty one (60%) of these patients being from CMJAH, comprising 16.4% of patients and 14 (40.0%) were from PMHC, contributing 21.2% of patients. There was no significant difference (P=0.410) in proportions of the female patients between the two units (Fig 2).

EMPLOYMENT STATUS

Overall, 84 (43.3%) patients were employed and 110 (56.7%) were unemployed. In the CMJAH sample, 57 (44.8%) patients were employed and 70 (55.2%) patients were unemployed. In the sample from PMHC, 27 (40.0%) patients were employed and 40 (60.0%) patients were unemployed, with the unemployment rate being higher than overall rate. This rate, however, was not statistically significant (p=0.6790).

TIME OF INJURY.

One hundred and twenty seven (65.5%) patients sustained injuries during the night, while 66 (34.0%) patients suffered maxillofacial fractures during the day. This variable was not recorded in one patient (0.5%) from CMJAH. This difference between the samples in times of injury was statistically significant (p=0.0017).

POPULATION GROUP

The majority (91.1%) of patients were blacks (Africans), 3.6% were whites and 5.2% were of other groups. Amongst the sample from CMJAH, blacks constituted 87.5% of patients; 5.5% patients were whites and 7.0% were others. In PMHC, there was a significantly higher proportion (98.4%) of black patients than in CMJAH (P=0.011),
and the remaining 1.6% patients were members of other population groups.

**AETIOLOGY OF MAXILLOFACIAL FRACTURES**

The combined data show that assaults (60.3%) accounted for the majority of fractures, followed by motor vehicle accidents (MVA) accounting for 17.5%. The contribution of other aetiological factors was as follows: pedestrian vehicle accidents 7.5% (PVA), falls 4.6%, gunshot wounds 4.1%, others 3.1%, sport injuries 2.6%, while industrial injuries accounted for the least number of fractures at only 0.3%.

In both units, assaults were the most common cause, accounting for 33.0% of the fractures in the PMHC group and 64.1% fractures in the sample from CMJAH, a rate slightly higher than the overall percentage (60.3%). Motor vehicle accidents followed with 22.7% in PMHC, a rate higher than the CMJAH figure (14.8%) and the overall rate (17.5%). However, no statistically significant differences (p=0.167) were detected when the data from the two units were compared. Pedestrian vehicle accidents accounted for 8.6% of maxillofacial fractures at CMJAH, a rate higher than PMHC (4.5%) and also of the overall rate of 7.5%. Gunshot wounds accounted for 5.5% at CMJAH, a rate higher than that seen at PMHC (1.5%) and also higher than the overall rate of 4.1%. Falls accounted for 6.1% of maxillofacial fractures at PMHC, a frequency higher than the CMJAH sample (3.9%) and the overall rate (4.6%). More patients (6.1%) sustained maxillofacial fractures due to sport injuries in the PMHC group than patients (0.8%) at CMJAH, with a significant difference (p=0.028) in these data between the two units. The one patient who sustained maxillofacial fractures due to industrial injury was recorded from CMJAH. Other aetiological agents accounted for 6.1% maxillofacial fractures in the PMHC data and 1.6% amongst the presentations at CMJAH (Figure 4).

**RELATIONSHIP OF ASSAILANT TO PATIENT.**

Of the one hundred and sixteen patients who sustained maxillofacial fractures due to assault, 57.1% knew their assailants. This was the case for 43 CMJAH patients (53.1%) but 38 patients did not know the perpetrators. Amongst the PMHC patients only 17 (48.6%) knew their assailants.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Relationship of known assailant to patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assailants</td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>CMJAH</td>
<td>PMHC</td>
</tr>
<tr>
<td>Partner</td>
<td>4 (9.3)</td>
</tr>
<tr>
<td>Family member</td>
<td>8(18.6)</td>
</tr>
<tr>
<td>Friend</td>
<td>3(7.0)</td>
</tr>
<tr>
<td>Not related (known)</td>
<td>28(65.1)</td>
</tr>
</tbody>
</table>

Analysis of the responses of the 60 patients who knew their assailants revealed that 9.3% from CMJAH and 11.8% from PMHC were assaulted by their partners. Ten patients, 18.6% from CMJAH and 11.8% from PMHC were assaulted by family members. Five patients, 7.0% from CMJAH and 11.8% from PMHC were assaulted by friends. Thirty-nine patients, 65.1% of those from CMJAH and 64.7% of those from PMHC, were assaulted by assailants known to them but not related.

**THE FRACTURE PATTERNS**

In the total sample, a high proportion (73.0%) of fractures occurred in the lower third of the face, followed by middle third of the face (19.0%), multiple sites (7.0%) and upper third of the face (1.0%), (Figure 5).

**LOWER THIRD FRACTURES**

Of the 141 mandibular fractures, an angle of the mandible was the most commonly affected site at both hospitals, (35.5%) angle fractures from CMJAH and 33.8% from PMHC, followed by the mandibular body (25.7%). When comparing the proportions of mandibular body fractures between the two units, the difference was found to be statistically significant (p=0.002).

Symphyseal fracture constituted 13.7% of all mandibular fractures, the majority (15.5%) of which were recorded at CMJAH and only 9.9% in PMHC. A significantly higher proportion (p=0.0002) of parasymphysial fractures (11.9%), were seen at PMHC (23.9%) as compared with the attendances for this problem at CMJAH (6.5%). Condylar fractures made up 11.1% of the total, contributing 15.5% to all fractures seen at PMHC and 9.0% at CMJAH. Much less frequent were dentoalveolar (1.8%), all four fractures being from the PMHC sample. Involvement of the coronoid process was recorded only once at each hospital (0.9%).

**MIDDLE THIRD FRACTURES**

Table 2 below shows a comparison of the frequencies of middle third fractures between the two units. Overall, the broken zygoma was the most (28.1%) common midface fracture. When comparing the two units, a statistically significant higher proportion (42.4%) of middle third fractures was noted to have involved the zygoma at CMJAH than the 12.9% occurrence at PMHC (p=0.0087). At PMHC, 25.8% of middle third fractures were on the dentoalveolar region. These fractures accounted for only 18.2% of middle third breakages at CMJAH, and no significant differences were demonstrated (p=0.462) between these data. There is, however, a significant difference (p=0.0010)
when comparing the number of orbital fractures recorded at CMJAH (12.1%) and at PMHC (29.0%). Le Forte I and zygomatic arch fractures accounted 7.8% each of the total number of fractures of the middle third of the face. Comparison of the data for Le Forte 1 fractures did not reveal any significant differences. There was also no significant difference (p=0.0618) when comparing the proportions of nasal bone fractures between CMJAH (9.1%) and PMHC (13.0%). Le Forte II fractures accounted for 3.15% of those occurring in the middle third, and all these were recorded at PMHC.

### Table 2 Distribution of fractures affecting the middle third of the face

<table>
<thead>
<tr>
<th>Site</th>
<th>Frequency(Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zygoma</td>
<td>14(42,4) 2(6,1)</td>
</tr>
<tr>
<td>Dentoalveolar</td>
<td>6(18,2) 8(25,8)</td>
</tr>
<tr>
<td>Le Forte I</td>
<td>4(12,1) 1(3,2)</td>
</tr>
<tr>
<td>Orbital fractures</td>
<td>4(12,1) 9(29)</td>
</tr>
<tr>
<td>Nasal bone</td>
<td>3(9,1) 4(13)</td>
</tr>
<tr>
<td>Zygomatic arch</td>
<td>2(6,1) 3(9,7)</td>
</tr>
<tr>
<td>Le Forte II</td>
<td>0 2(6,5)</td>
</tr>
</tbody>
</table>

### UPPER THIRD FRACTURES

In this sample, frontal fractures accounted for only 1.0% of the total fractures in both units. There was no significant difference (p= 0.088) in the occurrence of the problem between CMJAH (1.6%) and PMHC (6.1%).

### MULTIPLE FRACTURED SITES

Multiple fracture sites accounted for 7.0% of the total 227 fractures. The difference of the frequencies between CMJAH (5.5%) and PMHC (9.1%) was not statistically significant (p= 0.346).

### DISCUSSION

The aim of this study was to analyse and compare epidemiologic characteristics of maxillofacial fractures between CMJAH, which is in Johannesburg and PMHC, which is in a mainly rural province of Limpopo. There have been a number of epidemiological studies of maxillofacial fractures completed mostly in metropolitan cities of South Africa, but no similar studies were undertaken in rural provinces. Understanding the patterns helps in determining the level of skills required in both provinces and will assist in the planning for maxillofacial services.

The patterns of maxillofacial fractures between the two units seem to be the same albeit the notable differences in the number of cases consulted in that period. This statistically significant difference in numbers of patients with maxillofacial fractures in the two units is attributed to differences in population sizes in the two provinces. The outcomes of this study do not concur with Al-Dajana et al. who found that most maxillofacial injuries were recorded from the rural counties in Antanario.4

In this study, more than 80.0% of the total study population were males and over 70.0% were between the ages of 20-39 years. These findings were in agreement with results from other studies. The possible explanation for this finding is because these individuals are in active phase of life, and frequently take part in dangerous exercises and sports, drive motor vehicles carelessly and are more engaged in outdoor activities which are the leading causes of maxillofacial trauma. Anecdotal evidence suggests that there are high levels of irresponsible use of alcohol in this age group as well.

Gupta et al. in 2009 maintained that prevailing socioeconomic, cultural and environmental factors, from one country to another and even within the same country, are the cause of variations in the aetiology of maxillofacial trauma. However, noted in this study are the critical issues that firstly, employment status is not a contributing factor in victims of trauma, and secondly, that most maxillofacial fractures occur in the evenings. This latter finding concurs with Al-Dajana et al. who found that most maxillofacial injuries occur at evenings, weekends and during summer. This suggests that people who socialise together in high risk geographical areas and in the evenings are more likely to sustain maxillofacial injuries irrespective of the employment status.

This study found that black Africans were the most common victims of maxillofacial injuries. This is a reflection of demographics and of the socioeconomic situation in the country, as these units are public hospitals which are used by people without medical insurance.

Assaults (60.3%), followed by road traffic accidents (17.5%) were the leading causes of maxillofacial fractures identified in this study. This concurs with some studies which reported assaults as the leading cause of maxillofacial fractures, but differ with several investigations which have found road traffic accidents to be the most common cause of maxillofacial fractures in developing countries. The current study found that a slightly higher proportion (64.1%) of fractures due to assaults was reported at CMJAH, while most maxillofacial fractures from road traffic accidents were from PMHC (22.7%). The higher numbers due to assaults in Johannesburg could be attributed to crowding and the challenging crime rate of that region, which contribute to interpersonal violence. Anecdotal evidence suggests that many people in rural provinces tend to use public transport, like buses, where a single accident can result in many casualties. It can also be postulated that the low proportion of maxillofacial fractures due to road traffic accidents in the Johannesburg region may be attributed to good quality roads and visible policing.

Another relevant finding was that there was a statistically significant difference (p = 0.028) between the two units of the proportions of patients who sustained maxillofacial fractures due to sport injuries. More patients (6.1%) reported at PMHC with sport-related injuries than at CMJAH (0.8%). This could be attributed to inadequate recreational facilities and fewer sporting codes in the rural province as opposed to Johannesburg. It is general knowledge that soccer and boxing are some of the more risky sporting codes in terms of exposing patients to maxillofacial fractures. Unfortunately, these are the most accessible sports in Limpopo.

A significant number of patients (64.9%) who sustained maxillofacial fractures due to assault knew their assailants, although they were not related to them. This finding suggests that violence resulting in maxillofacial trauma mostly affects individuals living in the same geographical area or socialising together. Unfortunately, this study did not determine whether these known assailants were reported to the law enforcement officers.

The mandible was the most affected site of the face accounting for 73.0% incidence in the total study population, followed by the zygoma. This concurs with other studies on maxillofacial trauma. These results are however in reverse with those reported by Gupta et al. in 2009 where zygoma was the most affected maxillofacial bone, followed by the mandible. The reason for the preponderance of the mandible as the commonly affected bone in maxillofacial trauma is because of its prominence, mobility and its selection as a target of intentional violence. Whilst the mandible is overall a strong bone, it nevertheless has several areas of weakness that are prone to fracture.

The angle of the mandible was the most (35.0%) commonly affected site in this study population (Figure 9). This does not agree with the European survey which reported the condyle as the most commonly affected part of the mandible, followed by the angle. The majority of the fractured body and angle of the mandible were recorded on the right side, as opposed to studies where assault resulted in left side facial injuries. This finding suggests that probably most patients were assaulted from behind, or while running away from imminent danger or were kicked.

This study found that the CMJAH patients had a greater number of patients with zygomatic fractures due to road traffic accidents than did those at PMHC. This difference between the two units was
statistically significant (p=0.0087). This association of zygomatic fractures with road traffic accidents has been reported in other studies, and points to possible failures to comply with traffic rules as these injuries suggest that seatbelts are not being used while driving.

This study shows that the patterns of trauma in the two regions are the same, and that any differences reflect the relative total population sizes in the two regions. The limitation of the study is the small sample size. The maxillofacial surgeons diagnosing the fractures were not calibrated. Future multicentre studies with large sample sizes will give better perspectives of the patterns of trauma in rural and urban areas.

References

ABSTRACT

Introduction
Musculoskeletal pain (MSP) is a public health concern that affects millions of people in developed and developing countries. The consequences of MSP include a wide range of negative effects such as absenteeism, increased work restriction and reduced productivity.

Aim
To determine the prevalence and factors associated with musculoskeletal pain among oral health workers in public health facilities in KwaZulu-Natal.

Methods
An observational, cross-sectional study with an analytical component was implemented. Self-administered questionnaires were utilized to determine the risk factors among dentists, dental specialists, dental therapists, oral hygienists, and dental assistants employed in the public sector in KwaZulu-Natal. Descriptive and inferential statistics were used to analyse data. Alpha level was set at p<0.05.

Results
The prevalence of current MSP among oral health workers (OHW) was 50.9% and the chronic prevalence of MSP reported for the previous 12 months was 60.6%. A higher prevalence of current (47.2%) and chronic (46.9%) MSP was reported among dentists when compared with dental specialists, dental therapists, oral hygienists, and dental assistants. Occupational, environmental, and psychological factors were strongly associated with MSP.

Conclusion
MSP is an occupational hazard for OHW. There is a need for educational programs and adoption of strategies to reduce occupational injuries.

INTRODUCTION
Musculoskeletal pain (MSP) is a public health concern that affects millions of people in developed and developing countries.1-5 MSP may originate from any part of the musculoskeletal system (MSS) such the muscles and bones.2-3 Current MSP is pain lasting less than six weeks and chronic MSP is pain lasting for more than three months.2-3 The most common types of MSP affecting oral health workers (OHW) are lower back pain (LBP), neck, shoulder, hand, and wrist pain.4-9 OHW include dentists, dental specialists, dental therapists, oral hygienists, and dental assistants.

In 2015, musculoskeletal pain affected over 94 million people globally resulting in disability.1 The overall global prevalence of low back pain (LBP) was 17.2%, and neck pain was 21%.7 From 2005 to 2015, LBP and neck pain were the leading causes of years lived with disability globally.1 MSP is reported to have a significant impact on quality of life as a result of pain and discomfort experienced by sufferers1-5 and has a range of negative effects which include absenteeism, increased work restriction and reduced productivity.8,10 Moreover, MSP-related disorders place a huge burden on health care resources, including hospitalization and other additional costs on medical bills.8,9

In Africa, 14% to 72% of people were reported to be affected by MSP in 2000.12,13 Health care workers, in particular nurses, experience occupation-related MSP rates similar to those suffered by OHW. The prevalence of MSP among nurses in Africa ranges from 65.4% to 80.8%.14,15

ACRONYMS

BMI : Body Mass Index
CHC : Community Health Centres
KZN : KwaZulu-Natal
LBP : Lower back pain
MSP : Musculoskeletal pain
MSS : Musculoskeletal system
OHW : Oral health workers
OMPQ : Orebro Musculoskeletal Pain Questionnaire

KEY WORDS
Musculoskeletal pain, prevalence, work-related, oral health workers, risk factors, dentist, dental therapist, oral hygienist

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Musculoskeletal pain is a major threat in the workplace among OHW. The key occupational risk factors for OHW are ergonomic stresses, job organization, improper work design, poor working conditions, anxiety, depression, and stress. Studies that have been identified from South Africa focus mainly on OHW in the public sector. The prevalence and risk factors of MSP among OHW in the public sector remain unclear. The conditions of service, and the environmental factors affecting, OHW in South Africa differ for public sector employees compared with their private sector counterparts. Hence, it will be relevant to investigate the prevalence and factors associated with MSP among OHW in the public sector.

The study sought to assess the prevalence of MSP among OHW in the public sector in KwaZulu-Natal (KZN). It investigated the risk factors associated with MSP experienced by OHW. Understanding and identifying the risk factors will help in the provision of appropriate interventions such as education programmes and training on the ergonomics of practice, intended to reduce the incidence of MSP.

METHODS
An observational, cross-sectional study design with an analytic component was implemented. The study was conducted on OHW in all public health facilities in KZN. The sample included dental departments at clinics, community health centres (CHC), and hospitals. Ethical approval to conduct the study was granted by the UKZN Postgraduate Research and Higher Education Committee, Biomedical Research Ethics Committee (BREC (BE374/15) and the KZN Provincial Department of Health- Health Research & Knowledge Management (HRKM) (HRKM374/15 KZ_2016RP49_761) granted ethics approval as well.

All dentists, dental specialists, dental therapists, oral hygienists, and dental assistants working in the public sector for at least one year were invited to participate. Purposive sampling was used. All OHW who met this criterion (n = 320) were sent a questionnaire via email, and reminders were emailed every six weeks over a period of four months; those who had not by then completed the questionnaire were contacted by telephone.

A standardized self-administered questionnaire was used to determine the prevalence of MSP and its associated risk factors. The questionnaire was modified from the Dutch Musculoskeletal Questionnaire and the Ourebro Musculoskeletal Pain Questionnaire (OMPQ). The questionnaire was pre-tested through a pilot study to ensure that it was user-friendly. For the pilot study, ten OHW were randomly selected from the Gauteng public sector. The variables measured in the questionnaire included personal factors, occupational, and environmental factors, history of any MSP, and psychological factors.

The data were captured into a Microsoft Excel spreadsheet and were then exported to STATA 13. The statistical tests performed were the Chi-square test and logistic regression reporting odds ratios. All questionnaires having missing or incomplete data were omitted.

RESULTS
A total of 320 questionnaires were administered, of which 266 were adequately completed, yielding an 83% response rate. Participants in this study comprised dentists (40.6%), dental assistants (33.5%), dental therapists (13.9%), oral hygienists (9.8%) and dental specialists (2.3%). Their average age was 34 years (standard deviation = 10.12). Most of the participants were female (71.4%), aged between 20-29 years (41.7%), with normal BMI (39.1%). The majority of OHW had worked in the dental department (74.1%) and public sector (71.8%) for less than 10 years (Table 1).

The prevalence of current MSP among OHW was 50.9% and the prevalence of chronic MSP reported for the previous 12 months was 60.6%. A higher prevalence of current (47.2%) (p = 0.01) and chronic (46.9%) (p < 0.001) MSP was reported among dentists when compared with dental specialists, dental therapists, oral hygienists, and dental assistants. There were significantly increasing odds of the participant who reported having MSP being a dentist (current MSP OR: 2.12; 95% CI: 1.18-3.82; chronic MSP OR: 3.63; 95% CI: 1.86-7.09).

Whilst obesity was significantly associated with chronic MSP (p = 0.03; OR: 0.47) the odds of obese persons actually being affected by chronic MSP were low (Tables 2 and 3).

Overall, the most common areas of pain reported for current MSP were: lower back (n = 154, 48.1%), neck (n = 155, 48.4%), shoulder (n = 152, 47.5%), and upper back (n = 152, 47.5%). Chronic MSP affected most commonly the neck (n = 185, 57.8%), lower back (n = 183, 57.2%), and shoulder (n = 181, 56.6%) areas (Figure 1). The most severe levels of pain experienced by OHW were reported as located in the hand, wrist and forearm.

Amongst the OHW who had worked in the dental departments for 1-10 years, 69.3% reported current and 72.7% reported chronic MSP. There was a significant association between working in the dental department for 11-20 years with current (p = 0.01) and chronic (p = 0.01) MSP. Working in a health facility, whether provincial (current: p = 0.001; chronic: p = 0.01) or district (current: p = 0.01; chronic: p = 0.03) was found to be associated with MSP (Tables 4 and 5).

Among workplace factors, standing and working (p = 0.001), working in the same position (p = 0.05), and reaching/working away from the body (p = 0.001) were significantly associated with current MSP. In addition, participants who felt rushed to complete patients for the day (current MSP: OR: 4.10; 95% CI: 2.05 to 8.20; chronic MSP: OR: 2.79; 95% CI: 1.39 to 5.65) and those experiencing trembling during working (current MSP: OR: 2.77; 95% CI: 1.45 to 5.30; chronic MSP: OR: 2.15; 95% CI: 1.09 to 4.24) showed significant associations with MSP (Tables 6 and 7).

Sitting and working (p = 0.01) and carrying/lifting or moving heavy materials or equipment (p = 0.03) were shown to be associated with chronic MSP. Working in a cramped/awkward space showed a significant association with current (p = 0.01) and chronic (p = 0.03) MSP.

Several psychosocial factors were considered and a significant association was found between those suffering with mild levels of anxiety and current MSP (p = 0.05). Anxiety and depression during the day were experienced by 51.5% of participants and there was a significant association (p = 0.01) with current MSP (Table 8).

DISCUSSION
This study assessed the prevalence and risk factors associated with MSP among OHW working in public health facilities in KZN. The prevalence of current MSP was 50.9% and chronic MSP was 60.6%, which is consistent with previous studies conducted among OHW (54.2 – 99.1%) in South Africa. Dentists in the current study were found to have the highest prevalence of MSP when compared with dental specialists, dental therapists, oral hygienists, and dental assistants. A statistically significant positive association was found between being a dentist and current and chronic MSP. These findings are similar to the prevalence appearing in a study undertaken among private dentists (54.26%) in KZN. The higher prevalence of MSP among dentists in the current investigation could be a result of the nature of the dental procedures they are expected to perform, which include tooth extractions, scalings and restorations, as well as the high volume of patients seen in most public health facilities. A study in Poland found that 63.6% of dentists who performed dental procedures could lead to the development of MSP.

In South Africa, there is one dentist for every 50,000 people, which places a great burden on public sector dentists. Public sector OHW in Saudi Arabia attending to many patients in the day reported a higher prevalence of MSP compared with those attending to fewer patients.

A majority of female participants suffered from current MSP (69.6%) or chronic MSP (69.9%) respectively. The findings of this study concurred with studies done among OHW in Iran, China, and Saudi Arabia which...
reported a high prevalence of MSP among females.\textsuperscript{5,9,21} Public sector female OHW in Saudi Arabia were found to experience a longer duration of pain compared with males.\textsuperscript{9} In contrast, South African male dentists reported a higher prevalence of MSP in the neck, shoulder, and lower back (79.6%, 73.3%, and 70.1%) than females (74.8%, 70.7%, and 69.1%).\textsuperscript{9} However, no significant association was identified between gender and MSP in this study.

Overweight participants reported a higher percentage of current (35.6%) and chronic (37.6%) MSP. Obesity was significantly associated with chronic MSP in this study. Though obesity was found to be associated with chronic MSP, nevertheless a protective relationship was identified. A longitudinal population study in Norway identified that obese people had a 20% higher risk of experiencing chronic MSP compared with those of normal weight.\textsuperscript{27} Similarly, for dentists in an Indian study, overweight and obesity were found to be associated with MSP.\textsuperscript{21}

Among occupation-related factors, a career duration of 11-20 years of employment in the dental environment was significantly associated with current (p=0.01) and chronic (p=0.01) MSP, respectively. The findings of this study concur with a Tunisian study which reported that there was significant association between long service employment and MSP (p=0.001).\textsuperscript{22} In addition, a study in Saudi Arabia found that the majority of participants employed in the public sector for five years or more had high prevalence of MSP.\textsuperscript{9}

The lower back, neck, shoulder, hand, and wrist were the most painful body sites reported by OHW in this study; this is similar to the experience of OHW in the public sector in Thailand.\textsuperscript{23} Levels of pain reported globally by OHW ranged between: lower back (54%-72.01%), neck (48%-75.74%), and shoulder (48%-69.4%) areas.\textsuperscript{9,17,22}

Occupational factors were significantly associated with current MSP when participants were standing and working (p=0.00), working in the same position (p=0.05), and reaching/working away from the body (p=0.00). Tunisian health care workers were found to have occupation-related MSP caused by prolonged standing or sitting (p=0.023; p=0.016).\textsuperscript{22} Awkward back posture while standing to extract teeth, repetitive shoulder/hand movements, and use of vibrating tools were also associated with MSP amongst OHW in the public sector from Thailand and Saudi Arabia.\textsuperscript{9,11} Participants in the current study reported that they were unable to complete tasks due to MSP and experienced trembling while working. Dental procedures such as scaling and restoration were identified by 81% of dentists in KZN as causes of hand pain, which can be associated with trembling experienced during procedures.\textsuperscript{7,14,17} Furthermore, extended hand-scaling for more than five hours per day by oral hygienists was significantly associated (p=0.05) with hand pain.\textsuperscript{7}

Sitting and working (p=0.01) and carrying/lifting or moving heavy materials or equipment (p=0.03) were shown in this study to be associated with chronic MSP. Dental procedures while seated were considered as high risk occupation-related factors associated with MSP among public sector OHW in Thailand.\textsuperscript{21} South African oral hygienists reported experiencing neck (66.5%) and shoulder (56.6%) pain associated with time spent on poor seating.\textsuperscript{7} Incorrect seating position was identified as a major cause of MSP among dentists in KZN as well.\textsuperscript{23} OHW in this study reported that working in a cramped/awkward space was strongly associated with current (p=0.01) and chronic (p=0.03) MSP. Clinical procedures were associated with neck pain resulting in the OHW rotating the neck and tilting the shoulders towards the dominant hand, causing awkward posture.\textsuperscript{22} Lower back pain was a complaint related to inability of OHW to adjust the dental chair, resulting in standing or sitting in awkward positions.\textsuperscript{7}

In this study, depression and anxiety were identified as affecting OHW with current MSP to an extent greater than those with chronic MSP. When participants were asked whether they suffer from anxiety/depression during the day, 51.5% reported that they did, which was significantly associated (p=0.01) with current MSP. The odds of OHW being affected by anxiety/depression during the day were lower among OHW affected by current MSP. The findings show statistical significance and may identify the risk of current MSP as a protective factor for anxiety/depression. Similarly, depression (p=0.001) and anxiety (p=0.001) were shown to be significantly associated with MSP in a study from the USA and Qatar.\textsuperscript{24,25} The study in the USA found health workers with upper and lower MSP reported experiencing depression and anxiety compared with those without MSP.\textsuperscript{24} Depression and anxiety were associated with feelings of fear, feeling “down” and hopelessness among health workers which caused interferences in their work.\textsuperscript{24,25} Psychological factors such as depression and anxiety associated with MPS needs to further assessed and managed to prevent health workers from developing negative thoughts such as suicide.\textsuperscript{24,25}

LIMITATIONS OF THE STUDY

The inference of a causal relationship between MSP and the various risk factors could not be determined due to the cross-sectional design of the study. The reliance on self-reporting data is a limitation of the study as participants may have over- or under-reported in the questionnaire. Direct observation was not included in the study and the accuracy of reports of the times spent in a day seated and standing while working is a limitation to the study. OHW suffering from MSP might have left the profession or had stopped working for the public sector prior to data collection. Recollection of events might be affected as the results were the participants were required to recall events that had transpired in the past year. In addition, the small number of participants in the sub-groups was found to be a limitation to this study. Leisure or recreational activities were not assessed although these may be aggravating factors with MSP. In addition, a limitation of the questionnaire is that test-retest reliability and content validity was not established in the modified questionnaire.

RECOMMENDATIONS

The planning of dental departments should be carefully developed to ensure that proper ergonomic practices are followed. Incorporating input from public sector departments such as dietetics and rehabilitation (physiotherapists and occupational therapists) would be helpful to assist employed OHW to achieve/maintain an ideal BMI and ensure that all are working in a properly balanced posture during procedures. Future research needs to be conducted to investigate the influence of cumulative effects of performing various dental procedures on the occurrence of MSP. Participant observation should be conducted to determine the accuracy of reporting of posture and body positions assumed by participants. Further and more extensive research is required to assess sub-groups (dental assistants, dental therapist and oral hygienists) in detail.

CONCLUSION

MSP is an occupational hazard for OHW and the study found that the majority of dentists in this sample suffer from MSP. In addition to occupational factors such as ergonomic practices, psychological factors were found to have significant associations with MSP. There is a need for educational programs and adoption of strategies to reduce occupational injuries.

Declaration:

This research was funded by the University of KwaZulu-Natal, College of Health Sciences Masters Scholarship for funding the research. This research was submitted as the dissertation component in partial fulfilment (50%) of the academic requirements for the degree of Master of Public Health in the Discipline of Public Health Medicine, School of Nursing and Public Health University of KwaZulu-Natal. This article has not been published previously.

Ethics and permissions

The researcher had obtained ethical approval to conduct the study towards the Master of Public Health degree from UKZN. The Postgraduate Research and Higher Education Committee approval was granted on 12 August 2015. The Biomedical Research Ethics Committee (BREC) granted ethics approval on 28 January 2016 (BE374/15). The KZN Provincial Department of Health- Health Research & Knowledge Management (HRKM) (HRKM374/15 KZ_2016RP49_761) granted permission for the study to be conducted on the 8 January 2016.
References


Reasons why South African dentists chose a career in Dentistry, and later opted to enter an academic environment.

SUMMARY

Objectives: This study aimed to investigate the reasons why South African dentists chose to study Dentistry, later opting for an academic career.

Methods
A cross sectional survey using an anonymous 12-point questionnaire that was sent out to a cohort of dentists and specialists holding positions at the four South African universities which offer a dental degree. Descriptive statistics were calculated using STATA Release 14.

Results
Of 160 questionnaires distributed, 66 were completed. Popular reasons dentists cited for choosing this career were job security, a desire to help people, the degree is recognised, love working with their hands, and regular but flexible working hours. The main reasons the respondents chose an academic career were a need for intellectual stimulation, desiring a broad spectrum of work, having a love for teaching, wanting to influence or shape the profession, to pursue postgraduate studies and to do research. More than half (53%) of respondents would not choose Dentistry as a career again.

Conclusion
This study revealed that the career motivations of this cohort of SA dentists was far less related to the socioeconomic aspects of Dentistry than it was to their desire for more mental stimulation, in contrast to many findings elsewhere.

Key words: Career motivations, academic career, problems faced.

INTRODUCTION

Evidence gathered in 2001 showed that there was a shortage of lecturing staff in Dental Faculties throughout the United Kingdom (UK) and the United States of America (USA). It has been reported that the situation is related to the fact that dentists in private practice in the USA earn much higher salaries than do the academic dentists. Together with increasing the salaries, John et al. suggest that the shortage could be addressed by changing the academic culture to one respected and seen as noble, and the implementation of a mentor program. In South Africa (SA), however, there are generally many applications for positions in academic Dentistry and the posts are usually easily filled. This raises the question as to why more South African dentists opt for a career in academia than their overseas colleagues? By doing so they undertake a commitment to invest in and uphold the standards of, that dental school to contribute to the career development of all learners and to ensure that the profession continues to flourish in the future. The rewards for the lecturer include witnessing students being transformed from shy and insecure first years to confident, competent graduates during their years of study. An academic career may also allow a dentist the privilege of furthering his/her own education while at the same time benefitting from paid employment. Time and opportunities are also available to pursue research topics of interest.

The literature is replete with articles concerning the stresses that dentists in private practice experience, due to constant interaction with patients in pain and anguish, staffing and financial problems, medical aid non-payments, overheads, intrusive noise, awkward working position etc. An interview study showed, in addition, that the increasing demands of dental patients contributed largely to stress and depression in dentists. However, dental academia has its own challenges, in particular that of the pressures of long waiting lists which accumulate due to the economic status of many of the patients which precludes their seeking treatment in the private sector.

In addition to the service and teaching commitments, academic dentists are also expected to be involved in research. The philosophy “publish or perish” is paramount at all universities because of the financial benefits accrued by the institution as well as how research productivity impacts on international standing. Promotion is often dependent on the number of publications an applicant has in peer reviewed journals. It has been documented that the increased focus on research outputs has generated a burden upon academic dentists, requiring successful publication performance in order to gain more funds for the university as well as a higher ranking. Un fortunately meeting these demands is often at the expense of teaching. Sadly, there is not commensurate recognition given to outstanding teaching as there is to exceptional research, which could lead to ambitious clinicians reducing their undergraduate teaching commitments and devotion in order to focus more on their research outputs. The results from a study by Haden et al. in 2008 on work satisfaction among dental faculty members, showed that they found teaching students enjoyable. There were however, matters of concern, despite the positivity reported. Most significant were time constraints and a heavy workload that led to burn-out. The authors reported that faculty staff members felt overwhelmed as they had not anticipated the intensity of expectations in teaching, clinical, administrative and research duties.

ACRONYMS:
OSD: Occupation Specific Dispensation

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These considerations offer an explanation as to why dental academia were in a desperate position with regard to a shortage of lecturing staff in UK dental schools at the turn of the century. In the USA a similar crisis was found in dental education to the extent that at one stage 300 positions were vacant at forty five US dental schools. In a later study it was reported that 417 USA faculty posts were unfilled nationally.

In SA, however, the opposite situation seems to exist: there is a demand for academic positions and recruiting lecturers poses little or no challenge to the dental schools. The literature suggests that the public health care system, socioeconomic status, medical aids, litigation and sustainability are linked to the relatively low rate of commitment of dentists to private practice. This is summarized below:

1. The overwhelming majority of South Africans rely heavily upon the public health sector to meet their health service needs. Socioeconomic status and prohibitively expensive medical scheme memberships are the main determinants forcing the majority of South Africans to use public health services instead of private health services. There are also times when individuals who have medical aid scheme still make use of public health services in addition to the private sector. The main reason for this is that they are assured that they will pay contracted-in rates at government hospitals. Many patients also feel that they will obtain a more honest opinion about treatment requirements as the procedures performed have no impact on the dentist’s personal income.

2. Claiming from medical aid schemes poses an array of challenges encountered by dentists. These include the substantial reduction in medical aid scheme pay-outs towards Dentistry over the past 28 years, lack of funds to complete the ideal treatment procedures, time and costs incurred in telephoning and writing motivation letters to medical aids etc.

3. Pepper and Slabbert in 2011 stated that SA has been spared the increase in litigation being experienced globally for medical and dental malpractice. There has, however, recently been a sharp spike in SA medical and dental malpractice lawsuits as patients develop an awareness of their rights in a society where resources in the health system are exhausted or otherwise limited.

4. Many private practices are not sustainable due to the Occupation Specific Dispensation (OSD) policy which amended the vast discrepancy that previously existed between the incomes of private and public health care practitioners. This policy was implemented in 2007 by the South African government in an attempt to retain skilled health workers in the public sector. The purpose of the OSD was to provide health occupations with unique salary packages based on workers’ expertise, competencies and performances.

The above-mentioned socio-economic factors are bound to have a distinct influence on the career decisions South Africans dentists make. In addition to the rapid expansion in dental technology and the increasing dental awareness to which patients are exposed through social media, the economy has greatly affected the dental market. Financial constraints as well as skyrocketing medical and dental costs have influenced the provision of routine as well as high-tech Dentistry for many patients in both private dental practices and academic hospitals. There have been no studies that have examined the distinct influence on the career decisions South Africans dentists make. In addition to the rapid expansion in dental technology and the increasing dental awareness to which patients are exposed through social media, the economy has greatly affected the dental market.

The aim of this study was to identify the reasons why more dentists and dental specialists in SA were choosing a career in academia. The study also aimed to report their initial reason for selecting Dentistry as a career and whether they were satisfied with their choice.

METHODS
A descriptive and statistically analytical study was conducted amongst full time dentists and specialists employed by the four dental training schools in SA. The sample included registrars in full - time training positions. The survey consisted of 12 closed-ended questions based on previous literature, and aimed to establish factors which had led dentists to electing a career in dental academia. The questionnaire was based on a modified version of the Du Toit Questionnaire for Health Workers and Students on motives for studying Dentistry. Consent was given by the principal author of the Du Toit Questionnaire for Health Workers and Students. Written permission was obtained from the Deans or Heads of the four University Dental Schools for the study to be conducted. Permission was also granted by the Ethics Committee of the Faculty of Health Sciences, University of Pretoria (212/2017). Thereafter a covering letter and consent form explaining the purpose of the study together with the questionnaires, were hand- distributed to all academic staff at each of the four schools. To ensure anonymity, two separate ballot boxes (sealed containers) were placed in a designated area at each University into which participants deposited either their consent forms or completed questionnaires. No names appeared on any of the questionnaires.

The questions were related to the demographics of respondents (dentists or specialists), their initial motives for choosing Dentistry as a career, whether they would choose Dentistry as a career path again, the reasons why they chose to enter academia, the determination as to whether they had earned more in private practice than in academia, and the identification of common problems faced by respondents in the academic environment. The demographic questions included gender, age, highest qualifications, years of employment at current institution and previous dental employment of each participant. Three of the questions, namely the initial reasons for choosing Dentistry as a career, the reason for choosing academia and the problems faced in academia, incorporated a four-point scale from strongly agree to strongly disagree. These three questions comprised various motives in terms of personal statements with which participants could agree or disagree. The last response was named “other” for personal statements. The question as to whether they would choose Dentistry again required an explanation Why.

The survey also included a question on how the gross salary in academia compared with what had been earned in private practice and whether the dentist would feel comfortable clinically to go back into private practice.

The data was analyzed using the software package, STATA Release 14. Age was the only continuous observation in this study and was summarized using descriptive statistics; mean and standard deviation. All the other responses were discrete in nature (ordinal/nominal) and reported as frequencies, percentages, 95% confidence intervals and cross – tables.

RESULTS
Of the 160 questionnaires distributed, 66 completed questionnaires were returned (a response rate of 41.25%). It was not the desired response, but the surveys were distributed during a recess period when several dentists had taken annual leave.

There was no significant difference in gender, 35 male and 30 female with one person not disclosing gender. Additional results of this study pertaining to demographics are displayed in Table 1 below and in Figures 1 and 2. The mean age was 41, the youngest lecturer being 28 and the oldest 64 years of age. Three quarters (75%) of the respondents had started their academic careers before the age of 40.

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</tbody>
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Over half of the respondents had completed a Master's degree while 17% of respondents had not completed any postgraduate studies (Figure 1). A large proportion (68%) of respondents came from private practice, whether as owner, in partnership or as a locum. The remainder of the respondents came from other government institutions such as clinics, military or another university post (Figure 2).

More than half (55%) of the dentists surveyed would not choose Dentistry as a career again, given a second chance to choose a career path.

The reasons respondents chose an academic career were arranged in order of prevalence. The sequence was: a need for intellectual stimulation (90%), desiring a broad spectrum (service, teaching and research) of work (90%), having a love for teaching (89%), wanting to influence or shape the profession (86%), to pursue postgraduate studies (81%) and to undertake research (71%) (Figure 4).

The majority (45%) of respondents reported that they had earned more in private practice while 23% had earned the same and only 17% had earned less in private practice. The rest of the respondents had not been in private practice (Figure 5).

More than half (52%) of the respondents did not feel comfortable clinically to go back into private practice.

The overwhelming majority (95%) of respondents reported facing problems in academia. The top three problems were pressure to publish in the limited time allocated for research (77%), inflexible working hours which do not make provision for running important errands (71%) and administration and meetings tend to be a frustration (70%). Figure 6 describes the reasons for stress in academia.

**DISCUSSION**

This is the first study that not only analyses the motivation academics had in choosing to study Dentistry and why they chose an academic career but also displays the satisfaction of dentists in their choice of a career path.
The results of this study revealed that the majority (75%) of respondents entered academia before the age of 40. This is a good age for doing postgraduate studies and teaching students, supported by some clinical experience. The highest qualification obtained remained less or less balances with the percentage of respondents wanting to enter the academic career to do post graduate studies. A number of respondents are still new in their academic posts which provides an explanation why 17% of respondents have not obtained any postgraduate qualification. Most academic positions for dentists that are advertised in SA have a post graduate diploma as the minimal requirement.

The result of the study reveals that it is of absolute importance to carefully choose your career path. It is among the most important decisions to be made as an adult and the wrong choice can have negative consequences both financially and psychologically. Job security and a degree leading to a recognised job (the most popular reasons our respondents chose to study Dentistry) can be achieved in many other career paths. Students applying for a university degree may do so because they want job security, but this does not mean they will enjoy being a Dentist. In the same way, having a love to work with your hands could be satisfied through becoming a mechanic or faster with research outputs. Numerous sessional or part time workers which may contribute to the abundance of applicants for full-time positions. Many of the applicants for lecturing positions are employed on a sessional basis at the dental school which exposes them to the “other side of Dentistry”. These sessional dentists come to realize how their constructive feedback benefits these future dentists and will experience the satisfaction that comes with seeing a student grow and development under their guidance.

Academic dentists in SA are usually placed in a specific department where they teach and carry out service in a particular discipline of Dentistry such as extractions or orthodontics. This may lead to a lack of confidence or reduction in speed and quality in other disciplines of Dentistry and could be a reason why just over half of the academic dentists did not feel comfortable going back into private practice. The personal experience of the authors identified a need for dentists in academia to continue part-time work in private practice or hospital environment in order to retain confidence as well as to keep abreast new developments in Dentistry.

It is very clear from the results of this study that academia can be challenging; only five percent of academic dentists felt they did not face problems or challenges in academia. Time is a major concern in academia which is a hurdle that can be overcome. A solution may be to allow lecturers more flexibility and to assess the outcome of their work rather than the time spent at work. Sixty-two percent of respondents felt the need for an overview of academic writing to be included for undergraduate students. Implementing this suggestion in the curriculum could lead to academic staff being more productive or faster with research outputs.

CONCLUSION

The perspectives of South African academic dentists were significantly different from those in the US and the UK. A desire to teach and be intellectually stimulated dominated the decision of the respondents in this study to enter academia, above the financial aspects. Methods of selection of dental students appear to require some modification to ensure that the right choice of career is made. Making work experience prior to application into dental school a requisite could eliminate misconceptions aspirant dental students may have of the profession. Academia may have its challenges but could be a rewarding job for the dentist who is less fond of the practical side of Dentistry.

Acknowledgement:

I would like to acknowledge Professor PH Bekker (Biostatistician, Faculty of Health Sciences, University of Pretoria) for his assistance with the statistical analysis of the results.

References
8. Swart, Ina (2017) HR Manager, University of Pretoria Oral Health Centre,
Readers will note that we have reduced the number of General Questions to twenty whilst retaining five Ethics based questions. Our allocation of CPD points remains unchanged. There is optimism that this section will continue to provide members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure Continuing Education. Please note that SADA is no longer offering the ‘CPD via SMS’ service.

Contact Ann Bayman at SADA, Tel: 011 484 5288, for any enquiries and assistance.

Online CPD in 6 Easy Steps

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

1. Indications where surgical endodontics should be considered as the first treatment option, and has proven to have a weighted average success rate of 95%.

2. Anatomical factors such as close proximity to a neurovascular bundle.

3. Surgical access factors such as limited mouth opening.

4. Patient factors such as psychological problems or systemic diseases.

5. Clinician factors which include the level of training, skill and experience of the operator as well as the availability of appropriate equipment.

The procedure of surgery at the apex is commonly referred to as an apicoectomy, however, this refers to only one aspect of the sequence of events required to carry out the operation (root-end resection). The terms endodontic surgery or surgical endodontics are more appropriate as the objective of the procedure is to achieve three dimensional shaping, cleaning and obturation of the apical portion of the root canal system by accessing it via the raising of a surgical flap. Since this surgical procedure is now more routinely carried out using the surgical operating microscope it is also referred to as endodontic microsurgery. The sequence of procedures involved in periapical endodontic surgery are anaesthesia, flap design, incision and reflection of a full thickness flap, gaining access to the root apex, debridement of pathological periapical tissues, root-end resection, root-end cavity preparation, sealing off the root canal system with a root-end filling, flap replacement and suturing, postoperative instructions and care, removal of sutures and evaluation.

Over the past two decades the traditional technique of performing endodontic surgery has evolved significantly and has emerged as a predictable treatment option to maintain the natural dentition. The modern technique involves the use of the operating microscope, micro-surgical instruments, refined hard and soft tissue management techniques, and the use of more biologically acceptable root-end filling materials.
Cone Beam Computed Tomography (CBCT)

Until recently, radiographs have been the only means available to examine the anatomy of the tooth and surrounding structures. Limitations of radiographs are that they do not offer three dimensional information, and areas of interest may be obscured by overlying anatomy (anatomic noise). Cone beam computed tomography machines (Figure 1) were developed in the late 1990's. They produce three dimensional scans of the maxillo-facial skeleton, using significantly less radiation than conventional computed tomography.

Cone beam computed tomography is a valuable diagnostic aid, and is recommended for treatment planning for endodontic surgery. The anatomical relationship of the root apices to significant surrounding anatomical structures, such as the inferior alveolar canal, mental foramen and maxillary sinus, can be evaluated. Furthermore, the exact inclination of the roots, presence of fenestrations, thickness of the cortical bone as well as the true size and extent of periapical lesions can be determined accurately.

Dental Operating Microscope (DOM)

The DOM (Figure 2) has changed both non-surgical and surgical endodontics. Microsurgery can be defined as a surgical procedure performed on small, complex structures using a DOM. In 1992, Dr Gary Carr introduced a DOM that had Galilean optics and was ergonomically configured for dentistry. With Galilean optics, the light beams going to each eye are parallel and focused to infinity instead of being convergent, so that the operators’ eyes are at rest, as though looking into the distance. Because the illumination is coaxial with the line of sight, there are no shadows when viewing the surgical site, and there is no eye fatigue even during procedures that take several hours.

When using surgical loupes and a headlamp, there is a tendency for the operator to bend over the patient, resulting in head, neck and shoulder strain. In contrast and in addition to the enhanced magnification and illumination enjoyed with the use of the operating microscope, a more comfortable posture of the head, neck, spine and pelvis can be maintained by the operator, resulting in superior ergonomics. The benefits of using the dental operating microscope during endodontic surgery include:

1. Avoiding unnecessary trauma to the soft tissue during incision, reflection, retraction and suturing.
2. The root apex can be examined under high magnification, making it possible to identify and manage anatomical complexities, perforations or fractures.
3. Diseased tissue can be precisely and completely removed.
4. The root tip can be easily distinguished from bone.
5. A smaller osteotomy can be made using magnification, resulting in quicker healing and less postoperative pain.
6. Fewer radiographs are required as the apex can be directly and precisely examined.
7. The procedure can be documented by video recording for educational purposes and communication with the referring dentist.

MICROSURGICAL ARMAMENTARIUM

Microsurgical instruments have been developed for endodontic microsurgery as traditional surgical instruments were found to be too large to use in small places, or too traumatic to soft and hard tissues.

Micro-scalpels (N6900 Nordland blade, Micro Mini, Full Radius, G Hartzell & Sons, USA) (Figure 3) are used to create incisions, especially in delicate areas like the interdental papilla. Small, sharp, micro-surgical periosteal elevators (ZEPF Dental, Germany) (Figure 4) are then used under the DOM for atraumatic flap elevation. Rubenstein retractors (JEDMED, USA) have a variety of serrated contact surfaces that are flat, notched or recessed to suit different anatomical areas, and are designed to retract both the flap and lip, and will keep the operators hand out of the view of the microscope as the blade is set at 110 degrees rotation to the handle.

Ultrasonic tips have been designed to prepare root-end cavities, and the introduction of micro-mirrors (ZEPF Dental, Germany) make it possible to examine the apical preparation. Micro-surgical suturing techniques that involve smaller gauged tapered needles and smaller sizes sutures (5-0 and 6-0) also requires the use of smaller micro-surgical tissue forceps (ZEPF Dental,
The Micro-Apical Placement System (MAP) (Dentsply Maillefer, Ballaigues, Switzerland) (Figure 9) or the Dovgan MTA Carrier (Quality Aspirators, Duncanville, Texas, USA) (Figure 10) allows accurate placement of root-end fillings, such as MTA into the root-end cavity preparation without spillage into the bony crypt.

ANAESTHESIA AND HAEMOSTASIS
The goals of local anaesthetic during endodontic surgery are anaesthesia pain control, haemostasis and post-surgical pain control. An anaesthetic with a high concentration of vasoconstrictor, for example 1:50,000 epinephrine, is preferred to obtain adequate anaesthesia and prolonged haemostasis. Kim and Kratchman (2006) recommend the application of epinephrine pellets into the bony crypt, followed by pressure to the pellets with sterile cotton pellets for two to four minutes to achieve prolonged haemostasis. Should small bleeds occur from the bone, a cotton pellet soaked in ferric sulphate can be dabbed onto the area to further control haemostasis. In a large osteotomy site, calcium sulphate paste packed into the bony crypt is effective in achieving haemostasis, and can be left in place as it is resorbable.

MANAGEMENT OF SOFT TISSUES
Flap Design
During endodontic surgery, the cortical bone needs to be exposed by incision, elevation and reflection of a full thickness flap consisting of periosteum, gingival and mucosal tissues. The correct management of the soft tissues is necessary to obtain complete, recession-free healing of the gingiva with the avoidance of scar formation to obtain an aesthetically pleasing result.

The once popular semilunar flap that was developed by Partsch in the late 1890’s is no longer recommended, as it does not permit adequate access to the root apex, and results in excessive scarring (Figure 11). The two flap designs currently recommended for
apical microsurgery are the full sulcular flap (Figure 12) in the posterior quadrants, and submarginal (Ochsenbein-Leubke) (Figure 13) in the anterior zone. A
The full sulcular flap is also known as the full thickness marginal flap, and includes a primary incision within the gingival sulcus following

Figure 11: Semilunar flap design.

Figure 12: Full sulcular flap design.

Figure 13: Submarginal (Ochsenbein-Leubke) flap design.

the contour of the teeth. It is triangular if one vertical relieving incision is used, and rectangular when there are two such incisions.

The submarginal (Ochsenbein-Leubke) flap is rectangular and comprises two vertical incisions and a scalloped horizontal incision within attached gingiva that follows the contour of the gingival margin and is about 3 mm from it. A minimum thickness of 2 mm of attached gingiva is a pre-requisite to performing the submarginal flap.

SUTURING
Multifilament sutures such as 4/0 silk are no longer recommended as they accumulate plaque within the braids, and thus cause secondary inflammation and delayed healing. Thinner monofilament sutures such as polyamide (5/0 and 6/0) (Figure 14) or polypropylene sutures are ideal for endodontic microsurgery as they attract less plaque and therefore result in a cleaner surgical site. In the past it was customary to remove 4/0 silk sutures after 7 days. Currently, the belief is that the monofilament sutures should be removed within 48 to 72 hours as rescaling of the epithelium at the wound margin is visible after 2 days and an intense inflammatory response to the suture is seen after three days.

The monofilament sutures should be removed within 48 to 72 hours as rescaling of the epithelium at the wound margin is visible after 2 days and an intense inflammatory response to the suture is seen after three days.

HARD TISSUE MANAGEMENT - OSTEOTOMY
Osteotomy involves the removal of the cortical and cancellous bone to gain access to the apical portion of the root. The process can be carried out with an Impact-air 45 high speed hand-piece (SybronEndo, Orange, California, USA) or a similarly designed hand-piece. The head of the turbine is at a 450 angle to the shaft, making it easier to gain access to the apices of molar teeth. Furthermore, the water spray is directed toward the surgical site and the air stream is ejected from the back of the hand-piece, thus eliminating the possible complications of air emphysema or air embolism.

The traditional endodontic surgical technique involved creating an osteotomy that is 8–10 mm in diameter. Rubinstein and Kim (1999) found that the rate of healing was faster when the size of the osteotomy was smaller. The modern endodontic surgery advocates the osteotomy size to be 3–4 mm in diameter, which is just large enough for a retrograde ultrasonic tip to access the bone crypt and vibrate freely. An advantage of using the dental operating microscope is that it allows the operator to clearly distinguish the root tip from bone within a conservatively prepared osteotomy.

A constant stream of water or saline is required on the cutting surface of the bur to avoid overheating of the bone. Eriksson and Albrektsson (1983) found that bone is irreversibly damaged when its temperature is raised above 47°C for one minute.

The use of a diamond bur is not recommended, as the diamond grit traps bone particles and therefore increases frictional heat. A round, steel bur with widely spaced flutes to minimise bone chips is recommended for bone removal. The round bur, will however, be unsuitable for root-end resection. A Lindemann H151 (Brasseler USA, Georgia, USA) is a tapered steel surgical bur with widely spaced flutes and has been recommended by several authors for both osteotomy and root-end resection. The selected bur should run parallel to the surface of the cortical plate with a light brushing action to reduce friction.

A sharp bone curette is then used for surgical curettage of peri-radicular soft tissue lesions, which can then be saved as a biopsy to be sent for histopathological examination.

ROOT-END RESECTION
The complex apical portion of the root canal system harbours microorganisms, unless it has been accessed by root canal instruments and chemically disinfected. This nidus of infection is removed by resecting the apical 3mm of the root. Indications for root-end resection include:

1. Removal of pathologic processes such as foreign bodies, retained micro-organisms or firmly attached soft tissue lesion.
2. In order to remove anatomic variations, at least 3mm of the root apex should be removed, as 93% of lateral canals and 98% of apical ramifications are located within that length.
3. Removal or management of iatrogenic errors such as separated instruments, ledges, blockages, zips and perforations.
4. To enhance the removal of deeply placed soft tissue lesions.
5. To gain access to the root canal system that is inaccessible via orthograde treatment, and to inspect the apical seal or lack thereof.
6. To create an adequate apical seal by enhancing access and vision.
Reducing fenestrated root apices.
8. Evaluation of aberrant canals and root fractures by staining.

The process of resection may be carried out using a 170L tapered fissure bur in an Impact Air 45 turbine.

BEVEL ANGLE
Traditionally a bevel angle of 450-600 was advocated for the convenience of the operator so that the apex could be visualised and accessed for root-end preparation. The modern technique advocates that the root-end be resected perpendicular to the root, resulting in a 00-100 bevel angle. The advantages of not creating a bevel are that greater root length is preserved, and less dentinal tubules are cut, thereby reducing the leakage of microbes and their by-products from the root canal system. Further disadvantages of creating a bevel are the creation of a larger osteotomy, lingually positioned apices are missed, the root canal is elongated and the root is weakened because its diameter is reduced.

Inspection of the resected root-end
At this point the resected root-end is stained with methylene blue dye and inspected using the surgical operating microscope and micro-mirrors for isthmuses and for determining the canal morphology. This step was completely neglected during the traditional endodontic surgical techniques. Methylene blue (Vista Dental, USA) (Figure 15) has the ability to stain organic material only, and therefore demonstrates fractures, accessory canals, isthmus tissue and the periodontal ligament.

The methylene blue should be applied for 10-15 seconds to allow its complete saturation, after which the surface should be rinsed and dried for inspection.

ROOT-END CAVITY PREPARATION
The aim of preparing a root-end cavity is to remove root canal filling material and to create a cavity that can be adequately filled. The prerequisites for root-end cavity preparation include:

1. A thoroughly cleaned and shaped Class 1 cavity at least 3 mm deep into the root-canal system.
2. The walls of the preparation should be parallel to and coincident with the outline of the root canal space.
3. There should be adequate retention for the root-end filling.
4. Isthmus tissue should be completely removed.
5. The remaining dentinal walls should not be weakened.

Traditionally the root-end cavity was prepared using rotary burs in a micro-handpiece. The disadvantages of using these instruments to prepare the root-end cavity are:

1. Accessing the root-end is challenging, especially when working space is limited.
2. The risk of perforation of the lingual root-end is high when the original pathway of the canal is not followed.
3. The 45 degree bevel required during resection exposes too many dentinal tubules.
4. Difficult to clean necrotic tissue in the isthmus area between canals.

In the early 1990’s, Dr Gary Carr introduced specifically angulated ultrasonic retrograde tips for root-end cavity preparation. The modern technique for preparing a root-end cavity involves the use of ultrasonic tips designed for anterior (Figure 16) and posterior teeth, driven by a piezoelectric hand piece. There are a variety of ultrasonic retrograde tips available to favour different surgical access situations.

The advantages of using ultrasonic tips rather than burs for cavity preparation include:

1. The apical preparation is deeper, cleaner and runs parallel to the long axis of the root.
2. The operator experiences superior control with ultrasonic tips.
3. There is a lower risk of root perforation due to a greater ability to stay central within the canal.
4. The access to the root tip is easier.
5. Preparation of the isthmus area between canal exits is easier.

ROOT-END FILLING
The prepared root-end cavity is filled with a root-end filling material in order to provide a hermetic physical seal, thereby preventing the egress of micro-organisms or their by-products from the root canal.
system into the peri-radicular tissues. Peri-radicular curettage alone, without root-end filling, eliminates only the effect of the leakage from the root canal system into the surrounding tissues, but not the cause, as most periapical lesions are caused by a leaky apical seal. In order to ensure that healing that may occur does not regress, the root canal system should be resealed with an appropriate root-end filling. The materials that can be used include: Amalgam, Gutta-percha, Cavit, glass-ionomer cements, re-inforced zinc oxide eugenol cements, composite resin, compomer, gold foil, Diaket, polycarboxylate cement, and bioceramic cements. All these materials will be discussed in detail in Part 2 of this series.

Case Report Outlining the Clinical Technique

One of the main causes of failure after endodontic surgery is the failure to hermetically seal all the portals of exit, often the result of inadequate lightning, visibility and technique.

Figure 17 illustrates a periapical radiograph of a failing apicoectomy on a right maxillary lateral incisor on a 45 year old female patient, three years after surgery. The tooth is part of a six-unit fixed bridge. It was evident that an amalgam retrograde was placed, but the surgeon failed to remove all the bacteria from the entire root canal system before placing the retrograde filling material. Several authors have confirmed that if the root canal space is not completely instrumented or inadequately treated, the outcome will be poor. After anaesthesia, a submarginal flap was designed and the flap reflected using a micro-scalpel and micro-surgical elevators, under 10X magnification. Figure 18 depicts the clinical view after atraumatic reflection of the flap and clearly shows evidence of a large periapical granuloma or cystic lesion associated with the apex of the tooth. Peri-radicular curettage was done with a periodontal curette to remove the tissue for biopsy and to expose the root apex. Figure 19 shows the exposed root tip with evidence of a leaking retrograde amalgam filling with surrounding corrosion, at the apex of the root tip. Several studies indicate that amalgam retrograde performs consistently the poorest in leakage studies. According to Carr and Castellucci (2009) there is no longer any valid reason for using amalgam as a retrograde filling material due to the general controversy over the presence of mercury in amalgam. Furthermore, amalgam is prone to corrosion and disintegration, can cause amalgam tattooing if excess particles are incorporated into the soft tissue, and the healing characteristics following an amalgam root-end filling are questionable.

Upon inspection, it was found that the amalgam retrograde filling

Figure 17: Periapical radiograph of a failing apicoectomy on a right maxillary lateral incisor. Note the large periapical radiolucency and empty canal space between the metal post and the amalgam retrograde filling.

Figure 18: Evidence of a large periapical granuloma or cystic lesion (arrow) associated with the apex of the right maxillary lateral incisor.

Figure 19: Exposed root tip with evidence of a leaking retrograde amalgam filling with surrounding corrosion.
was completely loose, and it was removed. The bevel on the root apex was redefined with a 171 carbide tapered fissure bur before the exposed root tip was dried, covered with methylene blue solution (Figure 20) and left for 30 seconds. The dye was gently removed by flushing sterile water over the area. There was no indication of a crack in the root.

An ultrasonic root end preparation (UREP) was done using the ProUltra no.2 Surgical Ultrasonic Tip (Dentsply Sirona) (Figure 21) driven by an ultrasonic scaler (Satelec). These tips utilize port technology to deliver a constant stream of water directly to the working end of the tip. The design of the tips also ensures excellent vision for the operator during the cavity preparation under the DOM. The UREP was thoroughly rinsed with water, and dried with paper points.

A micro-mirror was used to inspect the UREP under different magnifications, to ensure complete removal of any remaining debris in the cavity (Figure 22). Finally, the UREP was etched with 37% phosphoric acid and rinsed with water to remove the smear layer. (Ultradent) material was mixed according to the manufacturer’s instructions and loaded into a skinny syringe. The mixed material was directly dispensed into the UREP and excess material was removed to the level of the resected root (Figure 23).

Figure 24 shows the immediate postoperative radiographic result after closing and suturing of the soft tissue flap.

CONCLUSION

Tsesis et al. (2009) carried out a meta-analysis of the literature, and found that when the modern endodontic surgical technique is used, a successful outcome was achieved in 91.6% of cases more than one year postoperatively.16

Setzer et al. (2010) conducted a similar study of the literature, comparing the traditional root-end surgery technique with the modern endodontic microsurgery technique. The weighted pooled
success rates were 59% for traditional root-end surgery, and 94% for modern endodontic microsurgery.  

Endodontic surgery using modern surgical techniques and appropriate armamentarium and root-end filling materials significantly improves the treatment outcome compared with the traditional technique.

References

A foreign object found in the ostiomeatal complex during dental implant planning: A case report.

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Smit DA,¹ Swart L,² Morkel, JA³

INTRODUCTION.
A general dental practitioner referred a 40-year-old Caucasian female to a maxillofacial and oral (MFOS) surgeon for the placement of an implant in the area of tooth number 25 (under the ISO System) and the evaluation of a neighbouring tooth (24) which had a poor prognosis. The patient’s medical history indicated pulmonary stenosis, mild hypothyroidism and endometriosis. Previous surgery had involved three Caesarean sections. Her medication included Oratane, vitamins and homeopathic thyroid medications. She was allergic to codeine. During the extra-oral examination, no abnormalities were detected. The intra-oral examination revealed that teeth 14, 35 and 45 were missing (removed previously as part of orthodontic treatment) and that teeth 25, 26, 28 and 44 had been lost. The patient was radiographically examined by pantomograph and a cone-beam computerized tomography (CBCT) scan with the pantomograph revealing restored teeth at 18, 16, 15, 24, 27 and a bridge extending from 43–28 area. The maxillary sinuses were pneumatized. A radio-opaque structure was detected in the right ostiomeatal complex (OMC). No opacification of the right maxillary sinus was detected. The CBCT scan confirmed the radio-opaque area in the right OMC, bulging into the ethmoid infundibulum. The differential diagnosis of this radio-opaque area in the OMC was that of either a fungus ball or a foreign object.

TREATMENT PLAN
The proposed treatment plan was to replace the missing and unsaveable premolars in the second quadrant with dental implants and to load immediately. The final restoration was to be carried out by the referring dentist. The patient was also referred to an ear, nose and throat (ENT) specialist with the request that the radio-opaque area be examined and assessed. The report from the ENT specialist proposed the removal of the foreign object under general anaesthetic, which would provide the opportunity to proceed simultaneously with the implant surgery.

TREATMENT
The root rest of 24 was removed atraumatically. Two 4.3-mm Nobel Active® implants were placed in the 24 and 25 areas (with immediate loading). Suturing was done with 3.0 Vicryl® rapide stitches. An endoscopic evaluation of the right OMC was performed and the foreign body was subsequently carefully removed transnasally via an endoscopic sinus approach to avoid injury to the orbital floor. A biopsy specimen was then sent for histological evaluation. There were no complications during surgery and the patient recovered well.

HISTOLOGICAL INVESTIGATION
Macroscopic investigation of the biopsy specimen revealed three grey-yellowish fragments which were each 3–5 mm in cross section and reminiscent of calculus. Microscopic investigation revealed oral tissue with the presence of scattered fibrovascular connective tissue containing a chronic inflammatory cell infiltrate that was partially covered by respiratory epithelium. The sub-mucus layer contained mucus glands and a chronic inflammatory infiltrate. The presence of a black pigmented foreign body was noted, having the appearance of dental amalgam restorative material. No further pathological analysis was done to confirm whether the particles were indeed amalgam.

ACRONYMS
CBCT : cone-beam computerized tomography
OMC : ostiomeatal complex
DISCUSSION

A 1965 description of the ostiomeatal complex considered it as a conjunct of anatomic structures which is primarily responsible for drainage of the anterior paranasal sinus. It forms the functional part of the anterior ethmoid complex which provides the final common pathway for drainage and ventilation of the frontal, maxillary and anterior ethmoid cells. A generalized theory is that obstruction of the OMC may lead to the formation of a fungus ball which is a diseased condition in the anterior ethmoids and frontal sinuses which then produces symptoms similar to those of chronic unilateral rhinosinusitis. However, a study conducted by Tsai et al. did not support this hypothesis and their findings suggested that even with the presence of a fungal ball, the OMC can still function normally in terms of draining and ventilation.

It is very rare to find a foreign object in the paranasal sinuses obstructing the OMC and causing maxillary disease such as is evident in the present case. The fact that microscopic histology revealed material similar to amalgam, makes this case even more intriguing. Whilst no chemical analysis was performed on the material, it may be reasonable to assume that it was amalgam, based on the microscopic description.

Only a few case studies report dental restorative material located near the maxillary sinus. Of these, only one involved obstruction of the OMC and most of these cases were associated with maxillary disease.

The case report published by Raman and Padgham in 2007 provides a possible explanation of how the dental amalgam migrated to the OMC: “It could have entered the maxillary sinus during a restorative procedure” and in their case, the patient began experiencing symptoms shortly after the dental procedure. In the current case it is uncertain whether the patient had a history of maxillary symptoms as she was asymptomatic on presentation and had given no indication of maxillary disease during the assessment for the planned dental implants.

Considering the endodontic treatment of the 16 and the extensive restoration performed on the patient several years ago, it can only be assumed that, during this procedure, amalgam particles had entered the maxillary sinus. Over time, the particles could have been migrated to the OMC under the influence of the mucociliary clearance mechanism found in the mucosal lining of the maxillary antrum. However, this is only a postulation, given the limited number of similar cases previously reported.

It may be relevant to note the difference between the present case and that reported by Raman and Padgham in that this patient had no acute sinusitis, which may indicate that the foreign object could have been present for several years. Also, despite the obstruction, the patient provided no history of chronic sinusitis. It was a coincidence that the radio-opaque object was discovered during the radiographic examination.

CONCLUSION

Cone Beam Computed Tomography has become indispensable in the surgical planning of dental implantology since it describes details of the anatomical structures in the vicinity of the surgical site and is superior to the limited view provided by two-dimensional radiographs. The present case highlights the importance of such full radiological evaluation as an adjunct to clinical assessment of the dental patient before any implant surgery is contemplated.

Reference

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Bilateral ectopic eruption of permanent maxillary canines into the incisive fossa, evaluated using Micro Focus X-ray Computed Tomography: A Case study and brief literature review.

Nyirenda T, Bacci N, Nchabeleng E, Billings BK, Ndou R, Mazengenya P.

ABSTRACT

Tooth development is a complex process whereby various genetic and environmental variables interact to achieve the final morphology and destination. Disruptions in the process lead to impaction or ectopic eruption. Bilateral ectopic eruption of maxillary canine teeth into the incisive fossa is a rare phenomenon. This report describes bilateral permanent maxillary canine teeth erupting into the incisive fossa of the skull of an adult male African. The skull specimen was first examined physically, followed by Micro Focus X-ray Computed Tomography (μCT) to determine the morphology and trajectory of the impacted and ectopically erupting teeth. Physical examination of the skull revealed a portion of the right maxillary canine tooth in the incisive fossa. μCT revealed the presence of right and left permanent maxillary canines within the palatine bone with cusps projecting into the incisive fossa. Both teeth were mature with well-developed root, root canal and crowns with distinct cusps. The root of the right impacted canine tooth was deflected at its apex. Tooth impaction is caused by mechanical disturbance in the path of the developing tooth. This information is vital to practicing maxillofacial surgeons during interpretation of the radiographs and surgical correction of disorders of the oral cavity.

INTRODUCTION

Tooth development is a continuous and complex process by which various biological, genetic and environmental variables interact to achieve the destination and final morphology of the tooth.1, 2 Disruptions in tooth development may lead to impaction and or ectopic eruption,3, 4 a frequently encountered clinical problem affecting the maxillary canine teeth. Impaction of these teeth is estimated to have a prevalence of 1-2 % in the general population, with 8% of all these cases being bilateral. Location of impacted tooth eruption has been reported including the maxillary sinus, the former is more prevalent.2, 4 Various other sites of ectopic tooth eruption have been reported including the maxillary sinus, mandibular condyle, coronoid process, orbit, nasal cavity and through the facial skin.1, 5 However, the aetiology of tooth impaction and or ectopic eruption remains elusive. Several theories have been suggested including trauma, infection, pathologic conditions, dental crowding, genetic and developmental anomalies.6, 7 Ectopic teeth may be asymptomatic, or may cause a variety of signs and symptoms, including facial pain, nasal obstruction, headache, epistaxis, foul-smelling rhinorrhea, external nasal deformities and nasolacrimal duct obstruction.8, 9 They can be associated with abnormalities such as intisicasosa with septal perforation, with aspergillosis, the formation of a rhinolith and with naso-oral fistula.10 The present study describes a rare case of bilateral ectopic eruption of maxillary canine teeth into the incisive fossa of an adult male dry skull.

CASE REPORT

During a routine inventory of the Raymond A. Dart Collection of Human Skeletons housed in the School of Anatomical Sciences at the University of the Witwatersrand, an erupted ectopic tooth in the incisive fossa of the hard palate was observed on a dry skull specimen of a 25 year old black African (Xhosa) male (Fig. 1A). The reported cause of death was suggestive of complications relating to lung carcinoma. External examination of the maxillary arch of the skull revealed intact premolar and molar tooth sets on both the left and right sides of the dental arch. Bilaterally, the central and lateral incisors were absent with evident signs of bone resorption at the sockets which had previously accommodated these teeth (Fig. 1A). All teeth were present on the mandibular arch except for the central and lateral incisors which were lost postmortem. There were no further tooth or bone abnormalities evident upon external observation.

The skull was then scanned using Micro Focus X-ray Computed Tomography (μCT) and the scan analysed with Amira (5.4.5) software to determine the type and trajectory of the tooth based on the dental morphology. The permanent maxillary canines possess an elongated single root apex and a sharp prominent coronal cusp which has mesial and distal cusp ridges (Figs. 2A, B). Permanent maxillary canines are large in size and contain a root canal (Figs.
The μCT investigation revealed two permanent maxillary canines within the palatine processes of the maxilla, having their cusps projecting into the incisive foramen (Fig. 1B). Both teeth were seen to have infero-medial inclinations towards the midline (Figs. 1C, D). The root of the right impacted canine tooth was deflected at its apex (Fig. 2A).

Figure 1. Photographic and μCT images of the hard palate in a young adult African skull specimen (A−D). (A) The cusp of the crown of right impacted canine tooth protruding into the incisive fossa. (B) Reconstructed image from the μCT scans showing the crowns of both the impacted maxillary canine teeth. Note the cortical bone has been excluded to reveal the left impacted tooth. (C) A coronal view reconstructed from μCT scans showing the orientation and trajectory of the impacted maxillary canine teeth. (D) A horizontal view of the orientation of the impacted teeth reconstructed from the μCT scans.

Figure 2. Coronal sections reconstructed from the μCT scans showing the morphology of impacted maxillary canine teeth and the relationship to the palatine processes of the maxillary bones in the hard palate (A−B). (A) An impacted maxillary canine tooth with an elongated single root. Note the well-developed root canal. The root apex is deflected (arrow) which is typical of impacted maxillary canine teeth (B) Sharp prominent cusps on the crown of the impacted maxillary canine teeth which have mesial and distal cusp ridges.

DISCUSSION
General considerations on impacted maxillary canine teeth
Canine teeth are the hallmark of a beautiful smile and of functional occlusion. They are also fundamental in successful dental arch development and disruptions in their development can lead to various tooth anomalies such as impaction and ectopic eruptions. Permanent maxillary canine teeth are the second most frequently impacted teeth after the third molar teeth. The general prevalence of impaction of permanent maxillary canine teeth is 1-2% in the general population with palatal impactions having the highest prevalence of 85%, the rest being displaced either buccally or labially. Permanent maxillary canine impaction occurs up to three times more frequently in females than in males. Several studies have been conducted to show variations in the prevalence of maxillary teeth impaction based on race and ethnic factors (Table 1). Morphologically, impacted maxillary canine teeth often present with deflected apical roots. The cause of apical root deflection is not clear, but the surrounding bone environment has been implicated.

AETIOLOGY
While the actual causes of tooth impaction or ectopic eruption remain inconclusive, various theories have been linked to these conditions. Richardson and Russell suggested that genetics and mechanical guidance are critical in determining the impaction and subsequent ectopic eruption of the maxillary canine teeth. Maxillary canine teeth develop far away from their final destination and hence obstacles like supernumerary teeth, tumours, and displaced teeth may disrupt normal eruption. However, various researchers have concurred that the absence of mechanical guidance from the maxillary lateral incisor teeth, which erupt earlier than the canine teeth, and variations in their root morphology are central to the impaction and subsequent ectopic eruption of canine teeth. It appears that the presence of lateral incisors with an appropriate root length and developed at the exact time are critical in providing guidance to the migrating canine teeth.

In addition, maxillary canine impaction can be as a result of either prolonged retention or early loss of deciduous canine teeth. In certain instances, tooth size-arch discrepancies can also lead to impaction or ectopic eruption of the canines. Regrettably, past medical history in the present case does not provide any information on how lateral incisors were lost and at what stage, hence it is not possible to reconcile the case with these theories. However, the observation of the absence of lateral incisors and signs of bone resorption on their healed sockets may suggest premature loss of the lateral incisors resulting in bilateral ectopic eruption of the maxillary canines.

Genetic theory describes palatally impacted maxillary canines as often presenting with other dental abnormalities in tooth size, shape, number and structure. Several abnormalities are believed to have a common hereditary link, manifested as a developmental disturbance during embryonic growth. It is reported that 33% of patients with palatally impacted canines also present with congenitally missing teeth and, in particular, patients with congenitally absent maxillary lateral incisors record a prevalence of palatally impacted canines of 2.4 times more than that of the general population. Besides, other congenital conditions such as ankylosis, cleft lip and cleft palate have been found in association with tooth impactions and ectopic eruptions.

Table 1: The prevalence of impacted maxillary tooth in different populations

<table>
<thead>
<tr>
<th>Author and year</th>
<th>Country and Population</th>
<th>Prevalence of impacted maxillary canines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zahrani</td>
<td>Saudi Arabia (4898 male and female children between 8 and 12 years)</td>
<td>2.05%</td>
</tr>
<tr>
<td>Aydin et al.</td>
<td>Turkey (148 cases of both male and female patients)</td>
<td>3.58%</td>
</tr>
<tr>
<td>Sajnani and King</td>
<td>China (533 adolescent children (327 females and 206 males)</td>
<td>2.1%</td>
</tr>
<tr>
<td>Mustafa and Abuaffan</td>
<td>Sudan (among 2401 male and female students between 17 and 25 years of age)</td>
<td>2%</td>
</tr>
<tr>
<td>Herrera-Atoche et al.</td>
<td>Mexico (860 patients between 12 and 39 years)</td>
<td>6.04%</td>
</tr>
</tbody>
</table>
CLINICAL COMPLICATIONS ASSOCIATED WITH THE INCISIVE CANAL AND IMPACTED ECTOPIC CANINE TEETH

The maxillary incisive foramen is a funnel shaped opening that conveys the nasopalatine nerves and arteries from the nasopalatine canal to the anterior palate. During life, the maxillary incisive papilla overlies the incisive fossa. The maxillary incisive papilla is an important anatomical landmark in prosthodontic dentistry particularly for arrangement and alignment of teeth to the midline. The incisive papilla also marks the site for the administration of local anesthesia in the anterior palate. The maxillary incisive canal together with the incisive foramen connects the palate to the floor of the nasal cavity.

Although no serious clinical complications have been reported as a result of surgical disturbance to the contents of the incisive canal, temporary sensory discomfort has been reported following surgical transection of the nasopalatine nerve during first week after surgery. Conversely, complications arising from pressure on neurovascular structures due to prolonged use of dental implants have been reported leading to neurological dysfunction. The cusps of the ectopic maxillary canines in the present case projected into the incisive fossa, suggesting the possibility of compressing the nasopalatine nerve and vessels in the incisive foramen.

In conclusion, the current presentation may be valuable to dental and maxillofacial surgeons for it highlights and focusses attention on a possible altered path of tooth eruption of the maxillary canines and associated clinical sequelae.

Conflict of interest: None

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Author contributions: TN, EN and NB were involved in data collection/inventory and preliminary writing of the paper. BKB, RN and PM designed and guided the manuscript development and review of the manuscript. PM is the principal investigator. All authors approved the manuscript.

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SUMMARY
Epithelial-myoepithelial carcinoma (EMC) is a rare salivary gland neoplasm with an incidence of less than 1%. It tends to form biphasic ductal structures, consisting of epithelial cells lining the lumen which is surrounded by abluminal myoepithelial cells. Occasionally, EMC may show a predominance of clear myoepithelial cells. In this report involving a 64-year-old woman, we describe a case of EMC of the right parotid gland with a less obvious biphasic pattern, and importantly, a double clear cell component, showing development of clear myoepithelial cells inside and outside of the lumen. Our objective is to demonstrate the importance of immunohistochemistry in identifying this tumour when faced with the differential diagnoses of clear cell tumours.

INTRODUCTION
The salivary glands may give rise to a wide spectrum of benign and malignant neoplasms, including many rare subtypes. Collectively these represent less than 2% of all neoplasias and less than 3% of all head and neck neoplasms.1 In human cancer pathology, this group of tumours demonstrates perhaps the greatest variability when considering the surprising multiplicity of types with different histology, cytology and macroscopic structures.1,2

Many authors attribute the complexity of these neoplasias to their myoepithelial component. The salivary gland tumours which most frequently contain myoepithelial cells in addition to other cell types include pleomorphic adenoma, adenoid cystic carcinoma and epithelial-myoepithelial carcinoma (EMC).2

EMC is a rare salivary gland tumour, which arises most commonly in the parotid gland. It has an incidence of less than 1%, the peak of which occurs in the seventh decade. It is predominantly therefore, a tumour of adults, and approximately 60% of patients are female.3,4

The histological structure of EMC tends to show multinodular growth, with tubular structures covered with a biphasic population of cells comprising luminal epithelial cells and abluminal myoepithelial cells.2 Occasionally, it shows solid growth with a predominance of clear myoepithelial cells.4,5

Our objective is to report a case of EMC of the parotid gland with a less obvious biphasic pattern and a two-fold clear cell component, consisting of luminal and abluminal clear myoepithelial cells. In addition, we demonstrate the importance of immunohistochemistry in identifying this tumour and in distinguishing it from other clear cell tumours.

PATIENT HISTORY
A 64-year-old female presented to the hospital of one of the authors (AC), with a four-year history of a right-sided parotid swelling of approximately 3cm in size. Mild facial pain had developed over the 6 months prior to presentation, and was increased on palpation. Initial radiological investigations included ultrasound and computed tomography (CT). The patient subsequently underwent a superficial parotidectomy under general anaesthesia. Pre- and sub-auricular incisions were made to remove the gland, while also identifying and preserving the facial nerve.

ACRONYMS
- o-SMA : alpha-smooth muscle actin
- CT : computed tomography
- EMA : epithelial membrane antigen markers
- EMC : epithelial-myoepithelial carcinoma
- FNA : fine-needle aspiration

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Ultrasound imaging of the right parotid gland revealed a nodular lesion within its middle third. This parenchymal lesion was well demarcated, lobulated and heterogeneous in appearance, and measured 21 x 18 x 16 mm. There was an acoustic shadow posteriorly and the lesion was poorly vascularised peripherally (Figure 1). There was no cervical lymphadenopathy and the other major salivary glands were normal in appearance.

CT revealed a space-occupying lesion in the anterior region of the right parotid gland. This was oval in appearance with well-defined but occasionally irregular borders. Its maximum diameter of 23 mm was visualised following administration of intravenous contrast. The lesion did not extend beyond the gland. The left parotid gland was mildly hypotrophic but with normal morphology. Non-specific lymphadenopathy was observed bilaterally inferior to the parotid glands and in the submandibular region.

Macroscopic examination of the resected specimen shows a nodule measuring 2.5 cm in diameter. On sectioning it had an elastic consistency and pale colour with cystic areas. Histopathological examination revealed a multinodular epithelial neoplasm surrounded by a thin capsule of fibrous connective tissue, which separated it from the normal parenchyma of the parotid gland. The surgical margins were free of tumour cells. There was a mixed pattern of tumour growth consisting of both biphic and clear cell areas, with the latter predominating (Figure 2a and Figure 2b). The biphasic pattern consisted of tubules with an internal lining of cuboidal epithelial cells and an external lining of one or more layers of large cells. The internal cuboidal epithelial cells had eosinophilic cytoplasm and round nuclei located centrally or basally, which occupied almost all of the cytoplasm. The large cells were myoepithelial in nature and had clear cytoplasm on H&E and on Cason’s trichrome staining, containing Periodic acid-Schiff (PAS)-positive glycogen granules. Their nuclei were vesicular and mildly eccentric. In many areas the predominance of clear cells was well manifested. These cells were arranged in solid trabeculae surrounded by a delicate stroma. Some trabeculae had small spaces filled with PAS-positive and toluidine blue-positive mucin (Figure 2c). Nests and tubules with a double layer of clear cells were also observed which did not contain mucin (Figure 2d).

Surrounding the tubular structures and solid areas was a material which was eosinophilic, metachromatic and PAS-positive. There was no nuclear atypia and only occasional mitotic figures (1-2 mitotic figures per 10 high-powered fields). There was no neurovascular invasion. The internal layer of epithelial cell was strongly positive to pan-cytokeratin AE1/AE3 and epithelial membrane antigen (EMA) markers. Immunoreactivity to p63 in the nucleus and alpha-smooth muscle actin (α-SMA) in the cytoplasm was highly specific to the tumour’s clear cells, markers which indicate myoepithelial differentiation. These findings corroborate the diagnosis of EMC (Figure 3a, Figure 3b, Figure 3c and Figure 3d).

DISCUSSION

Establishing the EMC of salivary glands as a diagnostic entity in 1991 represents another example of the terminological evolution in the classification of salivary gland neoplasms. Given the non-specific clinical and radiological presentation of EMC, the diagnosis of this neoplasm is established through histological and immunohistochemical characteristics as clear cells in EMC. The anti-mitochondrial antibody 113-1 may be used to identify tumours with oncocytes by recognising a 60 KDa glycosylated protein. The cells may be either clear or dark, given that the degree of eosinophilia varies between a moderate and high intensity. PAS-positive clear cells demonstrate a marked accumulation of glycogen and marginalisation of the mitochondria. These clear cells are negative for p63 and α-SMA. Differences in cell characteristics may be used to differentiate oncocytomas with clear cells and dark cells from oxyphilic oncocytopomas. In exceptional cases both cell types co-exist within the same tumour.

Clear cell myoepithelioma also has clear cells which demonstrate PAS-positivity related to glycogen content and the same immunohistochemical characteristics as clear cells in EMC. Despite this similarity, myoepithelioma does not tend to develop ductal or tubular structures and in the presence of clear cells, it may also contain foci of plasmacytoid, hyaline or epithelioid cells. A study by Thibault et al. in 1999 highlighted that the differential diagnosis of EMC should also include clear cell renal cell carcinoma. When affecting the parotid gland, metastasis of renal cell carcinoma may be difficult to distinguish from clear cell salivary gland tumours when using routine histological techniques. On the other hand, the use of cytokeratin immunomarkers may aid the diagnosis since positivity would be localised in renal metastasis yet diffuse in epithelial cells of EMC. Other characteristic features of renal metastasis are its heterogeneous architecture and the presence of a prominent vascular sinusoidal network with hemosiderin deposits.

In this case, the absence of renal pathology was corroborated by both clinical examination and complementary radiological studies.

Panel 1: Epithelial-myoepithelial carcinoma of the parotid gland. Ultrasound scan of the right parotid gland showing a nodular lesion within its middle third (arrow).

Panel 2: Epithelial-myoepithelial carcinoma of the parotid gland. Panel a) The biphasic type demonstrated double layer of epithelial (arrow) and clear myoepithelial cells (asterisk). Cason’s trichrome stain. 400x. Panel b) The clear cell dominant type demonstrated a large growth area of clear myoepithelial cells (asterisk). A double layer ductal structure showed inner epithelial (arrow) and outer clear myoepithelial cells (star). H/E stain. 400x. Panel c) Some trabeculae with luminal spaces containing mucinous material (arrow). Toluidine blue stain. 400x. Panel d) Clear myoepithelial cells arranged in solid trabeculae surrounded by a delicate stroma (arrow). Toluidine blue stain. 400x.

Panel 3: Epithelial-myoepithelial carcinoma of the parotid gland. Immunohistochemical staining patterns of epithelial and myoepithelial markers. Panels a) and b) p63. Nuclear immunoreactivity was expressed clearly in both biphasic and clear cells areas (arrows). p63 was not expressed in epithelial cells (star). 400x. Panel c) Pan-cytokeratin (AE1/AE3). Intense staining of the inner epithelial cells (arrow). Panel d) EMA. Epithelial cells exhibited positive EMA staining in their luminal surface (arrow). 400x.

We conclude that the immunohistochemical studies carried out confirm that our case corresponds to an EMC with two distinct tumour cell populations: epithelial and myoepithelial. In addition, the predominance of a clear myoepithelial cell component warranted a differential diagnosis considering other salivary gland primary epithelial tumours with clear cells and metastatic renal neoplasias.

Although EMC is considered a low-grade malignancy, there is a high rate of local recurrence, cervical metastases are seen in 18% of cases, and distant metastases (principally pulmonary, renal and cerebral) and death in 8%.9,11 In light of these data, the concept of EMC being a ‘low grade’ malignancy should be reconsidered.

Fine-needle aspiration (FNA) is a useful technique in clarifying the nature of these lesions but requires that the pathologist have an extensive knowledge of cervical pathology.14 This technique also risks sampling only one of the two cell populations present in the tumour. Despite this, it remains an excellent initial investigation with minimal side effects.

CONCLUSION

EMC is a rare salivary gland neoplasm with morphological disparities, which can cause significant diagnostic difficulties. As seen in the case presented, the strong positivity of the internal layer of epithelial cell to pan-cytokeratin AE1/AE3 and to EMA markers, as well as the immunoreactivity to markers that indicated myoepithelial differentiation, confirmed EMC. The diagnosis of EMC is usually complex, given the similarity of histological patterns with other neoplasms.

Acknowledgements

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Conflicts of Interest: The authors declare no conflicts of interest.

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Online CPD in 6 Easy Steps
1. Go to the SADA website www.sada.co.za.
2. Log into the ‘member only’ section with your unique SADA username and password.
3. Select the CPD navigation tab.
4. Select the questionnaire that you wish to complete.
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The role of laser therapy in removable prosthodontic dentistry.

INTRODUCTION
Laser technology has improved the patient management alternatives available for many disciplines in Dentistry including removable prosthodontics.

This is particularly true for soft tissue management including ulceration and inflammatory conditions, but also for hard tissue applications and pain control, enhancing outcomes in comfort, stability, retention and aesthetics.1

The lasers used in dentistry differ in the wavelengths of the radiation produced, each having a specific thermal output and a specific tissue interaction that are always predictable.2 The wavelengths include: low level laser: visible light from 400 to 700 nm, Diodes >800-1,064 nm, Nd : YAG 1,064 nm, Erbium: 2,790-2,940 nm, and CO2: 9.3-10.6 nm.

DISCUSSION
Lasers can be used as adjuncts to removable prosthodontic care for many different procedures.

These include reduction of hard and soft tissue tuberosities, removal of torus, preparation of unsuitable bony aspects of residual ridges such as reducing undercuts and smoothing irregularly resorbed ridges, vestibuloplasty and revising hyperplastic and unsupported soft tissues and dealing with other abnormalities of both hard and soft tissues such as epulis fissurata. Further, laser can be used in the treatment of papillary hyperplasia, denture stomatitis, nicotinic soft tissues such as epulis fissurata. Further, laser can be used in the treatment of papillary hyperplasia, denture stomatitis, nicotinic soft tissues such as epulis fissurata.

The erbium lasers may be used safely to ablate the osseous material of torus, preparation of unsuitable bony aspects of residual ridges layer by layer, until a sufficient amount has been removed. A slow but steady ablation of bone prevents the accidental perforation of the palate or creation of a fistula. Any laser wavelength can be used to create haemostasis and to decrease the risk of haematoma. Ablation of the bone involves a large number of different and rapid processes that occur as the laser beam is absorbed by the bone.

Mandibular tori are present in 8% of the population, affecting men and women equally. Mandibular tori occasionally can interfere with fabrication of a full or partial denture, in which case a torus reduction is indicated. Palatal tori occur in 25% of female patients, twice the incidence in male patients. Palatal torus reduction is rarely necessary before fabrication of a maxillary prosthesis, as the discomfort associated with wearing the denture is usually managed by judicious easing of the acrylic bases. During the reduction or removal of palatal tori the following complications can occur:

- Nasal perforation
- Oronasal/oroantral fistula
- Palatal tissue necrosis
- Haematoma
- Palatal fractures.

The erbium lasers may be used safely to ablate the osseous material layer by layer, until a sufficient amount has been removed. A slow but steady ablation of bone prevents the accidental perforation of the palate or creation of a fistula. Any laser wavelength can be used to create haemostasis and to decrease the risk of haematoma.

ACRONYMS
nm : nanometres

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One of the more common soft tissue abnormalities diagnosed before full-denture fabrication, or during routine examination of a patient wearing a complete maxillary denture, is papillary hyperplasia. Causative factors include poor hygiene, poor fit of the denture causing a localised irritation, and occasionally, a fungal infection. Removal of the hyperplastic tissue by laser results in coagulation and cauterization of the site, preventing any haemorrhage.

Other oral mucosal lesions associated with the wearing of removable prostheses include the following:
- Denture stomatitis
- Traumatic ulcers
- Angular cheilitis

All of these lesions could be treated with lasers in "non-contact mode" with specifically prescribed fibre.2,3

CONCLUSION

Laser therapy can be used in the delivery of conventional pre-prosthetic treatment as well as in the treatment of denture induced mucosal lesions, to the great advantage and comfort of the patient.4

References:
Maxillofacial radiology case 159

SADJ April 2018, Vol 73 no 3 p167
CJ Nortje

Below are images of a lesion that does not commonly present in the upper jaw and has a preference for the mandible. Discuss the important radiological features and what is your differential diagnosis?

INTERPRETATION

Fig. 1 shows a unilocular radiolucency affecting the body of the mandible. Fig. 2 shows a radiolucency with scalloped margins (red arrows) between the tooth roots with lack of expansion of the bone. Fig. 3 shows a multilocular lesion at the right angle of the mandible which is a rare finding. In all the cases a diagnosis of a solitary bone cyst was made. The cyst is a cavity in the mandible and is not a true cyst as it lacks an epithelial lining. It may be a normal variant rather than a disease process. The cyst is also known as a solitary, traumatic or a haemorrhagic bone cyst. The aetiology and pathogenesis of the cyst is unknown. The various names that have been applied suggest speculation as to the possible etiology of the lesion. The cysts have been detected in patients with widely ranging ages (2 to 75 years); however, most are found during the second decade of life. They occur in the mandible with almost equal frequency in the body and vertical ramus with no gender predilection. In the majority of cases it appears to be an incidental finding. Though the epi-pathogenesis of the solitary bone cyst is not clear, the most common underlying cause is trauma. Traumatic-haemorrhagic theory suggests that the lesion develops if intramedullary clots after trauma do not undergo lysis or resolution. The cyst is asymptomatic with no sign of pain and swelling, as it does not cause cortical expansion, as demonstrated by the axial CT image (Fig. 4). A common radiographic finding describes a unilocular radiolucency with scalloped margins in the periapical region of the teeth involved which are normally vital. Histopathologically, the cyst is either empty or may reveal connective tissue membrane lining or may be filled with serous or sanguineous fluid which shows a homogenous high signal as illustrated on the axial T2-weighted MRI image (Fig. 5). Surgical intervention may reveal an "empty" cavity in solitary bone cysts (Fig. 6). Generally the solitary bone cyst is above the mandibular canal. Differential diagnosis must include the odontogenic keratocyst tumour.

References:
There is consensus in the literature that (meticulous) tooth brushing at least once per day is sufficient to maintain oral health and to prevent caries and periodontal diseases. Tooth brushing is also regarded as an important vehicle for application of anti-caries agents, such as fluorides. However, most patients are not able to achieve sufficient plaque removal by performing oral hygiene measures at home. Therefore, tooth brushing twice daily is recommended by most of the dentists in order to improve plaque control. This rule is followed by most of the patients taking care for their oral health and has shown to be effective in maintenance of oral health in numerous studies. Hence, using a toothbrush (TB) within the personal daily oral hygiene procedure is nowadays a standard in developed societies.

The literature distinguishes between manual (MTB) and powered (PTB) systems, in which the latter are repeatedly described to be more effective in plaque removal and reduction of gingival inflammation. It is furthermore possible to differentiate within PTB into oscillating-rotating (OR) and sonic-active (SA) modes of action. The available literature shows the largest body of evidence for the effectiveness of OR systems.

The ability to effectively remove plaque is thought to be influenced by instructions received from oral health professionals, especially in the cases of manual toothbrushing. Additionally, the influence of instruction for PTB is also unclear. Schmalz and colleagues (2018) reported on a randomized clinical study (RCT) that compared instructed and non-instructed young, oral healthy participants within different groups including manual toothbrushing(MTB), powered oscillating-rotating (OR) toothbrushing, and powered sonic-active (SA) toothbrushing regarding their effectiveness in plaque removal and reduction of gingival inflammation. The aim of the study was to detect the effect of an instruction within a group using OR, SA, or MTB in young, oral healthy adults. It was hypothesized that PTB including OR and SA would be less dependent on instructions compared with MTB.

Materials and methods: This was a prospective RCT with a six-arm parallel design. Participants were randomly divided into three groups (powered oscillating-rotating (OR); powered sonic-active (SA) and manual toothbrushing (MTB); n = 50 each group) with two subgroups each: participants receiving no instructions (NI) and participants receiving instructions (I) (n = 25 per group).

A total of 162 participants were screened for eligibility, of whom 150 were included in the study. The following inclusion criteria were defined: Healthy oral conditions, i.e., no active carious lesions, which require invasive treatment (D-T = 0), and no periodontal treatment need (PSR/PSI ≤ 2) Periodontal Screening recording; Periodontal Screening Index); a minimum number of 20 remaining teeth; age between 18 and 30 years; ability to give informed consent and voluntary participation. The exclusion criteria were the following: Inability to participate due to severe general diseases; diseases affecting motor skills; presence of metabolic diseases (diabetes mellitus), infectious diseases (hepatitis A/B/C, HIV), renal insufficiency, seizure or neurological disorders, pregnancy, addiction (alcohol, drugs), required antibiotic prophylaxis due to endocarditis risk or immunosuppression (e.g., due to organ transplantation).

The plaque accumulation at screening examination of each patient was classified into three categories using the baseline-modified Quigley–Hein Plaque Index (mod. QHI) as follows: good (< 1), moderate (1–2), or poor (> 2). Based on these categories, as well as smoking habits, gender, and left-handedness, a matching was performed to ensure comparable groups.

Three types of toothbrushes were chosen: OR (Pro1000 Precision Clean, Procter & Gamble), SA (SonicCare™, Philips), and MTB (elmex®INTERX). Furthermore, all participants used the same toothpaste (Sensodyne®Fluoride) during the whole time.

**ACRONYMS**
- GI: Gingival Index
- TB: toothbrush
- MTB: manual
- PTB: powered
- PBI: Papilla Bleeding Index
- mod. QHI: Quigley–Hein Plaque Index
- ORoscillating-rotating
- SA: sonic-active
- RCT: randomized clinical study

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Gingival inflammation was evaluated using the Papilla Bleeding Index (PBI) and the Gingival Index (GI) by Loe and Silness. The PBI score ranged from score 0 (no bleeding) to score 4 (profuse bleeding). GI was used to assess changes of the gingiva. A score from 0 (normal gingiva, inflammation-free, no discoloration, no bleeding) to score 3 (severe inflammation, reddening and swelling, tendency toward spontaneous bleeding or ulceration) was used.

Plaque accumulation (using the Plaque Index by Quigley and Hein (QHI) modified by Turesky et al.) on the smooth surfaces of the tooth (buccal, oral) was assessed and evaluated on a scale with six grades (score 0 = no plaque; score 5 = plaque extending to the coronal third). Furthermore, the Marginal Plaque Index (MPI) was used to differentiate plaque extension at the gingival margin. The evaluation was performed on eight measuring points at each tooth (score 0 = no plaque; score 1 = plaque).

All study-related examinations were performed under standardized conditions by a skilled, calibrated, and blinded dentist (kappa > 0.8) at baseline, 2, 4 and 12 weeks.

All participants received a professional tooth cleaning including the removal of supragingival calculus, biofilm, and extrinsic discolorations as well as the polishing of the tooth surfaces at baseline. Then, the participants received the corresponding TB according to their group allocation (OR, SA or MTB). With respect to their subgroup (I or NI), participants got a brush-specific instruction. All groups were required to brush twice daily for 2–3 min and to abandon other oral hygiene aids such as dental floss and/or interdental brushes or mouth rinses. Furthermore, all participants had to use the same toothpaste (Sensodyne® Fluoride).

Results: One hundred thirty-one participants could be included for final analysis. Thereby, 43 individuals comprised to powered oscillating-rotating OR (OR-I = 21, OR-NI = 22), 44 to powered sonic active SA (SA-I = 22, SA-NI = 22), and 44 to MTB group (MTB-I = 22, MTB-NI = 22). During the study period, 11 participants (SA 4, OR 5 and MTB 2) missed their allocation appointment, and 8 participants got a brush-specific instruction. All baseline parameters including gender, smoking habits, left-handedness, DMF-T, PBI, and mod. QHI were comparable between the groups.

Within the manual toothbrushing (MTB) group over the study periods (baseline to 12 weeks), no statistically significant changes in modified QHI and MPI were found for both subgroups (I and NI; p > 0.05). With OR, I and NI subgroups showed a statistically significant reduction of MPI (I: p = 0.04, NI: p < 0.01) and of modified QHI (p < 0.01). Similarly, the SA group showed a significant reduction of MPI (p = 0.05, NI: p < 0.01) and of modified QHI (p < 0.01) for both subgroups. Comparing the outcome of all subgroups at 12 weeks, no statistically significant differences could be found between any of the subgroups for MTB (p = 0.34) and modified QHI (p = 0.08). Within the MTB group, no statistically significant changes in PBI were found between baseline and 12 weeks for both I (p = 0.14) and NI (p = 0.15). Regarding GI, a significant improvement could be found in the I subgroup of MTB (p = 0.03). In the OR group, no significant reduction of PBI and GI was detected (p > 0.05). Within the SA group, the I subgroup showed a statistically significant reduction in PBI (p = 0.02), and, for the NI subgroup, a significant improvement of GI was found (p = 0.05). Comparing the outcome of all subgroups at 12 weeks though, no statistically significant differences could be found between any of the subgroups for PBI (p = 0.29) and GI (p = 0.97).

At the final examination at 12 weeks (t3), only the modified QHI showed statistically significant differences between I and NI participants, regardless of the toothbrush system. Thereby, a significantly lower QHI was found for I compared to NI group (1.13 ± 0.32 vs. 1.17 ± 0.33; p < 0.01).

MPI (I: 0.62 ± 0.57, NI: 0.56 ± 0.15; p = 0.07), PBI (I: 0.45 ± 0.34, NI: 0.54 ± 0.38; p = 0.80), and GI (I: 0.97 ± 0.13, NI: 0.99 ± 0.09; p = 0.90) showed no statistically significant differences at 12 weeks.

Conclusion: The researchers concluded that the toothbrush system (MTB, OR, or SA) as well as the presence or absence of a single standardized brush-specific instruction has no relevant influence on plaque removal and reduction of gingival inflammation in young, orally healthy adults.

Implications for Practice: The results of this trial suggest that instructions on how to brush has a limited effect in this age cohort.

Reference:

2. Intraligamentary anesthesia versus inferior alveolar nerve block for extraction of posterior mandibular teeth: A RCT


Tooth extraction is one of the most common dental treatment measures requiring local anaesthesia. Currently, the inferior alveolar nerve block (IANB) is still the most commonly used technique for providing local anaesthesia in the posterior mandible.1 With the IANB, a wide area of the mandible is anesthetized; extended restorative and surgical procedures can then be carried out using one injection only. However, this technique is painful, has a relatively high failure rate and has technique immanent risks, such as transient or even persistent damage of the lingual and/or the inferior alveolar nerve.1 Further disadvantages of IANB may include intravascular injections, hematoma, muscle injury, and trismus. In general, the duration of soft tissue anaesthesia after IANB exceeds the time required for most dental treatments and there is an increased risk of burn and/or bite injury especially in children and patients with mental disabilities.1

An alternative technique to consider is the intraligamentary injection. When using intraligamentary anaesthesia (ILA), the local anaesthetic solution is injected under relatively high pressure directly into the periodontal space of the tooth to be anesthetized. The injected solution is forced laterally through the cribriform plate into the marrow space and into the blood vessels of the alveolar bone. From there, the solution spreads to adjacent teeth and structures.1 This results in a profound anaesthesia with an immediate onset of action and an anaesthetic duration of approximately 30–45 min using only a small amount of anaesthetic solution (about 0.2 ml for each root). The anaesthesia is limited to a single tooth and its supporting structures while anaesthesia

ACRONYMS
IANB: inferior alveolar nerve block
NRS: numeric rating scale
ILA: intraligamentary anaesthesia
NSAD: anti-inflammatory
of the lips, cheeks, and tongue is avoided. Reversible damage of periodontal tissue, bone and root resorption, and severe bacteremia are reported disadvantages of this technique.

Kämmerer and colleagues (2018) reported on a trial that sought to evaluate the efficacy of ILA—in comparison with IANB—for non-surgical extraction of mandibular posterior teeth. The primary objective was to evaluate the differences between ILA and IANB in respect to the pain perceived by the patient during the injection and during the extraction procedure, as well as the anaesthetic quality (complete/sufficient vs. insufficient/no effect), based on the outcome of treatment and the degree of discomfort associated with the extraction procedure. Differences in latency time, need for second injection, amount of anaesthetic solution, and duration of the local numbness were also assessed. A further objective of the study was to clarify whether impaired wound healing (dry socket) is more frequent after ILA.

MATERIALS AND METHODS
Patients of both sexes at least 18 years old with clinical indication for local anaesthesia because of scheduled extraction of one or more mandibular posterior teeth were considered for inclusion into this trial. Only teeth requiring simple extraction were included. Exclusion criteria were the following: incapacitated patients, pregnancy, lack of compliance, and chronic or simultaneous taking of psychotropic or anti-inflammatory (NSAD) drugs in temporal context with the dental treatment. Teeth with acute apical infections or drainage of pus from the gingival sulcus or surrounding tissues and teeth with more than 0.5-mm mobility in any direction were not included in the study. If more than one tooth on one side of the mandible was to be extracted under ILA, each tooth was considered as independent sample, as each tooth required its own anaesthesia. When, however, more than one tooth on one side was extracted under IANB, only one tooth that best fulfilled the inclusion criteria was considered. In the cases of bilateral dental extraction, either ILA or IANB was administered first on one side and tooth was extracted on this side. After completing the treatment and documentation on this side, the other technique was then administered on the other side and another tooth was extracted.

IANB was administered using disposable syringes and 25-gauge/42-mm needles. For the administration of ILA, pistol-type syringes (Ultraject®) and 30-gauge short-bevel/16-mm needles were used. The Ultraject® syringe consists of a screw-able holder for the local anaesthetic cartridge with a plastic protection tube and a fixture for attachment of the screw-able needle, a body of the syringe consisting of a toothed piston rod and a pawl for locking the piston rod, a trigger lever, and a handle with the mechanism of pressure limitation. The automatic pressure-limiting mechanism ensures that the applied pressure does not exceed 120 N. When pulling the trigger lever too quickly, the pressure transmission will stop automatically. The local anaesthetic agent used for both techniques was Ultracain D-S (articaine 40 mg/ml plus suprarenin 0.006 mg/ml) The exact time of the injection, the anaesthetic technique used, and the injected amount of local anaesthetic solution were recorded. Immediately after injection, each patient had to determine how painful the injection was using an 11-point segmented numeric rating scale (NRS). Numbness was tested with a dental probe on the gingiva immediately after the injection and further each 10 s in case of ILA and each 30 s in case of IANB till full numbness was declared, and the time of onset of the anaesthetic effect was recorded. The subjective quality of the anaesthesia was documented using a Likert scale (complete, sufficient, insufficient, and no effect). Anaesthesia was assessed as complete when it was possible to remove the tooth without pain and discomfort. The ability to remove the tooth successfully with mild but tolerable pain and discomfort was assessed as sufficient anaesthesia. Anaesthesia was assessed as insufficient when anaesthetic effect was reported by the patient subjectively, but the tooth could not be extracted successfully with tolerable pain and discomfort. Severe pain during the extraction and absence of subjective anaesthetic effect were assessed as no anaesthetic effect.

Cases of insufficient and no anaesthetic effect after the first injection were considered as primary anaesthetic failure. The need for second injection was documented. If the anaesthesia was still incomplete after the second injection and the completion of the treatment without pain was not possible, a combination of both anaesthetic techniques was undertaken. These cases were considered as cases of secondary anaesthesia failure. After complete removal of the tooth, the total time for the procedure was recorded. Patients were asked to remain seated for several minutes after completion of treatment and to evaluate the overall pain and unpleasantness of the entire treatment again using the 11-point segmented numeric rating scale (NRS). Prescription of postoperative antibiotics was done in only few cases with an increased risk of wound healing disturbances. One day later, the patients were asked (via telephone) about the duration of soft tissue anaesthesia. The wounds were examined for signs of retarded healing (dry socket) at a second appointment within 1 week after tooth extraction. The criteria for the diagnosis of a dry socket were as follows: empty alveolus, denuded bone surface being very sensitive to probing, extreme pain that lasted more than three days after extraction, and unpleasant taste and/or odour.

RESULTS
Two hundred sixty-six patients of both sexes (176 males, 90 females) were included in this study (teeth n = 301). For data evaluation, patients were categorized into two evaluation groups (group I and II) based on whether one or both anaesthetic techniques were used in individual patients (unilateral or bilateral tooth extraction). Group I (patient n = 238, teeth n = 245) involved the patients who received either ILA or IANB for indicated unilateral dental extraction while group II (patients n = 28, teeth n = 56) involved the patients who received both ILA and IANB because of indicated bilateral dental extraction (split-mouth). ILA was compared with IANB in each group separately, and the results in group I were then compared descriptively with those in group II (split-mouth).
In group I, the injection pain was rated with a mean of 2.19 ± 1.8 points on the NRS for ILA and 3.65 ± 1.9 for IANB. In group II, mean ratings of 2 ± 1.7 and 4.2 ± 1.8 were given for ILA and IANB, respectively. In both evaluation groups, injection of ILA was statistically significantly less painful for the patients (p < 0.001).

The pain perceived by patients during tooth extraction was rated with a mean of 2 ± 1.7 for ILA (1.6 ± 1.4 in group II) and a mean of 1.7 ± 1.9 points for IANB in evaluation groups I and II. The difference in pain during tooth extraction under ILA and IANB was not statistically significant in both groups (p = 0.211; 0.936).

The mean ratings for unpleasantness of the treatment under ILA were 2.3 ± 1.6 in group I and 2.1 ± 1.6 in group II in comparison to mean ratings of 2.5 ± 2 and 2.5 ± 1.8 for procedures under IANB in groups I and II, respectively. In both groups, the difference was not statistically significant (p = 0.31 and p = 0.427).

After the first injection of ILA in group I, complete anaesthesia could be achieved in 80/105 cases (76.19%). In 13/105 cases (12.38%), the anaesthesia was sufficient. In 11/105 cases (10.48%), the anaesthesia was insufficient, and in one case (0.95%), there was no anaesthetic effect. In case of IANB, complete anaesthesia could be achieved in 109/140 cases (77.86%). In 6/140 cases (4.29%) the anaesthesia was assessed as sufficient. In 23/140 cases (16.42%), anaesthesia was insufficient, and in two cases (1.43%), there was no anaesthetic effect. In group II, complete anaesthesia could be achieved in 23/28 cases (82.14%) of ILA. In 5/28 cases (17.86%), anaesthesia was sufficient. After IANB, complete anaesthesia could be achieved in 23/28 cases (82.14%). In 2/28 cases (7.14%), the patients assessed anaesthesia as sufficient, and in 3/28 cases (10.72%), the anaesthesia was insufficient. Accordingly, the success rate of ILA in extraction of mandibular posterior teeth was 88.6% after just one injection (100% in group II); this rate increased to 99% after the second injection. IANB, however, had a success rate of 82.2% after the first injection (89.3% in group II), and 98.6% after the second injection (100% in group II). The difference between the success rates of ILA and IANB after the first injection was statistically not significant.

The latency between the injection of the local anaesthetic and the onset of the anaesthetic effect was significantly shorter after ILA (mean 0.22 ± 0.6 min; 0.32 ± 0.7 in group II) than after IANB (mean 3.3 ± 1.9; 4 ± 2.8 min in group II; all p < 0.001).

The mean amount of local anaesthetic solution used was substantially less in the cases of ILA 0.35 ± 0.2 ml (0.36 ± 0.1 ml in group II) when compared with IANB 2.08 ± 0.3 ml (2.08 ± 0.2 ml in group II; all p < 0.001).

The mean duration of treatment under ILA was 5.6 ± 5.4 min in group I and 4.8 ± 4.2 min in group II. The mean duration of treatment under IANB was 10.7 ± 6.9 min (8.6 ± 5.5 in group II). The treatments under ILA were significantly shorter than those under IANB in both evaluation groups (p < 0.001 and p = 0.007).

The mean duration of soft tissue numbness was 47.7 ± 33.5 min for ILA (46 ± 16.4 in group II) and 228.6 ± 53.4 min for IANB (244 ± 59.6 in group II). The duration of soft tissue numbness after IANB was statistically significantly longer than that after ILA (all p < 0.001) and exceeded by far the average time required for tooth extraction.

Impaired wound healing (dry socket) was observed in six cases (5.7%) after ILA and in three cases (2.1%) after IANB. A comparison of the frequency of occurrence of impaired wound healing after ILA and IANB showed no statistically significant difference (p = 0.178). No case of clinically relevant bacteremia was observed in this study.

CONCLUSIONS
This study concluded that ILA fulfilled the requirements of a substantially complete and patient-friendly primary local anaesthetic technique. It represents a safe and reliable alternative to IANB for extraction of mandibular posterior teeth.

IMPLICATIONS FOR PRACTICE
The results suggest that ILA can be considered as an alternative technique especially for single tooth extraction in the posterior mandible. IANB should be restricted to more extensive dental treatment measures.

Reference
Embracing the ageing patient

INTRODUCTION
“Every flower is a soul blossoming in nature, and everyone is a rose, but even more complex than a mere flower. Everyone is made up of infinitely layered petals, and everyone has something indescribably precious at the heart of their being”. (Gérard de Nerval and Mary Balogh).

To carry this analogy further, the petals may be likened to a person’s life, with each one representing the different people or activities they encounter. The associates may include their spouse, children, work colleagues, friends, family, medical practitioners, as well as any number of strangers met during daily activities. Activities could revolve around work, family, sports, hobbies, education, social life, health, religion, or leisure.1 In a young bud the petals are tightly packed with no spaces between them. As the flower ages and opens some of the petals spread apart, and even begin to fall out. By old age there may be very few petals left. Those that remain gain importance as they occupy so much more of the individual’s time and thought processes. Medical and dental practitioners are often amongst the last petals to be lost, and may become central figures in the lives of their patients. Visits are often more about the social interaction than the actual provision of treatment.

AGEING IS NOT AN ILLNESS
In the past, Identiulism (sic) was considered part of ageing along with the other four “I’s” often associated with illnesses of the elderly, namely Incontinence, Instability, Immobility and Intellectual Impairment.2 Old age is not an illness, but is rather the gradual, irreversible and inevitable changes in structure and function, that occur with time. They are not due to disease or trauma, and are often associated with decreased functional capacity.3

Fortunately many of the characteristics once considered as inevitable in ageing are changing. The literature is replete with studies showing an increase in the percentage of the people living beyond 65 years, with an increase in the number of teeth being retained into old age, and an increased desire by patients to retain their teeth.4 In industrialised countries, the edentulous rates have decreased due to improved oral hygiene, patient health and dental care, with many people retaining some of their natural dentition into old age. At the same time the total number of edentulous patients has also increased due to falling birth rates and increased longevity of the adults.4

Nevertheless, there are many oral and dental complications which are frequently associated with physiological ageing. The most common, and it is a long list, include: progressive loss of gingival attachment, recession, cervical caries, tooth discolouration, attrition, fracture, interproximal wear, calcification of dental tubules, decreased pulp vascularity, root dentine transparency, increased cementum deposition, thinning of the oral mucosal epithelium, depapillation of the tongue, decreased number of taste buds, fibrosis of salivary glands, altered salivary pH and constituents and decreased salivary volume. Xerostomia reportedly occurs in 30% of adults older than 65 years and up to 40% of patients older than 80 years.1 It affects their speaking, enjoyment of food, mucosal healing and denture wearing. It may also be a major contributor to the common disease-related changes in the mouth, notably caries, periodontal disease and oral cancers. The caries may also result from habits such as sucking sweets and frequent sips of acidic drinks to try and relieve the dry mouth, and is a common side effect of medications such as antidepressants, respiratory agents, opiates containing analgesics, and cardiac and anti-hypertensive drugs.1 Root caries in particular is prevalent in those with gingival recession, which exposes the vulnerable root surfaces. Over 50% of persons over 75 years have root caries on at least one of their remaining teeth.1 Sadly, the annual increase in caries experienced by older people residing in nursing homes is reported to be double that experienced by those living in the community.4

DISEASE-RELATED CHANGES, MULTIPLE DISEASE STATES AND MULTIPLE MEDICATIONS
Disease must be differentiated from ageing. Old people are not ill because they are ageing, but because there is some disease process affecting them. Elderly people have fewer reserves of strength than the young, and illnesses that are not serious in youth can be dangerous in old age. The most common age-related conditions, and leading causes of death in those over 75 years are heart disease, cancer, cerebrovascular disease and pneumonia as a complication of influenza.4

The elderly tend to suffer from more diseases than the young especially chronic diseases, and may suffer several pathological conditions at the same time. As a result they are more likely to be taking multiple medications. Commonly prescribed medication for the elderly include “statins” for hypercholesterolemia, antihypertensive agents, analgesics, drugs for endocrine dysfunction notably thyroid problems and diabetes, antiplatelet agents, anticoagulants, drugs for respiratory conditions, antidepressants, antibiotics, and those for gastro oesophageal reflux.2 The most frequently taken over-the-counter (OTC) medications are analgesics, laxatives, antacids and vitamins.1

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Polypharmacy brings with it a host of problems. A recent survey in America revealed that over 40% of elderly patients take five or more prescription drugs at any one time. These drugs can cause adverse reactions, such as stupor, confusion, excitement from sedatives; respiratory depression from narcotic analgesics; peptic ulcers from corticosteroids; and increased cardiotoxicity of digitalis in the presence of diuretic-induced hyperkalaemia. They also show a decreased homoeostatic competence, which may magnify these drug responses. Patient compliance is a potential problem in elderly patients who need to take multiple medications. Non-compliance may result from patient error, non-comprehension, financial constraints, cultural attitudes, logistical obstacles obtaining medicine, or even battling to get medicine out of the bottle.

**PSYCHOLOGICAL AND SOCIAL PROBLEMS OF THE AGED**

With increased age faculties such as hearing and sight are diminished. This makes communication between the dentist and the elderly patient more difficult. In addition, visual and hearing impairment may lead to social isolation and/or withdrawal. This may be compounded in those who have additional social and psychological problems related to their role in life. They may be experiencing "Empty nest syndrome", be newly retired, recently lost a partner, or moved into a retirement home. These situations can impact negatively on their self-esteem. While some adapt well, others may not cope, and can display symptoms of overt or hidden depression. Some patients may not report ill health symptoms to their doctor, or may minimize their severity so as not to make a fuss. They may also be denying the possibility of disease out of fear, hoping that if they ignore it, it will go away. On the other hand, others may constantly be seeking medical attention and are labelled as "chronic complainers" by their family or caregivers. The dental process should be explained in a way that these patients have a real physical condition, or are merely seeking the company and attention of the practitioner and staff, one of their remaining "petals".

**EXPERIENCE INFORMS ATTITUDE**

Attitudes develop over time based on previous life events. They reflect where a person has come from, the influence family, friends and experiences have had on their lives, and often dictate how they will proceed with their life in the future. They are thus powerful, long lasting and difficult (but not impossible) to change. One of the problems with attitudes is that they can blind a person to information inconsistent with the particular attitude. The patients become selective in the way they perceive and respond to issues, and tend to lose objectivity. In dentistry, clinicians need to consider their patient’s attitudes and beliefs, try to identify some of the significant events that have shaped those attitudes, and establish what values and are important to the patient(s). For example, some patients in their 80s and 90s may have lived through the great depression and World War II and the austerity that accompanied those events. They grew up with a pennywise culture, and were prudent when disposing of items and money. This is in sharp contrast to affluent younger adults who are part of the modern "throw-away generation". The latter are accustomed to having easy access to commodities, are spoilt for choices, eat fast foods from disposable containers, and are familiar with updating devices and appliances as soon as a newer model become available. They may expect the same from their dental treatment and be impressed with / or insist on modern high-tech treatment such as that which promises a "smile in a day". Dentists need to be aware of differing patient attitudes and values, and try to understand the socio-economic history that may have shaped patient opinions. Perhaps the one feature both generations do often have in common, is that neither believe dentistry to be worth what it actually costs.

Although these two examples are broad generalization, the alert clinician, aware of differing patient experiences, attitudes and expectations, may better be able to counsel patients, as well as to effectively manage their oral needs and desires – which don’t always correspond! Thomson also cautioned against believing the stereotypes that “older people are disabled by their accumulated burden of clinical oral disorders”, and that they don’t place importance on their dental requirements, or have high aesthetic expectations. He postulated that their “age related stoicism, adaptability, capacity for coping, and ongoing reappraisal of what is important in their lives actually helps them manage well regardless of their physical handicaps.”

**EFFECTS OF AGEING AND DRUGS ON NUTRITION**

Age related changes in the gastrointestinal system could lead to a significant decrease in the absorptive capacity of essential nutrients. These changes include decreased intestinal blood flow and gastric motility, increased gastric pH, and decreased rate of cell renewal in the intestinal wall, with older cells being less effective in nutrient absorption. The resulting mal-absorptive processes primarily affect fat adsorption which impacts on calcium absorption, resulting in a negative calcium balance that in turn leads to osteoporosis and other disorders. Absorption of essential nutrients may be further impaired due to reactions with ingested medications. Laxatives and antacids adsorb nutrients to their magnesium oxide particles, while vegetable oil laxatives bind and prevent adsorption of fat-soluble vitamins. Vegetable fibre laxatives adsorb nutrients and may contain up to 50% dextrose, which is bad for diabetics, and have a high salt content, which affects cardiovascular patients. As well as impaired absorption of drugs, the elderly have altered distribution of medicines in the body as total body water decreases, while body fat increases. Therefore, water-soluble drugs have decreased distribution, and fat-soluble drugs (e.g. Valium) result in more extensive distribution. Protein-binding also influences distribution. With age, there is a decrease in plasma albumin, which is further decreased by illness and poor nutrition. Therefore, drugs that usually bond to protein will be higher in unbound concentrations where they exert a greater effect, e.g. salicylates, diazoxide, digoxin, furosemide, indomethacin, penicillin, phenytoin, probenecid, sulphonamides and warfarin. Clearance of drugs from the body is slowed by factors such as decreased hepatic blood flow, decreased glomerular filtration rate, and decrease in liver mass and enzyme activity.

Dietary deficiencies may result in malnutrition or even starvation. Vitamin deficiencies in particular are of importance to the dentist where they may be related to degenerative changes, including painful and/or burning mouth symptoms, while decreased folic acid leads to a smooth, red tongue and inflamed, delicate gingiva, and zinc deficiency leads to decreased salivary flow and also to loss of taste.

**Note:** Decreased chewing forces that result from wearing dentures may influence the selection of food types, and can make mastication difficult, but poor nutrition is not necessarily the outcome. Often social and economic factors impact more on diet than dental issues. Financial need can result in patients having an inadequate diet, poor nutrition, weight loss, inattention to medical needs, and inability to afford medicines.

**HOLISTIC PATIENT CARE**

While dentists still need to be familiar with the presentation and management of physiological and pathological age-related conditions in older adults, “care of the aged should be less focused on procedures and be more holistic and patient-centred.” Many of the following examples seem obvious and simple, but are often overlooked. These may include: speaking loudly, clearly and slowly for those who are hard of hearing, while at the same time not sounding patronising or condescending; facing the patients who read lips and making sure the lips are visible by removing your mask; avoid too much background noise for those with hearing aids; gaining the patient’s attention by using a light touch or signal before beginning with explanations; avoiding use of technical terms; follow up all verbal communication with written instructions; before starting a procedure inform the patient what equipment will be used, and again alert them when something different is about to
be done; and follow up all verbal communication, especially post-operative instructions, with written notes that they can re-read at home. Remember too, that learning and memory are also affected by age. Understanding, assimilating and remembering new information may be more difficult for older patients. These factors of age, memory and communication are important in conveying facts, obtaining informed consent and giving instruction on post-operative oral hygiene or prescription drug taking.

On a more practical side, the clinician should also consider the mode of transport patients use to get to the clinic, if they are able to travel alone or need to rely on others to take them, if they use public transport, the costs involved and the time of day that is best in relation to the management of their other diseases, medications and meals. They may also consider comfort and technical issues such as keeping large print magazines in the waiting room and use of large print on prescription bottles, have good lighting in areas where patients will be filling in forms, using bright colours on door handles, rails and stair markers, and having a chair that is easy to access or modify (turning the headrest around) for patients who are wheelchair-bound. For patients with physical disabilities such as osteoarthritis, consider how to adjust home care oral hygiene aids such as by attaching Velcro straps or bicycle handle grips to a toothbrush, suggesting use of an electric toothbrush, or providing floss holders. When trying to determine how much home-care help the patient may need the dentist can also assess their functional status by using an index called the “Activities of Daily Living” (ADL) which measures the person’s ability to function independently when performing daily activities such as moving, eating, dressing and bathing.⁸

On a more sinister note, the dental team are also in a good position to detect elder abuse. The dentist may treat “tell-tale” injuries, or notice on the body, while the receptionist and nursing staff may perceive hostile, neglectful or awkward relationships between the elderly patient and their caregiver in the surgery or waiting room. This is commonly referred to as “granmy bashing”, and is thought of as a recent phenomenon, but actually has deep historical roots. It was so rife in Europe, 200 years ago, that documents were drawn up in farming communities to ensure the rights of elder parents to use the front door of the house and to sit at the family table. Elder abuse may include: physical, psychological and verbal abuse; denial of rights; withholding of personal care; financial exploitation; and active or passive physical and/or psychological or emotional neglect. Abuse is often subtle, knows no social or economic boundaries, but should never be ignored.

AGEISM AND OTHER “ISMS” (AD NAUSEUM)

Are you still reading? Good. Are you smiling? Even better. So then, having got this far, perhaps you are still YOUNG enough to read further. (Notice that first ageism already).

Like most people living in the 2nd decade of the 21-century, you too are probably punch drunk with PC (political correctness), tired of tact, sick of sensitivity, and immured by inclusiveness. So, to add to the torture, let’s add ageism to the list. Once one becomes aware of such practices, it’s easy to see why they may offend older people, be they patients, colleagues, friends or family.

1. Advertising:
Dentists all work, to some extent, in the sphere of facial “aesthetics”. Despite the fact that the effects of ageing lie at the core of this issue, the aesthetics industry is one of the worst offenders of ageism. Consider the profusion of age-related advertisements for a myriad of “beauty products and services, guaranteed to restore the appearance of youth”. By buying into this and promoting treatment that will create or restore a perfect, bright, white smile, clinicians may be just as guilty of offending their elderly patients.

2. Conversation:
Everyone will have heard conversations along the lines of “Mrs Jones, I see you are 80 years YOUNG”, or “Mrs Jones, you look fantastic for an 80 year old”. By using patronizing phrase like these, one is accentuating rather than diminishing their person’s age, and relaying the message to Mrs Jones that she looks fantastic only because she is 80 years old. It’s important to guard against compliments that have hidden negative connotations.

3. Elderly behaviour:
Be wary of giving excessive acclaim to older people because they are behaving as if they are younger (sometimes inappropriately youthful behaviour). One frequently sees praise for a senior who has, for example, run a marathon, climbed a mountain, or parachuted out of an aeroplane. The older lady, sitting in her rocker, battling illness, financial constraints, mobility problems, and loneliness may be far braver but remains never acclaimed.

4. Euphemisms:
This is a bit of a minefield. Surveys have shown that some people take offence at being referred to as “elderly”, “elders”, “boomer”, “senior citizen,” or “mature”. The most acceptable term seems to be “older person/people” or “senior” (without the “citizen”). All the preceding terms are, however, more acceptable than “golden oldies”, “geezer”, “retiree”, “person of a certain age” or reference to someone being in their “sunset years”. Beware also of adding adjectives as in “cute little old lady”. Perhaps we should follow the advice of Dumbledore, Harry Potter’s wise guardian who counselled Harry with regard to the feared Voldemort: “Call him Voldemort, Harry,” he said. “Always use the proper name for things. Fear of a name increases fear of the thing itself.”

5. Comedy:
Jokes about older people are sure to get a laugh – a fact well known, and so often overused by many comedians. The sort of one line quips such as: “Q: What is the advantage of Alzheimer’s? A: You get to hide your own Easter eggs!” Would anyone repeat this joke with regard to a mentally handicapped person? Awareness of potential sensitivity to this is useful in one’s social interactions. Because negative humour is so frequent and insidious, it may well be a root cause of the more serious forms of ageism. Perhaps the comedy industry too should be held to greater account by legal bodies, for overstepping socially acceptable boundaries.

6. The “Other –ism” test:
How does one judge for oneself what constitutes ageism? A useful way to make a judgement is to replace the age-related factor with another –ism and then make the decision. “Mr Smith, it is amazing that you bungee jump at your age!” Alternately “Mr Smith, it is amazing that you bungee jump as a gay man!” Would this be acceptable? Or once again, “Mrs Jones, you look fantastic for an 80 year old!” Alternately “Mrs Jones you look fantastic for a dentist / lawyer/ second hand car dealer” Acceptable?

There is of course the flip side of ageism (or any other –ism). Not reverse–ism, but what may be termed “boomerang –ism”, where the “benefits” of belonging to a cohort are exaggerated and harmful to some members of the cohort. With ageism this is
undoubtedly on the increase, and best demonstrated in older men where pharmaceutical aids to sexual function have brought about the expectation that virile sexual activity and being a “sexy senior” should extend well into the 9th or 10th decade of life. No such pharmaceutical benefit is yet available for women. On the other hand, women are pressured by societal expectations to pursue and conform to stereotypical images of physical attractiveness. There are a myriad of cosmetic and surgical procedures such as “rejuvenating” skin treatments, breast enhancements, and even vaginoplasty being advertised and available to them. Yes, you did hear right – and on that note, even hearing aids are now promoted as “sleek and sexy devices” in colours such as “Champagne Beige, Samoa Blue, Racing Green, Cabernet Red, Sexy Silver, and Negligee black!”

One has to be realistic – with increasing age one is closer to dentures, dribbling, diapers and death. Let’s take a cue from our older friends and family by declaring war on ageism – see if it doesn’t liberate you a little.

CONCLUSION
The increasing number of dentate and edentulous older adults will likely form a larger proportion of dental patients in the future. There will be a greater demand on dentists to manage conditions such as chronic xerostomia, active root caries, progressive recession and periodontal disease and ongoing incremental tooth loss. This may be complicated by physiological age-related oral and general changes, co-morbid medical conditions, regular use of a number of prescription as well as OTC drugs, and declining physical, sensory and cognitive faculties. This final chapter has emphasised the need to be more aware of the older patients’ problems, experiences, attitudes and oral health needs, and to identify, develop and test innovative approaches to catering for them holistically.

References
Head and Neck Cancers among HIV-positive patients: A 5 year retrospective study from a Johannesburg hospital, South Africa

1. Identify the INCORRECT statement. The progression of HIV infection to AIDS is diagnosed when:
   a. the immune system is depressed and opportunistic infections occur
   b. there is incidence of cancers such as Kaposi sarcoma (KS), non-Hodgkin’s Lymphoma (NHL) and invasive cervical cancer (ICC).
   c. the CD4+ T-cell count drops to below 350 cells/mm³
   d. the CD4+ T-cell count drops to below 200 cells/mm³

2. The introduction of HAART (Highly Active Anti-retroviral Therapy) in South Africa has been immediately successful in reducing the incidence of Kaposi Sarcoma
   a. True
   b. False

Oral Squamous Cell Carcinoma, a growing problem

3. Identify the CORRECT statement. The study found that the most commonly affected site for occurrence of oral squamous carcinoma (OSSC) was :
   a. The dorsum of the tongue
   b. The buccal mucosa
   c. The retromolar pad
   d. The floor of the mouth

Oral Squamous Cell Carcinoma, a growing problem

4. Identify the INCORRECT statement. There is delayed recognition of OSSC, possibly because :
   a. patients are ignoring the early signs
   b. the condition is masked by oral infections
   c. the medical and dental professionals in our region are not adequately addressing the progressive disease process
   d. a lack of patient education

Epidemiology of maxillofacial fractures at two maxillofacial units in South Africa

5. Identify the INCORRECT statement. The mandible is the commonly affected bone in maxillofacial trauma because :
   a. of its prominence
   b. the associated musculature does not protect it
   c. mobility
   d. its selection as a target of intentional violence.

6. Identify the CORRECT statement. The most common reason for the trauma was assault and most victims knew their assailants.
   a. True
   b. False


7. Identify the CORRECT statement. The most common area of pain reported for chronic musculoskeletal pain is :
   a. Wrist, shoulder, upper back
   b. Neck, upper back, shoulder
   c. Hand, wrist, forearm
   d. Neck, lower back, shoulder

8. Working in the dental department for 0-10 years was found to be more significant in the frequency of chronic musculoskeletal pain than working for 11-20 years:
   a. True
   b. False

Reasons why South African dentists chose a career in Dentistry, and later opted to enter an academic environment.

9. In electing to enter academe, dentists were less influenced by financial aspects and more by a desire to teach and be intellectually stimulated.
   a. True
   b. False

10. Having entered academe, dentists continue to experience pressures, as a result of long patient waiting lists and the need to perform research.
    a. True
    b. False

Micro-Endodontic Surgery-Part 1: Surgical Rationale and Modern Techniques

11. Identify the INCORRECT statement. Micro-endodontic surgery is indicated :
    a. Where peri-radicular disease persists in an endodontically treated tooth, and retreatment is unsuccessful or unfeasible.
    b. The retrieval of separated instruments or root filling materials that have protruded beyond the apex of the root.
    c. A tooth having inadequate root length.
    d. When a clinical investigation is required to directly visualise a possible vertical fracture.
    e. When a combined nonsurgical and surgical approach is required, such as treatment of a possible radicular cyst.

12. The retractors recommended for micro-endodontic surgery have a blade set at 110 degrees rotation to the handle.
    a. True
    b. False
A foreign object found in the ostiomeatal complex during dental implant planning: A case report.

13. The ostiomeatal complex is a functional part of the anterior ethmoid complex which forms the final common pathway for drainage and ventilation of the frontal, sphenoidal and posterior ethmoid cells.
   a. True
   b. False

Bilateral ectopic eruption of permanent maxillary canines into the incisive fossa, evaluated using Micro Focus X-ray Computed Tomography: A case study and brief literature review.

14. Trauma, infection, pathologic conditions, dental crowding, genetic and developmental anomalies have been suggested as possible aetiological factors in causing tooth impaction.
   a. True
   b. False


15. Identify the INCORRECT statement. Clear cell carcinoma is an unusual low-grade neoplasia which:
   a. develops almost exclusively in the minor salivary glands.
   b. has significant glycogen cellular content.
   c. shows cellular immunoreactivity to both low and high molecular weight cytokeratins.
   d. has a surplus of myoepithelial cells.

The role of Laser Therapy in Removable Prosthodontic Dentistry

16. Identify the INCORRECT statement. The advantages of using laser therapy in surgery during prosthodontic dentistry include:
   a. Shorter overall treatment time owing to reduced mechanical trauma and less oedema.
   b. Accuracy and safety even in untrained hands.
   c. Decreased bacterial contamination of the surgical site.
   d. Reduced swelling, scarring, and wound contraction at the surgical site.
   e. Excellent haemostasis, leading to superior visualisation of the surgical site.

Maxillo-Facial and Oral Radiology

17. The solitary bone cyst normally occurs below the mandibular canal.
   a. True
   b. False

18. The solitary bone cyst normally presents in the second decade of life.
   a. True
   b. False

Windows

19. In the Kämmerer et al. trial, injection of intraligamentary anaesthesia (ILA) was statistically significantly less painful for the patients than the inferior alveolar nerve block (IANB).
   a. True
   b. False

20. In the Kämmerer et al trial, the mean duration of treatment under intraligamentary anaesthesia (ILA) was significantly shorter than for inferior alveolar nerve block (IANB).
   a. True
   b. False

Answer True or False for the following statements.

21. Elder abuse may be active or passive.
   a. True
   b. False

22. Elder abuse encompasses use of euphemisms when referring to older people.
   a. True
   b. False

23. Elder abuse and ageism is seldom encountered in a dental setting.
   a. True
   b. False

24. Elder abuse includes financial exploitation of the elderly.
   a. True
   b. False

25. Ageism may include speaking loudly and slowly to an older person.
   a. True
   b. False

NOTE
Members are advised that there are no Ethical questions this month. All questions for this issue are Clinically related and therefore only Clinical CEU’s will be awarded. Apologies for any inconvenience.
- Bill Evans, Managing Editor
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