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The Malaysian Dental Journal covers all aspects of work in Dentistry and supporting aspects of Medicine. Interaction with other disciplines is encouraged. The contents of the journal will include invited editorials, original scientific articles, case reports, technical innovations. A section on back to the basics which will contain articles covering basic sciences, book reviews, product review from time to time, letter to the editors and calendar of events. The mission is to promote and elevate the quality of patient care and to promote the advancement of practice, education and scientific research in Malaysia.

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CONTENTS

Editorial: New Editor	5
Malaysian Dentist: Tax implications, penalties for non compliance and tax planning aspects <i>KF Choong</i>	6
Expression of p53 and PCNA at the tumour invasive front of oral squamous cell carcinoma <i>BTF George, RB Zain, SKS Kumar</i>	10
The Expert says.....Tumour markers in a nut shell <i>HM Hussaini</i>	18
Drug-induced pemphigus in Wilson disease <i>S Ram, SKS Kumar, RB Zain, NP Kipli, Lee GK, Ching LL</i>	20
A radiographic study of mandibular third molar development in a local orthodontic population <i>ST Loke, SK Tee</i>	24
Level of knowledge, perception and practices in relation to oral health promotion among final year trainee dental nurses <i>NA Azli, AT Zamzuri</i>	37
Minimally invasive approach in management of ranula in children <i>B Saripudin</i>	44
A comparative study of prevalence of tori between Malay, Chinese and Indian races residing in Johor, Malaysia and Indians in Chennai, India <i>P Pushparajan, S Nalin Kumar, TR Saraswathi, S Ramachandran, Arasaratnam</i>	48
Dental management of patients with prosthetic joints: A review <i>WL Chai, CK Yong, WC Ngeow</i>	53
Manifestation of systemic diseases in the periodontium – a report of two cases. <i>YK Chan</i>	58
Instructions to contributors	62
Survey on readership of Malaysian Dental Journal	64

MDJ cover page: H&E pictures show intraepithelial split of pemphigus vulgaris in original magnifications of 40X and 100X. Note the basal cells separated from the epithelium (arrows). Two illustrations below show DIF positive for IgG and DIF positive for fibrinogen.

The cover picture is courtesy of Professor Dr. Rosnah Zain. Taken from article “Drug-induced pemphigus in Wilson disease”



EDITORIAL : NEW EDITOR

It is indeed an honour to be invited by the Publication Secretary, Dr. M. Thomas Abraham to become the editor of the 2005/06 issue of the Malaysian Dental Journal. Dr. Abraham has done a great job in reviving the Malaysian Dental Journal, coming out with not only one issue but two issues per year. It is indeed a difficult task for me to follow. Nevertheless, I take this new challenge as a new learning opportunity. Hopefully I can equal Dr. Abraham's contribution if not better.

For a start, I hope to continue the good work that Dr. Abraham has established. Hence it is my commitment to make sure that 2 issues of the Malaysian Dental Journal will be published during my tenure as the Editor. I am glad to announce that this is the first of the 2 issues I am committed to publish. We hope to be able to come up with the next issue before the next Annual General Meeting in June 2006.

Most dental professional journals restrict the contents to matters pertaining to research, updates, tips and news in dentistry. A few well read journals like the British Dental Journal, Journal of the American Dental Association and Dental Updates do include non-scientific journals like articles on the world-wide web to keep dentists abreast with the ever fast changing world. I too, believe we shall not restrain ourselves if we can receive good contribution/articles that may improve our profession as well as quality of life. For a start, I am glad to include an article on taxation for dentists. It is specially commissioned by a good friend of mine, Associate Professor Dr. Choong Kwai Fatt who gladly share with us his knowledge of income taxation and how we can get the best out of the allowances provided under the Malaysian Law. If the respond is good, we hope to come up with articles on financial planning as I personally feel that these topics were less taught in dental schools, yet they in fact become an important part of our life once we start working.

The Malaysian Dental Journal (formerly the Dental Journal of Malaysia), has been published for decades. Unfortunately, we have no feedback of the quality of publications as well as feedback on what dentists want to read. Prominent journal like the British Dental Journal conducted surveys on its readership. As a matter of fact, its survey even looked into dentists' lifestyle in order to cater for advertisers. So, you do see advertisement on car for example in this dental journal. It is my hope to do the same in order to improve on any shortcomings. I have included at the end of this journal a set of questionnaire survey forms which I hope readers will send back to the Editorial Office of the Malaysian Dental Journal. Some of you may have seen the forms being circulated around at some CDE programmes. We hope those who have not responded will do so.

One feature that we are experimenting with this issue of Malaysian Dental Journal is the incorporation of a section called: The Specialist says..... This is a commission column especially to discuss some learning issues on selected topics. We hope the busy practitioners will find that they learn something even if they are not interested to read the whole content of a related article.

Lastly, I would like to extend my gratitude to the members of the MDJ Editorial Advisory Board. I could have never done all the editorial work without their tireless assistance. Also grateful thanks to all the referees who have kindly review articles for the Malaysian Dental Journal.

Thank you.

Associate Professor Dr. Ngeow Wei Cheong
Editor
Malaysian Dental Journal 2005/06



Malaysian Dentist: Tax Implications, Penalties for Non Compliance and Tax Planning Aspects

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INTRODUCTION

Malaysian dentists exercising employment income have to file in the income tax return Form BE latest by 30 April 2006 to the Central Processing Center at Aras 12, Menara C, Persiaran MPAJ, Jalan Pandan Utama, Pandan Indah, 55100 Kuala Lumpur. Under the self assessment system, the difference between the actual income tax payable and the total monthly tax deducted by employer also has to be accounted to the Inland Revenue Board (IRB) collection branch by 30 April 2006. If there is excess payment, the tax authorities would refund this amount by crediting the taxpayer's bank based on the details provided by taxpayer.

Employment Income

Dentists exercising employment with the private sector will report the gross employment income as stated in the EA Form.¹ If entertainment allowances or traveling allowances are provided by the employer, then these entertainment expenses and traveling expenses incurred by the employee in carrying out his/her duties are tax deductible. Only the net amount is reported.

Dentists exercising employment with the government sector however have the following income exempted from their income tax:

- i) Fixed Housing Allowance;
- ii) Special Housing Allowance;
- iii) Fixed Public Service Allowance;
- iv) Critical Allowance;
- v) Free Utilities Allowance;
- vi) Mobile Phone Facility;
- vii) Driving License Allowance;
- viii) Wilayah Housing Allowance.

The gross employment income reported in the EC Form has to exclude the above and reported the net sum in the tax return.

Interest Income

Interest income derived from commercial banks is not required to be disclosed in the return Form BE as such interest income is either exempted or already taxed at source (5% tax) by the bank.

Interest income derived from the following sources will be taxed:

- (a) Loans to relatives or friends;
- (b) Convertible loan stocks/debentures/bonds
- (c) Convertible loan stocks issued by companies listed on MESDAQ.

Dividend Income

Only taxable dividend income is required to be reported to the tax authorities. The dividend income will be stated in the tax voucher as follow:

Gross dividend	Tax 28%	Net dividend
RM 1,000	RM 280	RM 720

The amount included in the Form BE is the gross dividend of RM 1,000 and the tax deductible of RM280 is deducted from the income tax payable computed, included in Column E11 of Form BE.

Rental Income

Rental income is reported in the tax return Form BE at the net amount, after deducting the following expenses that are incurred wholly and exclusively in the production of rental income. These expenses are:

- (i) quit rent and assessment;
- (ii) cost of repairs and maintenance of the property;
- (iii) insurance premium on fire/burglary;
- (iv) cost of supervision and rental collection;

- (v) cost of obtaining a new tenant to replace the old tenant;
- (vi) interest paid on loan facility taken to finance the property;
- (vii) cost of renewing the rental agreement and other miscellaneous expenses.

Foreign Source Income

Income received from outside Malaysia will be tax exempt by virtue of para 28 of sch 6 of the Income Tax Act 1967. It is not required to be reported.

If the properties are in joint name of husband and wife, then each will be responsible to report their share of the net rental income in the respective tax return.

Maximising donation and tax relief

Individuals embarking on the following charitable activities will be given tax deductions.

Section	Description	Individual
44(6)	Cash donation to Government, or local authority	√
44(6)	Cash donation to approved institution or organization	√
44(6A)	Artifact, manuscript or painting to the Government, State Government	√
44(8)	Cash donation to public or school libraries (restricted to RM20,000)	√
44(9)	Cash or contribution in kind for provision of facilities in public places for disabled persons	√
44(10)	Cash or medical equipment to approved healthcare facility (restricted to RM20,000)	√
44(11)	Painting to national or state art galleries	√

The following are tax reliefs available to the taxpayer:

Reliefs	YA 2005 RM
Personal (self)	8,000
Medical expenses for parents (restricted to)	5,000
Basic supporting equipment for taxpayer, spouse, children or parents (restricted to)	5,000
Disabled taxpayer	6,000
Fees for education in technical, industrial, scientific, technological or vocational fields – only apply to that individual and restricted to	5,000
Medical fees for taxpayer, spouse and children for serious diseases (restricted to) (includes RM500 for complete medical examination)	5,000
Purchase of books, magazine, journals for taxpayer, spouse, child	700
Interest expense incurred on acquisition of first residential property (restricted to)	2,000
Wife relief (if housewife or wife elects joint assessment)	3,000
Disabled wife	3,500
[Husband relief: if husband elects joint assessment with wife Disabled husband	3,500]
Child relief	
: Disabled (RM5,000 per child)	√
: Local universities, colleges or similar establishments (RM4,000 per child)	√
: Overseas universities, colleges or similar establishments (RM 1,000 per child)	√
: Others (RM1,000 per child)	√
EPF and life insurance premium (restricted to)	6,000
Education or medical insurance – taxpayer, spouse, children (restricted to)	3,000
EPF annuity insurance (restricted to)	1,000

Tax Rebate

Tax rebates are given preferential tax treatment as compared to tax relief. It is deducted from the income tax payable. The following are the tax rebates available to dentists:

- (a) Religious payment
A rebate shall be granted for any zakat, fitrah or any other payment of Islamic religious dues which are obligatory and paid in the basis period of 2005. The payment must be evidenced by a receipt issued by the Pusat Zakat of the respective States.
- (b) Personal computer
A rebate of RM500 shall be granted to an individual in respect of purchase of a personal computer in 2005. The claim has to be substantiated by a receipt. The rebate of RM500 would not be granted:
- for the following 4 years;
 - where the personal computer was used for business; or
 - where such rebate has been granted to spouse.

Income Tax Payable

The income tax payable is arrived at after taking the chargeable income and multiplying it with the scale tax ranges between 0% – 28%.

Aggregate income (from all source of income)	xx
- Donation	(x)
Total Income	xx
- Tax relief	(x)
Chargeable income	xx
Income tax rate (range of 0% - 28%)	
Income tax payable	x
- Rebate	
Zakat & Fitrah (for Muslim dentists)	x
Computer	(500)
Net income tax payable (A)	xx
- Tax credit on dividend income	(x)
- Total monthly tax deducted (as per Form EA/EC)	(x)
Final tax payable (A – B)	x
Refund of excess tax paid (B – A)	x

Where there is final tax payable, the dentist needs to fill in the remittance slip (CP 501) at the end of Form BE together with the payment to either a commercial bank (Public Bank or Bumiputra Commerce) or the IRB's collection branch located at:

SEMENANJUNG MALAYSIA

Tingkat Bawah, Block 8A,
Komplek Bangunan Kerajaan,
Jalan Duta
Kuala Lumpur

SABAH & WP LABUAN

Tingkat Bawah
Wisma Bandaraya
Jalan Masjid Lama
Kota Kinabalu

SARAWAK

Aras 1
Wisma Ting Pek Khiing
No. 1, Jalan Padungan
Kuching

The final tax payment has to be paid latest by 30 April 2006. Failing which, a late payment penalty of 10% will be imposed.

Where there is excess tax payment, the excess will be refunded by the tax authorities via the bank account provided by the taxpayer. The taxpayer however is required to write in to IRB's collection branch if the excess amount is not received by 31 December 2006. The relevant addresses are:

SEMENANJUNG MALAYSIA

Lembaga Hasil Dalam Negeri
Malaysia
Cawangan Pungutan, Tingkat 15,
Blok 8A Komplek Bangunan Kerajaan,
Jalan Duta Karung Berkunci 11061
50990 Kuala Lumpur.

SABAH & WP LABUAN

Lembaga Hasil Dalam Negeri
Malaysia
Unit Pungutan Tingkat Bawah ,
Wisma Bandaraya
Jalan Masjid Lama
88600 Kota Kinabalu

SARAWAK

Lembaga Hasil Dalam Negeri
Malaysia
Unit Pungutan
Aras 1, 3, 6, 7 & 8
Wisma Ting Pek Khiing
No. 1, Jalan Padungan
93100 Kuching

Responsibility of Keeping Records

The self assessment regime of taxation requires the taxpayer to keep and retain in safe custody the statement of income and expenditure, Form EA/EC, income tax payment, invoices, vouchers and receipts that are necessary to verify the particulars in the return Form BE for a period of 7 years. Failure to do so will result in non deductibility of such expenditure, a fine of between RM300 to RM10,000 and/or imprisonment for one year.⁴ The tax authorities will carry out tax audits by visiting the taxpayer's premises once in every five years to ensure the computation and the records are retained in accordance to the Income Tax Act 1967 (the Act). Penalties and/or additional notices of assessment will be imposed after the tax audit if there exists non compliance with the Act.

Submission of Return

The Act imposes strict penalty for non submission of income tax return Form BE, that is 3 times of the income tax payable,⁵ notwithstanding the fact that monthly tax deductions have been made by the employer. The deduction of monthly tax does not constitute a reasonable excuse and has no relevance to the submission of returns.

In hardcore cases, where a taxpayer has consistently failed to submit his/her income tax returns for several years, the tax authorities, in practice, would prosecute the taxpayer and if convicted, the taxpayer will be liable to a fine of between RM200 and RM2,000 and/or imprisonment for a period of 6 months for each year of non submission. In addition, the court will further order the taxpayer to submit the returns within 30 days from the order and will accordingly be liable for the income tax.

Tax Planning

Employment income exercised by a dentist has not much scope of tax planning. The significant tax planning tool will be to forgo the annual bonus or allowances in exchange for an increased contribution by the employer to the Employees' Provident Fund (EPF). Under the existing tax regime of section 34(4), the employer will be given a tax deduction against their business income up to 19% of the employee's salary. This tax planning tool only be effective if it is from the employer's contribution and not the employee's contribution.

Employees will have a much lower income tax payable by forgoing the receipt of annual bonuses and allowances. The amount is now represented by the EPF contribution to the Employees Provident Fund. Employees may now withdraw 30% of the accumulated fund in EPF to purchase residential homes or retain it to enjoy an annual dividend of 5%, compounded annually. This return of 5% is superior to the interest income derived from commercial banks.

Alternatively, dentists having to pay for child care facilities personally which is not tax deductible may arrange with the employer for the provision of child care facility by the employer as this is a tax free benefit to employee.

CONCLUSION

Living in a modern society is very stressful and demanding. Dentists are required to keep abreast with the technical knowledge in his/her profession and also familiarize themselves with the self assessment regime of taxation. Failure to do so will result in unnecessary money being incurred on penalties or additional income tax payable. The alternative solution is to seek professional tax advice when embarking on filling in of the tax return.

REFERENCES

1. C1 of B5 Form.
2. Section 103 of the Act.
3. A18 to A20 of Form BE.
4. Section 119A of the Act.
5. Section 112(3) of the Act.
6. Section 112(1), 112(2A) of the Act.
7. Section 1B(1)(b)(i) benefits.

Additional Reading:

1. Choong Kwai Fatt (2005), 'How To Fill In Your Income Tax Form B', InfoWorld.
2. Choong Kwai Fatt (2004), 'Tax Planning For Employees', Sweet and Maxwell Asia.

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Expression of p53 and PCNA at the Tumour Invasive Front of Oral Squamous Cell Carcinoma

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ABSTRACT The tumour invasive front of oral squamous cell carcinoma (OSCC) has been shown to have prognostic significance. The aim of this study was to evaluate the expression of p53 and PCNA (Proliferating cell nuclear antigen) at the invasive front of OSCC and to determine their association with certain clinicopathologic factors. **METHODS:** The study sample consisted of biopsies from 27 patients diagnosed with OSCC in buccal mucosa. Immunohistochemistry was used to investigate the expression of p53 and PCNA. **RESULTS:** The expression of p53 and PCNA was detected in 92.6% (25) and 100% (27) cases respectively. In general, the predominant distribution of immunoreactivity for p53 at the tumour invasive front with almost sparing of the central keratinising areas was observed to be similar to that for PCNA. The present study also suggests that there is no relationship between expression of p53 and PCNA with TNM staging. However there appears to be a relationship between expression of p53 and PCNA with both modified Broders malignancy grading and “pattern of invasion”. **CONCLUSION:** p53 and PCNA are well expressed at the invasive front of oral squamous cell carcinoma. Thus, it is feasible to use these markers in future studies to look into these markers as prognostic indicators.

KEYWORDS: Tumour, Invasive front, SCC, Markers.

INTRODUCTION

Oral cancer is a serious global public health problem with an annual incidence of about 200,000 of which up to two-thirds occur in developing countries.¹ Although there have been significant advances in the multi-modal treatment of the disease, the prognosis for oral cancer has not improved significantly.^{2,3}

The present study has focused on the tumour invasive front areas of oral squamous cell carcinoma (OSCC) because these parts have been observed to reflect important biological events, like morphological and molecular characteristics of the tumour, which may be of prognostic significance.^{4,5}

Mutation of the p53 tumour suppressor gene, also known as the “guardian of genome”,⁶ has been reported as one of the most common event in cancer.⁷ This mutation may lead to an increase in the pool of proliferating cells and also the probability of neoplastic transformation.⁸

PCNA (Proliferating cell nuclear antigen) plays an essential role in DNA replication and has been suggested as a marker of proliferating cells.⁹ p53 may act as a complimentary marker to PCNA given that PCNA reactivity defines the growth fraction of a tumour and p53 reactivity demonstrate the irreversible malignant change having occurred inside this fraction.¹⁰

The aim of the present study is to determine any association between expression of p53 and PCNA at the tumour invasive front of OSCC in the buccal mucosa with certain clinicopathologic features which have established prognostic significance, namely TNM clinical staging,¹¹ conventional malignancy grading as in modified Broders grading¹² and “pattern of invasion”.^{4,5} This is the first study in Malaysia which looks into the expression of PCNA and p53 at the tumour invasive front. This preliminary study is in accordance to the first phase in a hierarchy of prognosis study proposed by Hall and Going in 1999.¹³

This study utilised the immunohistochemical method to investigate the expression of p53 and PCNA at the tumour invasive front. This is because tissue morphological changes observed under light microscope are now recognised as a comparatively late consequence of key molecular events that have initiated pathological change, and the immunohistochemical studies are used to link these specific regulatory proteins in either their normal or mutated forms with these tissue changes.¹⁴

MATERIALS AND METHODS

The sample for this study was obtained from the archives of the Department of Oral Pathology, Oral Medicine and Periodontology, Faculty of Dentistry, University of Malaya, consisted of 27 cases of untreated primary tumours in the buccal mucosa that had been diagnosed histopathologically as oral squamous cell carcinoma (OSCC). These specimens had been fixed in 10% buffered formalin and then embedded in paraffin wax.

Histopathological grading

This was carried out using the modified Broders malignancy grading¹² and “pattern of invasion”.^{4,5}

Broders malignancy grading (Modified)¹²

The modified Broders system took into account a subjective assessment of the degree of keratinisation, cellular and nuclear pleomorphism and mitotic activity of the tumour population, and the tumours were then graded as well differentiated (grade 1), moderately differentiated (grade 2), and poorly differentiated (grade 3) oral squamous cell carcinoma.

Invasive front grading

The evaluation of “pattern of invasion” was carried out at the most invasive part of tumours (defined as 3-6 cell layers at the advancing front of tumours). A score of 1 to 4 is given based on the cohesiveness of the tumour at the invasive front¹⁵ (Refer Table 1). A high score indicated a poor prognosis and a low score, a good prognosis.

Immunostaining procedures

The immunostaining was carried out using the avidin biotin peroxidase technique. Heat mediated antigen retrieval was performed by incubating sections (4µ thick) in 0.01M citrate buffer at pH 6.0 in a microwave oven set at 100°C for 20 minutes. The primary antibodies used were DO-7 (Dako) and PC-10 (Dako) for p53 and PCNA respectively, while the controls were from a known case of OSCC that reacted positively to p53 and PCNA.

Immunohistochemical grading

The immunoreactivity for both PCNA and p53 were graded only at the invasive front area by integrating the staining intensity and proportion of tumour cells stained described in previous studies (16), with the aid of an image analyser (Refer Table 2).

TNM staging

The TNM staging used in the present study was based on the guidelines provided for lip and oral cavity carcinomas found in the 4th edition of the International Union Against Cancer (IUCC) TNM guidelines¹¹.

RESULTS

The present study consisted of histological specimens taken from 27 patients diagnosed earlier with primary OSCC in the buccal mucosa. The age of these patients ranged from a minimum of 47 years to a maximum of 76 years. The mean age is 61.6 years (standard deviation = 9.9). This sample consists of 18 (66.7%) female and 9 male (33.3%) patients, while the ethnic distribution is made up of 22 (82%) Indians, 3 (11%) Malays and 2 (7%) Chinese. The patients in this series had TNM clinical stages: II, III and IV. There were 5 (18.5%) patients clinically staged at II, 6 (22.2%) at stage III and 16 (59.3%) at stage IV. There were no patients at TNM stage I in this study. Fourteen (51.9%) patients had well differentiated carcinoma (grade 1), 9 (33.3%) had a moderately differentiated tumour (grade 2), while the remaining 4 (14.8%) had a poorly differentiated SCC (grade 3). The evaluation of the morphologic parameter of “pattern of invasion” at the tumour invasive front revealed 9 (33.3%) specimens with a score of 2, and 13 (48.1%) had a score of 3 while the remaining 5 (18.5%) had a score of 4.

Expression of p53 at the tumour invasive front of OSCC in buccal mucosa

Immunohistochemically detectable p53 protein accumulation was observed in 25 (92.6%) cases. Two cases (7.4%) did not demonstrate any expression of p53 at the tumour invasive front. All reactions with a distinct nuclear staining were considered positive, irrespective of the intensity of the immunoreactivity. A striking accumulation of p53 positive tumour cells were seen at the tumour invasive front as well as in peripheral layers of invading tumour islands (Refer Table 3; Figure 1). However, the central keratinizing areas in most tumours were p53 negative.

Table 1: Criteria of scoring used for “pattern of invasion”^{4,5}

Score	Criteria
1	Pushing, well delineated infiltrating borders
2	Infiltrating, solid cords, bands and/or strands
3	Small groups or cords of infiltrating cells (n<15)
4	Marked and widespread cellular dissociation in small groups and/ or in single cells (n < 15)

Table 2: Criteria for the grading of tumours for p53 and PCNA immunoreactivity:

Grading	P53/PCNA immunoreactivity
Strong (3)	Strong nuclear immunostaining in >50% of the ITF cells
Moderate (2)	Strong nuclear immunostaining in 10% to 50% or moderate nuclear immunostaining in > 50% of the ITF cells
Weak (1)	Moderate nuclear immunostaining in 10% to 50% or weak nuclear immunostaining in any proportion of the ITF cells
Negative (0)	Tumours completely lacking nuclear immunostaining

ITF: Invasive tumour front

Table 3: Relative grading of OSCC in buccal mucosa at tumour invasive front for p53 immunoreactivity

Grading	Grade 0 (G0) (Negative)	Grade 1 (G1) (Weak)	Grade 2 (G2) (Moderate)	Grade 3 (G3) (Strong)
n	2	9	4	12
(%)	(7.4%)	(33.3%)	(14.8%)	(44.4%)

Table 4: Relative grading of OSCC in buccal mucosa at tumour invasive front for PCNA immunoreactivity

Grading	Grade 0 (G0) (Negative)	Grade 1 (G1) (Weak)	Grade 2 (G2) (Moderate)	Grade 3 (G3) (Strong)
n	0	3	20	4
(%)	(0%)	(11.1%)	(74.1%)	(14.8%)

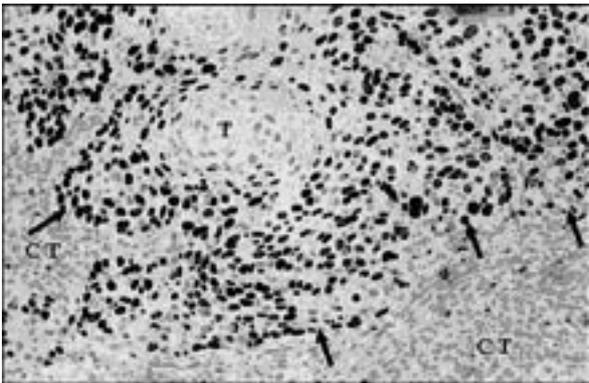


Figure 1 Immunoreactivity of p53 at the tumour invasive front of SCC in buccal mucosa. A striking accumulation of p53 positive tumour cells is seen at the tumour invasive front as well as in peripheral layers of invading tumour islands. However, the central keratinizing areas in most tumours are virtually p53 negative. Arrows showing tumour invasive front. T – Tumour area; CT – Connective tissue area. (Original magnification X50).

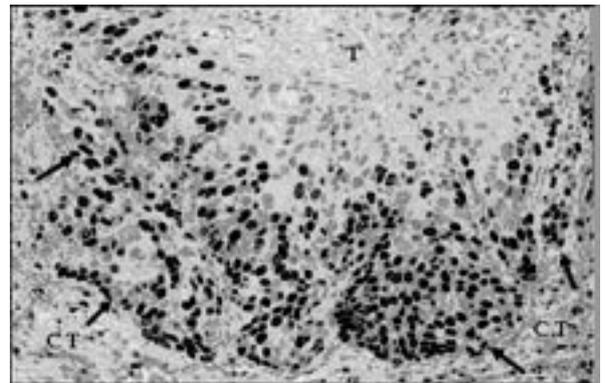
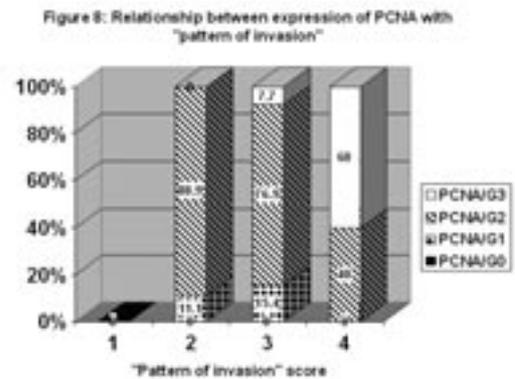
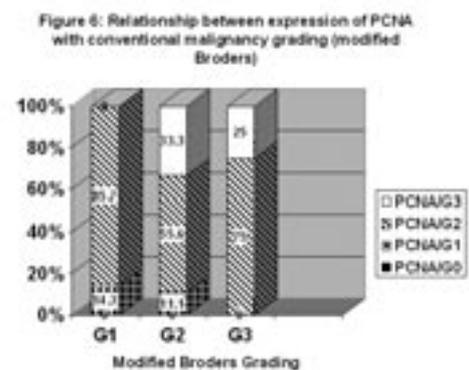
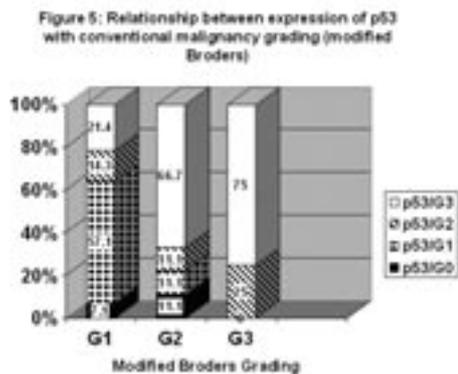
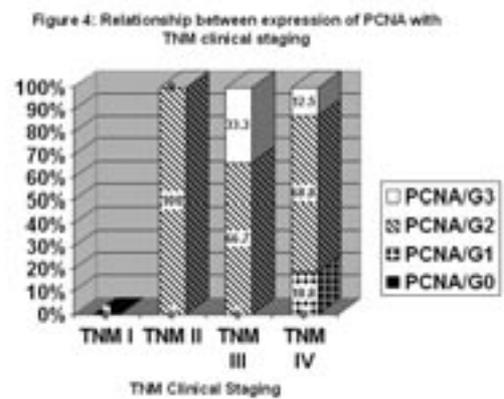
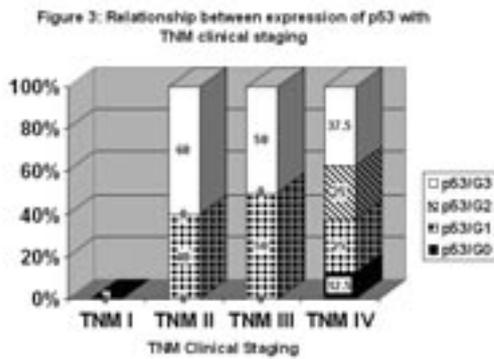


Figure 2 Expression of PCNA at the tumour invasive front of SCC in buccal mucosa. Generally the distribution of immunoreactivity for PCNA is observed to be similar to that of p53. An intense nuclei staining for PCNA is seen in tumour cells at the deep infiltrating margins as well as in the periphery of invading epithelial nests. Keratinized cells are however not stained. Arrows showing tumour invasive front. T – Tumour area; CT – Connective tissue area. (Original magnification X50).



Expression of PCNA at the tumour invasive front of OSCC in buccal mucosa

PCNA expression was observed in all 27 cases in this study. Again only reactions with a distinct nuclear staining were considered positive, irrespective of the intensity of the immunoreactivity. Generally, the distribution of immunoreactivity for PCNA was observed to be similar to that of p53. An intense nuclei staining for PCNA was seen in tumour cells at the deep infiltrating margins as well as in the periphery of invading epithelial nests (Refer Table 4; Figure 2). Keratinized cells were however not stained.

Relationship between the immunohistochemical expression of p53 and PCNA at tumour invasive front of OSCCs in buccal mucosa with selected clinicopathologic parameters

TNM clinical staging

The relationship between p53 and PCNA expression with TNM clinical staging is shown in Figures 3 and 4 respectively. For p53, there was an increase in grades 2 and 3 staining in TNM IV as compared to TNM II and III. For PCNA, while TNM II and III samples showed quite intense staining of grade 2 and 3, TNM IV showed the presence of grade 1 (less intense) staining.

Conventional malignancy grading (modified Broders)

The relationship between p53 and PCNA expression with conventional malignancy grading is shown in Figures 5 and 6 respectively. Degree of expression or grading for both p53 and PCNA is seen to generally increase with decrease in differentiation of tumour as defined by modified Broders grading.

“Pattern of invasion”

The relationship between p53 and PCNA expression with “pattern of invasion” is shown in Figures 7 and 8 respectively. The degree of expression of both p53 and PCNA is seen generally to increase with increase in the score of “pattern of invasion”.

DISCUSSION

The sample size in the current study is small when compared to other case series of oral SCCs diagnosed from biopsies seen at the Institute of Medical Research, Malaysia¹⁷⁻¹⁹ and the Faculty of Dentistry, University of Malaya.²⁰ However, the socio-demographic characteristics (age, gender and ethnicity) of this case series are in accord with those from previous studies¹⁷⁻²⁰ that OSCC is a disease of the older age group in Malaysia with an overall female preponderance, and predominantly involving the Indian

ethnic group. Previous studies have also observed that the most frequently encountered type of OSCC is the well differentiated type while the poorly differentiated type is the least common.¹⁷⁻²⁰ These distinct findings are also generally noted in the present study.

Distribution of p53 and PCNA

The distribution of p53 and PCNA immunoreactivity seen predominantly accumulating at the tumour invasive front agrees well with previous observations and support the validity of assessing molecular activity at this area of oral carcinoma.^{10,21,22} The generally similar immuno-localisation of p53 and PCNA staining at the tumour invasive front appear to suggest that p53 protein expression is found in areas with proliferative activity and might indicate the involvement of the mutated form of the p53 protein in the alteration of the cell cycle regulation process.^{10,21,22}

Therefore it has been suggested that p53 may act as a complementary marker to PCNA, since PCNA reactivity defines the growth fraction of tumour and p53 reactivity demonstrates the irreversible malignant change having occurred inside this fraction.^{10,22}

These observations may however, also be due to accumulation of the wild type p53 induced by DNA damage or specific viral protein binding.^{21, 23-25} These findings are compatible with functions of p53 as an inducer of DNA repair and PCNA as a DNA repair protein.^{21,26}

Tumours without detectable p53, with a high PCNA index, can also contain cells with mutations that result in production of truncated proteins that are not detectable or cells containing non sense mutation that leads to termination of protein synthesis.^{21,27,28}

The difficulty in interpreting the results from this study is due partially to the complex biologies of p53 and PCNA proteins, and to the influence of immunohistochemical techniques on patterns of immunoreactivity.¹⁴ Thus, the use of immunohistochemical techniques requires care in interpretation, caution in drawing conclusions and to always consider the biology of molecules being investigated.²⁹

Relationship between the immunohistochemical expression of p53 and PCNA at the tumour invasive front of OSCC in buccal mucosa with selected clinicopathologic parameters

TNM clinical staging

The results from the present study appear to suggest that there is no relationship between the expression of p53 and PCNA at the tumour invasive front and TNM clinical staging. A similar finding has also been observed in previous study involving SCC of head and neck.³⁰ Morawski et al.'s³⁰ study however demonstrated their findings using statistical analysis (Spearman Rank Correlation Test) while the present study did not use any test of significance due to its small sample size.

It is a known fact that there is some disagreement between observers regarding the determination of tumour size and node status owing to the inherent subjectivity of the system.^{4,5} Furthermore, the clinical staging may sometimes turn out to be different from what is found after excision and histopathological examination (pTNM).³¹ Therefore some of patient's data on clinical staging obtained from their respective folders may be associated with uncertainty, which may in turn weaken the findings and conclusions of study.

Conventional malignancy (modified Broders) grading

Previous studies on oral and head and neck squamous cell carcinoma have found that there is no correlation between expression of p53 at tumour invasive front, and conventional malignancy grading^{30,32} whereas the present study appears to suggest otherwise. The two previous studies demonstrated their findings using statistical analysis (Pearson and Spearman correlation test respectively) while the present study did not.

There has been suggestion that the lack of statistically significant correlation between expression of p53 and clinicopathological parameters such as conventional malignancy grading may probably indicate a more important function for p53 in early phase of tumour generation rather than determining a prognosis-related parameter.³²

The difference in findings may also be attributed to the inherent subjectivity of the malignancy (Broders) grading system whereby there is no complete agreement on classification of individual tumours and histopathological specimens.^{4,5} However, attempts were made to minimise these problems in the present study by regrading (conventional malignancy grading and "pattern of invasion") the samples independently by two examiners after a training and calibration exercise.

The present study has observed a possible relation between expression of PCNA at the invasive front and conventional malignancy (modified Broders) grading. This finding appears to concur with that of Morawski *et al.* (1999) study, which demonstrated the correlation using statistical analysis (Spearman Rank Correlation Test). This relation seems logical, as modified Broders grading describing the degree of cancerous cell differentiation considers cell proliferative properties.³⁰

"Pattern of invasion"

The findings from the present study suggest that there is a relationship between expression of p53 and PCNA at tumour invasive front, and the histological parameter "pattern of invasion".

"Pattern of invasion" has been reported as the most important single histological parameter in assessing the ability of tumours to metastasize,³³ thus making it an indicator of tumour aggressiveness.³⁴ Therefore, it would

appear that the findings in this study may be of significance when one consider the important relationship between "pattern of invasion" and clinical outcome,^{33,35} and also because of the very high level of interobserver reproducibility obtained with "pattern of invasion" (when compared to other histological parameters of Invasive Front Grading and Broders malignancy grading) (36,37).

SUMMARY AND CONCLUSION

This is a preliminary study with a small sample size with variable clinical stages and malignancy grades. No test of significance was carried out to confirm the relationship between expression of p53 and PCNA at the tumour invasive front with the selected clinico-pathologic parameters. Therefore the present findings are preliminary in nature.

In conclusion, p53 and PCNA are well expressed at the invasive front of oral squamous cell carcinoma. Thus, it is feasible to use these markers in future studies to look into these markers as prognostic indicators. However, to further validate the prognostic significance of any markers will require the knowledge of the survival pattern of these patients. With such patterns, a comparison of the survival patterns between those with higher and lower p53 and/PCNA expressions at the tumour invasive front can further indicate its possible clinical significance. Thus, good record keeping of follow-up of these patients by clinicians will further enhance the clinical applicability of such laboratory findings.

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The Expert Says.....

Tumour Markers in a Nut Shell

By Dr Haizal Mohd Hussaini

One day a general dental practitioner would be able to say to his patient "Mr Big, I suggest you better stop smoking, if you don't, from my reading you will developed cancer in approximately 23 month and 15 days from now...". This conversation might seems like it coming from one of those Star Trek episode but with the tremendous amount of research being done in the area of cancer, this conversation might not be in too distance future.

One of the key factors of success in any cancer treatment would be to be able to diagnose the lesion early (prognostic) and to predict how it is going to behave (predictive). Markers or tumour markers are very useful to indicate the presence of malignancy or the process of malignancy. They are frequently present due to alteration in the metabolism of cancerous cells and may be found in a body fluid such as blood, serum or in a tumour tissue. Among serum base tumour markers, the most well known which has been use extensively is Prostate-Specific antigen (PSA). It is widely use to detect prostatic carcinoma, although not 100% fool proof, it has fulfill most criteria of being a good tumour marker such as differentiating healthy and those with malignant tumour. Other serum base tumour markers such as Alpha-feto Protein (AFP) and Carcinoembrionic antigen which is good for detecting gastrointestinal related tumours. These tumour markers have been generally accepted due to its less invasive nature and most private hospital in Malaysia include these markers in their routine screening package. Other tumour markers such as hormonal in testicular carcinoma (Choriogonadotrophic hormone), protein such as Bence Jones protein in Myelomas are also good tumour markers since they are by products of the tumour itself. In cervical cancer, Pap smear has saved countless lives in detecting early step towards malignancy, although it is more of a clinical process rather than tumour markers, most centre send their smear tissues for Human Herpes (HPV) markers since HPV inclusion in cervical cells mark a step towards malignancy.

Unfortunately, in oral cancer there is still a long way to go. Most tumour markers in relation to oral cancer are concentrated around tissues or cellular markers. There are no satisfactory tumour markers that can be used routinely at the moment, to detect malignancy transformation. Most promising markers are around cell cycles regulator such as p53, as well as cellular growth and proliferation such as growth factors. Most articles that you would come across usually dealt within these two types of markers.

Our normal cell would need to divide in order to maintain a healthy tissue; therefore it would go into a complex process called cell cycle. The cell cycle is regulated by certain regulators (regulators such as Cyclins and Ki67 proteins etc), and the cell would then be thoroughly checked for any errors before being allow to duplicate itself (p53, p21 DNA damage detection). If there is any error with the cell DNA, p53 will ask the cell to destroy itself (apoptosis). If these regulators itself are at fault, you might then have a potentially cancerous cell duplicating. Growth factor receptor (EGF-R) and other kinases which help the cell to proliferate are also seen to be overproduced in cancerous tissue.

These are among the promising candidate for oral cancer tumour markers. Some papers also suggests that the cancerous cell at the frontline (tumour front) might give a clue on how the tumour would behave, hence giving a prognostic indicator for the patient. However, a lot of research still being done in oral cancer tumour markers, and it will be a while until we have a good candidate.

It might seems like tumour markers articles and research are endless and they seem to be nowhere near solving the problems, the genetic and molecular network is intricate and each research is like a one piece of a big jigsaw puzzle. Perhaps one day we will be able to put the last jigsaw on the puzzle and for once solve the oral cancer problem. For more in depth information, I would suggest reading the following references.

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Drug-Induced Pemphigus in Wilson Disease

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ABSTRACT Wilson disease is an autosomal recessive abnormality in the hepatic excretion of copper characterised by a marked increase in the storage of copper by body tissues. Recurrent oral ulcerations in Wilson disease are most commonly caused by drug therapy for the disease. Drug-induced pemphigus presenting as recurrent oral ulcerations in a case of Wilson disease on Penicillamine therapy is described.

KEY WORDS: Wilson disease; Drug-induced pemphigus, Oral ulcers

INTRODUCTION

Wilson disease is a rare autosomal recessive disorder characterised by a decrease in hepatic excretion of copper that results in toxic accumulation of the metal in liver, brain, kidney and cornea. Deficiency of the plasma copper binding alpha globulin protein ceruloplasmin and an excessive absorption of copper from the intestine is the characteristic feature of this disease.¹⁻⁴

Management of the disease requires lifelong medication with copper chelating agents, the most widely used of which is penicillamine.¹⁻³ However, penicillamine has numerous side effects, one of which is drug-induced pemphigus (DIP).^{5,6}

DIP is a well-established variety of pemphigus. Since the 1950s, evidence has shown that drugs may cause or exacerbate pemphigus. A drug origin should be considered in every new patient with pemphigus.^{7,8} The purpose of this report is to describe a rare, longstanding and challenging case of DIP in a patient with Wilson disease on chronic penicillamine therapy.

CASE REPORT

A 22-year-old Malaysian Chinese female was referred from the Faculty of Medicine, University of Malaya to the Oral Medicine clinic, Faculty of Dentistry, University of Malaya in December 2002, with a complaint of recurrent painful oral ulcerations. The patient's medical history was significant for Wilson disease since 1999 and the patient was on penicillamine and spirinolactone. Extraoral examination of the patient revealed no abnormalities. Intraorally, the patient had large sloughing ulcers on the right buccal mucosa, right lower vestibule and right upper vestibule. A few petechiae were seen on the left lower labial mucosa and right soft palate. A bony hard swelling of normal mucosal colour and measuring about 0.5cm in diameter, was noticed on the right upper alveolar mucosa. Apart from these findings, a lingually placed supernumerary tooth was observed between 34 and 35. Orthopantomographic examination revealed the presence of multiple supernumerary teeth located between 13, 14; 15, 16; 23, 24; 25, 26; and 35, 36 (FDI numbering system) (Fig. 1).



Figure 1. Orthopantomograph showing multiple supernumerary teeth (arrows).

The patient was initially managed with dexamethasone mouth rinse 0.5mg in 5ml of water three times a day and Kenalog®-in-orabase for two weeks. A differential diagnosis of DIP, erythema multiforme, paraneoplastic pemphigus and herpes simplex virus induced erythema multiforme was considered. In January 2003, the patient was reviewed and the ulcers had healed completely. However, three months later, there was a relapse of ulcers in the oral cavity and throat associated with odynophagia. Intraorally, sloughing ulcers were seen on the lower labial mucosa, right upper labial mucosa and right buccal mucosa. The ulcers extended posteriorly into the soft palate and oropharynx. Treatment was instituted with dexamethasone mouth rinse and the solution was to be swallowed after rinsing.

In June 2003, penicillamine therapy was replaced with prednisolone tablets 5mg, twice daily for three weeks and the patient presented with ulcerations of the oral mucosa and lip (Fig. 2) with signs of bleeding and encrustation. Two weeks later, the ulcers had resolved considerably although a few residual ulcers were still present on the lips, pharyngeal mucosa and ventral surface of tongue. Prednisolone dosage was increased to 30mg per day and Kenalog®-in-Orabase and chlorhexidine mouth rinse was prescribed for the oral ulcers. A review in July 2003 revealed limited mouth opening with multiple painful ulcers seen on the lips and oral mucosa.

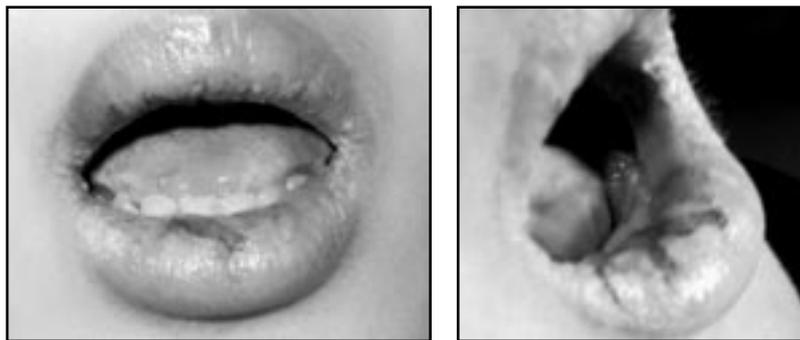


Figure 2. Recurrent ulcerations of the lower lips with bleeding and encrustations.

An incisional biopsy was done on the left buccal mucosa after a discussion with the internal medicine specialist. Direct immunofluorescence staining was performed for IgG, IgM, C3 and fibrinogen (Fig. 3a and 3b). The tissue stained positive for IgG (Fig. 3c) and fibrinogen (Fig. 3d) and negative for C3 and IgM. The positive staining for IgG and fibrinogen appeared around the cell membranes. The diagnosis of DIP was thus confirmed. The patient was managed with zinc sulphate 50mg thrice daily

and prednisolone 20mg once daily. The ulcers showed signs of frequent remissions and exacerbations. The patient also developed oral candidiasis involving the soft palate, tongue and labial mucosa of the lower lip. Nystatin suspension 100,000 iu four times a day for 3 weeks was prescribed following which the candidiasis resolved. Currently the patient is on zinc sulphate therapy for Wilson disease and the ulcers have not recurred.

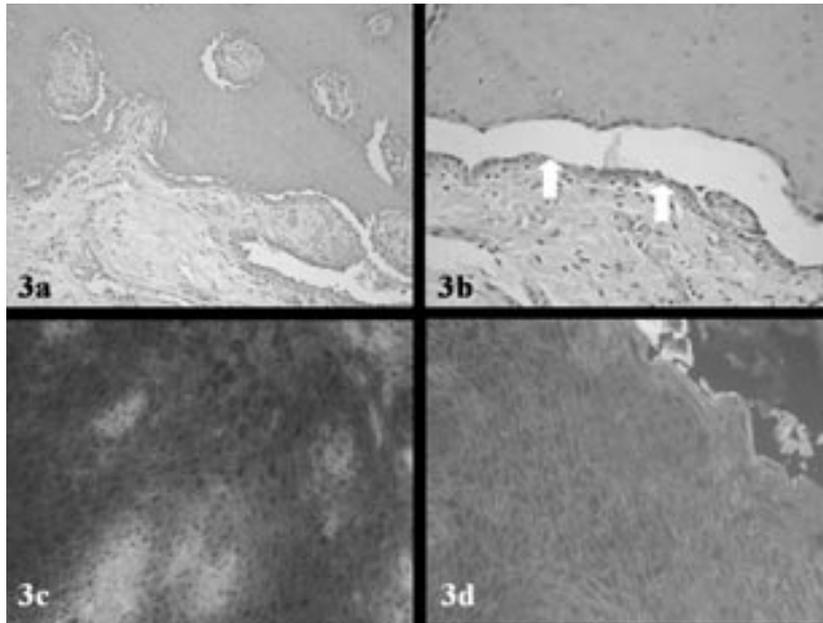


Figure 3a: H&E picture showing intraepithelial split of pemphigus vulgaris (Original magnification: 40X). **3b:** Higher magnification (100X) of figure 3a. Note the basal cells separated from the epithelium (arrows). **3c:** DIF positive for IgG; **3d:** DIF positive for fibrinogen.

DISCUSSION

Wilson disease or hepatolenticular degeneration is a neurodegenerative disease caused by mutations or deletions of the chromosome sub bands 13q14.3-q 21.1 which encodes a cation transporting P-type ATPase in the liver.^{1,3} The ATPase transports copper within the hepatocyte, thereby allowing the incorporation of copper into ceruloplasmin and the subsequent excretion into the bile. In Wilson disease, copper accumulation occurs in the cytoplasm of hepatocytes resulting in cellular necrosis and leakage of copper into the plasma. The excess copper then collects in extrahepatic tissues leading to a progressive degeneration of the corpus striatum, liver cirrhosis and deposits in the eyes giving rise to the characteristic 'Kayser-Fleischer ring'.^{1,3,4} The therapeutic goal in all patients is to restore and maintain normal copper homeostasis. This can be accomplished with different copper chelating agents including penicillamine, trientine, zinc acetate and tetrathiomolybdate.^{2,3,9}

Drugs that induce pemphigus may be categorized into 2 groups: thiol drugs and non-thiol drugs. Thiol drugs contain a thiol or sulfhydryl group (-SH) in their chemical structure and are the most frequent cause of DIP. They are postulated to induce acantholysis through biochemical mechanisms without antibody formation.^{7,8} Penicillamine is a thiol drug that has been reported to account for almost 50% of cases of DIP, and about 7% of patients who take penicillamine for longer than 6 months develop pemphigus.⁷

Direct and indirect immunofluorescence testing are effective diagnostic tests for DIP. Direct

immunofluorescence (DIF) is effective in detecting tissue bound intercellular IgG antibodies in about 75-90% of DIP cases.⁷ Using DIF, antibodies (usually IgG or IgM) and complement components (C3) can be demonstrated in the intercellular spaces between epithelial cells in almost all patients with pemphigus.⁵ Eisenberg *et al.*⁶ reported a negative DIF staining in a similar case of DIP in Wilson disease on penicillamine therapy. In our case, DIF was positive only for IgG and fibrinogen and was negative for IgM and C3. Recommended treatment of DIP involves withdrawal of the offending drug with institution of steroid (prednisolone) or immunosuppressant (azathioprine) therapy.⁷ Replacement of the penicillamine with zinc sulphate and administration oral steroid has greatly improved the oral condition in our case.

There were a few reports in the dental literature reporting about the oral findings and dental management of Wilson disease patients. McGuinness *et al.*¹⁰ reported that high-copper alloys should not be used in restorative procedures in patients with Wilson disease as they tend to corrode at a steady rate within the oral cavity leading to leaching of copper from the restorations. Mestrom and Spanauf⁷ reported germination of right lower lateral incisor in a patient with Wilson disease. An interesting finding in our case has been the presence of multiple supernumerary teeth.

A diagnosis of DIP must be considered for Wilson disease patients on penicillamine therapy and presenting with multiple, recurrent ulcerations involving the oropharyngeal mucosa.

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A Radiographic Study of Mandibular Third Molar Development in a Local Orthodontic Population

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ABSTRACT The purpose of this study was to evaluate mandibular third molar development before and after orthodontic treatment. There were 82 patients with mean age of 15.31 years (range 10.08 to 46.67) and a total of 149 mandibular third molars at pre-treatment. The post-treatment sample was 16 mandibular third molars. The most common angular position of mandibular third molar was mesioangular (79.9%), followed by vertical (15.4%), horizontal (2.7%) and distoangular (2.0%). Mesioangular was the most common position within gender and ethnic distribution. The angular position of mandibular third molars changed unpredictably as the root developed and eruption is not predictable even when there was sufficient space for eruption. Only one in four of teeth that had sufficient space for eruption and full root formation erupted in alignment at recall. However, more teeth (88.2%) were impacted when the space/width ratio was less than 1.00 compared with space/width ration of 1.00 or more (46.2%). Root formation and eruption continued even when impaction occurs. The majority (81.3%) of the third molars that had erupted with part or entire crown at the occlusal level of the second molar had full root formation with closed apices at a mean age of 20.19 years.

KEY WORDS: third molar, development, radiograph, orthodontic treatment

INTRODUCTION

Dental panoramic radiographs are routinely taken in the orthodontic clinic before orthodontic treatment is commenced. These radiographs give a good overall view of the dentition in the mandible and maxilla and are invaluable in orthodontic diagnosis and treatment planning, assessing treatment progress and detecting pathology. The majority of orthodontic patients are in the pre-teens and teenage age group when the third molars are developing and it would be advantageous if we could predict the final outcome of these teeth taking into account individual growth and whether extractions were carried out. The mandibular third molars would need to be preserved if it is judged to erupt successfully and have a functional role in the dentition.

Some researchers have found that premolar extraction treatment has been associated with mesial movement of the molars concomitant with an increase in the eruption space for the third molars^{1,2,3,4,5} while others have only small differences treated with and without extractions.^{6,7} The average age of mandibular third molar emergence varies from 17 to 21 years, but the roots are not fully formed until 18 to 25 years of age.^{8,9,10} The angulation of many of these teeth has been observed to change to a

more upright position and eventually erupted with full development of the root and mandibular growth^{4,5,6,11,12} but this is an unpredictable phenomenon. Capelli (1991)¹³ used cephalometric radiographs instead of orthopantomograms to study third molar impaction in 60 patients who had first premolars extracted for orthodontic treatment. He found that mandibular growth was directly related to the position of mandibular third molars with impactions more likely in those with a predominance of vertical growth. Thus third molar impaction could have been overdiagnosed in studies examining subjects where the root is not fully developed or the subject has not achieved his/her potential growth. The majority of orthodontic patients are still in their teens after orthodontic treatment is completed thereby making it difficult to predict the final outcome of the third molars.

Dental age determination from tooth development is important from forensic, criminal and legal aspects when the chronological age is unknown or suspect. However, the correlation between chronological age and dental age as estimated from mandibular third molar is poor.^{14,15,16} This is probably due to the large range, that is, about +/- 10 months, in individual maturity.¹⁴ There was a systematic underestimation of chronological age, the 95 per cent confidence interval, which was about +/- 4 years. Third molar dental age estimation may still be useful to a

certain extent in specific cases if it is not possible to evaluate other teeth or there were no other better non-dental methods. It would be interesting to compare our sample of predominantly Asian ethnic origin with that of Caucasians.¹⁴

Thus, the main objectives of this study were:

1. To assess third mandibular tooth development in terms of root development, tooth depth, angulation, tooth width between sexes and in different ethnic groups.
2. To compare root development, tooth depth and angulation in groups with sufficient/insufficient space to erupt.
3. To evaluate mandibular third molar development pre- and post-orthodontic treatment.
4. To compare chronological age at different stages of root development with that of a Caucasian group.

METHODOLOGY

Case Selection:

1. Patients with at least one mandibular third molar where crown formation has completed. The pre-treatment panoramic radiograph must be of good quality. All dental panoramic radiographs (DPT) were taken with the Proline Model 2002 in the Radiology department, Alor Star Hospital, Kedah.
2. Exclusion criteria:
 - Cleft lip and palate patients.
 - History of extraction of mandibular permanent pre molar/molar teeth.
 - Radiographs that were unclear or distorted

This is a retrospective, cross-sectional study of orthodontic patients seen in the Orthodontic unit, Teluk Wanjah dental clinic, Alor Star from 1992 to 2000. There were 82 cases that satisfied the selection criteria.

Reference lines from DPT:

- The DPT is evaluated with a lighted radiograph viewing box in a room with dimmed lighting by a single investigator.
- A tracing paper is secured onto the DPT by using Blue Tack®.
- Outlines of all mandibular first, second and third molars and ascending ramus are traced onto the tracing paper using a sharp 2B pencil.
- A horizontal line (A) is drawn through the clearest or most superior points of the occlusal surfaces of

the first, second molars (buccal/ lingual cusps) extending to the ascending ramus (Fig.1).

- Another reference line (B) is drawn perpendicular to the first line and is tangential to the distal surface of second molar. (Fig. 1)
- The distance between the intersection of the horizontal line with the ascending ramus and the reference line distal to second molar is measured (x) to the nearest 0.05mm using plastic Vernier callipers (Fig.1).
- The occlusal line of third molar is determined using a line drawn from beginning of mesio-and disto-cusp formation. This line is drawn until it meets with line A.
- The third molar angulation is measured in degrees using a protractor (ORMCO SYBRON) to the nearest 0.5° (Fig.2).

Variables recorded from DPT:

Root formation

The dental development of the mandibular third molar is determined using the system based on the 8 stages of tooth formation devised by Demirjian et al. (1973).¹⁷

The detailed written criteria are followed, with supplementary illustrations of the stages¹ (Table 1). Root formation is labelled 1 to 5, equivalent with stages D to H of the Demirjian system (1986).⁸ Cases where crown formation was at stages A to D are excluded.

Depth of tooth in relation to adjacent second molar

Relative depth of the third molar is determined according to Archer (1975).¹⁸ The highest point of a mandibular third molar is recorded as level with the occlusal, cervical, or apical portion of the neighbouring second molar. (Fig. 3)

Third molar angulation

Angulation of the third molar is measured using the method of Shiller (1979)¹⁹ (Fig. 2).

The angulation is recorded as vertical ($\pm 10^\circ$), mesioangular (11 to 70°), distoangular (-11 to -70°), horizontal ($\geq 71^\circ$), or horizontally tilted in the buccal or lingual direction. This is coded 1, 2, 3, 4, and 5 respectively.

Space for eruption

The relation of the mandibular third molar to the ramus of the mandible and the second molar is estimated in terms of sufficient/ insufficient space for eruption.¹⁸ Space for eruption (x) = space between second molar and the ramus (Fig.1).

Tooth width

Third molar width (w) is determined by measuring the most bulbous points (mesial and distal contour) of the crown to the nearest 0.05mm (Fig.1).

$$\text{Space/width ratio} = \frac{\text{Space available between second molar and the ramus (x)}}{\text{Mesiodistal width of third molar (w)}}$$

Selection of patients for recall post-treatment

Patients with mandibular third molars that showed impaction at pre-treatment were recalled after five years. Those molars that were already erupted into occlusion were excluded. Patients have to be at least 18 years old at recall. A DPT is taken at recall and the variables recorded as before. All these patients had completed orthodontic treatment with/ without extractions. There were 27 patients that satisfied the criteria but only 8 patients (total of 16 third molars) attended the clinic for recall despite extensive efforts to contact the patients.

Measurement error

To assess measurement error in the tracing and recording techniques, ten radiographs were randomly selected, traced and measured on two separate occasions by the same investigator. The correlation between the two measurements for space was 0.997 and for width was 0.974. The mean measurement error for space was $-4.00E-02$ (S.D. 0.34) and for width was 0.14 (S.D. 0.29).

Statistical Analysis

Data is analysed using Statistical Package for Social Sciences (SPSS) Version 10.0. Paired t test and correlation were used for intra-examiner reliability. Descriptive analysis, Pearson's correlation and one-way analysis of variance (ANOVA) were carried out to test for significant difference between groups. Paired t test was carried out to compare variables at pre-treatment (T1) and post-treatment (T2). Association of age and root development was compared with that of Thorson and Hagg (1991).¹⁴

Table 1. Description of the root formation stages in molars.⁸

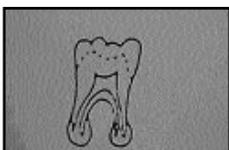
STAGE	DESCRIPTION
1	 <p>The crown formation is completed down to the cemento-enamel junction. The pulp chamber has a trapezoidal form. Beginning of root formation is seen in the form of a spicule.</p>
2	 <p>Initial formation of the radicular bifurcation is seen in the form of either a calcified point or a semilunar shape. The root length is still less than the crown height.</p>
3	 <p>The calcified region of the bifurcation has developed further down from its semilunar stage to give the roots a more definite and distinct outline, with funnel-shaped endings. The root length is equal to or greater than the crown height.</p>
4	 <p>The walls of the distal root canal are now parallel. The apical end of the distal root canal is still partially open.</p>
5	 <p>The apical end of the distal root canal is completely closed. The periodontal membrane has an uniform width around the root and the apex.</p>

Figure 1. Measuring the space for eruption (x) and width of (w) third molar

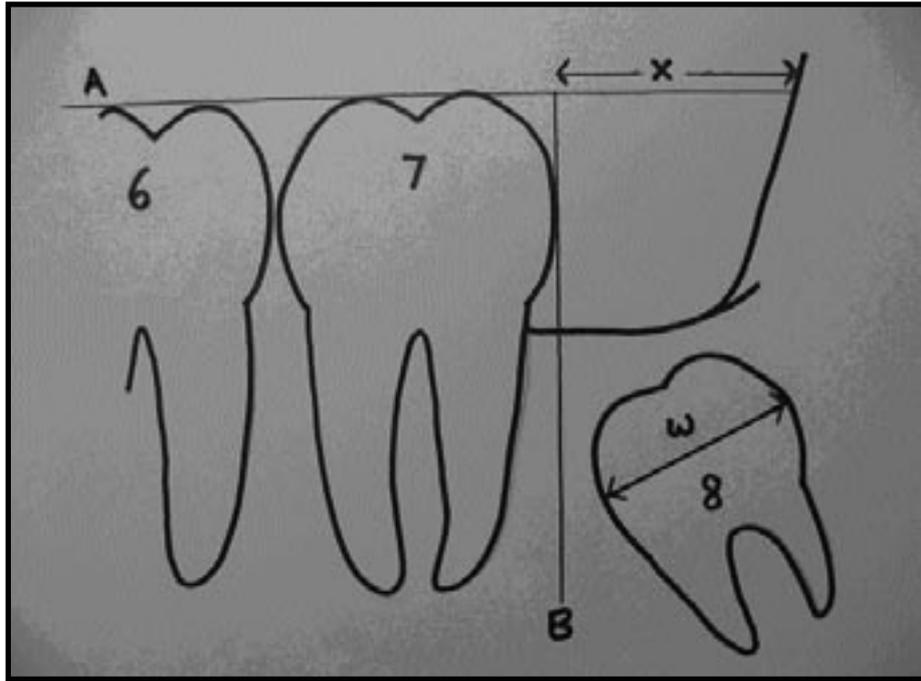


Figure 2. Recording the angulation in degrees (a) of a third molar (Shiller, 1979)¹⁹

Code:

- 1 = Vertical ($\pm 10^\circ$)
- 2 = Mesioangular (11 to 70°)
- 3 = Distoangular (-11 to -70°)
- 4 = Horizontal ($\geq 71^\circ$)
- 5 = Horizontally buccal or lingual crown (absence of calcified point of semilunar shape of root formation)

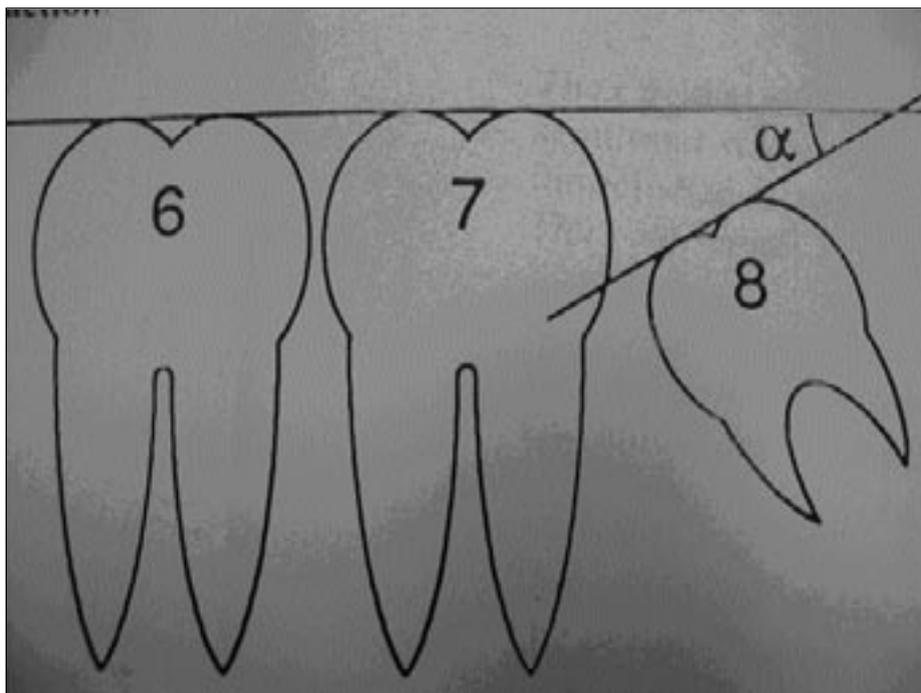
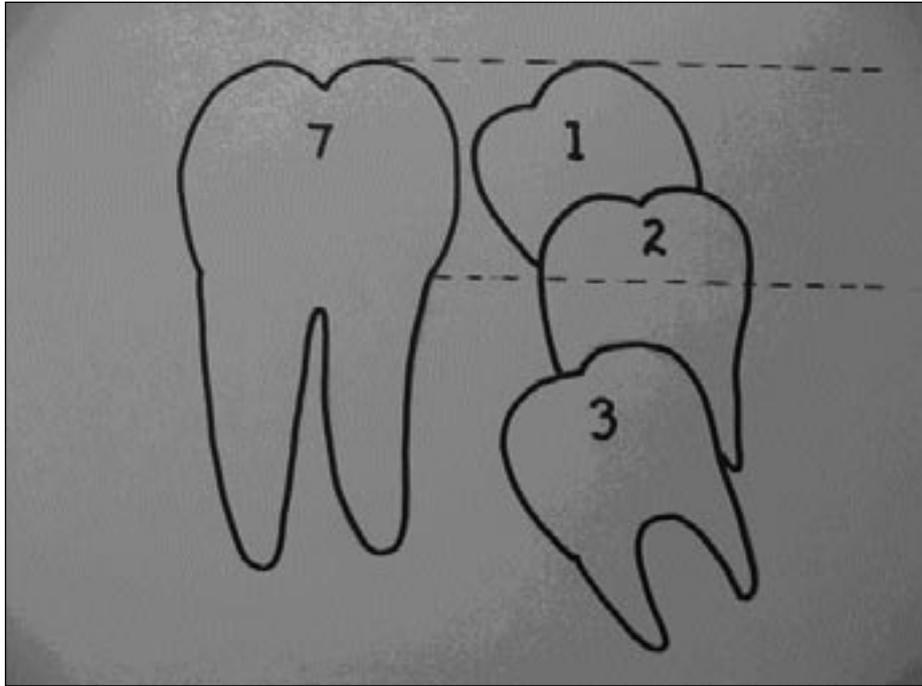


Figure 3. Depth of third molar in relation to adjacent second molar.¹⁸**Stage:**

- 1 = Highest part of third molar at same level or above occlusal plane of second molar (soft tissue impaction)
 2 = Highest part of third molar below occlusal plane but above cervical of second molar (partial bony impaction)
 3 = Highest part of third molar beneath cervical of second molar (complete bony impaction)

**RESULTS****PRE-TREATMENT (T1)**

There were 82 patients with mean age of 15.31 (range 10.08 to 46.67) and an ethnic distribution of 67 Malays, 69 Chinese, 12 Indians and 1 other group. A total of 149 mandibular third molars (78 right, 71 left) were evaluated. There was no significant difference in vertical and mesioangular mandibular third molars between Chinese and Malays (Table 3). More than half of the teeth were located below the cervical line (tooth depth stage 3) of the second molars and the root development was in stage 1 and 2 in the majority of cases in all races. This is quite obvious as the mean age of the study sample was less than 16 years of age.

The mean width of mandibular third molars was 14.31 mm (S.D.1.34) with a range of 9.50 to 18.05 mm. The mean space available at pre-treatment was 8.08 mm (S.D.4.20) with a range of -6.50 to 19.70 mm. Mean space/width ratio was 0.57 (S.D. 0.30) with a range of

-0.43 to 1.39. Only 13 teeth (8.9%) had a space/width ratio at or above 1.00. Mean width of mandibular third molars in males is 15.06 (S.D. 1.15) and 14.02 (S.D. 1.30) in females. There is no statistically significant difference between the sexes. The most common position of the third molar in both sexes was mesioangular followed by vertical and distoangular. Less than 10% had completed root formation (Table 2).

Age was associated with space/width ratio ($p < 0.01$), root development ($p < 0.01$), tooth depth ($p < 0.01$) and angulation ($p < 0.05$). There was no significant association of third molar angulation with eruption space, tooth depth or tooth width. The majority of third molars had space/width ratio of less than 1.00 (Table 4). The group with space/width ratio of ≥ 1.00 were more vertical than mesioangular (Table 5). None of the distoangular or horizontal angulation third molars had space/width ratio of ≥ 1.00 . There were six cases (46.2%) that were fully erupted into occlusion (vertical, tooth depth 1). All these cases were 18 years or older (Table 5).

Table 2. Gender distribution of angulation, root development and tooth depth.

GENDER	ANGULATION					Total
	Vertical	Mesio- angular	Disto- angular	Horizontal	Horizontal Bucc/ ling	
Male	5 (11.9)	32 (76.2)	2 (4.8)	3 (7.1)	0	42
Female	18 (16.8)	87 (81.3)	1 (0.9)	0	1 (0.9)	107
Total	23	119	3	3	1	149
	ROOT DEVELOPMENT					
	Crown (1)	Bifurcation (2)	Parallel (3)	Open apex (4)	Complete (5)	
Male	15 (35.7)	6 (14.3)	12 (28.6)	5 (11.9)	4 (9.5)	42
Female	51 (47.7)	24 (22.4)	17 (15.9)	6 (5.6)	9 (8.4)	107
Total	66	30	29	11	13	149
	TOOTH DEPTH					
	Same level or above occlusal plane of M2 (1)	Below occlusal plane but above cervical line of M2 (2)	Beneath cervical line of M2 (3)			
Male	10 (23.8)	10 (23.8)	22 (52.4)			42
Female	14 (13.1)	25 (23.4)	68 (63.5)			107
Total	24	35	90			149

() figures in parentheses indicates percentage

Table 3. Ethnic distribution of angulation, root development and tooth depth

ANGULATION	RACE				Total
	Malay	Chinese	Indian	Others	
Vertical	10 (14.9)	13 (18.8)	0	0	23 (15.4)
Mesioangular	51 (76.1)	55 (79.7)	12 (100)	1 (100)	119(79.9)
Distoangular	3 (4.5)	0	0	0	3 (2.0)
Horizontal	3 (4.5)	0	0	0	3 (2.0)
Bucco-lingual (horizontal)	0	1 (1.5)	0	0	1 (0.7)
	ROOT DEVELOPMENT				
1. Crown	26 (38.8)	35 (50.7)	4 (33.3)	1 (100)	66(44.3)
2. Bifurcation	12 (17.9)	18 (26.1)	0	0	30(20.1)
3. Parallel	15 (22.4)	8 (11.6)	6 (50.0)	0	29(19.5)
4. Open apex	7 (10.4)	2 (2.9)	2 (16.7)	0	11(7.4)
5. Complete	7 (10.4)	6 (8.7)	0	0	13(8.7)
	TOOTH DEPTH				
Same level or above occlusal plane of M2 (stage 1)	14 (20.9)	8 (11.6)	2 (16.7)	0	24(16.1)
Below occlusal above cervical line of M2 (stage 2)	18 (26.9)	13 (18.8)	4 (33.3)	0	35(23.5)
Below cervical line of M2 (stage 3)	35 (52.2)	48 (69.0)	6 (50.0)	1 (100)	90(60.4)
Total	67(44.9)	69(46.3)	12 (8.1)	1 (0.7)	149

() figures in parentheses indicates percentage

Table 4. Angulation of mandibular third molars with space/width ratio <1.00 and ≥ 1.00

ANGULATION	SPACE/WIDTH RATIO		Total
	Less than 1.00	One or more than 1	
Vertical	16 (11.8)	7 (53.8)	23 (15.4)
Mesio-angular	113 (83.1)	6 (46.2)	119(79.9)
Disto-angular	3 (2.2)	0	3 (2.0)
Horizontal	3 (2.2)	0	3 (2.0)
Bucco-lingual (horizontal)	1 (0.7)	0	1 (0.7)
Total	136 (91.3)	13 (8.7)	149

() figures in parentheses indicates percentage

Table 5. Mandibular third molar characteristics with space/width ratio ≥ 1.00

Case	Age (years)	Space/width ratio	Root formation (stage)	Tooth depth (stage)	Angulation
1	20.25	1.10	5	1	Vertical
2	20.25	1.06	5	1	Mesioangular
3	18.17	1.25	4	2	mesioangular
4	23.42	1.33	5	1	vertical
5	18.0	1.00	4	1	vertical
6	15.08	1.05	3	2	vertical
7	16.50	1.10	2	3	mesioangular
8	46.67	1.22	5	1	vertical
9	23.25	1.13	5	1	vertical
10	16.08	1.14	2	3	mesioangular
11	15.08	1.39	1	3	mesioangular
12	25.17	1.03	5	1	vertical
13	17.08	1.02	4	2	mesioangular

RECALL CASES (T2)

There were only 8 patients with a total of 16 mandibular third molar teeth for evaluation. The mean age was 14.23 (S.D. 1.41) years at pre-treatment and 19.82 (1.85) years at recall. Only descriptive and comparative analysis was carried out because of the small sample size. The majority of third molars had complete root formation and erupted to the occlusal level except for two cases where the root development was still at stage 3. Only 43.8% of cases remained in a mesioangular position at post-treatment (Table 6). The rest of the third molars changed from the initial mesioangular position to vertical, distoangular and horizontal.

The space/width ratio ($p \leq 0.001$) and tooth depth ($p \leq 0.000$) was statistically significant different at pre-treatment and recall while the angulation was non-significant.

All except two of the recall cases had first premolars extracted. Only 5 teeth (31.25%) had space/width ratio of ≥ 1.00 at post-treatment (Table 7). Of these 40% were vertical, 40% mesioangular and 20% horizontal. All had erupted to the occlusal level (stage 1) from the initial complete bony stage 3. Figures 4-6 show space/width ratio, tooth depth and angulation of mandibular third molars in individual cases at pre-treatment and post-treatment.

Table 6. Demographics at pre-treatment (T1) and post-treatment (T2)

N = 16

ANGULATION	T1	T2
Vertical	0	4 (25)
Mesioangular	16 (100)	7 (43.8)
Distoangular	0	3 (18.6)
Horizontal	0	2 (12.5)
Bucco-lingual (horizontal)	0	0
ROOT DEVELOPMENT		
Crown (stage1)	8 (50)	0
Bifurcation (stage2)	6 (37.5)	0
Parallel (stage3)	2 (12.5)	2 (12.5)
Open apex (stage4)	0	1 (6.3)
Complete (stage5)	0	13 (81.3)
TOOTH DEPTH		
Same level or above occlusal plane of M2 (stage1)	0	14 (87.5)
Below occlusal plane & above cervical line of M2 (stage2)	2 (12.5)	0
Below cervical line of M2 (stage3)	14 (87.5)	2 (12.5)
Total	16	16

() figures in parentheses indicates percentage

Table 7. Tooth depth and angulation at pre-treatment (T1) and recall (T2) in cases with space/width ratio ≥ 1.00 .

SPACE/WIDTH RATIO		TOOTH DEPTH stage		ANGULATION	
T1	T2	T1	T2	T1	T2
0.71	0.99	3	1	Mesioangular	Vertical
0.75	1.06	3	1	Mesioangular	Horizontal
0.72	1.08	3	1	Mesioangular	Vertical
0.92	1.13	3	1	Mesioangular	Mesioangular
0.83	1.34	3	1	Mesioangular	Mesioangular
1.39	0.92	3	1	Mesioangular	Mesioangular

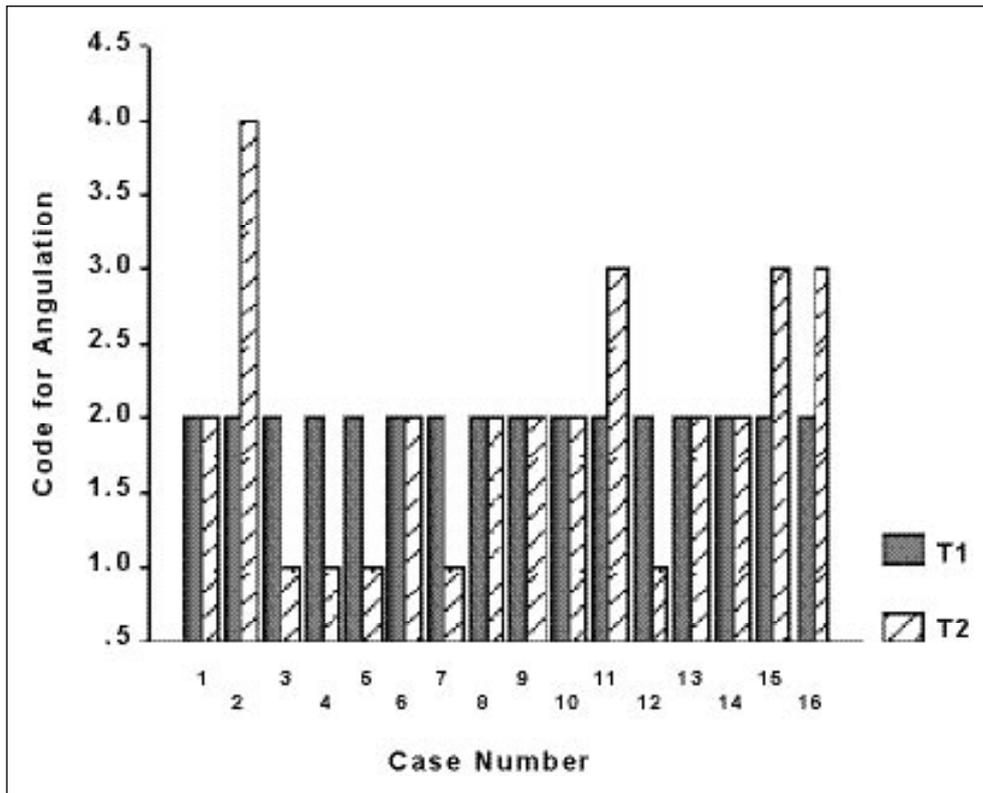


Fig 4. Angulation at pre-treatment (T1) and recall (T2)

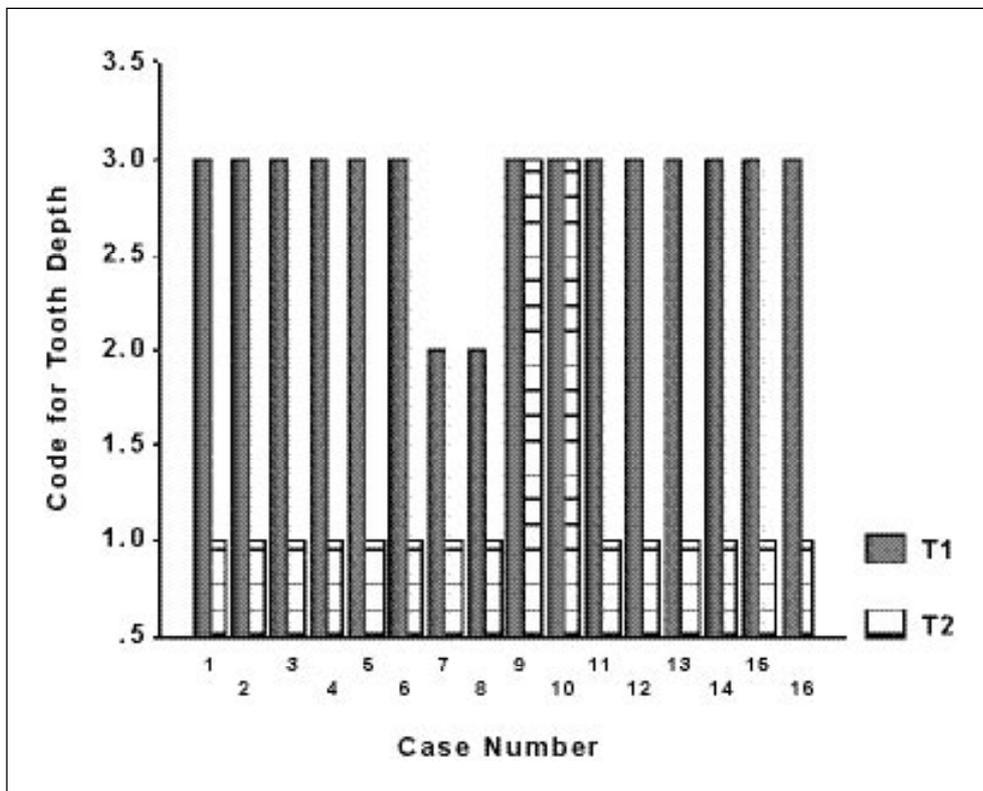


Fig 5. Tooth depth at pre-treatment (T1) and recall (T2)

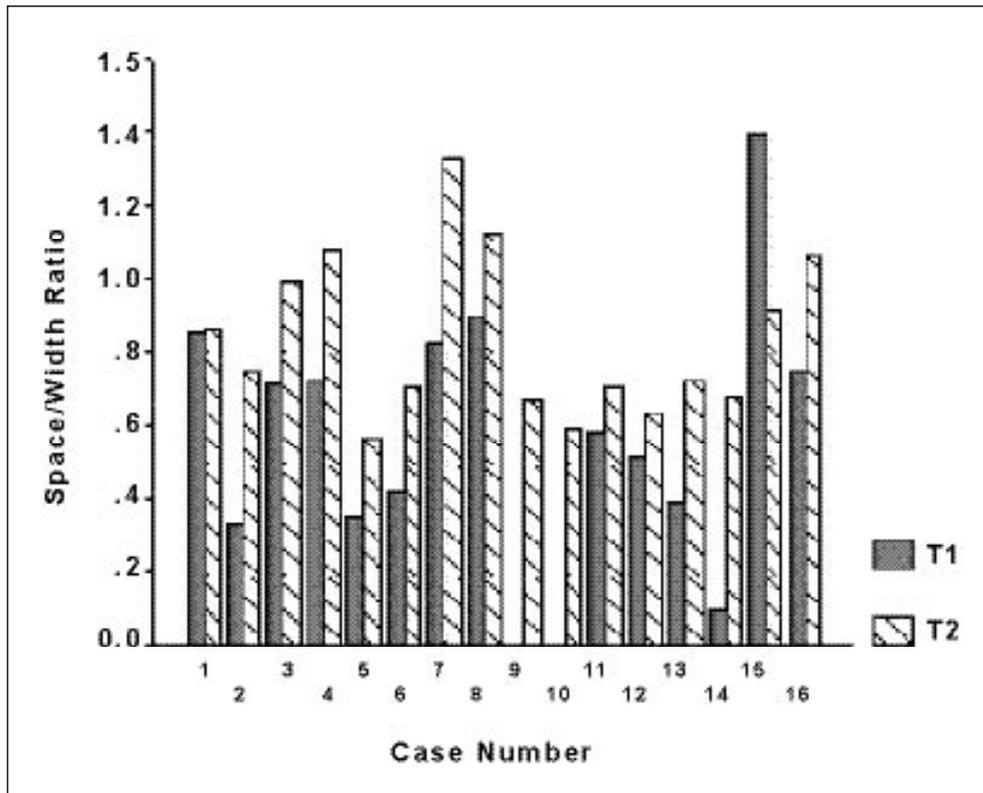


Fig 6. Space/width ratio at pre-treatment (T1) and recall (T2)

Table 8. The mean age (in years) assessed by the different stages of root formation with the present study and figures given by Thorson and Hagg (1991)¹⁴

Stage of root formation	1	2	3	4	5
GIRLS					
Thorson & Hagg (estimated dental age)	13.75	15.40	17.30	19.50	20.70
Present study (chronological age)	13.65 (S.D.1.70)	14.69 (S.D.0.99)	15.76 (S.D.1.15)	17.85 (S.D.0.68)	24.58 (S.D.8.47)
BOYS					
Thorson & Hagg (estimated dental age)	13.95	15.40	16.95	18.40	19.20
Present study (chronological age)	13.88 (S.D.1.27)	15.50 (S.D.0.87)	15.65 (S.D.0.67)	16.08 (S.D.2.24)	16.88 (S.D.2.94)

DISCUSSION

Angulation

There was no statistically significant difference in angulation between males and females. Shiller (1979)¹⁹ found that if the initial inclination of a mesioangular mandibular third molar was 35° or less, then 13% became upright within a year before the age of 20. In the present study, all 16 teeth had inclination less than 35 degrees at pre-treatment and 4 teeth (25%) uprighted to a vertical position at recall despite two teeth with space/width ratio of less than 1.00. But 31.1% changed to distoangular and horizontal positions. Hattab et al. (1995)²⁰ found that half of the impacted mandibular third molars were mesioangular and 23% of these erupted by 20.4 years. This was comparable to that of Venta et al. (1991)⁴ who showed that more than 50% of mesioangular teeth remained unerupted ($p < 0.001$) while more than 85% of those that were vertical were partially or fully erupted ($p < 0.001$). A later study by Hattab (1997)¹¹ found that 44% of initial mesioangular teeth uprighted at complete root formation and 37% became fully erupted while 15% were partially erupted.

Venta et al. (1997)²¹ developed a method (transparent measuring device) to predict lower third molar eruption from the orthopantomogram. The predicted reliability and sensitivity of this device was 95%. He found that mesioangular deviation of more than 45° would remain impacted. Venta (1993)²² looked at five radiographic characteristics of mandibular third molars, namely, angulation, root formation, type of impaction, crown depth in bone and relative space to develop a predictive model at age 20. He found that the most important predictor of third molar eruption was the 'type of impaction' ($p < 0.01$). There was no significant difference between males and females. Haavikko et al. (1978)⁶ similarly found that most mandibular third molars emerged when the initial angle between second and third molar was less than 10 degrees and this decreased to one in every three cases when the initial angle increased to between 20 and 30 degrees. With larger angles the prediction of eruption becomes more difficult and impaction increases. Castella et al. (1998)²³ found that the more the tooth is developed, the higher is the accuracy of prediction although two stages where the crown is fully formed or when the roots were 1/3 formed possessed high predictive value of impaction. He concluded that impaction was predictable both in extraction and non-extraction patients although his results have to be interpreted with caution because of the small sample size.

Richardson (1975)²⁴ and Richardson et al. (1984)²⁵ found that during development of the dentition, the position of the mandibular third molar continuously changes before eruption and uprighting occurs. Hattab (1997)¹¹ found that a significant proportion of mesially impacted mandibular third molars had changed their angulation and became fully erupted by the individual reached 24 years of age. Even those that originally presented at 35 degrees or more registered an average

decrease of 12 degrees in angulation although none became upright. This was previously observed in the study by Haavikko et al. (1978)⁶ who found that the third molar had a tendency to upright or changed to a more distoangular position during development both in the normal and extraction groups.

Tooth depth

In the present study, 87.5% of the third molars initially in partial or complete bony impaction (stage 2 and 3) had reached occlusal level (stage 1) of crown depth when root formation was complete or near completion. Only two cases (12.5%) remained at stage 3 with root formation at stage 3. Venta et al. (1991)⁴ found that the majority of third molars (about 70%) initially completely buried in bone ($p < 0.05$) and about 30% of those in partial bony impaction remain unerupted. All those in soft tissue impaction only were partially or fully erupted ($p < 0.01$).

Space for eruption

Kim et al. (2003)⁵ found higher third molar impaction ($p < 0.01$) and smaller retromolar space ($p < 0.001$) in both arches of the non-extraction patient than in the extraction patients. However, they could not detect any difference in mandibular mesial movement between patients with eruption and impaction of the mandibular third molars suggesting that other variables could be equally important for the development of sufficient eruption space. Although Haavikko et al. (1978)⁶ found that 71.8% of mandibular third molars was unerupted in the normal group and 65.0% in the extraction group at age 19.5 years, they concluded that extraction of premolars merely accelerate but not promote eruption. Their findings suggested that teeth with favourable angulations would eventually erupt.

Earlier studies have suggested that the probability of mandibular third molar eruption is directly related to the proportion of the third molar in front of the anterior border of the ramus before eruption. However, Kim et al. (2003)⁵ found that as many as 60% of their subjects with eruption space ≤ 5 mm and 55% of those with a distance of ≤ 3.5 mm erupted into occlusion. They suggested that the size of the third molar eruption space associated with increased risk of impaction might be smaller than the 23 mm as previously suggested.^{26,27,28} In the present study, at recall, two cases erupted into occlusion despite pre-treatment space/width ratio of less than 1.0. One case had space/width ratio increased to 0.59 from zero and the other case increased from 0.58 to 0.70. The mean eruption space of the four cases that had erupted into occlusion was 10.4mm at post-treatment and the mean width of the teeth was 13.7 mm. All those with sufficient space to erupt had erupted partially or completely to the occlusal level from the initial bony impaction stage. Of those with insufficient space, 18.2% remained in bony impaction. This observation was comparable to that of Venta et al. (1991)⁴ who reported that about 40% of those with initial insufficient space to erupt remain unerupted.

Our pre-treatment findings; mean eruption space of 13.3 mm with a mean space/width ratio of 0.96 (range 0.50 to 1.33) in 12 cases where the mandibular third molars were fully erupted into occlusion (vertical + tooth depth 1), contradicts the higher space requirements as observed by Schulhof (1976)²⁶ and Ricketts (1979).²⁸ Two of the cases (16.7%) had eruption space of less than 9 mm while the other ten (83.3%) had eruption space between 10 and 20 mm. This was comparable to the findings of Kim et al. (2003).⁵ The mean age of our cases was 22.08 years and root development was nearly complete or completed (stage 4 and 5).

Root development

Hattab (1997)¹¹ studied mesially impacted mandibular third molars in young Jordanian Arab adults (mean age 19.7 years) and he observed that 79% of mandibular third molars had complete root formation. All had complete root formation by 24 years. In the present study, 81.3% of the recall cases had complete root formation and reached the occlusal level at a mean age of 20.19 years. The root formation of the other three cases progressed to stage 3 and 4 with a mean age of 18.72 years. Venta et al. (1991)⁴ observed that although development of the root was already complete at the baseline, a number of unerupted or partially erupted teeth erupted by the age of 26 years implying eruptive activity still continued. And about 40% of those with initially incomplete development of the root remained unerupted. In the present study the two teeth with incomplete root development (stage 3) remained in complete bony impaction while the rest with complete root formation erupted.

Age estimation

Menzies-Clow (1984)¹⁵ used Gravely's (1965)²⁹ description of third molar crown formation to compare root formation in 6-15 year olds in two centres. He extended this measurement of estimated dental age by measuring root formation in second molars. He concluded that dental age was better correlated with chronological age in second molar root formation than third molar crown formation. This conclusion seems obvious since the stages of root formation are more clearly defined than stages of crown formation as developed by Gravely (1965)²⁹ using oblique lateral jaw radiographs.

Thorson and Hagg (1991)¹⁴ followed the Demirjian system (1986)⁸ of eight stages of molar tooth formation using panoramic radiographs and they transferred each stage to a dental age using the figures from a reference sample of 4640 French-Canadian girls and boys by Levesque et al. (1981).³⁰ They found that association between dental age and chronological age was poor although precision was high. In girls, the mean difference between dental age and chronological age varied from - 6 months to - 3.5 years, being largest in the oldest group. In boys, the mean difference between dental age and chronological age was - 10 and - 17 months in the age groups between 14.5 to 20.5 years. There was no

significant correlation in the older age groups. The chronological age of the patients in the present study when compared to the dental age in patients in Thorson and Hagg (1991)¹⁴ is comparable only in stage 1 and 2 of root formation (Table 8). This may be attributed to the very small number of patients in the later stages of root formation.

Limitations of study

The pre-treatment sample is biased towards a larger younger age group. This is inevitable since the majority of patients seeking orthodontic treatment are in the pre-teens and teens. Thus comparison of chronological age to root development in the later stages is difficult to provide an accurate representation due to the small sample. The recall sample is too small for a more valid statistical analysis. Thus the analysis is limited to a descriptive nature. Any inferences made have to be taken with caution.

CONCLUSION

Our findings suggest that the dental panoramic radiograph is a useful radiograph to monitor development of the mandibular third molar besides being invaluable in diagnosis and treatment planning for orthodontic treatment. The most common position of mandibular third molars was mesioangular in both males and females and in the different ethnic groups; followed by vertical, horizontal and distoangular. Root formation and eruption through bone continued even when the teeth remained or become impacted and the majority of patients had complete root development after 18 years. Positional changes and eruption of initially impacted mandibular third molars are unpredictable phenomena. Although it is difficult to predict the ultimate position of the third molar with a reliable degree of accuracy after root formation is complete, the space/width ratio and initial angulation appears to give some prognostic value. Chronological age as compared to dental age estimation from root development of mandibular third molars is comparable to a Caucasian group when the root formation was at the initial stages.

RECOMMENDATION

Since there is no reliable way to predict the eruption of mandibular third molars in young patients, it is recommended that National Clinical Practice Guidelines be adhered to in the management of unerupted and/or impacted third molar teeth. For example, the health service in Scotland uses the Scottish Intercollegiate 'Guidelines in the management of unerupted and impacted third molar teeth'.³¹ A longer follow-up of orthodontic patients until at least above 20 years of age may be advisable before a decision is made to extract asymptomatic impacted teeth since positional changes continued until root development and growth is complete.

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Level Of Knowledge, Perception And Practices In Relation To Oral Health Promotion Among Final Year Trainee Dental Nurses

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ABSTRACT Dental Nurses have an important role in oral health promotion. This study aims to examine the extent of knowledge, perception and practices of oral health promotion among the final year trainee dental nurses. Self administered questionnaires were distributed to a sample of 131 final year trainee dental nurses. The questions were grouped under five domains measuring knowledge, perception, practices and perceived roles in oral health promotion, and problems in implementation of oral health promotion activities. Descriptive analysis was performed and the Chi-square test was initially used to examine association between variables. Majority of trainees had good and moderate knowledge of oral health promotion (21.4% and 45.8% respectively). About 64% perceived oral health promotion as moderately important and substantially high percentage have good perception of their role (90.8%). Getting canteen operators to sell healthy food was perceived to be the main practical constraint. However teachers and school authorities were felt to be generally more cooperative compared to parents and children. Slightly more than half felt they have insufficient time to carry out other activities apart from achieving their work schedule. The main source of knowledge was reported to have been received during their course of training (79.4%). Although findings of this study suggest that level of knowledge, perception and perceived roles to be associated with chair side practices of oral health promotion, however this association was found to be statistically insignificant. In conclusion, the trainee dental nurses demonstrated appropriate knowledge of oral health promotion, perceived oral health promotion to be moderately important and have a generally good perception of their role in promoting oral health. Subsequently, these findings suggest that this group will carry out oral health promotion practices in their future work environment based on their assimilation of knowledge and good perception.

KEY WORDS: Oral health promotion, Knowledge

INTRODUCTON

Health is an emotive concept and is defined differently by many people. Many attempts have been made to define health. Health is both an individual and a social responsibility that is best secured by collaborative actions at all levels of society.¹ World Health Organisation (WHO) in 1948 defined health as "a complete state of physical, mental and social well-being and not merely the absence of disease and infirmity". Following this concept, WHO in 1984 further defined health promotion as "the process of enabling people to increase control over and to improve their health". In an attempt to identify a framework for health promotion the WHO has recognized a set of activities that are central to health promotion known as the Ottawa Charter (1986).² The five guidelines as outlined in this charter are used in the implementation of oral health promotion activities.

Contrary to health education, health promotion principles seek to involve more than just the actions of individuals. It involves the population as a whole who are then empowered to take control of their own health needs.³ Oral health promotion is an umbrella term which incorporates all types of oral health education. It not only encompasses the broader term that includes political, economic, social and behavioral processes which contribute to oral health, it still incorporates preventive interventions which can only be delivered by trained professionals.⁴

In 1994 the Ministry of Health set up the Oral Health Promotion Unit previously known as the National Dental Health Educational Unit. Apart from the formulation of policies, this unit aims to promote, regulate and monitor oral health promotion efforts and activities nationwide. The School Dental Service, which was set up in 1950 forms an integral part of dental services rendered

to schoolchildren. Traditionally the focus of these services by the dental nurses has been primarily curative rather than promoting health. The school set up is seen to be an ideal place to promote oral health among the schoolchildren. Being the thrust of the school dental services, dental nurses have a pivotal role in promoting oral health in a school setting. Therefore, they need to be empowered with the knowledge, perceptions and skills in promoting oral health and health in general.

Topics on health promotion were added into the curriculum for Dental Nurses in the year 2000 as an adjunct to the preventive information they have acquired. It was initially introduced to the students in 2001 during their course of study in the second year, semester IV. With proper knowledge and attitude in oral health promotion, they can play an important role in the health education of individuals and groups, and be a role model themselves.⁵ The aim of this study was to determine the level of knowledge acquired, the perception and practice of oral health promotion activities among the final year trainee dental nurses with the following specific objectives:

- i) To determine the extent of oral health promotion knowledge among the final year trainee dental nurses
- ii) To determine their perception and perceived roles in promoting health
- iii) To identify practical constraints in conducting oral health promotion activities
- iv) To identify sources of knowledge concerning oral health promotion
- v) To examine the relationship between knowledge, perception, perceived roles and practices of oral health promotion

METHOD

A qualitative cross-sectional study was conducted involving all 131 final year trainee dental nurses (Intake 2001). The questionnaire used was based on that used elsewhere.⁶ However slight modifications were made to 8 questions to make it more acceptable to the students. A pre-test of the questionnaire involving 20 second year trainee dental nurses selected at random was done prior to the actual study. The pre-test was made known to the participants and administered face to face. Time to complete the questionnaire was noted. Slight modifications were made to the questionnaire based upon responses and the survey format was finalized.

The self-administered questionnaire has five domains: (i) knowledge in oral health promotion (ii) perception of oral health promotion (iii) oral health promotion practices (iv) perceived roles in oral health promotion and (v) problems in implementation of oral

health promotion activities. Demographic information was also recorded. This was not reported with due consideration that the sample comprises of students. The scale used varies from a simple 2-point scale (Yes, No), a simple 3-point scale (agree, disagree, don't know and never, sometimes, always) to a 4-point scale (strongly agree, agree, disagree, strongly disagree). The administration of the questionnaire was conducted in a classroom setting facilitated by the researchers. Participation was voluntary but remained anonymous.

Knowledge, perception and perceived role in oral health promotion were analysed in relation to chair side oral health promotion practices. The data were analysed using the statistical software SPSS for Windows version 12.0. Both descriptive and measures of association using Chi-Square test was used in the analysis. The significance level was set at $p < 0.05$.

RESULTS

A pre-test of the questionnaire was conducted to ensure reliability and validity for this group of subjects albeit it being used elsewhere.⁶ The mean time taken for respondents to complete the questionnaire was 32 minutes as compared to 18 minutes in the actual study. Modifications were made to four questions based upon responses from a total of 35 questions (11.0%).

A total of 131 final year trainee dental nurses participated in the study. The response rate received for the questionnaires was 100%. However the overall completed response rate was comparable (99.9%). Knowledge on oral health promotion was rated as good, moderate and poor based on the strength of their agreements on the five statements given. **Table 1** indicates that only 21.4% had good knowledge and 45.8% had moderate A total of 97.0% of students agreed that parents and teachers are encouraged to be equally responsible towards the school children's oral health, and 95.0% agreed that dental health messages should be included in general health messages and activities.

Altogether 12 statements were used to measure the students' perception of oral health promotion. The overall perception was rated as "not important", "moderately important" and "very important". It was noted that about 64.0% perceived oral health promotion as "moderately important" and only 7.0% perceived oral health promotion as "not important" (**Table 1**). To instill awareness and responsibility among school children towards oral health was perceived as "important" by all the students. They also unanimously agreed that teachers' cooperation are needed to upgrade the oral health status of schoolchildren, and that they must be explained the need to brush their teeth. Only 26.0% perceived that school children could be trusted to look after their teeth and gums.

Table 1 also indicates 90.8% of students had a good perception on their role in oral health promotion based on their agreement to more than three out of five statements.

Slightly more than 9.0% students did not perceive their role in cooperating with the school about providing healthy food at the canteen. Almost all had a good perception on their role in instilling good oral health habits.

The 4-point scale (strongly agree, agree, disagree, strongly disagree) used in the questionnaire was further reduced to a 2-point scale (agree, disagree). The greatest constraint reported was getting cooperation from canteen operators in selling healthy food (77.1%) (Table 2). The next constraint was getting parents involvement in their children's oral health, and equally difficult to get the children to be interested in their own oral health (65.7% and 64.1% respectively). However, more than half felt that getting cooperation from teachers and school authorities was not a constraint.

Majority reported having heard about oral health promotion (95.4%). The main source of knowledge on oral health promotion approaches was reported to have been received during their course of training at the institution (79.4%). Other sources are as shown in Table 3.

To facilitate analysis for overall practice of oral health promotion at chair side, a score of 0, 1 and 2 were given to "never", "sometimes" and "always" respectively.

In this study, a composite score of 0 - 9 were considered as "poor practice" and a score of 10 - 14 as "good practice". Table 4 shows that 57.3% had "good practice" while 42.7% had poor practice. These practices are shown in Table 5. About 85.0% reported getting the children to relax while talking to them and only 9.2% reported having discussed other topics while providing treatment. Among the other topics discussed were pertaining to hobbies, ambitions, studies and favourite food.

Table 6 suggests that students with good and moderate knowledge on oral health promotion had better practice at chair side as compared to those with poor knowledge. The differences observed however, are not statistically significant ($p=0.395$).

An association between perception and practice of oral health promotion was observed as in Table 7. Students who perceived oral health promotion as "very important" reported to have good chair side practice and those whose perception was rated "unimportant" had poor practice. However the findings were also found to be statistically insignificant ($p=0.266$).

There is an association between perceived role and practice as shown in Table 8 but the evidence to support this observation is insufficient ($p=0.124$).

TABLES AND FIGURES

Table 1. Knowledge, perception and perceived roles of oral health

Knowledge of oral health promotion	Frequency (n= 131)	Percent
Good	28	21.4
Moderate	60	45.8
Poor	43	32.8
Total	131	100.0

Perception of oral health promotion	Frequency (n= 131)	Percent
Very important	38	29.0
Moderately important ('Important?')	84	64.1
Not important	9	6.9
Total	131	100.0

Perceived role in oral health promotion	Frequency (n= 131)	Percent
Good perception	119	90.8
Poor perception	12	9.2
Total	131	100.0

Table 2. Practical constraints in conducting oral health promotion activities

Practical constraints	Disagree		Agree		Total	
	n	%	n	%	n	%
It is difficult to get teachers to cooperate in improving the oral health of schoolchildren	70	53.4	60	45.8	130	99.2
It is difficult to get parents to be involved in their children's oral health	45	34.3	86	65.7	131	100
It is difficult to get school authorities to cooperate in improving the oral health of schoolchildren	79	60.3	52	39.7	131	100
It is difficult to get canteen operators to cooperate in selling food that is good for health	29	22.1	101	77.1	130	99.2
It is difficult to get children to be interested in taking care of their own dental health	47	35.9	84	64.1	131	100
Time is insufficient to carry out other activities apart from achieving schedule targets set by training institution	64	48.8	67	51.2	131	100

**Table 3. Sources of knowledge concerning oral health promotion (how about using a bar chart here?)
Just a suggestion**

Sources of Knowledge*	No. of Dental Nursing students (n= 131)
During course of training (DTC)	104 (79.4)
CDE talks at practical training centres (PTC)	76 (58)
Discussion with trained Dental Nurses at PTC	85 (64.9)
Discussion with Dental Officers at PTC	46 (35.1)
Television, mass media	66 (50.4)
Books/journals	75 (57.3)

* There may be more than one source of knowledge for each subject
Percentage in parenthesis

Table 4. Practice of oral health promotion

Practice of oral health	Frequency (n= 131)	Percent
Good practice	75	57.3
Poor practice	56	42.7
Total	131	100.0

Table 5. Chairside oral health promotion practices

OHP practices	Never		Sometimes		Always		Total	
	n	%	n	%	n	%	n	%
I discussed with the child about his dental health after I have examined his teeth and gums	6	4.6	80	61.1	45	34.3	131	100
If a child has gingivitis, I use a mirror to show him the plaque on his teeth	19	14.5	68	51.9	44	33.6	131	100
If a child has poor oral hygiene, I try to find out if he has any problems brushing his teeth	8	6.1	41	31.3	82	62.6	131	100
If a child still has caries, even after being case completed, I try to find out if he has been taking a lot of sweet foods	17	13.0	42	32.0	72	55.0	131	100
I try to get the children to relax while I'm talking to them, by smiling and being friendly	0	0	20	15.3	111	84.7	131	100
When I talk to children about keeping their teeth clean, I also tell them about keeping themselves clean	21	16.0	82	62.6	28	21.4	131	100
I discuss with the children about their family, diet and living conditions	27	20.6	84	64.1	20	15.3	131	100
While treating the children, do you ever discussed other topics?	76	58.0	42	32.1	12	9.2	130	99.3

Table 6. Knowledge and chair side oral health promotion practices

Knowledge of oral health promotion	Practice of oral health promotion		Total
	Good practice	Poor practice	
Good	17 (60.7%)	11 (39.3%)	28 (100%)
Moderate	37 (61.7%)	23 (38.3%)	60 (100%)
Poor	21 (48.8%)	22 (51.2%)	43 (100%)
Total	75 (57.3%)	56 (42.7%)	131 (100%)

Table 7. Perception and practice of oral health promotion

Perception of oral health promotion	Practice of oral health promotion		Total
	Good practice	Poor practice	
Very important	24 (63.2%)	14 (36.8%)	38 (100%)
Moderately important	48 (57.1%)	36 (42.9%)	84 (100%)
Not important	3 (33.3%)	6 (66.7%)	9 (100%)
Total	75 (57.3%)	56 (42.7%)	131 (100%)

Table 8. Perceived role and practice of oral health promotion

Perceived role in oral health promotion	Practice of oral health promotion		Total
	Good practice	Poor practice	
Good perception	71 (59.7%)	48 (40.3%)	119 (100%)
Poor perception	47 (33.3%)	8 (66.7%)	12 (100%)
Total	75 (57.3%)	56 (42.7%)	131 (100%)

DISCUSSION

This study was based on the questionnaire used in a previous study of similar topic but targeted towards trained dental nurses. For the purpose of this study, slight modifications were made to the questionnaire before and after pre-testing.

The domain on activities being carried out in the school was not considered in the present study since the trainee dental nurses were not expected to participate directly with the school authorities in carrying out such

activities. The composite scores to attain overall measures of knowledge, perception and practice did not consider weightage for each item in the domains but rather was given arbitrarily. Since evaluation was made on the basis of self-reported data, measurement error due to misinterpretation of questions and memory errors were expected to occur.⁷ Thus findings from this study are based on these limitations.

As primary health care workers, school dental nurses have a key role in promoting oral health by encouraging positive health behaviours in school children. In the past, training of dental nurses did not include oral health promotion and even if present were often lacking and their levels of knowledge about fundamental issues may still not be good.⁸ The authors recommended updating their oral health knowledge and practices.

Dental health education mainly focuses on modes of delivery that ensure knowledge is imparted. The acquisition of knowledge does not necessarily result in behaviour change nor does good knowledge of oral health promotion necessarily relate to good practices. However knowledge that has been assimilated is more likely to be translated into practices.⁹ Assimilation of knowledge gives a sense of personal control over their oral health, thus they are more likely to adopt self-care practices.

The knowledge of oral health promotion among the trainees fell into the category of good and moderate rather than poor as observed in a similar study on trained dental nurses.⁶ This is expected as this batch of trainees received a formal training in oral health promotion which was integrated into their curriculum unlike their counterparts.

In the same previous study on trained nurses, majority of both trainees and trained dental nurses perceived oral health promotion as moderately important and more than half have demonstrated good oral health promotion practices. Similarly, those who have good perception of their role in oral health promotion are more likely to carry out oral health promotion practices. Thus despite not being trained formally in oral health promotion the acquisition of experience and their positive perception of oral health promotion portrayed good practices.

Since auxiliary health personnel specialize in preventive information and health promotion, it is important that their own oral health knowledge is good and their oral health behaviour conforms to professional recommendations.¹⁰ With a proper knowledge and oral health behaviour, they can play an important role in health education of individuals and groups,⁵ and act as role models for schoolchildren and teachers in their workplace. The concept of health promoting school is well established and it is important that oral health is addressed within this framework.

Both descriptive and measures of association were carried out in the analysis. The Chi-Square tests however did not demonstrate the strength of the association between the variables due to the small sample. It is recommended that a cohort study be carried out on the same group of trainees after a period of actual working experience in order to examine the differences.

CONCLUSION

It may be concluded that the trainee dental nurses have appropriate knowledge of oral health promotion, perceived oral health promotion to be moderately important and have a generally good perception of their role in promoting oral health. The findings also suggest this group will carry out oral health promotion practices based on their assimilation of knowledge and good perception.

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Minimally Invasive Approach in Management of Ranula in Children

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ABSTRACT Ranula is a disorder of the salivary gland that is usually presented as a swelling in the floor of the mouth. It can be managed through a few different modalities but surgical management is the ultimate option. Among the various surgical techniques, surgical removal of the lesion together with the sublingual gland has been the most acceptable technique. However recent findings have found that a minimally invasive approach in surgical technique such as marsupialization was as successful in comparison, with less risk of recurrence. These findings have led to inclination towards marsupialization as a better option in managing ranula in paediatric population. This paper presents four such cases including a plunging ranula, which was managed through such a technique.

KEYWORDS: Ranula, Surgery, Children.

INTRODUCTION

Ranula is a clinical term used for cystic swelling in the floor of the mouth that resembles the frog underbelly as the name also suggests. It is actually a disorder of the salivary gland, which is rather common in that region. It is thought to arise as a result of either retention of saliva within the gland substance or extravasation of saliva that is collected in the submucosal tissue. Though it is commonly seen intraorally, it can be present as submandibular or neck swelling extraorally which is called the plunging ranula.¹ The extraoral swelling developed as an extension of the intraoral lesion. It rarely causes any pain² unless it suddenly enlarges or becomes infected. However, patients or their parents would complain of enlarging lump that interrupt speech and masticatory function such as chewing food or feeding.^{2,3,4,5}

Cases of ranula have been reported in numerous literatures since the late nineteenth century. It has been reported to be seen in patients of various ages but a recent literature has found that the majority of those cases were seen in the second decade of life.⁶ A number of recent literature has described findings and management of ranula in infants and children.

Surgical management is the ultimate choice in managing these cases and it has been proven to be successful in eliminating the lesion. Surgical excision of the associated gland together with the cyst has been regarded the best option among the surgical techniques since the risk for recurrence is the least.⁶ In children however there has been inclination to manage these cases through a minimally invasive or conservative approach that has resulted in comparable success.

The paper presents four interesting cases that were managed by the author through a minimally invasive approach including a case of plunging ranula. These cases were reviewed for duration between 3 to 16 months.

CASE REPORT

A 4-year old Malay boy was referred to the Department of Paediatric Dentistry for the management of a swelling under his tongue that has been present since a few months ago. Its presence was noticed by his father but it was painless. It maintained its size for such period of time and only caused some disturbances while chewing food and talking. It has ruptured once and its size reduced. Intraoral examination has shown a bluish 2cm x 2cm lump on the right side of the floor of the mouth. It was a soft, non-tender and fluctuant lump on palpation. The overlying mucosa was normal. An intraoral radiograph of an occlusal view did not show any remarkable findings. The lesion was diagnosed as ranula with the view of other possible differential diagnosis such as dermoid cyst and lymphangioma. The patient was managed with surgical intervention through marsupialization under local anesthesia whereby the cyst content aspirated as viscous substance. The mucosa was unroofed to expose the cyst lining. An incision was made through the lining to drain out the content. The cyst lining was then sutured to the oral mucosa to create a patent opening. Three weeks after the surgery the patient was reviewed and the lump had resolved. The lump recurred after 2 months to a lesser extent but an extraoral swelling had now developed. The patient was planned for another surgical intervention but

the father has requested for a delay of treatment. The patient only returned for follow-up one year later and the swelling remained the same. Another follow-up a month later has led to an unexpected spontaneous resolution of the lump.

A 9-year old Chinese girl was referred for management of swelling below the tongue, which was noticed by her mother since birth. There was no discomfort or disturbance related to the swelling except that it was increasing in size lately. On examination it was found that a non-tender extraoral swelling present at the right submandibular region about 3cm x 3cm in size. Intraorally a large soft tissue lesion was found in the floor of the mouth about 2cm x 4cm in size. The extraoral lesion was found to be an extension of the intraoral lesion. The soft, fluctuant and non-tender lesion had normal overlying mucosa. The lesion was diagnosed as plunging ranula. Marsupialization of lesion was done in which the cyst was decompressed and followed by suturing the cyst margin to the normal mucosa. Ribbon gauze without any medication was then packed into the cystic cavity and left for seven days. Healing was uneventful at one-week review and both extraoral and intraoral lesion resolved. At one month's review, the wound edges were inflamed but there were no other obvious features of infection. There was no evidence of recurrence at review 2 month later. The duration of follow-up was 3 months since the day of the surgery.

A 12-year old Indian girl was referred for the management of swelling on the left floor of the mouth that had been noticed for the past few months ago. Generally there was no complaint from the patient but the parents were concerned. On examination a 2cm X 3 cm lesion was noted on the left side of the floor of the mouth. On bimanual palpation it was soft, fluctuant and non-tender. The lesion was limited to the sublingual region with a well-defined margin. A diagnosis of ranula was made and the lesion was managed through marsupialization under local anaesthesia. An opening was made to drain out the content of the lesion. The cyst lining was then sutured to the normal oral mucosa. The patient was reviewed after one week and the wound was found healing well. Another follow-up at 3 month postoperatively has shown complete resolution but the father claimed that the swelling has arisen and subsided consecutively from time to time. Another follow-up that was done 16 months postoperatively did not show any evidence of recurrence.

An 11-year old Indian boy was referred for swelling of the whole floor of the mouth. Patient did not notice the swelling until during dental check-up in school two weeks earlier. On examination a large 3.5 cm x 3cm lesion was noted in the middle of the floor of the mouth. It was soft, fluctuant and non-tender to palpation. Aspiration of the lesion has given viscous, translucent whitish fluid. A diagnosis of ranula was then made in view of the clinical features. Marsupialization under local anaesthesia was done almost similar to the other cases. Ribbon gauze was packed inside the cystic cavity and left for about a week. At one-week review, healing progressed satisfactorily. There was no evidence of recurrence as seen at 8 and 12 months follow-up postoperatively.

The summary of the cases presented is as shown in Table 1.

DISCUSSION

Ranula is managed through various surgical techniques such as drainage, marsupialization, surgical excision of lesion alone or with removal of the salivary gland involved. All of these techniques has shown success in eliminating the lesion but the variety in surgical technique is possibly contributed by unclear understanding on the etiology and pathogenesis of ranula.^{1,5} There were some evidence in the literature that suggested the development of ranula was due to obstruction of salivary duct or extravasation of saliva into the submucosal tissue but the possibility of other concept⁷ for its development should not be neglected. Ranula might not necessarily arise from only the sublingual gland. Some experts have found that ranula arose from the submandibular gland or from extravasation of the accessory incisal gland and even as subsequent to perforated submandibular duct.⁵ Despite the existence of various surgical techniques in management of ranula, recurrence is still experienced by patient. This is possibly due to the variation in etiology and pathogenesis of ranula as mentioned above. Hence it is of importance to really identify the exact etiology of each lesion before deciding on the surgical technique to be used.

A review on a series of cases managed through various surgical techniques to manage ranula has found that surgical removal of the sublingual gland has the least risk of recurrence.⁶ It was recommended then that removal of the sublingual gland is necessary in management of various clinical patterns of ranula. This is also supported by an earlier report in the literature whereby the failure rate with marsupialization was higher.²

Marsupialization is a minimally invasive approach in which the cyst is unroofed and the lining is sutured to the adjacent mucosa to create a patent communication with the oral cavity. This is among the earliest techniques in the management of ranula but it became out of favour because of recurrence that occurred as early as 6 weeks postoperatively.⁸ However, in recent years this technique has been found gaining acceptance in cases of children and infants. Such technique has shown almost equal success and lesser recurrence in comparison to other techniques.^{9,10} Moreover, a number of literatures have shown evidence against a more invasive approach such as surgical removal of the associated gland. The result of the current situation is felt to be contributed by reduction of recurrence through the technique that was modified. The modification is by additional packing of the cyst cavity with ribbon gauze that is left for a period of time.⁸ This was evident in case 2 and 4.

Marsupialization is preferred than the surgical removal of sublingual gland because the latter would carry a greater risk of injuring the submandibular duct and the lingual nerve. Moreover in children the risk would increase because of relatively limited access to the floor of the mouth. Nevertheless, any recurrence that occurred after

removal of the associated gland would probably be caused by the damaged or obstructed salivary ducts.¹¹ Even worse, plunging ranula developed concurrently as could be seen in case 1. Unexpected spontaneous resolution of the lesion in case 1 however, has erased the worry and concern of the parents. There is no clear explanation on how spontaneous resolution could occur and the factors that may initiate its process. The only possible explanation is that trauma during mastication may cause the cyst lining to rupture and depressurize the cyst. A patent communication between the cyst cavity and the oral cavity could then prevent the cyst fluid from accumulating within the cyst cavity.

Some other conservative approaches have also shown favourable results even in an extensive case such as plunging ranula. In case 2, marsupialization followed by gauze packing was performed while other experts have used method of fenestration and continuous pressure¹² to manage plunging ranula. A much less invasive approach such as simple incision and decompression⁴ or ligation technique using sutures^{3,13} has shown promising results particularly in infant. However, the present literatures have only shown successful results in very few cases. Much more convincing evidence is required to prove such claims.

Despite the surgical management, it is very interesting to note that in a paediatric patient, the potential for spontaneous resolution still exist as evident in case 1. Suggestion for observation of spontaneous resolution for a period of 6 months should be considered as part of management of ranula before any surgical intervention is to be done in a child patient.¹⁴ This is recommended particularly when parents are not keen on surgical management.

CONCLUSION

The four cases presented have demonstrated that marsupialization is a successful technique in managing ranula in children. Marsupialization, which is a minimally invasive surgical technique, is now becoming widely accepted and recommended as the technique of choice in the management of ranula in children. It has been found in the literature that this method has comparable success and less recurrence compared to other surgical techniques. It is however important to determine the etiology of each ranula individually before any decision is made on which is the best technique to be used.

TABLE 1. Summary of the four cases of ranula

Case	Age(Years)/ Gender/ Ethnic	Size of Lesion (cm)	Diagnosis	Surgical Technique	Follow-up duration	Recurrence/ Post-operative duration	Duration of post-operative resolution
1	4/ Male/ Malay	2 x 2	Ranula	M	24 months	Yes / 3 months	3 months * spontaneous resolution after 13 months
2	9/ Female/ Chinese	Extraoral – 3 x 3 Intraoral – 2 x 4	Plunging ranula	M + GP	3 months	No	3 months
3	12/ Female/ Indian	2 x 3	Ranula	M	16 months	No	16 months
4	11/ Male/ Indian	3.5 x 3	Ranula	M + GP	12 months	No	12 months

M, Marsupialization; GP, Gauze packing

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A Comparative Study of Prevalence of Tori Between Malay, Chinese and Indian Races Residing in Johor, Malaysia and Indians in Chennai, India

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ABSTRACT Torus palatinus (TP) and torus mandibularis (TM) are two of the most common developmental anomalies that present as intraoral exostoses. They are usually asymptomatic unless the overlying mucosa undergoes irritation or ulceration. In recent times, the presence of these tori has been associated with parafunctional disorders and temporomandibular problems. The objective of this article is to compare the prevalence of tori between Malay, Indian and Chinese people residing in Malaysia and Indians in Chennai, India. Screening of 150 consecutive persons was done in the Sentosa Dental Surgery centre in Johor Bahru, Malaysia constituting of 50 persons in each race of Malay, Chinese and Indians. A group of 100 Indian people was also screened at the Department of Periodontia, Ragas Dental College and Hospital, Chennai, India. Out of 50 persons in each group residing in Malaysia, 15 (38%) Malay and 4 (8%) Indians had tori, whereas the maximum number of tori was seen in 25 (50%) Chinese. No Indian in Chennai presented with a torus. In the Malay group, 2 out of the 14 persons with torus palatinus had TMJ clicking, whereas 3 Chinese persons with TP had a complaint of TMJ clicking. Only one Malaysia based Indian with torus mandibularis had a TMJ disorder. An overview of the incidence of tori in different races and populations of the world along with various hypotheses and current genetic concept on aetiology is included in this article.

KEYWORDS: Torus palatinus, Torus mandibularis, Ethnicity, Temporomandibular disorders.

INTRODUCTION

Torus palatinus (TP) and torus mandibularis (TM) are the most common bony exostoses occurring in specific intraoral locations.¹ TP is an exophytic mass of bone occurring usually in the midline of the hard palate whereas TM is frequently seen in the canine/premolar area in the lingual aspect of the mandible. Usually they are asymptomatic unless the overlying mucosa undergoes secondary irritation or if these tori interfere with the construction of complete dentures.

Earlier reports have suggested vast variation in the occurrence of tori in different races and ethnic groups.^{1,2} The prevalence of TP ranges from 0.4% to 66.5% whereas for TM it was 0.5% to 63.4% as reported in English literature in different populations.¹

Although asymptomatic in most patients, the presence of tori have been linked to parafunctional and temporomandibular disorders.^{3,4} The purpose of this study is to record the prevalence of tori between Malay, Indian and Chinese people residing in Malaysia and Indians in Chennai and to compare the differences in outcome with regard to gender, size and shape of tori between the 3 races.

MATERIALS AND METHODS

Screening of 150 consecutive adult persons constituting of 50 persons in each race of Malay, Chinese and Indians was done in the Sentosa Dental Surgery centre in Johor Bahru, Malaysia. A group of 100 Indian people

was also screened at the Department of Periodontia, Ragas Dental College and Hospital, Chennai, India. A predetermined clinical case sheet was used to record all the cases. The details of history included age, sex, past medical and dental history along with the history of habits and trauma. This was followed by extra-oral and intra-oral examination and evaluation of the dental status. The type, location and size of tori were recorded and the data were entered using SPSS 10.0 package. Comparative analysis was done where possible.

RESULTS

The mean age of Malay group was 40.5 years, whereas it was 41.7 and 44.2 years for the Chinese and Indian groups respectively (Table I). The gender distribution of these three races are also shown in Table I. The mean age of the Indians residing in Chennai, India was 45.7 years with a gender distribution of 59 males and 41 females. Out of 50 persons in each group residing in Malaysia, 15 (38%) Malay and 4 (8%) Indians had tori,

whereas the highest number of tori was seen in 25 (50%) Chinese. The highest number of TP was recorded in 17(34%) Chinese whereas 14 (28%) Malay and 2 (4%) Indians had torus palatinus. Eight (16%) Chinese had torus mandibularis, while 1 (2%) Malay and 2 (4%) Indians had TM (Figure 1). TP or TM was not recorded in the Indians screened at the department of Periodontia, Ragas Dental College and Hospital, Chennai, India.

Concurrence of TP and TM was seen in 2 Chinese and 1 Indian person whereas it was absent in the Malay group. The average size of TP and TM was 2 x 1 cm excepting for one case where the torus mandibularis measured at 4 x 1cm. The TP and TM were predominantly smooth, whereas few cases did have a lobulated structure (Table II).

Temporomandibular joint (TMJ) clicking was recorded in these groups. In the Malay group, 2 out of the 14 persons with torus palatinus had TMJ clicking, whereas 3 Chinese persons with TP had a complaint of TMJ clicking. Only one Malaysia based Indian with torus mandibularis had a TMJ disorder.

Table I: Demographic data of the 3 races in Johor, Malaysia

Race	Sex		Mean Age (yrs)	SD (yrs)	Range (yrs)
Malay	Male	24 (48%)	40.5	11.3	18-66
	Female	26 (52%)			
Chinese	Male	33 (66%)	41.7	11.5	22-70
	Female	17 (34%)			
Indian	Male	31 (62%)	44.2	11.6	17-66
	Female	19 (38%)			

Figure 1: Prevalence of tori among races in Johor, Malaysia

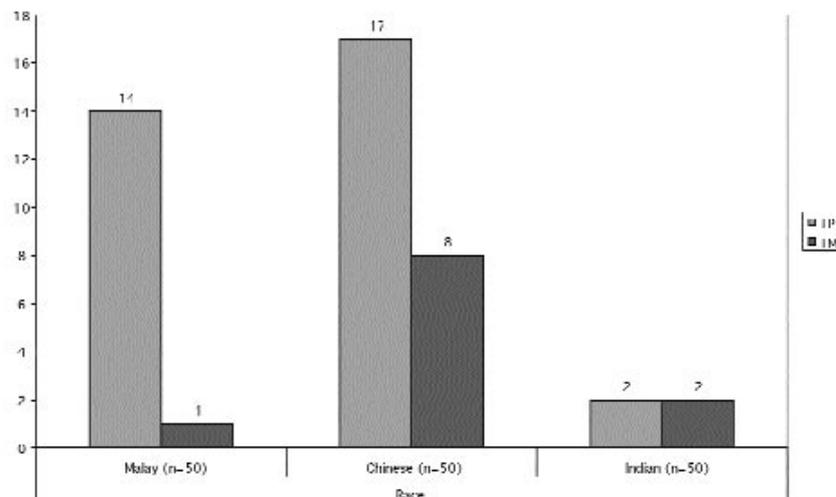


Table II: Torus type among races in Johor, Malaysia

Race	Torus Type			
	TP		TM	
	Lobulated	Smooth	Lobulated	Smooth
Malay	4	10	1	0
Chinese	1	16	1	7
Indian	0	2	1	1

TP – Torus Palatinus

TM – Torus Mandibularis

DISCUSSION

Torus palatinus has been observed and described as early as 1724;¹ however the term “torus palatinus” was coined by Kupffer and Bessel-Hagen in 1879.¹ The term “torus mandibularis” was coined by Furst in 1908 but the first description of TM was reported in 1884.¹ TP occurs more frequently in females with an average female: male ratio of 1.7: 1, whereas TM is reported to have a male predilection in most of the studies.^{1,2} In our study TM had a male predilection in all the three races. TP was seen more in Chinese females whereas in Malay and Indian races it was more prevalent in males, which is contrary to earlier reports. Both TP and TM tend to occur in 35-65 year age group in either gender.^{1,2,5} In our study, both TP and TM were seen mainly in the age group of 25-50 years, which is in a relatively younger age group than reported earlier in literature. The youngest person with a torus in this study was a 17 year old male and the oldest was a 66 year old male, both in the Chinese race.

Concurrence of TP and TM has been reported earlier in various populations. Reichart et al reported the concurrence TP and TM to be 0.7% in population of German patients and 4.7% in a group of Thai patients.⁶ Haugen et al reported a concurrence of tori in 2.22% of 5000 Norwegian patients.⁷ Chohayeb et al reported the presence of both tori to be 8.4% of 448 female patients in America.⁸ In this study, concurrence of TP and TM was seen in only 2 Chinese and 1 Indian patients whereas it was not noted in the Malay group.

Race wise, Chohayeb et al reported that tori were detected in 107 African Americans (35.4%), 20 Caucasians (32.3%), 13 Hispanics (30.2%), 14 Asians (38.9%), and 1 of the 5 Native American (20%) in a study group of 448 women. Torus palatinus were found in 69.7% of the study group whereas the percentage of torus mandibularis was 38.7%.⁸ Shah et al reported that the prevalence of Torus Palatinus and Torus Mandibularis in 1000 Indian patients was 9.5% and 1.4% respectively.⁹ Reichart et al reported that TP was recorded in 13.5% of 1317 German patients and in 23.1% of 947 Thai patients. TM was recorded in

5.2% of the German patients and 9.4% of the Thai patients.⁶ Tori have been reported in Saudi Arabian schoolchildren,¹⁰ Icelandic schoolchildren¹¹ and Nigerian children.¹² Tori have also been reported in Israelis,¹³ Brazilians,¹⁴ Peruvians¹⁵ and Ghanaians.¹⁶ In general, the prevalence of tori is reported to be higher in mongoloids than in caucosoids.²

In our study, the Chinese showed the highest number of tori (n=25; 50%) followed by the Malay (n=15; 38%) with the remaining occurred in Indians (n=4; 8%). Both TP and TM were seen predominantly in Chinese. In the Malay, TP was more common than TM. Indians do not have a tendency for tori formation as supported by the least number of tori cases.

The aetiology of tori is suggested to be the result of interplay of genetic, environmental, functional, nutritional and climatologic factors.¹ Several studies have suggested that torus formation is influenced by stress from masticatory hyperfunction whereas others stated dietary habits and avitaminoses to be the underlying cause.^{1,4,7,17} Habitual clenching of teeth, grinding and bruxism are the other proposed etiological factors.^{1,4} Since there were no tori in the Indian group screened in Chennai, India when compared to 4 cases in Indians residing in Malaysia, masticatory hyperfunction as a result of nutritional and diet variations perhaps should be considered as the environmental factors leading to tori formation in Indian residents of Malaysia.

Various theories and hypotheses have been put forth regarding the etiology of tori. Considering the genetic influence, an autosomal dominant mode of inheritance was suggested, which was not satisfactory due to the improper penetration of TP and TM trait from one generation to the other.¹ Eggen and Natvig proposed that X linked dominant or recessive mode of inheritance to be the cause for the variations in the prevalence of TP and TM. This hypothesis was deemed incomplete as it requires the transmission of the torus trait from the male parent to all the female offsprings in the X linked dominant model and only males should have tori according to the X linked recessive model.¹⁸

Current genetic concepts have localized the problem to a mutation in the gene for low-density lipoprotein receptor-related protein 5 (LRP5) located in chromosome 11q12-13. The mutation in this gene is the substitution of valine for glycine at codon 171 denoted as LRP5V171. The presence of LRP5 mutation resulted in increased bone growth signaling and causes high bone density, with the formation of torus mandibularis and torus palatinus.¹⁹

More recently, a genetic model have been suggested whereby tori can be formed in particular populations with genetic predilection but with a threshold value above which only individuals will be affected. This hypothesis states genetic as well as environmental factors constituting a multifactorial system for the etiology of tori.^{13,20} The quasi-continuous genetic/threshold model proposes that the environmental factors responsible must first reach a threshold level before the genetic factors can express themselves in the individual. Hence, both genetic and environmental factors determine liability, making the system multifactorial. These characteristics tend to cluster in families but genetic patterns are not clear cut and do not fit any dominant or recessive mode.^{7,21}

In this study, though the three races were residing in the same region, the high incidence of tori in Chinese and Malay when compared to Indians suggests a genetic predilection influenced by environmental factors such as diet and parafunctional activity.

Sirirungrojyng *et al* conducted a study to compare the presence of oral tori and parafunctional activity (clenching, grinding teeth and/or bruxism) between temporomandibular disorder patients and control subjects. The results showed that the prevalence of TM and parafunctional activity was higher in temporomandibular disorder patients than control patients. Kerdpon *et al* reported a strong association between clenching/grinding of teeth and the presence of TM in study group of 609 Thai patients.⁴ Hence, TM might be useful as an indicator of increased risk of TMD in some patients.^{3,4}

In our Malay group, 2 out of the 14 persons with torus palatinus had TMJ clicking, whereas 3 Chinese persons with TP had a complaint of TMJ clicking. Even though only 2 Indians had TM, one of the persons was recorded to have a TMJ disorder. Further study needs to be done to determine the relationship between TM & TP and temporomandibular disorder in the Malaysian population.

CONCLUSION

Torus palatinus and torus mandibularis are the most common intraoral bony exostoses occurring in specific intraoral locations in the jaws. However, the presence of these tori has been associated with parafunctional disorders and temperomandibular problems. The accepted hypothesis for formation of tori states a multifactorial system with genetic as well as environmental factors constituting a quasi-continuous genetic/threshold model. In this study, though the three races were residing in the same region, the high incidence of tori in Chinese and Malay when compared to Indians suggests a genetic predilection.

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Dental Management of Patients with Prosthetic Joints: A Review

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ABSTRACT Most prosthetic joint infections originate from wound contamination or haematogenous seeding from distant sites of infection. Bacteraemia may follow dental treatment but there is little evidence of it related to prosthetic joint infection. Nevertheless, controversy continues with regards to the effect of dental treatment in patients with prosthetic joints. Dentists are always at dilemma as whether to prescribe prophylactic antibiotics prior to dental procedures. This article reviews current English literature on this dilemma. It is suggested that dentists and orthopaedic surgeons in Malaysia adopt the latest recommendation by the American Dental Association and the American Academy of Orthopaedic Surgeons (ADA/AAOS).

KEY WORDS: Dental treatment, Prosthetic joint, Bacteraemia.

INTRODUCTION

Replacement of diseased joints with prosthesis started about 5 decades ago. It has since become a major achievement in orthopaedic surgery. Initially post-operative infection rates of 15 to 25% were reported.¹⁻⁵ With intra-operative antibiotic prophylaxis, modern operation theatre designs and aseptic surgical techniques, prosthetic joint infection rate has dropped to 0.5 to 5%.⁶ The consequences of prosthetic joint infection are devastating, entailing prolonged hospitalisation and antibiotics, multiple surgeries, significant morbidity and mortality.⁷ Early prosthetic joint infections happen within 2 months of operation, mostly from direct inoculation or airborne contamination. Late infection usually occur after 2 months of operation and is usually the result of haematogenous seeding or contagious spread. Bacteraemia from surgical and dental treatments has been implicated in late haematogenous spread.^{8,9} Understandable concern about the disastrous consequences of prosthetic joint infection has led to advocacy of prophylactic use of antibiotic before a dental procedure. However, it is important to recognise that routine use of prophylactic antibiotic has little supporting evidence, and is not without its own adverse effect.

DENTAL TREATMENT BACTERAEMIAS

The role of dental treatment bacteraemia as the source of prosthetic joint infection has been disputed.

The incidence of late infection in arthroplasties has been quoted as from less than 0.1%¹⁰ to 0.6%,¹¹ with microorganisms from a dental source involved in from 0.04%³ to 0.07%.¹¹ It has been suggested that even these very small proportions may derive from bacteriological methods that may be flawed¹² and the actual incidence of joint infection secondary to dental treatment is perhaps even lower.¹³

It has earlier been suggested that bacteraemias can cause haematogenous seeding of total joint implants, both in the early postoperative period and for many years following implantation.¹⁴ It has also been suggested that the most critical period is up to two years after joint replacement.¹⁵ However, it has been shown too that bacteraemias may occur in the course of normal daily life^{16,17,18,19} and concurrently with dental and medical procedures.¹⁸ Guntheroth suggested that more oral bacteraemias are spontaneously induced by daily events than are dental treatment-induced.¹⁸

Moreover, the predominant pathogens in prosthetic joint infection are *Staphylococcus aureus* and *Staphylococcus epidermidis*, accounting for 54%.¹¹ These microorganisms are more commonly found on the epidermis. In contrast, the commonest human oral flora like *Streptococci viridans* and *Peptostreptococcus* are only implicated in 0.07% of prosthetic joint infection.²⁰

Ching *et al.*, found 4 cases of infected joints due to streptococci viridans but they were related to acute oral infection, and not dental treatment-induced bacteraemia.²¹ Out of twenty-one reported prosthetic joint infections after a dental procedure or infection, Thyne & Ferguson found

only one case close to meeting criteria of being related to dental treatment-induced bacteraemia.⁸ Bartzokas *et al.*, reported 4 cases of prosthetic joint infection caused by *S. sanguis* of the viridans group, with same strain isolated from the mouth and from the infected prosthesis. However all these four cases had history of caries and periodontal disease and the prosthetic joint infections were thought not associated to dental treatment-induced bacteraemia.²²

On the other hand, Waldman *et al.*, reported nine infected total knee arthroplasties associated with dental procedures, five of which had predisposing systemic risk factors, and all the dental procedures were extensive in nature, with average time of 115 minutes.⁹ LaPorte *et al.*, reported of the 52 late infections identified among 2973 patients after total hip arthroplasty, three (6%) were strongly associated with a dental procedure. *Streptococcus viridans* was identified in two cases and *Peptostreptococcus* in one. These were attributed to predisposing conditions, of which one patient had diabetes mellitus and another rheumatoid arthritis.²⁰

DILEMMA FOR DENTISTS

The problem for the dentists is that most orthopaedic surgeons still recommend antibiotic prophylaxis for dental treatment of their prosthetic joint patients.^{2,23,24,25} Little²⁶ has noted that if a consultation is obtained from the patient's orthopaedic surgeon, prophylaxis will most likely be recommended. Normally, it is difficult for the dentist to go against such a recommendation when most other orthopaedic surgeons would make the same recommendation. However, if the dentist follows the recommendation and the patient has a serious adverse effect to the antibiotic, the dentist may be faced with an emergency situation in the dental clinic, not withstanding legal proceedings that may follow.

RECOMMENDATION OF PROFESSIONAL BODIES ON ANTIBIOTIC PROPHYLAXIS FOR DENTAL PATIENTS WITH TOTAL JOINT REPLACEMENT

Despite most of the orthopaedic and dental surgeons supported antibiotic prophylaxis in patients with prosthetic joints undergoing dental treatments, and many more reviews against it,^{26,27,28} there are currently only two main professional guidelines. One is the recommendation by the Working Party of the British Society for Antimicrobial Chemotherapy (BSAC) in 1992,²⁹ and the other, a joint statement by the American Dental Association and the American Academy of Orthopaedic Surgeons (ADA/AAOS) first reported in 1997 and later updated in 2003.^{30,31}

BSAC²⁹ recommended against any use of antibiotic prophylaxis in dental patient with prosthetic joint

replacement: "Advice of a Working Party of the British Society for Antimicrobial Chemotherapy is that patients with prosthetic joint implants (including total hip replacements) do not require antibiotic prophylaxis for dental treatment. The Working Party considers that it is unacceptable to expose patients to the adverse effects of antibiotics when there is no evidence that such prophylaxis is of any benefit, but that those who develop any intercurrent infection require prompt treatment with antibiotics to which the infecting organisms are sensitive". The Working Party had commented that joint infections have rarely been shown to follow dental procedures and were even more rarely caused by oral streptococci.

A slightly different stand was taken by the ADA/AAOS in 1997:³⁰ "Antibiotic prophylaxis is not indicated for dental patients with pins, plates and screws, nor is it routinely indicated for most dental patients with total joint replacements. However, it is advisable to consider premedication in a small number of patients who may be at potential increased risk of haematogenous total joint infection". The latest advisory statement issued by ADA/AAOS, which is the first periodic update of the 1997 statement and was recently published in the Journal of the American Dental Association,³¹ again echoed the same finding and recommendation. The 2003 statement includes some modifications of the classification of patients at potential risk and of the incidence stratification of bacteremic dental procedures. The patients deemed to be at potential increased risk of haematogenous total joint infection were categorised by ADA/AAOS into 3 groups, namely:³¹

- a) All patients during the first two (2) years after prosthetic joint replacement.
- b) Immunocompromised / immunosuppressed patients:
- c) Patients with co-morbidities

The immunocompromised / immunosuppressed patients include those who suffer from drug-induced and radiation-induced immunosuppression and those who have inflammatory arthropathies like rheumatoid arthritis, systemic lupus erythematosus.³¹

Patients with co-morbidities are those who suffer from malnutrition, haemophilia, HIV infection, insulin-dependent diabetes and malignancy and those who have had previous prosthetic joint infections.³¹

ADA/AAOS also reviewed the latest incidence stratification of bacteraemic procedures in which procedure that cause bleeding were deemed to be of high risk.³¹ This includes dental extractions, periodontal procedures including surgery, subgingival placement of antibiotic fibres/strips, scaling and root planning, probing, recall maintenance, dental implant placement and reimplantation of avulsed teeth, endodontic (root canal) instrumentation or surgery only beyond the apex, initial placement of orthodontic bands but not brackets, intraligamentary and intraosseouslocal anaesthetic injections and prophylactic cleaning of teeth or implants where bleeding is anticipated.³¹

ADA/AAOS emphasised that prophylaxis should be considered for patients with total joint replacement that meet these criteria (medical condition & bloody dental procedure). They stressed that no other patients with orthopaedic implants should be considered for antibiotic prophylaxis prior to dental treatment/procedures.³¹ However, they stressed that clinical judgement may indicate antibiotic use in selected circumstances that may create significant bleeding and hence bacteraemia in patients of lower risk group.³¹

ORAL HEALTH CARE

The best measure in tackling late haematogenous spread prosthetic joint infection is by prevention. For patients undergoing total joint replacement, the ADA/AAOS recommended that they should be in good dental health prior to surgery.³¹ All patients planned for joint replacement should first visit their dental practitioners as early as possible, and if possible, upon their first orthopaedic consultation. This is important in our context as oral health status in the adult Malaysian population is not good in general. Ninety five per cent of the adult population had caries experience, with the mean decayed, missing and filled teeth (DMFT) being 13.2. More than seventy two per cent (72.4%) of adults had some form of periodontal disease with 29 percent having pockets deeper than the normal 3 mm.³² In fact, periodontal disease among Malaysian adults is a problem of worrying magnitude to the dental professions.³³ This happens despite Malaysian regularly brushes their teeth. In a study by Esa *et al.*,³⁴ it was reported that about 90% of their subjects brushed their teeth, of which 57% brushed twice a day. Taiyeb Ali & Razak³⁵ attribute poor oral health status among Malaysian adults to the low priority for dental health and possibly the lack of dental consciousness and knowledge among the general population. In addition, they postulated that increase in the retention of the dentition due to the reduction in tooth loss from dental caries as a result of nationwide fluoridation programme for the past years and the widespread use of fluoridated toothpaste in this country, may have resulted in a greater number of teeth being exposed to the ravages of periodontal disease. Roberts *et al.*,¹⁹ have shown that simple tooth-brushing produced a detectable bacteraemia in 38.5% of 52 children and in older patients with periodontal disease, the proportion is probably higher. Such episodes of spontaneous bacteraemia have been quoted to happen up to 12 times a day, that is over 4000 per year.¹⁹ Thus, the risk of bacteraemia seems significant even in healthy adult Malaysian population due to the prevalence of periodontal disease.

No study has been done to evaluate the oral health status of Malaysian patients prior to prosthetic joint replacements. Nevertheless, based on data regarding oral health status in general, it is suspected that most of them

require some form of dental treatment. Most patients do not see the relationship between undergoing joint replacement and dental treatment. Most often they are at lost when referred to the dental clinics. It is therefore, the duty of dental surgeons to explain to the patients the association between dental bacteraemia and possible infection to their prosthetic joints.

Patients who already have had a total joint arthroplasty should perform effective daily oral hygiene procedures to remove plaque (e.g. manual or powered toothbrushes, interdental cleaners, oral irrigators) to establish and maintain good oral health. The risk of bacteraemia is noted to be far more substantial in a mouth with ongoing inflammation than in one that is healthy and employing these home-oral hygiene devices.^{30,31} Nevertheless, as for the dentists, they are concerned of possible risk of bacteraemia following dental treatment. In essence, dental procedures that produced bleeding (most often extractions and periodontal/gum treatment) may require antibiotic prophylaxis in patients deemed to be of high risk.

Any patient who have had total joint prosthesis replacement and suffers from acute orofacial infection should be vigorously treated by eliminating the source of infection by incision and drainage, endodontics, exodontia, and appropriate therapeutic antibiotics when indicated.¹³

ANTIBIOTICS RECOMMENDED

When prophylactic antibiotic is indicated, the regime of antibiotics recommended by the ADA/AAOS as summarised in Table 1 is to be followed.^{30,31} In a recent review, Curry & Phillips found no new evidence to change the ADA/AAOS recommendation, and agreed that all the drugs recommended can be safely given as a single-dose prophylaxis.³⁶

CONCLUSION

According to current evidence, routine antibiotic prophylaxis is not recommended for all patients with prosthetic joints when receiving dental treatments. However, antibiotic prophylaxis may be prescribed for high-risk groups with predisposing factors to infection, as recommended by the American Dental Association and the American Academy of Orthopaedic Surgeons (ADA/AAOS). The best measure in tackling late haematogenous spread prosthetic joint infection is by prevention. All patients planned for joint replacement should first visit their dental practitioners as early as possible, and if possible, upon their first orthopaedic consultation. Postoperatively, they should practise regular dental check-up and proper oral hygiene lifelong.

Table 1: Recommendation of antibiotic regime by ADA/AAOS³¹

	Able to take orally	Unable to take orally
Not allergic to penicillin	Single-regime of 2 grams of oral cephalexin, cephadrine or amoxicillin 1 hour prior to dental procedure	Cefazolin 1 gram or ampicillin 2 grams given IM/IV 1 hour prior to dental procedure
Allergic to penicillin	A single dose of 600 mg of oral clindamycin 1 hour prior to dental procedure	Clindamycin 600 mg IM/IV 1 hour prior to dental procedure

IM = Intramuscular

IV= Intravenous

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Manifestation of Systemic Diseases in the Periodontium – A Report of Two Cases.

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ABSTRACT A variety of systemic diseases could manifest in the periodontium. This article reports two examples of systemic cases, pemphigus and acute myeloid leukemia that manifested in the gingiva. These cases presented to general dental practitioner prior to referral to specialist clinic. This article shows that the general dental practitioner could play an important role in the early diagnosis of these conditions as they might first present in the oral cavity.

KEYWORDS: systemic, disease, periodontology

INTRODUCTION

A variety of systematic diseases could manifest in the periodontium. These include mucocutaneous disorders such as lichen planus,¹ pemphigoid,² pemphigus vulgaris,³ erythema multiforme⁴ and lupus erythematosus;⁵ gastro-intestinal disease such as Crohn's disease,⁶ ulcerative colitis and hematological disorders such as leukemia.⁷ A recent classification of periodontal diseases and conditions had included systematic manifestation in the gingiva.⁸

CASE REPORT 1

A 35-years old Chinese lady presented to the general dental surgeon with a complaint of painful gums in the region of #43 and #42. The gum bled on brushing and got torn off since one month before. She was eventually referred to the specialist periodontal clinic for further consultation. Her medical history was unremarkable and she was a non-smoker. Intra oral examination revealed the labial gingiva of #43 and #42 erythematous with erosion of the gingiva (Fig. 1). No pocketing was found. Both teeth were vital. Basic periodontal examination score was 2. Provisional diagnosis was desquamative gingivitis. An incisional biopsy was taken for histo-patological examination.

Histo-pathological examination revealed a surface covering of stratified squamous epithelium exhibiting intra epithelial clefting with intact basal cells. There was a dense infiltration by lymphocytes and plasma cells in the underlying fibrous connective tissue. Interpretation by the oral pathologist: consistent with vesiculo bulous lesion, a differential diagnosis of Pemphigus should be considered. She was placed on topical steroid since October 2004 and

reported improvement in reduction of the erythematous area on subsequent follow-up. She is currently comfortable and able to eat without problem. She is still being reviewed three to four monthly with supportive periodontal therapy. Her skin and eye condition is constantly monitored during every review.

CASE REPORT 2

AZ, an 18 years old boy, a special needs patient with difficulty communicating was referred to the periodontal clinic for bleeding gums and loose teeth by the dental officer. His father had noticed blood patches on his pillow 2-3 days before. AZ had a history of blood clot in the brain 1998 and was admitted for three weeks at Hospital Sultanah Aminah, Johor Bahru.

Patient appeared thin, pale and was unable to communicate well. Extra oral examination revealed enlarged, mobile, firm submandibular, submental and upper cervical lymph nodes bilaterally. Intraoral examination revealed very inflamed hyperplastic gingiva with abnormal architecture and areas of spontaneous bleeding (Fig.2). The gingiva bled easily upon probing. Blood dyscrasia was suspected and a full blood count and differential count was ordered. The investigation revealed a high white blood count of $29.0 \times 10^3/\text{mL}$, low haemoglobin of 8.97g/dL and a low platelet count of $28.3 \times 10^3/\text{mL}$. The differential count showed abnormalities with low neutrophil (0.56%), high lymphocyte (61.3%) and a high monocyte (36.1%) count. Due to the abnormal blood picture, the patient was immediately referred for consultation with the medical out patient clinic. Final diagnosis was acute myeloid leukemia and AZ is currently undergoing chemotherapy.



Fig.1 Pemphigus presenting with erosion of the gingival labial to # 42 and #43.



Fig. 2 Acute myeloid leukemia presenting with erythematous, hyperplastic gingiva with abnormal architecture and areas of spontaneous bleeding.

DISCUSSION

The most common presentation of muco-cutaneous diseases in the periodontium is desquamative gingivitis characterised by a diffuse erythema of the marginal and attached gingiva associated with areas of vesiculation, erosion and desquamation.⁹ Desquamative gingivitis is not a disease but represents a reaction pattern of the gingiva to various stimuli.⁹ Cicatricial pemphigoid, mucous membrane pemphigoid, pemphigus vulgaris, erosive lichen planus may manifest as desquamative gingivitis.^{9,10,11,12} The first case report was diagnosed as pemphigus manifesting in the gingival as desquamative gingivitis. A biopsy procedure was needed to determine the diagnosis. Further confirmation of the diagnosis could be done using direct immunofluorescence microscopy which was not available locally. The desquamative gingivitis was managed locally, using topical steroid. More severe cases might require the use of systemic steroids or immunosuppressive drugs. In 75% to 80% of cases, PV lesions first appear in the oral cavity. Dentists are therefore in a unique position to recognize the oral manifestations of the disease, allowing early diagnosis and initiation of treatment.¹³ Combined local treatment of the disease with supportive periodontal therapy is important for long term maintenance of oral health.¹⁰ In the second case, the possible diagnosis of acute myeloid leukemia was made in the dental clinic. The unusual presentation of the gingival with abnormal architecture and spontaneous bleeding and enlarged lymph nodes pointed to the possibility of blood dyscrasia manifesting in the gingiva. A blood count was all that was needed to confirm the suspicion. There are also reported cases of gingiva involvement in hematological diseases including chronic myelomonocytic leukemia, granulocytic sarcoma, myelodysplastic syndrome and acute myeloblastic leukemia.^{14,15,16,17} Manifestation include sudden onset of bleeding and ulceration, petechiae and gingival hyperplasia.^{16,18}

Oral health professional must recognize that gingival enlargement may represent an initial manifestation of an underlying systemic disease. Acute myelogenous leukemia is a hematological disorder with a predilection for gingival involvement.¹⁶ Mucosal pallor was the most common presenting oral symptoms in acute leukemias (39.6%).¹⁹ Erythema, ulceration and swelling of the lip, tongue, palate and gingiva were also frequent symptoms.

The oral health professional must be able to differentiate between the commonly encountered chronic gingivitis and unusual presentation in the gingiva. Unusual presentation in the gingiva should be investigated further with histo-pathological examination or hematological test. All oral health professional should be knowledgeable in the manifestation of systemic disease in the periodontium to ensure appropriate investigation and early diagnosis of the underlying disease. Local management of the manifestation in the gingiva should be combined with supportive periodontal therapy to ensure the optimal oral health.

CONCLUSION

Gingival manifestation of systemic disease may not be common, nevertheless, the GP should have an adequate knowledge to be able to detect suspicious lesions and refer the patient quickly for further management. The role of the general dental practitioner as oral physician is going to be more important in the years to come.

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