Malaysian Dental Journal (2007) 28(1) 1-2

MALAYSIAN DENTAL JOURNAL

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MALAYSIAN DENTAL JOURNAL

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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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CONTENT

MDJ Cover page : Clinical picture showing a person with tooth wear, before and after treatment. Picture courtesy of Nor Azlin Yahya, Zamri Radzi and Zamros Yuzadi (of article: Diagnostic overlay removable partial denture in the management of tooth wear: A clinical report)

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MALAYSIAN DENTAL JOURNAL

EDITORIAL : CHANGES OVER TIME FOR JOURNALS - ARE WE READY FOR e-MDJ?

For more than three centuries, printed journals are the primary medium of research communication and a means for Continuing Professional Development/Education (CPD/CPE). It has remained unchanged in form and function since the first scholarly journal, the Journal des Scavans was published in 1665.[1] Despite its benefits to the academic and research community, printed journals have been subjected to criticism from many angles such as the peer review process, delays in publication, escalating costs, lack of selectivity, stoppage of subscriptions by libraries and commercial publishers holding copyrights.[2] And needless to say, the MDJ is currently facing some of these problems.

Nowadays, the scholarly scientific, technical, and medical/ dental journal systems are undergoing tremendous change. With steady increases in the price of print subscriptions, the number of subscriptions has declined correspondingly.[3] A clear cut alternative currently available is the publication of electronic journals (e-journals). As has been highlighted by Dr. Lee Soon Boon, the Honorary Financial Secretary of the Malaysian Dental Association in his march 2007 message to the members, the inflating cost of printing and postage to around RM 125,000 in FY 2006 against RM 92,188.00 in FY 2005 should be a point for all of us to ponder. He thinks that electronic publishing should be the way forward as embraced by many leading Associations, citing the Commonwealth Dental Association as being the latest one to do so. From a financial point of view, electronic or digital publication can be produced and circulated relatively inexpensively, and can reach a readership far wider than small-scale print publication. Moreover, it is not subjected to the risk of late or undelivery that often plagued the conventional mailing system.

The electronic journal is a version of the traditional print or paper-based journal which is disseminated electronically in some form or other directly to the end-user.[1] Although e-journals have been in existence since 1976, full fledged e-journals only came into the limelight in the 1990s.[4] Nasir defined e-journal as a regularly issued publication that is available in electronic form, with or without its print equivalent and is accessed online.[5] Any journal produced, published, distributed and received via an electronic medium is also considered an e-journal.[6] In comparison to print journals, e-journals have the following advantages:[1]

a) easily accessible;
b) easy to publish,
c) no physical barriers,
d) time saving,
e) low cost (sometimes free),
f) and authors and readers get closer easily

With the emergence of the Internet, publishing has become very easy, quick and cheap in a medium that can be accessed easily by everyone from anywhere. With the steady growth of e-journals on the Internet, it was found that creativity and productivity has improved due to network technologies.[7] Scholars have understood the power of electronic journals and seem to have accepted the new medium for communicating research ideas and results among fellow professionals.[1]

There are lots of dental professional journals that are now available online, such as the Brazilian Dental Journal, the British Dental Journal, the European Journal of Dental Education, the New York State Dental Journal, the International Journal of Pediatric etc. Some of the online journals can be browse freely e.g. the Australian Dental Journal, the Journal of The Canadian Dental Association,

and the Journal of Oral Sciences, but some of them need to be subscribed.

So, are we ready for e-journal, in particular if the Malaysian Dental Journal (MDJ) is only available electronic form? In the finding of a survey that is going to be published in this issue of the MDJ, the answer is a sad, "not yet". With that, I leave all the readers of the MDJ to ponder upon our next course of direction. Thank you.

Associate Professor Dr. Ngeow Wei Cheong,
Editor,
Malaysian Dental Journal.

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MALAYSIAN DENTAL JOURNAL

Survey on Readership of Professional Journals among Malaysian Dentists Part I: Readership of Professional Dental Journals

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ABSTRACT

The objective of this survey was to understand the current trend of readership of professional dental journals among Malaysian dentists. A total of 225 questionnaires were sent out to Malaysian dentists who attended various dental related conferences throughout Peninsular Malaysia from February 2006 to July 2006. Questionnaires comprised of questions relating to dentists' socio-demographic status and a list of journal(s) read by them. Malaysian dentists' view on the content and quality of a particular dental journal, i.e. the Malaysian Dental Journal (MDJ) was also enquired. The details of this finding are highlighted in Part II of this study. A total of 156 questionnaires were returned; the respondents were made up of 61 male and 91 female dentists. Almost 80% of the respondents aged between 20-49 year-old and most respondents (n= 132; 84.62%) only had a basic Bachelor of Dental Surgery or equivalent degree while another 19 (12.18%) had in addition, a post-graduate degree. Almost equal numbers of respondents were working in the Ministry of Health (MOH) or Armed Force (n=73; 46.8%) and private practice (n=74; 47.4%). Also, equal number of respondents (n=67; 42.95%) were found to be working as single-handed practitioner and in a partnership/assistant/working-with-other specialties type of practice Almost two-thirds (n=103; 66%) of the respondents read more than one professional journal, and a majority of them worked in the private sector. The percentage of readers reading more than one journal from the private practice (n=67, 60.0%) was close to twice of that from the MOH (n=36, 35.0%). No specific age-group pattern was present but the least number of subscribers were from those 60 year-old and above (n=3), whereby none of them subscribed to any professional dental journal/magazine. The highest percentage of subscribers were from those in the age group of 40-49 year-old, whereby 86.49% (n=32) of dentists in this age-group subscribed to at least one professional dental journal/magazine. Out of the list of journals/magazines provided, it was found that the MDJ has the most number of readers. The MDJ was most read by dentists in the private practice while the Annals of Dentistry of the University of Malaya was most read by dentists in the MOH. In conclusion, it was found that almost two-third of the respondents read more than one professional journal, with the MDJ receiving the most number of readers. More dentists in the private practice read professional dental journals than dentists in the MOH.

Key words:

dental journal, readership, survey, continuing professional development

INTRODUCTION

The pursuit of ongoing professional education or updating is referred to as continuing professional development (CPD) or continuous professional education (CPE).1 In the United Kingdom, CPD is defined as a process of "lifelong learning" for all individuals and teams which meets the needs of patients and delivers the health outcomes and healthcare priorities of the United Kingdom National Health Services (NHS).[1] CPD is becoming increasingly recognised by professional institutions as essential in ensuring that their members remain up to date and maintain their professional competence.[2,3]

Madden and Mitchell[4] had identified two models of CPD, namely the sanctions model and the benefits model. The former represents some mandatory requirement which must be met if the individual is to be able to demonstrate consistent professional competence. The latter model is founded on actions where the individual can take a conscious decision whether or not to pursue some particular form of CPD. The sanction model is usually found in the older, well-established professional institutions.[5,6] This model may be adopted by the Ministry of Health of Malaysia (MOH) which is currently in the midst of making CPD compulsory before dental practitioners renew their Annual Practising Certificate.[7]

The benefits model, which is usually found in new or developing professional institutions, emphasises the benefits of CPD to the individual, and CPD is therefore encouraged as a voluntary activity. The Malaysian Dental Association (MDA) has over the years informally adopted this model whereby it organizes CPD for members throughout their career. Attendance is on voluntary basis. Another means of achieving the benefit model is through journal readership. The MDA has been contributing to this by regularly publishing the Malaysian Dental Journal (*MDJ*) and the MDA Newsletter.

Around the world, dental registration bodies are beginning to demand that dentists keep up-to-date and be able to show proof of doing so. It is quite clear that in the future, dentists will not be able to coast along once they have their basic qualification but will be expected to stay abreast of current knowledge.[8]

Leggate and Russel[9] in a survey reported that most of their respondents indicated an interest in using several different learning methods. As might be expected, a preference for 'hands-on' was strongly expressed for clinical procedures, although even for practical topics many respondents favoured using a wide variety of learning methods. They also reported that lectures were still favoured as one of several useful formats, with small group tutorials, books and journals also popular with the majority. Videos were also valued by over half of their respondent as a useful tool for many different learning scenarios.[9]

In the United Kingdom, there are several types of CPD activity that the dentists usually participated in, such as journal reading, course attendance, participation in local and/or international professional associations and societies, formal discussion of professional matters with colleagues, purchase of books, watching professional videos, accessing to the internet for information or online journals, attending conferences with self assessment, joining journal clubs and/or study groups, and organising peer review or clinical audit, either via formal collaboration or individually.[1]

Razali *et al*.[7] stated that the Malaysian dentist showed highest preference to CPD activity that entailed learning from experience and from peers as compared to reading professional journals. They claimed that about 42 percent of their respondents did not subscribe to any professional journal while the rest subscribed to at least one professional journal. In terms of total number of journals read/ commented/written in the past year, about 20 percent of their respondents did not engage in any of these activities. They also stated that, on the average, the respondents read/ commented/wrote about only 3 journals per year.[7]

Hence it is the aims of this study to understand the current trend of readership of professional dental journal(s) and magazine(s) among Malaysian dentists.

MATERIALS AND METHODS

A total of 225 pre-tested questionnaires were sent out to Malaysian dentists who attended dental related conferences/continuing professional development (CPD) throughout the Peninsular Malaysia (Kuala Lumpur, Kuantan, Johor, Melaka, Seremban and Alor Star) between February 2006 and July 2006. This form had been pre-tested among dentists attending CPD in Penang and modified according to their feedback before actual use.

The questionnaires comprised of questions relating to dentists' socio-demographic status and a list of journal(s) read by them. In details, the variables collected were as follows:

i) gender
ii) age
iii) marital status
iv) ethnic
v) professional qualifications
vi) number of years of practice
vii) types of practice (*single-handed or partnership)
viii) place of practice (**MOH/Armed forces or private practice)
ix) Subscription to professional dental journals/ magazines.
x) various types of professional journals/ magazines read

* The participants were categorized as either working in a single-handed practice or in partnership (with colleague[s]), irrespective of their place of work; be it in the MOH or private practice. Hence, a dental officer working alone in the MOH but has no contact with any colleague was deemed to work in a single-handed practice.

** The word MOH will be used in the text to denote respondents who worked in either the Ministry of Health of Malaysia or the Royal Armed Force of Malaysia.

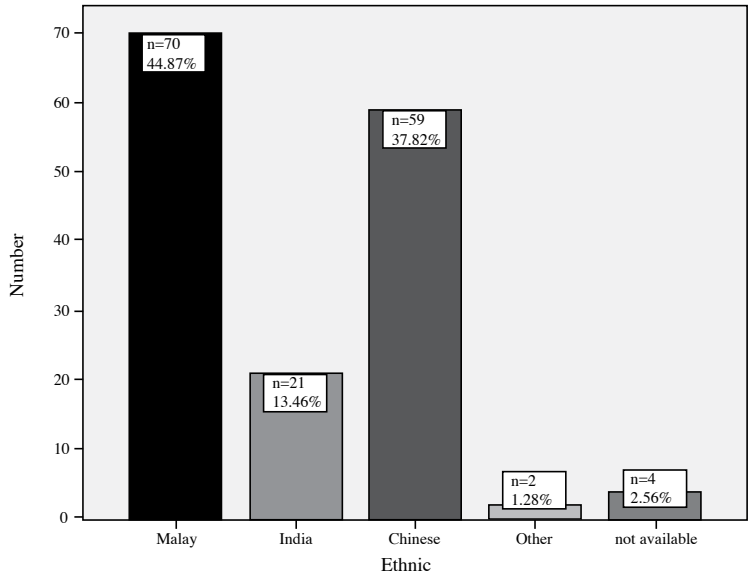
The data received were then compiled, entered and analyzed using SPSS version 12.0. Descriptive statistic was employed when necessary.

RESULTS

Socio-demographic background of respondents

Out of the 156 survey forms that were returned, 39.1% (n=61) were from male respondents, 58.33% (n=91) from female respondents and 2.56% (n=4) from respondents who did not state their gender. Their ethnic distributions are shown in Figure 1.

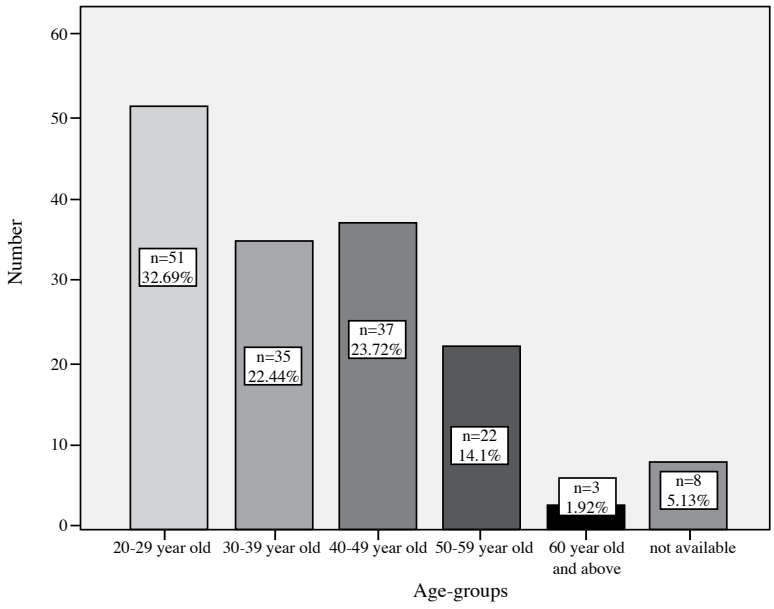
Figure 1 : Ethnic distributions of the respondents



Age-groups

Almost 80% of the respondents aged between 20-49 year-old, with the following breakdown: 32.69% (n=51) were 20-29 year-old; 22.44% (n=35) were 30-39 year-old; and 23.72% (n=37) 40-49 year-old (Figure 2).

Figure 2 : Age groups of respondents



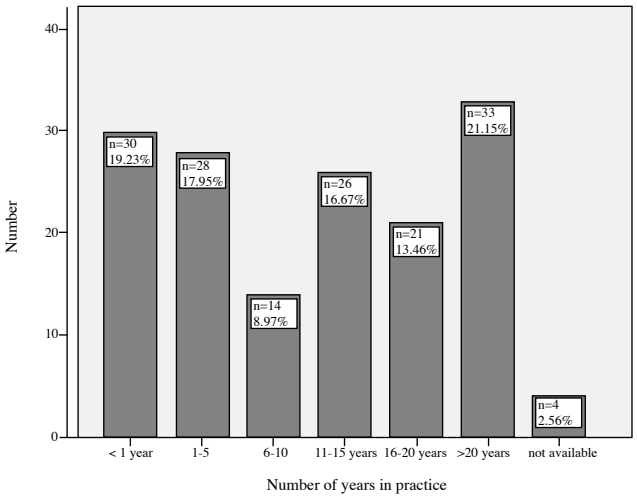
Professional qualifications

Most respondents (n= 132; 84.62%) only had a basic Bachelor of Dental Surgery or equivalent degree while another 19 (12.18%) had in addition, a post-graduate degree. One respondent (0.64%) was still undergoing his/her postgraduate study, while the professional qualification(s) of 4 respondents were not available.

Working experience and location & type of practice

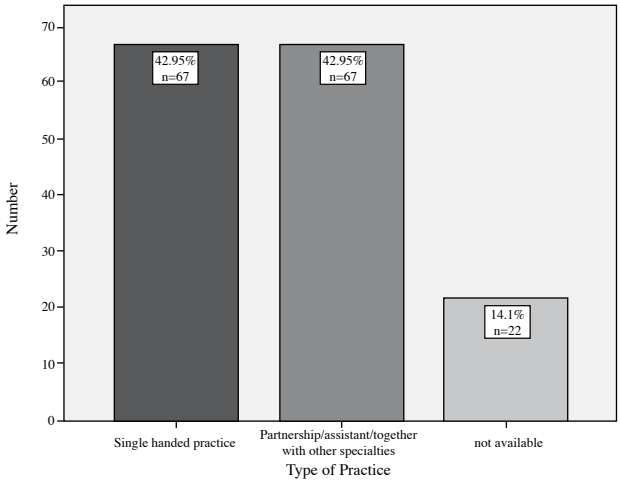
In terms of working experience, the results are as follows: 19.23% (n=30) were respondents with less than 1 year of working experience, 17.95% (n=28) had between 1 to 5 years of working experience, and 8.97% (n=14) had been in practice for between 6 to 10 years. Another 26 (16.67%) had been in practice for between 11 to 15 years, 21 (13.45%) had been in practice for between 16 to 20 years, and 33 (21.15%) had been working for more than 20 years (Figure 3).

Figure 3: Working experience of respondents



Almost equal numbers of respondents were working in the Ministry of Health or Armed Force [denoted as MOH] (n=73; 46.8%) and private practice (n=74; 47.4%). Only three respondents (1.94%) work as part-time private practitioners while the working information for the remaining 6 respondents (3.8%) was unavailable. The breakdown of gender and ethnicity of respondents in relation to work place are as follows: in the MOH, 55 respondents were Malays (7 males, 48 females), 7 were Indians (3 males, 4 females), and 11 were Chinese (4 males, 7 females). The gender and ethnicity breakdown of 74 respondents from full time private practice are as follows: 14 respondents were Malay (4 males, 10 females), 13 were Indians (7 males, 6 females), 45 were Chinese (32 males, 13 females) and for the two "other" respondents, both were male. Equal number of respondents (n=67; 42.95%) were found to be working as single-handed practitioner and in partnership/assistant/working-with-other-specialties type of practice (Figure 4).

Figure 4 : Type of practice



In the MOH, only 23.9% (n=16) were single-handed practitioners while more than two-thirds (n=47; 70.1%) were in partnership/assistant/working-together-with-other-specialties type of practice.

In comparison, almost three quarters (n=50; 74.6%) full time private dental practitioners were single-handed practitioner, while another 28.4% (n=19) were in partnership/assistant/working-with-other-specialties type of practice. Where as in part time private dental practice, equal number of respondents work as single-handed practitioner and in partnership/assistant/working-with-other-specialties type of practice (n=1;1.5% each) (Table 1).

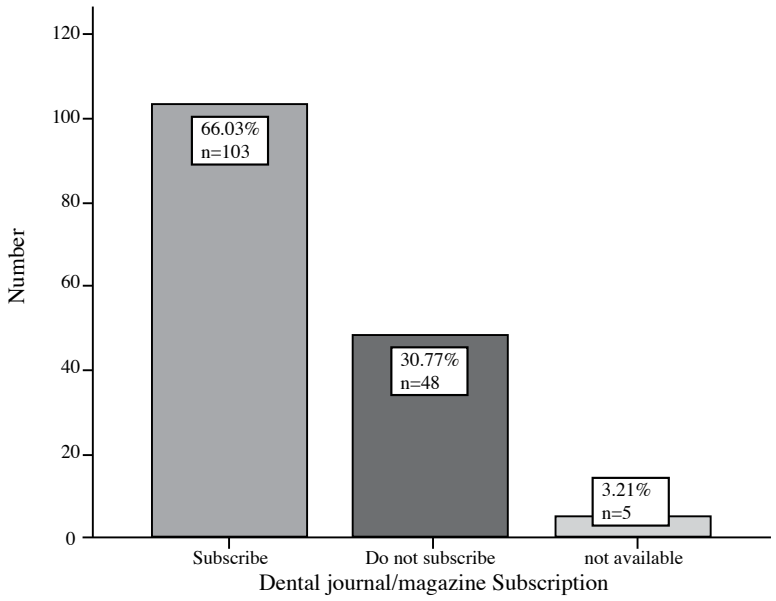
Table 1 : Breakdown of practitioners working in single-handed practice or partnership/assistant/together –with-other-specialties in relation to place of practice

Place of practice / Type of practice	MOH		Private practice (full time)		Private practice (part time)		not available	
	No.	%	No.	%	No.	%	No.	%
Single-handed practice	16	23.9%	50	74.6%	1	1.5%		
Partnership/assistant/ together with other specialties	47	70.1%	19	28.4%	1	1.5%		
Not available	10	45.5%	5	22.7%	1	4.5%	6	27.3%

Subscription to professional dental journals/dental magazines

When asked about current subscription(s) to any professional dental journal(s)/magazines(s), almost two-thirds (n=103; 66.03%) claimed doing so, while another 30.77% (n=48) did not (Figure 5). Those who subscribed were mainly from full time private practice (n=61; 59.22%), while readers from the MOH make up another 38.83% (n=40) of subscribers. No specific age-group pattern was present but the least number of subscribers were from those 60 year-old and above (n=3), whereby none of them subscribed to any professional dental journal/magazine. The highest percentage of subscribers were from those in the age group of 40-49 year-old, whereby 86.49% (n=32) of dentists in this age-group subscribed to at least one professional dental journal/magazine.

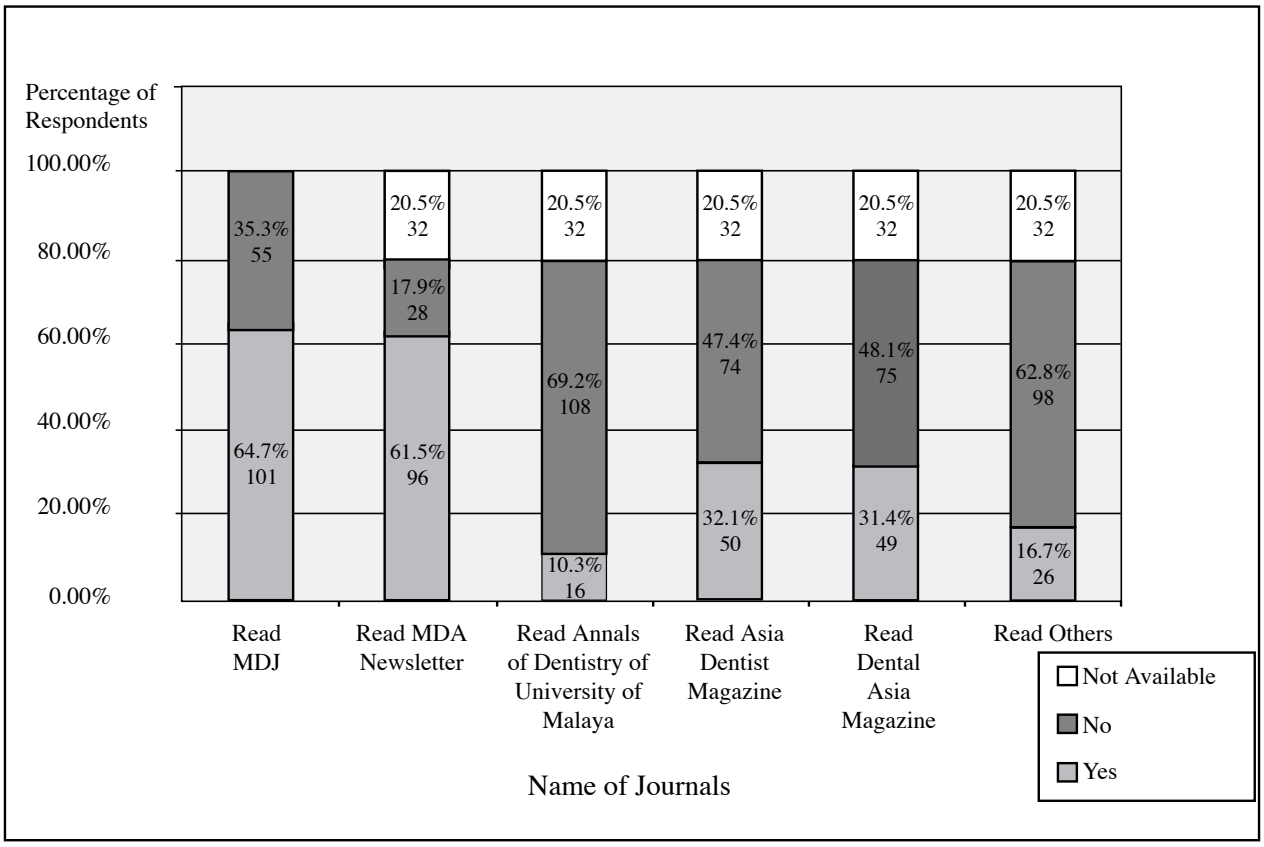
Figure 5 : Subscription to professional dental journal(s)/magazines



Readership of professional dental journals/dental magazines

A list of journals and magazines were given and it was found that 64.74% (n=101) respondents read the Malaysian Dental Journal (MDJ), 61.5% (n=96) read the MDA Newsletter, 10.3% (n=16) read the Annals of Dentistry of the University Malaya, 32.1% (n=50) read Asian Dentist Magazine, 31.4% (n=49) read Dental Asia Magazine while 16.7% (n=26) read other journals like the British Dental Journal (BDJ)(Figure 6).

Figure 6: Readership of various professional dental journals/magazines



Of all (n=101; 64.74%) of the respondents who claimed that they read the MDJ, 30 (29.70%) were from the MOH, two-third (n=64; 63.37%) were full time private practitioner and 3 (2.97%) was in part time private practice. The profile of another 4 respondents was unavailable.

Of the 96 respondent who claimed that they read the MDA News, 30 (31.3%) were from the MOH, 63 (65.6%) were from full time private practice, while 3 (3.1%) were from part time private practice.

For the Annals of Dentistry of University of Malaya, only 10.3% (n=16) respondents gave positive response. More than two-third (n=11; 68.8%) readers were from the MOH, another quarter (25.0%) were from full time private practice and only 1 person (6.3%) was from part time private practice.

Almost one third of the respondents read Asia Dentist Magazine (n=50, 32.1%), of which, 30% (n=15) of them were from the MOH, 68% (n=34) were from full time private practice and 2% (n=1) were from part time private practice.

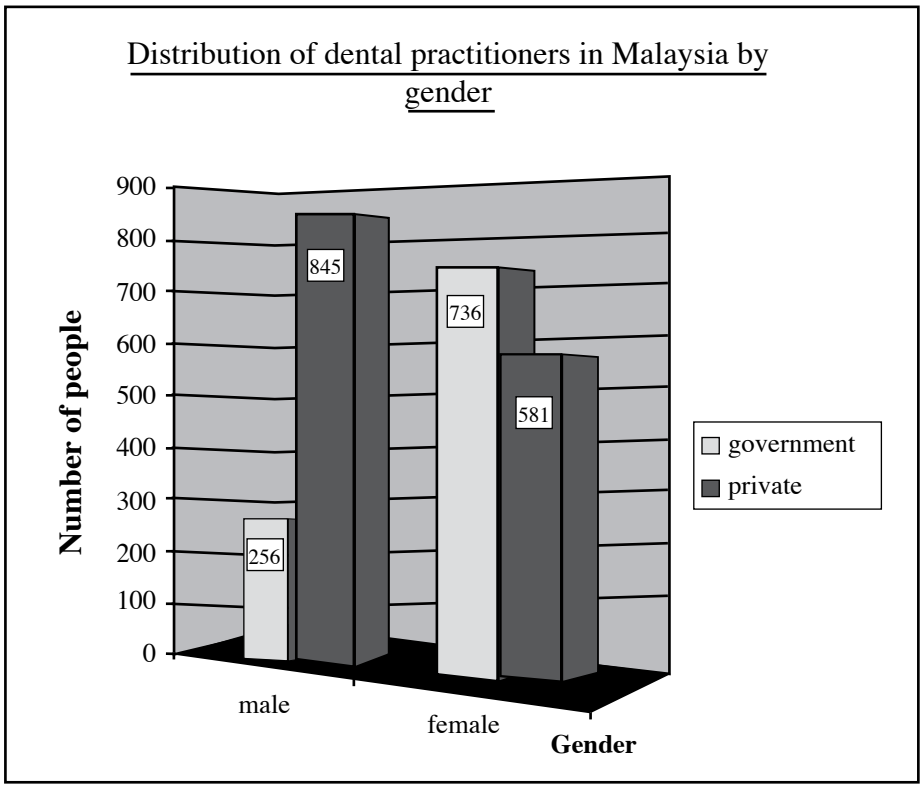
Dental Asia Magazine received 31.4% (n=49) positive responses. Out of 49 respondents, 40.8% (n=20) were from the MOH while 55.1% (n=27) were from full time private practice and 4.1% (n=2) were from part time private practice.

It was found that 66.0% (n=103) of the respondents read more than one journal. The percentage of readers reading more than one journal from the private practice, (n=67, 60.0%) was close to twice of that from the MOH (n=36, 35.0%). There were 3 respondents who stated that they read all the professional journals/magazines listed and they were from the younger age group of 20-29 year-old. They consisted of 1 Malay male, 1 Malay female and 1 Chinese female dentists. They all had only 1 basic degree and were working in the MOH.

DISCUSSION

As at the end of 2003, a total of 2418 dental practitioners were serving in both the government sector and private practice, giving dentists to population ratio as 1:10,612.10 Of that total, 992 (41%) were government dentists. The majority of government dentists were female (n=736; 74%), with only 256 male dentists (26%). Almost 60% of the dentists in Malaysia were private practitioners (n=1,426). As shown in Figure 7, male dentists accounted for 845 (59%) of the private practitioners while the remaining 581 were female. As can be noted, the demographic distribution of respondents in this survey is not directly in proportion to the distribution of dental practitioners in Malaysia.

Figure 7: Distribution of dental practitioners in Malaysia by gender



Source: MDC (as at 31/12/2003)

Alreck and Settle[11] stated that it was seldom necessary to sample more than 10 percent of the population for a study. They disputed the logic that sample size was necessarily dependant upon population size. However, choice of sample size is often as much a budgetary consideration as a statistical one. Hence it is necessary to think of all resources needed namely time, space, energy and money. Razali *et al.*[7] stated that generally choice of sample size is as much a function of budgetary considerations as it is statistical considerations. When they can be afforded, large samples are usually preferred over smaller ones. Based on these reasons, we sent out about 225 questionnaires but only 156 dentists responded.

We would like to highlight that for this survey, the samples were not selected randomly from the dentists listed on the Malaysian Dental Council due to difficulty in accessing them as well as basing on past experiences of the MDA, whereby survey questionnaires sent out were mainly unanswered. Instead, we resorted to making direct approach by asking participants at various continuing professional development (CPD) sessions organized by the MDA to volunteer for this survey. Hence, it must be emphasized that there is a certain degree of business in these samples in that the respondents may be more motivated to participate in CPD as compared to those who never or attended very few CPD sessions. Nevertheless, we would like to treat this study as a pilot project and would definitely like to extend it to cover randomized samples when the problem of time and financial constrain are addressed to.

The findings of this survey are indeed very encouraging. A list of journals and magazines were given and it was found that 64.74% (n=101) of respondents read the *MDJ*, 61.5% (n=96) read the MDA Newsletter, 10.3% (n=16) read the Annals of Dentistry of the University Malaya, 32.1% (n=50) read Asian Dentist Magazine, 31.4% (n=49) read Dental Asia Magazine while 16.7% (n=26) read other journals like the British Dental Journal (*BDJ*). This makes the *MDJ* the most read dental journals among the respondents, and if extrapolated, may indicate the same for the whole country.

In fact, almost two-third (n=103; 66%) of the respondents claimed they read more than one professional dental journal/magazine. Only a slightly lower number (n=101; 64.74%) of respondents were *MDJ* readers. Free dental magazines like the Asian Dentist and Dental Asia seemed to be able to attract more readers, perhaps because of the nature of their easiness to gain access to, as compared to other journals that needed subscription like the Annals of Dentistry of the University of Malaya and other foreign dental journals, which of course could be costly. This is in contrast to the finding of a survey by Razali *et al*.[7] whereby about 42 percent of their respondents did not subscribe to any professional journal. However, direct comparison cannot be made on this matter as Razali *et al*.[7] specifically looked into subscription of dental journals whereas in this survey, we concentrated more into readership, with subscription being just 1 of the questions asked. And one has to bear in mind that readership does not equal subscription as a dentist may still be able to read any professional dental journals without subscribing to it. Even so, the percentage of dentists claiming to subscribe to at least 1 dental journal is higher in this survey as compared to that observed by Razali *et al*.[7]

Of the respondents who claimed to read more than one professional journal, a majority of them worked in the private sector. The percentage of readers reading more than one journal from the private practice (n=67, 60.0%) was close to twice of that from the MOH (n=36, 35.0%). This may re-emphasize the usefulness of having a professional dental journal as a source of CPD, especially for private practitioners, in our local context. Leggate and Russel[9] reported that journal is a popular means of CPD. It has been accepted as one of the official means of CPD in the United Kingdom.[1] Unlike their colleagues in the government services where ward rounds, in-house seminars and workshops and internal courses are more easily available, our general dental practitioners have to rely on professional dental journals and CPD talks for their continuing professional development.

The finding that the highest percentage of subscribers were from those in the age group of 40-49 year-old, whereby 86.49% (n=32) of dentists in this age-group subscribed to at least one professional dental journal/magazine is also a positive finding. This again indicates the need for CPD, as this group of dental practitioners would have left dental schools 15-20 years ago and certainly would need to keep themselves abreast with development in dental technology, skill and current concept of management and treatment. As the dental practitioners reaches near the age of retirement, their need for CPD reduces. This is suggested by the finding that respondents 60 year-old and above, did not subscribe to any professional dental journal/magazine.

Lastly, it has to be noted that the list of journals/ magazines provided in this survey may not reflects the complete list of professional dental journals/magazines available in Malaysia. Moreover, even though these dental journals and magazines are listed together as "professional dental journals/magazines", they are not of equal standard. Two of them were professional journals that were peer-reviewed (the MDJ and the Annals of Dentistry of the University of Malaya) where as two others were non-refereed dental magazines and one was a newsletter. They were group together as "professional dental journals/ magazines" out of convenience that all of them provide the same objective, i.e. to provide CPD updates for the dental practitioners and their content solely concentrated on dentistry.

Nevertheless, it is interesting to note that the *MDJ* was most read by dentists in the private practice while the Annals of Dentistry of the University of Malaya was most read by dentists in the MOH. This may be due to the easiness to access to these journals in the two different working environments.

CONCLUSION

In conclusion, it was found that almost two-third of the respondents read more than one professional journal, with the *MDJ* having the most number of readers. More dentists in the private practice read professional dental journals than dentists in the MOH. The *MDJ* was most read by dentists in the private practice while the Annals of Dentistry of the University of Malaya was most read by dentists in the MOH.

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MALAYSIAN DENTAL JOURNAL

Survey on Readership of Professional Journals among Malaysian Dentists Part II. Readership of the Malaysian Dental Journal

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ABSTRACT

The objective of this part of the study was to understand the current trend on readership of the Malaysian Dental Journal (MDJ) among Malaysian dentists. Their views on the contents and quality of the Malaysian Dental Journal were enquired. We also enquired the reasons they chose-to/chose-not-to read the MDJ. Of the 225 dentists surveyed, the number of MDJ readers was 101; with only 24.75% reading all issues published. The editorial section was rated as "useful" by 70.3% of readers, while 79.2%, 87.1%, 87.1% and 80.2% of readers rated the research article section, the review article section, the case reports section and book recommendation section similarly respectively. Feedback from readers indicated that they wanted more case reports, more review articles on "how to do it" and on medical problems in dentistry. More than half (55.45%) of the MDJ readers preferred to receive the journal in both hard and soft copies. For the non-readers, the most common reasons cited for not reading the MDJ was not being able to access to the journal, followed by not having time to read. Our finding suggested that the respondents preferred to learn from colleagues' experience and to read article that can improve their clinical knowledge and skill.

Key words:
continuing professional education, journal, readership, Asia

INTRODUCTION

The Malaysian Dental Journal (*MDJ*) is a publication of the Malaysian Dental Association (MDA) and is published twice yearly. It provides a means for continuing professional development/education (CPD/CPE) due to the nature of its content. Other means of CPD available in this country include seminars, workshops, conferences, journal club discussions and ward rounds.

This report details the finding of a readership survey of the *MDJ*, undertaken between February and July 2006. The reason this survey was undertaken was to bridge the gap between the publisher (MDA) and the readers, so that the readers may voice their opinions on the quality and what they expect from the journal. Unless a journal arouses criticism, it hardly achieves the objects for which it is published.[1] With statements like this more and more journal are doing readership surveys to get more positive feedback and criticism from their readers.

In the United Kingdom, the British Dental Journal (*BDJ*) is the most popular journal when compared to its counterparts. Even so, the *BDJ* has been undertaking readership survey continuously since 1992 to get feedbacks from its readers in order to improve itself and for making sure the readers' needs are met.[2-6]

In Malaysia, even though the *MDJ* has been published for more than three decades, no readership survey has been undertaken. The authors are of the opinion that such an exercise is inevitable as dental technology and needs of dentists have changed tremendously since its inaugural issue as the former Dental Journal of Malaysia in 1974. Hence, this exercise of getting feedback from readers was done to obtain their views on the content and quality of the *MDJ* and what they want in future issues.

In essence, the objectives of this study were:

- To seek Malaysian dentists' views on the Malaysian Dental Journal (*MDJ*).
- To find out reasons why Malaysian dentists choose-to/choose-not-to read a particular professional journal (*MDJ*).
- To find out most favourable ways to attract new readers and reach existing readers.

MATERIALS AND METHODS

This is a continuation to the materials and methods described in Part I of these series. Similarly, a total of 225 pre-tested questionnaires were sent out to Malaysian dentists who attended dental related conferences/ continuing professional development (CPD) throughout the Peninsular Malaysia (Kuala Lumpur, Kuantan, Johor, Melaka, Seremban and Alor Setar) between February 2006 and July 2006. This questionnaire has been pre-tested among dentists attending CPD in Penang and modified according to their feedback before actual use.

The part relating to dentists' socio-demographic status and a list of journal(s) read by them has been dealt with in Part I of this study. In this second part, their readership, perceived quality, preference mode of delivery and the reasons why they choose-to/choose-not-to read the *MDJ* were obtained. In details, the variables collected were as follows:

A) Readers section
   i) Frequency reading the *MDJ*
   ii) Sections ratings
   iii) Frequency of sections read
   iv) Perceived quality of the *MDJ*
   v) Preference mode of delivery (soft/hard copy)
   vi) Suggestion for future issues of the *MDJ*

B) Non-readers Section
   i) Reasons not reading the *MDJ*
   ii) How to attract non-readers' to read the *MDJ*
   iii) Interest in purchasing the *MDJ*
   iv) Interest in browsing through the *MDJ* webpage.

The data received were then compiled, entered and analyzed using SPSS version 12.0. Descriptive statistic was employed where necessary.

RESULTS

I. Feedback on the readership of the *MDJ*

Almost two-third (n=101; 64.7%) of the 156 respondents were readers of the *MDJ*. A quarter of the readers (n=25; 24.75%) claimed to read all issues of the *MDJ* while almost half (n=49; 48.51%) read only selective article(s). Another 22.77% (n=23) said they only browsed through the *MDJ* while no information was obtainable from the remaining 4 respondents.

i) Ratings on various sections of the *MDJ*

Readers of the *MDJ* were asked to rate the usefulness of various sections of the *MDJ*, namely, the editorial, research article, review article, case reports and book recommendation. The editorial section was rated as between "somewhat useful" to "most useful" by 70.3% of readers, while 79.2%, 87.1%, 87.1% and 80.2% of readers rated the research article section, the review article section, the case reports section and book recommendation section similarly respectively. The breakdown on the ratings for all these sections is shown in Table 1.

Table 1. Ratings on various sections of the *MDJ*.

Section	Not useful	Some what useful	Useful	Most useful	Information Not available
	Number (n)				
Editorial	14	44	26	1	16
Research article	9	26	41	13	12
Review article	5	26	48	14	8
Case report	4	15	51	22	9
Book recommendation	5	45	34	2	15

The editorial section was rated as "useful" by more than two-third of respondents from both the Ministry of Health, Malaysia (MOH) (73.33%) and full-time private practices (71.88%). In contrast, more respondents who rated the research, review article and case report sections as "useful" were from the MOH than full-time private practices. [* "useful" denotes between "somewhat useful" to "most useful"]

A higher percentage of respondents from the MOH (20%) rated the editorial section as "not useful", so as compared to full-time private practitioners (10.94%). Lesser respondents rated research articles (8.9%), review articles (5%), case reports (4%) and book recommendations (5%) as "not useful". However, a higher percentage of full-time private practitioners (12.5%) gave this rating as compared respondents from the MOH (3.33 %) for the research

article section. As a matter of facts, the respondents who rated the case reports and book recommendation sections as "not useful" were all from full-time private practice. When analyzing negative feedbacks from the respondents, it was noted that they were not made consistently by the same person. However, 6 respondents gave two or more negative answers. Four of them were overseas graduates and were all in the 50-59 year-old age group while the other two local graduates are younger dentist, (one from 30-39 year-old, and one from 40-49 year-old groups). In terms of gender, 4 of the respondents were male while two other were female.

ii) Readership of various sections of the *MDJ*

Readers were asked to indicate which section(s) of the *MDJ* they read most. The result is shown in Table 2.

Table 2. Readership of various sections of the *MDJ*.

Section	Not useful	Somewhat useful	Useful	Most useful	Information Not available
	Number (n)				
Editorial	16	59	12	12	14
Research article	45	42	3	6	11
Review article	48	42	2	2	9
Case report	63	30	1	1	7
Book recommendation	18	60	7	7	16

All the sections surveyed were rather well read (includes "always read" and "sometimes read") by the respondents with the percentage of readership that varies between 74.2% for the editorials to 92.1% for the case reports. However, compared to others, the editorial section recorded the highest percentage of respondents (11.9%; n=12) who claimed that they never read this section.

A higher percentage of respondents from the MOH (93.33%) read research article section as compared to respondents from full time private practice (84.38%). In contrast, only a very slightly higher percentage of respondents from the MOH (93.33%) read the review articles section as compared to respondents from full time private practice (90.63%).

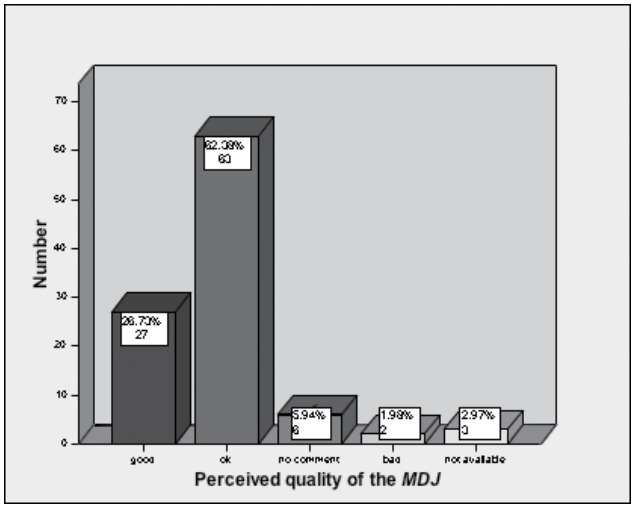
The case reports section seemed to be the most popular section with 92.1% respondents reading it. It also recorded the most respondents (n=63; 62.4%) who claimed that they "always read" this section. The percentage of readers who were full-time private practice (92.19%) was comparable to those working in the MOH (93.33%).

The distribution for readership for the book recommendation section is the same from that of the editorial section (Table 2). Similar to other sections, a higher percentage of positive respondents were from the MOH (86.67%) as compared to respondents from full-time private practice (76.56%).

iii) Perceived Quality of the *MDJ*

Respondents were also requested to give their opinion on their perceived quality of the *MDJ*. The majority (n=90; 89.11%) rated it between "ok" (n=63; 62.38%) and "good" (n=27; 26.73%). Only two respondents (2%) thought it was "bad" (Figure 1). Further analysis showed that, these 2 respondents rated negatively on most part of the questionnaires. They were both private practitioners, were overseas graduates and were in the 50-59 year-old age group.

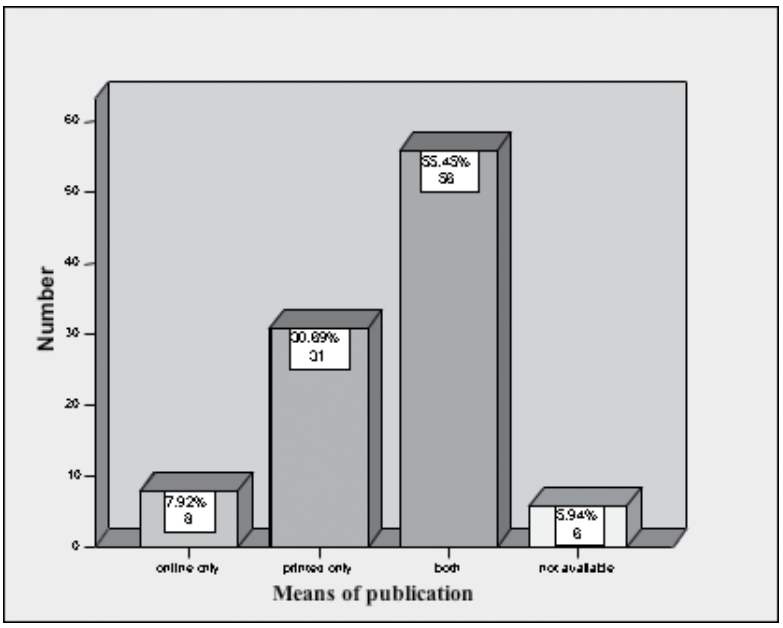
Figure 1 : Respondents' perceived quality of MDJ.



iv) Preference mode of delivery of the *MDJ*

This questionnaire survey made an attempt to look into respondents' preferred means of publication i.e. hard copy or e-journal. It is interesting to note that more than half of the respondents (n=56; 55.45%) preferred to receive the *MDJ* in both the hard and soft copies (Figure 2). Only 8 respondents were ready to go fully electronics, while the remaining 31 respondents (30.69%) preferred to receive printed copies only (Figure 2).

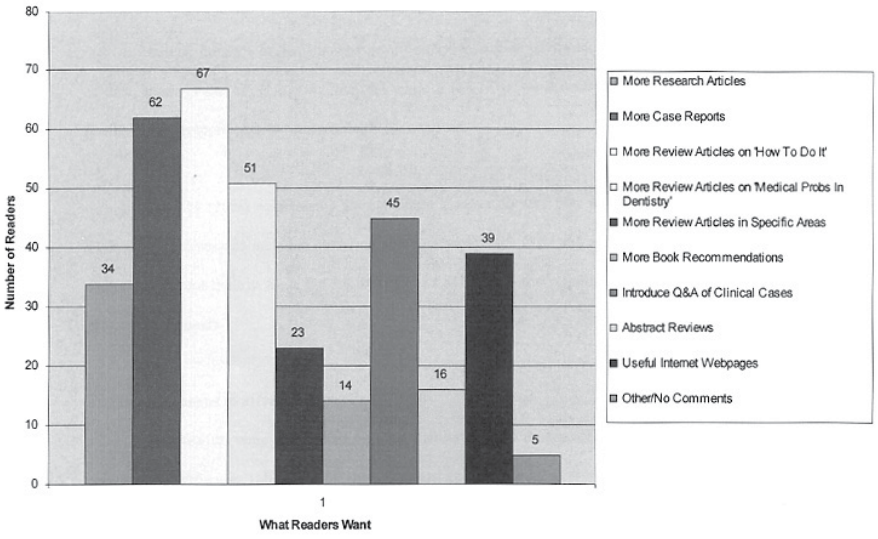
Figure 2 : Respondents' preferred means of publication.



v) Respondents' needs for future issues of the *MDJ*

Readers were finally asked on what would they want in future issues of the *MDJ* (Figure 3). Most of the respondents answered more than one option. Only 19 (18.81%) respondents chose a single option. Generally, this group of readers chose to have more case reports followed by asking for more review articles on 'how to do it'.

Figure 3 : What readers want from future issues of the *MDJ*.



Whilst 80 (79.21%) respondents suggested more than one option, 2 (1.98%) respondents did not answer the questions at all. The majority of these respondents preferred to have more review articles on 'how to do it' and more case reports, followed by more review articles on 'medical problems in dentistry'.

II. Feedback on non-readership of the *MDJ*

While the *MDJ* readers were asked specific questions reading to the contents and perceived quality of the *MDJ*, non-readers had to answer a different set of questions enquiring why they did not read the *MDJ*.

i) Reasons for non-readership

The most common reasons cited for not reading the *MDJ* was the inability to access to the journal (81.8%) as well as not having time to read it (36.4%). Another 1.8% dentists stated that it was "too scientific", while 5.5% stated that it was not relevant to their practice, or that they were not interested in it respectively.

Among the 80% of dentists who gave a single reason on why they did not read the *MDJ*, majority of them work in the MOH (n=34; 77.27%) while 8 (18.18%) were from full-time private practice. The profile of two respondents was not available for analysis.

Only 11 (20%) respondents gave multiple reasons on why they decided not to read the journal. Their combined reasons included not being able to access to the *MDJ* and not having time to read it. These respondents were mainly from the MOH (n=9; 81.81%) with the remaining 2 (18.18%) were full-time private practitioners.

ii) Potential means to attract non-readers

Non-readers were then asked on what can be done to arouse their interest to read the *MDJ* and results are as shown in Table 3. In essence, the most common requests were for the *MDJ* to provide useful internet web pages (49.1%), to publish review articles in "medical problems in dentistry" (45.5%) and to publish "Questions & Answers" section on clinical cases (38.2%). More respondents (n=34; 61.81%) gave more than one way to attract future readers as compared to single suggestions (n=21; 38.18%).

Table 3 : Articles that may attract new readers of the *MDJ*.

Attractions	Frequency	
	Number (n)	Percentage (%)
Publish More Frequently	4	7.3
Publish on Time	6	10.9
Publish Review Articles on 'How to Do It'	16	29.1
Publish Review Articles on 'Medical Problems in Dentistry'	25	45.4
Publish Research Articles of Special Interests	4	7.3
Publish Review Articles of Special Interests	2	3.6
Publish Q & A	21	38.2
Publish More Case Reports	14	25.5
Publish More Book Recommendation	9	16.4
Publish Abstract Review	8	14.5
Provide Useful Internet Webpage	27	49.1
Others	7	13.2

iii) Accessibility of the *MDJ*

When non-readers were asked whether they would be interested to purchase the *MDJ* if it was available for sale, almost three quarters 74.5% (n=41) claimed they would do so while 12.7% said they would not. Another 12.7% did not respond to this question.

They were also asked whether they would be interested to browse through the journal if the *MDJ* was freely available on the MDA webpage. A big majority (n=50; 90.9%) replied "yes", while 5.5% said "no" and 3.6% did not respond to this question.

Only one full-time private practitioner in the 60 years and above age group declined to read the *MDJ* even if he were able to buy it or download free from the web. He however, reads MDA Newsletter, Asia Dentist magazine and Dental Asia Magazine. The other respondents mostly said they were not interested to buy the *MDJ* but if it were freely available on the webpage, they would read it.

Lastly, another 2 respondents stated that they were not interested to read the journal even if it was freely available on the MDA webpage. They were from full-time private practice and they did not answer questions in previous sections. They only answered this question making the previous question data unavailable for analysis. Both were female dentists in the 40-49 and 30-39 year-old age groups.

DISCUSSION

The questions used in this survey were very similar to the one used by the *BDJ* in 2002 in order to allow comparison.[2] However, some modifications had to be done to ours as the *MDJ* has limited sections to analyze as compared to the *BDJ*. In essence, readers in our survey were asked how often they read different sections of the *MDJ* and the answers provided were, "always read", "sometimes read" and "never read", similar to that used by the *BDJ*. Readers were also asked to rate the usefulness of each section using a scale of 1 (not useful) to 4 (most useful), again similar to that used in the *BDJ* survey questions. However, unlike the *BDJ* survey that only targeted their readers, our study also looked into getting feedback from non-*MDJ* readers, as we believe that their opinion and needs would also have to be taken care of. We hope, with their feedback, we can reach out to more dentists in Malaysia.

In 2002, the *BDJ* sent out 1000 questionnaires and received 587 responds,[2] while in comparison, we sent out 225 questionnaires and received 156 responds which make it a 69.33% response. However, their questionnaires were sent out via mail, employing a similar survey methodology used by Razali *et al*.[7] We managed to get a higher percentage of response than the *BDJ* as we approached potential volunteers personally.

Some of our findings were comparable to that of the *BDJ* survey.[2] For example, the majority of our respondents worked in general dental practice (75.68% of full time private practitioners & 32.88% of dental officers in the MOH). However, more of our respondents worked in solo dental practice (46.5%) as compared to the 16% found reported in the *BDJ* survey. Results from the *BDJ* survey showed that the typical *BDJ* reader was between 30 and 50 year-old (58%), male (60%) and married (71%). In comparison, the *MDJ* readers were mostly 40-49 years old (30.69%), male (54.46%) and married (77.23%). This finding suggests that our profile of target audience is not dissimilar from that of the *BDJ*, and therefore, the editorial team could consider adopting changes that the *BDJ* has made, if any to the future issues of the *MDJ*.

Similar to the *BDJ* survey, readers of the *MDJ* were asked to indicate how many issues they read. Sadly, the percentage of the *MDJ* readers who read all or most issues of the *MDJ* was lower than that reported in the *BDJ* survey (*MDJ*, 24.8% versus *BDJ*, 91%). This implies to us that Malaysian dentists only read selectively, perhaps due to their time constrain working in a solo practice.

Among the 101 *MDJ* readers, 55 (54.4%) were male and 43 (42.6%) were female; the gender for the remaining 3 respondents was unknown. When compared to all respondents whereby there were more female (n=91) than male (n=61), our finding seemed to indicate that there were more male respondents (in term of percentage) who were readers of the *MDJ* as compared to female dentists. This echoed a similar finding by the *BDJ*.[2] A total of 48 female respondents and 6 male respondents were noted in the non-*MDJ* readers category to read at least one other professional dental journal, if not the *MDJ*.

Several reasons were speculated as to why there was a lack of female dentists interested in reading professional journals in general. Among them could be due to time constrain dividing themselves between their career and homely duties as most of these non-readers were found to be between 20-29 year-old (n= 32, 66.67%), working in the MOH and the majority of them were Malays.

Out of the 101 *MDJ* readers, 82.17% (n=83), had basic degree who also made up the highest number of readers, followed by dentist who had postgraduate qualifications (n=15; 14.9%). This is almost in proportion to the number of dentists with and without post-graduate qualification surveyed. Hence, we did not find any co-relationship between the number of degrees obtained and readership of the *MDJ*.

In terms of quality, 93.3% of respondents from the MOH and 89.1% of respondents from full-time private practice were happy with its quality indicating that the *MDJ* had been providing enough information and latest updates to dentists. Even though the positive respond was overwhelming, there were two senior dentists working in full-time private practice who commented the *MDJ* as "bad". Both were male dentist in the age group of 50-59 year-old. As the questionnaires incorporated reasons and suggestions for improvement in the event a negative feedback was received, we were able to obtain a positive suggestion from one of them, whereby he suggested of

'making the journal more interesting and having more clinical dentistry in it'. The second dentists seemed to be more focused on local situation when he remarked that there was a 'lack of local clinical articles' in it. The latter person commented that he was not interested to read the journal at all unless the quality improves. Unfortunately, he did not elaborate on what needed to be done to improve the quality of the *MDJ*. As these two senior dentists were overseas graduate, they might be using a more sophisticated and established professional journals for comparison. Nevertheless, the editorial team will look into these negative comments as a challenge to improve the quality of the future *MDJs*.

Dentists in Malaysia seemed to prefer articles with clinical application rather than editorial and book recommendations. These were case reports (62.4% always read, 29.7% sometimes read), research articles (44.6% always read, 41.6% sometime read) and review articles (47.5% always read, 41.6% sometimes read), more preferred probably because they were relevant to the dentists' daily practice. Moreover, by reading these sections, the dentists might encounter new technology and get updates on new research being done in their area of interests. Case reports seemed to receive the most positive reading preference, especially among those in the 40-49 year-old age group (n=30, 96.77% of them) because it was not a heavy reading as compared to the other two sections. On the same note, Razali *et al*.[7] in a questionnaire survey among private dental practitioners in Malaysia found that Malaysian dentists showed highest preference to learning from experience and from peers. Case reports, in a way, are documentation of experiences in managing cases in a person's clinical setting. This is akin to learning indirectly from peers. It was also found that dentist in the private practice made up the highest number of readers (n=61; 64.89%) for case reports. It was also more popular among male readers as compared to female readers.

Interestingly, we found a higher percentage of readers in Malaysia who always read research articles, case reports and book reviews as compared that always read by the *BDJ* readers. For example, 44.6% of the *MDJ* readers stated that they always read the 'research articles' section as compared to only 24% of the *BDJ* readers. Similarly, the *BDJ* reported that 42% of their readers always read the case reviews section while our survey indicated that 62.4% of our readers always read this section. As for book review sections, the percentage of readers who always read the book review section in the *MDJ* was twice of that for the *BDJ*. No comparison can be done for "review article" section, as the *BDJ* does not have one in their survey.

When analyzing the "sometime read" option, the *BDJ* readers opted to do so more often for research articles (69% versus 41.6% of the *MDJ* readers), case reports (57% versus 29.7% of the *MDJ* readers) and book reviews (70% versus 59.4% of the *MDJ* readers). Both these findings are, nevertheless, very positive considering that Malaysian dentists generally read the *MDJ* selectively, indicating that they may still be able to get the best information out of the 'little' that they read.

However, when analyzing the usefulness of each sections, i.e. the amalgamation of scores 3 & 4 (useful and most useful), the percentage obtained did not differ much between the *MDJ* readers and the *BDJ* readers for every section analyzed, although in general our percentage was lower. For example, the *BDJ* found that 77% of their readers rated the case reports useful where as in our case, 72.3% of the *MDJ* stated the same. Two-third (67%) of *BDJ* readers reported that they found the research article section useful while 53.5% of the *MDJ* readers stated the same. Lastly, 59% of the *BDJ* readers stated that the book recommendation section was useful while only slightly more than one-third (35.7%) of the *MDJ* readers stated the same. This implies that even though Malaysian dentists read more than their British counterparts did, they found the quality and content read was not as useful as the *BDJ*. Hence, the editorial team needs to do more improvement in order to increase the ratings of each section of the MDJ.

The *BDJ* survey asked its readers if more or less coverage was needed of their 17 topics/subjects.[2] Similarly, we put up a list of topics/subjects, which we feel our readers may want more/less and asked for their feedback. The top three requests were for the *MDJ* to publish more case reports (n=62; 61.4%), more review articles on "how to do it" (n=67; 66.3%), and more review articles on "medical problems in dentistry" (n=51; 50.5%). This is comparable to the request by the *BDJ* readers whereby they thought there should be more coverage of practical clinical techniques and 'How to do it' articles and fewer non dental topics.[2] This finding also reinforced the finding by Razali *et al*.[7] that Malaysian dentists preferred to learn from the peers' experiences.

Lastly, this questionnaire survey also looked into respondents' preferred means of publication i.e. hard copy or e-journal. It is interesting to note that more than half of the respondents (n=56; 55.45%) preferred to receive the *MDJ* in both the hard and soft copies with only 8 respondents were ready to go fully electronics, while the remaining 31 respondents (30.69%) preferred to receive printed copies only. The reluctance to access professional dental journals electronically was also manifested among the readers of the *BDJ*. Most of their respondents (57%) accessed the *BDJ* website occasionally and 39% never accessed it at all.[2] We believe the arises by the lack of need to use the computer and the internet in dentistry as compared to other professions. Moreover, some of the dentists concerned might be computer illiterate. More studies need to be done to understand the use of computer among dentists.

Slightly more than one-third (n=55; 35.3%) of the respondents were non-readers of the *MDJ*. However, we found that all of the non-readers read at least one professional journal/magazine such as the MDA Newsletter (21.82%), the Annals of Dentistry of the University of Malaya (12.73%), the Asia Dentist Magazine (12.73%), the Dental Asia Magazine (20.0%) and others. (14.55%) [see Part I for details]. An attempt was made to analyze the profiles of these non-readers and to understand the reason for their reluctance to read the *MDJ*. It is interesting to

note that the majority of non-readers of the *MDJ* were Malay respondents (n=40; 72.7%) and were those who worked in the MOH (n=43; 78.2%). More specifically, we found 83.72% of non-readers who were Malays and were working in the MOH as well.

The most common reason (n=38; 88.4%) cited by non-readers from the MOH for not reading the *MDJ* was inability to gain access to the journal. This could be due to the fact that the *MDJ* is provided as part of the membership benefit to the member MDA, and as these dentists were not members of the MDA, they were unable to gain access to it. Moreover, government hospitals general do not have resources to subscribe to the *MDJ*. In addition, reading journal is not the only means of CPD for dentists in the MOH. They may learn from ward rounds, journal club discussion and attend seminars as at the one where they were recruited into this study.[8,9]

The second most common reason (n=17; 39.5%) cited by the non-readers from the MOH was that they had no time to read the journals. This could be due to the packed working hours and endless number of patients needing attention, especially if these respondents were required to work in the rural areas. These respondents were mostly working in partnership/assistant/together with other specialist (n=13, 76.47%) as compared to solo practice (n=3, 17.65%). However, our survey forms did not look into the location of their practice; hence we are unable to ascertain if the majority of these respondents work in busy dental clinics. In contrast, only 1 respondent from full-time private practice stated that she had no time to read.

Surprisingly, a higher number of single dentists (n=31; 56.4%) was found not reading the *MDJ* as compared to married dentists (n=22, 40%). Three married dentists (13.6%) and 15 single dentists (48.4%) claimed that they did not have time to do so. All the married dentists were female of no particular age group. For single dentist, most of them were 20-29 years old female dentists (n=13, 86.67%). However, the good news was that only 1 married respondent and 2 single respondents stated that they were not interested in reading the *MDJ* at all. This indicates that there is still potential hope to promote the *MDJ* and other professional dental journals as a means of CPD to these dental professionals.

CONCLUSION

Slightly below two-third (n=101; 64.74%) of respondents were readers of the MDJ readers. Only a quarter of MDJ readers read every/most issues of the MDJ. The most frequently read section of the MDJ was case report followed by the review article section. Overall, readers wanted more coverage of practical clinical techniques and "how to do it" articles. Finally, the possibility of publishing the *MDJ* on the web could be looked into as some respondents were interested in reading the *MDJ* hosted on the internet. As for non-readership of the *MDJ*, the reason cited was inability to gain access to it as well as practitioners not having time to read the journal.

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Efficacy of Training Dental Officers in the Index of Orthodontic Treatment Need (IOTN)

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ABSTRACT

***Introduction*: There is generally inconsistent appropriate orthodontic referral among local dentists. Orthodontic indices are not routinely used to assess the need for treatment. The aim of this pilot study is to evaluate the efficacy of the Index of Orthodontic Treatment Need (IOTN) as an educational tool to improve their ability to assess orthodontic treatment need. *Methodology*: Local dental officers assessed 30 study models on two occasions (before and after IOTN training) and their findings compared with an expert group for agreement in IOTN scores and referral decisions. Training comprised oral/visual presentation, instruction manuals, 'hands-on' and self-study. Kappa statistic (κ) was used to assess agreement. *Results*: As a group there was no significant improvement in referral decisions after training with only 'moderate' agreement (κ=0.47), although half of the subjects improved. Agreement was better with aesthetic (κ=0.51) than functional (κ=0.41) assessment. 'Sensitivity' was 82.4% and 'Specificity' was 58.2% but both were not statistically significant before and after training. *Conclusion*: The IOTN has potential as an educational tool for improving the diagnostic skills of dental officers. More accurate assessment of the Dental Health Component with the IOTN ruler and familiarity with the Aesthetic Component has to be emphasized in future training.**

Key words:
IOTN, dental officer, efficacy

INTRODUCTION

The provision of orthodontic treatment is justified on the grounds of potentially improved dental and facial aesthetics, occlusal function, long-term dental health and psychosocial benefits[1,2]. However, the efficacy of orthodontic treatment at improving dental health and function is still somewhat controversial[3]. Most research suggests that patients seek treatment mainly for aesthetic improvement and the principle benefits perceived by patients are related to aesthetics[4,5]. The spectrum of malocclusion ranges from mild to markedly deviant and so the justification for treatment for an individual will vary. The point at which the potential risks of treatment outweigh the potential benefits is a matter of contention and must be judged on an individual basis. Often, clinicians may be influenced by non-clinical factors such as individual patient demands and pressure when assessing borderline cases[6].

Shaw et al.[7] found that about 70% of orthodontic patients were advised to seek orthodontic treatment by their general dentists. In our local government orthodontic clinics, all patients are referred from the general dentists and doctors. Thus it is important that the referrals were appropriate. In 1989, Brook and Shaw[8] developed the Index of Orthodontic Treatment Need (IOTN) for a more consistent and standardized orthodontic assessment. This Index attempts to quantify malocclusions objectively by measuring and scoring certain important occlusal features which may be detrimental to dental health and subsequently grading the results according to severity[9,10,11]. The IOTN also consider the psychological aspects of aesthetic impairment by incorporating an aesthetic component (AC) in the form of photographs of malocclusions in descending order of attractiveness[1,12]. However, this Index reflects current British opinion for orthodontic treatment need, although it has been proven valid and reliable in other countries[2,13,14]. In Great Britain, 75% of orthodontic consultants use orthodontic indices to determine which patients will receive treatment from a long waiting list[15]. In Norway, the Norwegian orthodontic treatment index is used to establish the severity of a malocclusion and this determines the level of governmental payment for orthodontic treatment[16].

There is high demand for orthodontic treatment in local government dental clinics[17]. It is important to determine objectively how public funds are used and why only certain patients should receive orthodontic treatment in public health facilities since treatment is heavily subsidized. Prioritization and selective eligibility for treatment is not only necessary for a more equitable delivery of orthodontic service to the public, but is crucial to the survival of the specialist health service in the future. Providing public-funded orthodontic care to everyone is simply not pragmatic or feasible due to limited financial and human resources. Treatment benefit has to be weighed with cost in each case.

In recent years, undergraduate dental students from a local university were given an introduction to IOTN, but graduates from other universities and very senior officers in-service have no or limited exposure to IOTN. The frequency of patient referral for orthodontic treatment depends very much on the diagnostic skills of the clinician besides patient demands. An inconsistent standard of referral may result in unnecessary referral while others may be missing out on timely intervention. The IOTN was the index of choice in the present study as the majority of local orthodontists use this index and it has been shown to be effective as an educational tool to improve orthodontic diagnostic skills of dental undergraduates[14].

This pilot study evaluates the IOTN as an educational tool for improving our dental officers' ability to assess appropriate orthodontic treatment need. It is hoped that unnecessary orthodontic consultations and waiting lists can be cut down with reduced diagnostic shortcomings.

MATERIAL AND METHODS

Selection of study models

The original IOTN by Brooke and Shaw[8], modified by Richmond1 and later re-categorized into three grades by Lunn et al.[18] reflects current British dental opinion. The IOTN has two parts, the Aesthetic (AC) and the Dental Health (DHC) components. The AC (Fig.1) consists of 10 photographs ranked in level of dental attractiveness, 1 being most attractive and 10 least attractive. Photographs 1-4 represent 'no/slight need', 5-7 a 'borderline need', and 8-10 a 'definite need' for treatment on aesthetic grounds. The DHC grades the necessity for orthodontic treatment based on 5 occlusal traits, which is believed to be related to the deleterious dental health effects of malocclusion (Table 1). The 5 occlusal traits assessed are missing teeth, overjet, overbite, displacement of contact points (crowding) and crossbite. A grade is allocated according to the severity of the worst single trait present in the malocclusion. There are 5 grades; grades 1 & 2 indicate 'no need', grade 3, 'borderline need' and grades 4 & 5, 'definite need' for orthodontic treatment on dental health grounds. The grade also describes the priority for treatment.

Ideally, the expert group has to undergo the IOTN calibration course in the United Kingdom before they can carry out the exercise[14]. Since this was not possible in the present study, a 'local standard' was established by agreement between two senior orthodontists (expert group) using local study models. Thirty study models were sorted according to severity of malocclusion to represent the different grades in the AC and DHC. Two additional

Fig 1 : Aesthetic Component of the Index of Orthodontic Treatment Need

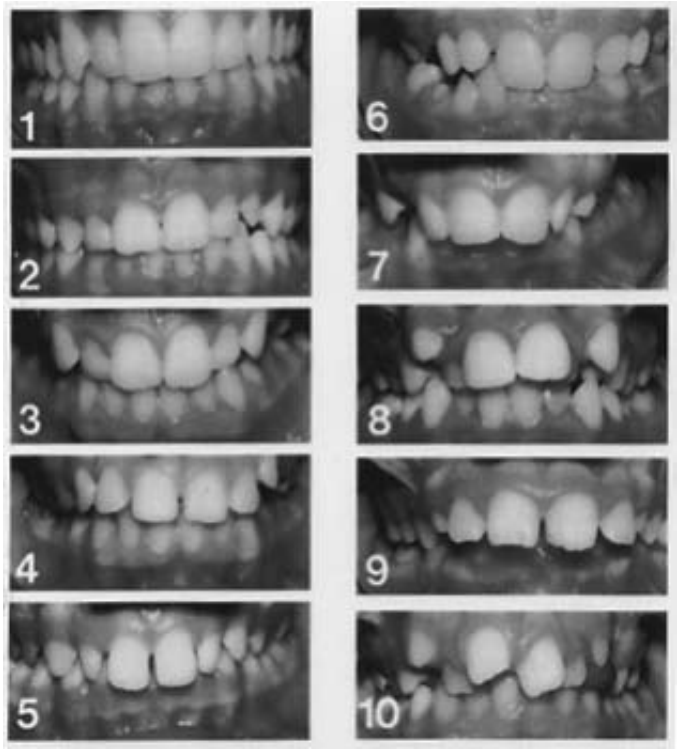

Table 1 : The Dental Health Component of the Index of Orthodontic Treatment Need (IOTN)

Grade 5 (Need treatment)

5.i Impeded eruption of teeth (except for third molars) due to crowding, displacement, the presence of supernu merary teeth, retained deciduous teeth and any pathological cause.
5.h Extensive hypodontia with restorative implications (more than 1 tooth missing in any quadrant) requiring pre-restorative orthodontics.
5.a Increased overjet greater than 9 mm.
5.m Reverse overjet greater than 3.5 mm with reported masticatory and speech difficulties.
5.p Defects of cleft lip and other craniofacial anomalies.
5.s Submerged deciduous teeth.

Grade 4 (Need treatment)

4.h Less extensive hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need for a prosthesis
4.a Increased overjet greater than 6 mm, but less than or equal to 9 mm.
4.b Reverse overjet greater than 3.5 mm with no masticatory and speech difficulties
4.m Reverse overjet greater than 1 mm, but less than 3.5 mm with recorded masticatory and speech difficulties.
4.c Anterior or posterior crossbites with greater than 2 mm discrepancy between retruded contact position and intercuspal position.
4.l Posterior lingual crossbite with no functional occlusal contact in one or both buccal segments.
4.d Severe contact point displacements greater than 4 mm.
4.e Extreme lateral or anterior open bites greater than 4 mm.
4.f Increased and complete overbite with gingival or palatal trauma.
4.t Partially erupted teeth, tipped and impacted against adjacent teeth.
4.x Presence of supernumerary teeth.

Grade 3 (Need treatment)

3.a Increased overjet greater than 3.5 mm, but less than or equal to 6 mm with incompetent lips.
3.b Reverse overjet greater than 1 mm, but less than or equal to 3.5 mm.
3.c Anterior or posterior crossbites with greater than 1 mm, but less than or equal to 2 mm discrepancy between retruded contact position and intercuspal position.
3.d Contact point displacements greater than 2 mm, but less than or equal to 4 mm.
3.e Lateral or anterior open bite greater than 2 mm, but less than or equal to 4 mm.
3.f Deep overbite complete on gingival or palatal tissues, but no trauma.

Grade 2 (Little Need)

2.a Increased overjet greater than 3.5 mm, but less than or equal to 6 mm with competent lips
2.b Reverse overjet greater than 0 mm, but less than or equal to 1 mm.
2.c Anterior or posterior crossbite with less than or equal to 1 mm discrepancy between retruded contact position and intercuspal position.
2.d Contact point displacements greater than 1 mm, but less than or equal to 2 mm.
2.e Anterior or posterior openbite greater than 1 mm, but less than or equal to 2 mm.
2.f Increased overbite greater than or equal to 3.5 mm without gingival contact.
2.g Prenormal or postnormal occlusions with no other anomalies (includes up to half a unit discrepancy).

Grade 1 (No need)

1. Extremely minor malocclusions including contact point displacements less than 1 mm.

malocclusions that are not reflected in the British AC, the bialveolar dental protrusion and Class III malocclusions were included to reflect the cases commonly seen in the local population[19,20].

Grading of selected study models

The selected study models were rated using the AC and DHC by the author and another senior orthodontist (expert group). Both have more than 8 years of orthodontic working experience. Rating of the DHC is facilitated by the IOTN ruler. The raters then made decisions of 'yes' or 'no' for orthodontic referral for each case. The AC and DHC are two discrete components and the scores cannot be combined. The decision to refer is based on either the severity of the AC or DHC. This rating was repeated at another time with an interval of more than a month. Any major discrepancies were examined and re-graded for agreement as the 'local standard'.

Subject selection

The target group was all dental officers in Kota Star district, Kedah, and who have not previously undergone any training or calibration in the IOTN. Senior officers-in-charge and specialists were excluded. To facilitate teaching the subjects were divided into two groups.

Assessment before (T1) and after (T2) IOTN training

At T1 the selected 30 study models were arranged on tables in random numbered order that had no relation to treatment need. The subjects were asked to determine the classification of the malocclusion and orthodontic treatment need. The instructions given were as follows:

"You are to assess these study models from the aesthetic and occlusal aspects. If you think that orthodontic treatment, whether in the form of removable or fixed appliances are required, you should refer this case. If you think other forms of treatment is required instead of orthodontic treatment, for example, extractions only, conservative means, prosthodontics or the malocclusion is deemed too mild for orthodontic treatment, do not refer this case."

All subjects were asked to make 'yes' or 'no' decisions for orthodontic referral. The participants were instructed not to discuss the cases with each other or with the other group who has not been assessed. At T2 the subjects reevaluated the models for orthodontic referral. This time, they were to record both the AC and DHC grades using the AC photographs and DHC with the IOTN ruler respectively. An interval of about two weeks between T1 and T2 was deemed adequate to lessen the probability of subjects remembering the study models whilst minimizing the deterioration of their knowledge and training.

Training in IOTN

After T1 the subjects were given a general introduction to orthodontic indices followed by a detailed explanation on grading with the IOTN. Instruction manuals similar to the visual presentation were also provided. Time for question & answer was allotted after the presentation and subjects encouraged to ask questions and to clarify doubts. Seven sets of selected study models were used for 'hands-on' training in the grading of AC and DHC and decision to refer. The acronym *MOCDO* (**m**issing, **o**verjet, **c**rossbite, **d**isplacement of contact points, and **o**verbite) was used to enhance learning in assessing DHC. The training exercise was continued until all the participants demonstrated correct grading of each case. The lecture and hands-on session was limited to about 2 hours. Self-study was encouraged with the instruction manuals.

Statistical analysis

The κ statistic (kappa coefficient) was used to determine the level of agreement between different examiners[14,21,22]. In this study it is used to assess subject/ orthodontist agreement in referral decisions and the IOTN grades. This study used a binary yes or no decision with no rank ordering, so a simple K was used[14]. It is designed specifically to look at agreement beyond chance. Inter- and intra-orthodontist reliability tests were not done. However K statistic was calculated in the expert group for agreement between the two evaluation periods. One-way analysis of variance (ANOVA) was used to compare before and after training group differences. Statistical significance was at $p<0.05$.

'*Sensitivity*' (those correctly indicated for referral/ those requiring referral) was used as a measurement of the subjects' ability to identify patients requiring referral for orthodontic treatment. '*Specificity*' (those correctly not indicated for referral/ those not requiring referral) was used to measure the subjects' ability to identify those who did not require referral for orthodontic treatment. For sensitivity and specificity, the numerator is the subjects' decision, and the denominator is the orthodontic standard[14,23]. '*Accuracy*' was defined here as the percentage of agreement with the decisions of the orthodontists; this measure did not take into account agreement due to chance.

Before κ analysis was carried out, the actual AC and DHC scores were grouped into 3 categories, representing 'no need treatment' (group 1), 'borderline treatment' (group 2) and 'definite need treatment' (group 3)18. For the AC, scores of 1-4 was 'group 1', scores 5-7 was 'group 2' and scores 8-10 was 'group 3'. For the DHC, scores of 1 & 2 was 'group 1', score of 3 was 'group 2' and scores of 4 & 5 was 'group 3'.

Analysis was done in Statistical Package for social science (SPSS) version 10.0.

RESULTS

The sample size was reduced to 13 subjects (3 males, 10 females) due to failure in attendance of one of the participants at T1. Some subjects failed to score on the decision to refer or not in some of the cases. It is not known whether this was a deliberate omission due to indecision or carelessness in scoring. Eight subjects were first-year dental officers with ≤ 1 year in-service and five subjects with 2-10 years in-service. Although there is no universal agreement on interpreting kappa scores, the scale of Landis and Koch[22] is widely accepted as an interpretation of the strength of agreement for kappa scores (Table 2). There was 'substantial' agreement (κ=0.79) within the expert group at repeat evaluations.

Table 2 Evaluation of kappa (κ) statistics[22]

κ values	Strength of agreement
<0.0	Poor
0.00-0.20	Slight
0.21-0.40	Fair
0.41-0.60	Moderate
0.61-0.80	Substantial
0.81-1.00	Almost perfect

The results showed wide variability between subjects, with improved agreement in referral decisions in six subjects and deterioration in seven subjects after training (Table 3). Before training, there were three 'substantial', six 'moderate' and four 'fair' agreements; while after training there were eleven 'moderate', one 'fair' and one 'slight' agreement in referral. As a group, there was no significant improvement in referral decisions with only 'moderate' (0.47 ± 0.10) strength of agreement. Agreement was generally better with the AC than DHC although there was a large variation within the group. Mean AC agreement was 'moderate' (0.51 ± 0.12) with two subjects in 'substantial' agreement, ten in 'moderate' agreement and one in 'slight' agreement. The mean DHC was 'fair/moderate' (0.41 ± 0.14) with one subject in 'substantial' agreement, five in 'moderate' agreement and seven in 'fair' agreement. Accuracy was not improved either as a group (Table 4).

Mean 'Sensitivity' was increased after training but this was not statistically significant as a group (Table 5). There was individual improvement in seven subjects, no change in three subjects and deterioration in three subjects. 'Specificity' improved in three subjects but was worse in ten subjects although there was no significant difference as a group. There were no significant differences in kappa results for referral decision agreement, sensitivity, specificity or accuracy between the first-year dental officers and more senior officers.

DISCUSSION

There was only 'moderate' agreement (κ=0.47) for referral decisions in the current study at T2 in contrast to Bentele et al.[14] who showed 'substantial' improvement (κ=0.62) in dental students after IOTN training. Their control group with no IOTN training had similar strength of agreement (κ=0.45) with the current study after training. Brook and Shaw[12] found good inter-examiner and intra-examiner reproducibility for AC, which was reflected in the better AC agreement (κ=0.51) than DHC (κ=0.41) in the current study. In contrast, Norzakiah MZ et al.'s[24] study on Malaysian patients showed only 'fair' agreement (κ=0.32) in AC assessment between orthodontist and dental undergraduate. Their study found 'poor' agreement between undergraduate and patient, and orthodontist and patient. From the general opinion of our study subjects, it appears that bialveolar protrusion was generally more acceptable in females, and Class III malocclusions in males respectively. Since these two types of malocclusion were not reflected in the British AC, it may have presented difficulties in rating them. The DHC agreement faired worse although the rating here is more objective and theoretically should have a higher level of agreement. Perhaps the lack of accuracy and skill in usage of the IOTN ruler is a factor.

The higher mean scores at T2 for '*Sensitivity*' (82.4%) than '*Specificity*' (58.2%) suggested that the subjects were better at recognizing cases that required treatment than those that did not require treatment. This is reassuring since it meant that cases which require treatment are probably not under-detected. Bentele et al.[14] similarly showed better '*Sensitivity*' (91.7%) at the expense of '*Specificity*' (67.0%). There was no significant difference between their control and experimental groups since both had high scores. The application of the IOTN in the present study did not significantly improve overall diagnosis and decision-making as a group although there were individual improvements. The varied working experience and undergraduate training of the subjects may have influenced individual learning and diagnostic skills.

One of the criticisms of the IOTN is that it cannot rank cases with greater or lesser need for treatment within grades[12]. Finer differentiation may be more useful in audit and financial applications, for instance when applied to treatment charges based on the difficulty or complexity in treatment. But for the purpose of referral decisions; clear, cut-off points that the IOTN is designed for is simpler to use for non-orthodontic personnel. The difficulty in deciding to refer or not is usually seen in the borderline cases or in cases where the AC differs widely from the DHC[10,12,15].

Table 3 κ values in scoring Aesthetic component (AC) and Dental Health component (DHC), referral before (T1) and after (T2) IOTN training.

Subject	κ values			
	Referral at T1	**Referral at T2**	**AC**	**DHC**
1	0.51	0.54	0.58	0.27
2	0.46	0.56	0.61	0.64
3	0.52	0.46	0.54	0.56
4	0.52	0.50	0.56	0.47
5	0.31	0.51	0.51	0.47
6	0.38	0.49	0.53	0.31
7	0.37	0.40	0.48	0.27
8	0.63	0.16	0.47	0.22
9	0.58	0.48	0.44	0.54
10	0.63	0.46	0.50	0.54
11	0.57	0.43	0.67	0.40
12	0.72	0.49	0.57	0.35
13	0.31	0.58	0.17	0.25
Group	Mean 0.50	Mean 0.47	Mean 0.51	Mean 0.41
N=13	S.D. 0.13	S.D. 0.10	S.D. 0.12	S.D. 0.14

Table 4 'Accuracy' of referral before (T1) and after (T2) IOTN training

Subject	Accuracy at T1 (%)	Accuracy at T2 (%)
1	76.7	73.3
2	73.3	76.7
3	76.7	73.3
4	76.7	63.3
5	70.0	73.3
6	70.0	76.7
7	70.0	70.0
8	80.0	56.7
9	80.0	76.7
10	76.7	76.7
11	76.7	73.3
12	86.7	76.7
13	66.7	80.0
Group	Mean 75.4	Mean 72.8
N=13	S.D. 5.37	S.D. 5.67

Table 5 Sensitivity and Specificity before (T1) and after (T2) IOTN training

Subject	*Sensitivity* At T1 (%)	*Sensitivity* At T2 (%)	*Specificity* At T1 (%)	*Specificity* At T2 (%)
1	83	83	67	58
2	72	61	75	100
3	78	89	75	50
4	78	67	75	58
5	72	72	67	75
6	72	89	67	58
7	78	83	58	50
8	89	78	67	25
9	83	94	75	50
10	78	100	75	42
11	78	83	75	58
12	89	89	83	58
13	72	83	58	75
Group	Mean 78.6	Mean 82.4	Mean 70.7	Mean 58.2
N=13	S.E. 1.66	S.E. 2.9	S.E. 2.01	S.E. 4.00

In the present study, about half of the group did improve with training. The fact that the other half of the group performed worse after training suggested that they might be confused in their decisions when they had to evaluate two different components in which the scores cannot be combined[12]. Perhaps the 2-hour training session was adequate for basic understanding of the IOTN but more skill is required for accuracy in measurement with the IOTN ruler and familiarity with the AC.

CONCLUSION

The baseline performance level of the dental officers as a group was 'moderate' with no statistically significant difference before and after IOTN training, although variation in K scores within the group ranged from 'slight' to 'substantial' agreement. Teaching dental officers the IOTN was beneficial even though only about half of them improved. It was feasible to teach dental officers with a combination of lectures and 'hands-on' training in a limited time frame within the constraints of public health service. Training in future may need to emphasize on diagnostic and measurement skills in the DHC in order to have better objectivity and agreement.

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MALAYSIAN DENTAL JOURNAL

The Expert Says..... IOTN as a Tool in Prioritizing Orthodontic Treatment

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INTRODUCTION

Deviations from normal occlusion are known as malocclusion. Orthodontics treatment usually is the choice of management of irregularities and abnormalities of their relation to the surrounding structures i.e malocclusions. Patient or parent commonly seeks orthodontic treatment for aesthetic reasons rather than functional problems such as temporomandibular joint dysfunction. With greater demand for orthodontic treatment due to greater awareness of the people towards dental health, good orthodontic treatment outcome would be expected. Good orthodontic treatment outcome usually related to good clinical management of the patients.

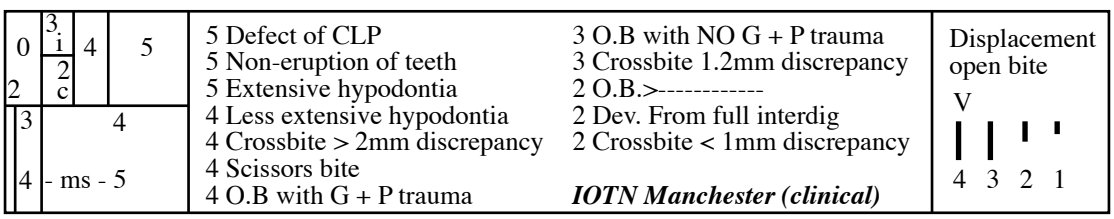
The categorization of malocclusions is important for describing and documenting a patient's occlusion which help assessment of need, difficulty and success of orthodontic treatment. Indices are developed to ease the recording and standardization of the prevalence of malocclusion. The indices should fulfill the criteria: 1) clinically valid and reliable, 2) objective and reproducibility, 3) quick to apply and 4) acceptable to both profession and the patient.

One of the commonly used Indices to categorize malocclusion is Index of Orthodontic Treatment Need (IOTN). The purpose of the index was to determine the likely impact of a malocclusion on an individual's dental health and psychosocial well-being. It comprises of two components; 1) Dental health and 2) Aesthetic[1]. It ranks the malocclusions in terms of the significance of various occlusal traits of an individual's dental health and perceived aesthetic impairment. This is to identify individuals who would most likely benefit out of orthodontic treatment.

The aesthetic component (AC) of the IOTN consists of a visual 10-point scale that represents a wide range of dental attractiveness. It is illustrated by a series of 10 front view of oral photographs arranged from number 1 to 10 with number 1 for most attractive and number 10 for least attractive. The photographs were selected on the basis of the attractiveness ratings of six non-dental judges of a sample of 1000 photographs of 12-year-old subjects[1]. During orthodontic consultation, the child would be asked: "Here is a scale of 10 photographs of teeth showing different levels of attractiveness. Number 1 is considered most attractive and number 10 the least attractive. Where would you put your teeth on this scale?"[2]. The scores are categorized according to need of treatment as follows: score 1 or 2 – none, score 3 or 4 – slight, 5, 6 or 7 – moderate / borderline and score 8, 9 or 10 – definite.

The Dental Health component (DHC) is a modification of the index used by the Swedish Dental Board. The DHC records the various occlusal traits of malocclusion that would increase the morbidity of the dentition and surrounding structures. It has five grades ranging from grade one, "no need" for treatment, to grade five, "very great need". Cleft palate, severe overjet greater than 9 mm would fall into grade 5 whereas displacements between contact points less than 1 mm would fall into grade 1. A hierarchical scale of occlusal anomalies was developed to help identify the occlusal feature. The hierarchical scale is as follows: 1) missing teeth (including congenital, ectopic and impacted teeth), 2) overjet (including reverse overjet), 3) crossbite, 4) displacement of contact points, 5) overbite (including open bite). The acronym "**MOCDO**" was used to remember the hierarchical scale, constructed from the first letter of

Figure 1 : The IOTN Ruler



each category. The purposes of using hierarchical scale are firstly, to provide guide which enables the examiner to survey the dentition in a systematic manner and ensures all relevant occlusal anomalies are identified. Secondly, to record DHC grade of higher up in the order of occlusal anomaly if more than one occlusal anomalies are found.

A ruler called the Dental Health Component ruler (Figure 1) was designed for clinical setting to identify competence of lips, displacement on closure and masticatory / speech problems. It also contained all the information necessary to record the DHC. For overjet assessment, the ruler is held parallel to the occlusal plane where the most prominent incisor is recorded. In the absence of patient, dental cast could be used to record the DHC, with the assumption of worst scenario, for example if overjet is 3.5 – 9 mm, assume the lips are incompetence and recorded as 3a. If there is crossbite, assume that there is a discrepancy between retruded contact position and intercuspal position of greater than 2 mm and recorded as 4c and if there is reverse overjet, assume presence of masticatory or speech problems.

The reliability of IOTN, according to Brook and Shaw[1] is that in general, the reproducibility of the DHC was good in ideal clinic settings but less ideal in school setting. They also reported that the AC showed good inter-examiner and intra-examiner reproducibility when dentist rated a child for aesthetic impairment. However, Holmes[3] found that the between the examiner and the children on the aesthetic score rating in only 32% of cases. An average score can be taken from the two components, but the DHC alone is widely used. Furthermore, the aesthetic component has been criticized for being subjective, and difficult to assess Class III malocclusion or anterior open bite due to all photographs are only Class I and Class II cases.

In conclusion, IOTN could be a useful tool for prioritizing treatment due to lack of manpower. This will also reduce the long waiting lists for orthodontic treatment, especially in government clinics.

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MALAYSIAN DENTAL JOURNAL

Diagnostic Overlay Removable Partial Denture in the Management of Tooth Wear: A Clinical Report

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ABSTRACT

This clinical case report describes an aspect of restorative management of worn teeth. It illustrates the use of diagnostic overlay removable partial denture or DORPD, which has the same function as occlusal splint but with advantages of providing immediate aesthetic improvement and function.

Key words:

tooth wear, vertical dimension of occlusion (VDO), diagnostic overlay removable partial denture (DORPD)

INTRODUCTION

Tooth wear is a clinical problem that is becoming increasingly important in aging populations.[1] This phenomenon can occur as a natural physiological process where the average wear rates on occlusal contact areas were estimated to be 29 μm per year for molars and 15 μm per year for premolars.[2] Tooth wear is considered excessive or pathologic when compared with the amount of wear typical for the patient's age and when an intervention is necessary for cosmetic and functional purposes.

Tooth wear has been classified into the following types:[3] (1) erosion, the result of chemical damage (acids) excluding chemicals produced by bacteria, (2) attrition, the physical wear of one tooth against another, (3) abrasion, the physical wear of the tooth surface by something other than another tooth.

However, a differential diagnosis is not always possible because there may be a combination of these processes occurring at the same time.[4,5]

Loss of vertical dimension of occlusion (VDO) caused by physiologic tooth wear is usually compensated by continuous tooth eruption and alveolar bone growth.[6] In situations where tooth wear exceeds compensatory mechanisms, loss of VDO occurs. If the VDO is still acceptable, treatment may include crown lengthening, orthodontic movement with limited intrusion, and placement of crowns and bridges.[7]

To determine whether VDO has been altered, the following aspects should be observed in a patient:[7] (1) loss of posterior support, (2) history of tooth wear, (3) phonetic evaluation, (4) interocclusal distance, and (5) facial appearance.

A carefully monitored trial period with removable occlusal splints, followed by final restorations should be performed when clinical evaluation demonstrates the necessity to restore VDO.[8-10] Often a simple acrylic diagnostic appliance is sufficient to assess the patient's ability to cope with the necessary increase.[11] For most patients, moderate alterations to the VDO may well be tolerated and final restorations can then be executed at this modified condition.[7,10]

This clinical report describes the treatment of a patient who was clinically monitored to evaluate the adaptation to the diagnostic overlay removable partial denture (DORPD) that have the same function as removable occlusal splint during a 2-month trial period.

CLINICAL REPORT

The patient, a 44-year-old man, was referred by his general dental practitioner with a view to reconstruction. The chief complaints included a desire to improve aesthetics and function, and eliminate tooth sensitivity. The medical and dental histories were recorded, and a complete series

of radiographs were taken. History of high consumption of fruit juices and carbonated drinks and history of bruxing were reported.

Extraoral examination showed overclosure facial appearance with a 5-mm loss of VDO. Clinical determination of the VDO was achieved with the following methods: phonetics, interocclusal distance, swallowing, patient preferences, and facial appearance. The loss of VDO could be caused by a combination of attrition and erosion. In addition, there was also a discrepancy between centric relation (CR) and centric occlusion (CO).

The dentition showed signs of severe tooth wear especially on upper front teeth (Fig. 1). The worn insical edges of the upper and lower teeth were in close fit with some evidence of "cupped" appearance. Active carious sites were found and a number of teeth were missing (14 to 18, 24 to 26, 28, 36, 37, 46 and 47). Recurrent caries was detected underneath large composite restoration on 11, whereas arrested caries were found at cervical margins of several lower teeth. Abrasion cavities can be seen at 41, 42, 31 and 32. There was inadequate coronal seal to the existing endodontic filling at 23. Existing metal ceramic crown on 22 had lost half of its porcelain facing. In addition, the crown was short and worn down.

Fig. 1: Intraoral anterior view of patient presenting worn maxillary and mandibular dentition

In this case, the first consideration was to identify and eliminate or reduce any factor(s) that might contribute to the excessive wear. The patient was informed of the nature of the problem. A two-week dietary analysis was carried out to identify possible dietary causes of tooth wear and the result indicated high consumption of carbonated drinks and fruit juices. Therefore, a preventive regime consisting of dietary advice and instruction were given to reduce consumption of acidic drinks and to improve diet.

At subsequent appointment, impressions of both arches were taken using stock trays and irreversible hydrocolloid impression material. The diagnostic casts obtained were then articulated in a semi adjustable articulator, using a centric relation record and a face-bow transfer. The treatment plan was to restore the worn teeth by increasing the actual VDO by 2 mm and to provide 3 mm of interocclusal space. Thus, the new VDO was set by a 2 mm increase in the incisal guidance pin of the articulator.

To evaluate the patient's tolerance to the new position, the DORPD was fabricated using heat-polymerizing acrylic resin. The finished and polished DORPD was then fitted (Fig. 2 & 3) in the patient. The patient was advised to wear it for a 2-month trial period. He was instructed to wear the DORPD 24 hours a day, removing it only for oral hygiene. During the trial period, the condition of the tooth wear was monitored and minor restorative works such as composite restorations were done where indicated. The occlusion of the DORPD was assessed and adjusted accordingly at each appointment to harmonize with the natural occlusion. The improvement in mastication, speech, and facial esthetics at each appointment indicated the patient's tolerance to the new mandibular position at the restored VDO. In addition, the DORPD also helped in managing the patient's parafunctional habit. Based on these observations, it was then decided to undertake the definitive oral rehabilitation.

Fig. 2: Intraoral anterior view of DORPD on maxillary teeth.

Fig. 3: Occlusal view of DORPD

Surgical crown lengthening of 13 to 23 followed by crowning of these teeth at the increased VDO was carried out. The aim was to increase the height of the clinical crowns in order to improve retention and aesthetic of the permanent restorations. Metal ceramic crowns were fabricated for the maxillary anterior teeth (Fig. 4, 5, 6). The missing maxillary posterior teeth were replaced with a removable cobalt chrome partial denture. No attempt was made to replace the missing teeth (36, 37, 46 and 47) at the lower arch. After 2 review appointments (postinsertion) that included minor adjustments, the patient was then placed on a 6-month recall.

Fig. 4: Intraoral anterior view of restored maxillary dentition.

Fig. 5: Occlusal view of maxillary arch after rehabilitation.

Fig. 6: Close up view of patient smiling after treatment.

DISCUSSION

This case has illustrated the use of DORPD as an interim management for the treatment of worn dentition. In this case, a moderately complex approach was adopted, in which it was deemed necessary to reorganize the patient's occlusion to improve function, speech and aesthetics.

Despite warnings against increasing the VDO, there is evidence from long-term observations which supports the view that, as a general rule, the patient adapts to such an increase and that the new VDO is stable.[11,12]

A monitoring period is important in order to assess the patient's tolerance to the new VDO. Although a simple acrylic diagnostic appliance is sufficient, it will not solve the problem of aesthetic or missing teeth during the trial period. In this case, the patient was clinically monitored to evaluate the adaptation to the DORPD during a 2-month trial period. Once the compatibility to the new VDO has been achieved, permanent reconstruction could then be initiated. In this clinical report, a satisfactory clinical result was obtained by restoring the VDO, which has given the patient an improvement in aesthetics, function and comfort.

DORPD provides immediate aesthetic results, re-establishes the occlusion by replacing missing teeth, and allows the patient to become familiar with the new VDO before delivery of the definitive prostheses.[13,14,15] The main disadvantage of DORPD is the inadequate appearance created by the teeth themselves and the butt joint made by the DORPD on the incisor and canine teeth. Therefore, DORPD should be seen as a transitional procedure.

CONCLUSION

A case report has been used to describe aspects of restorative management of worn teeth. It illustrates the use of DORPD which has the same function as occlusal splint but with an additional benefit of providing immediate aesthetic improvement and function.

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Periodontal Referral

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ABSTRACT

A dentist in his busy dental practice is responsible, not only for diagnosis of periodontal diseases, but also decisions about treatment and their implementation. This article highlights the issue when to refer a patient to a periodontist, factors affecting decision to refer, selection of a periodontist and necessities of the referral process, which are very essential for a healthy professional relationship between a periodontist and a general dentist

Key words:

Periodontal referral, general dentist, periodontist, team approach

INTRODUCTION

Periodontal diseases are some of the most common ailments to affect mankind. An overwhelming number of patients who need treatment to avoid the loss of appearance and function that is associated with missing teeth is due to periodontal disease.[1,2] Ideally patient welfare and dental health should be of paramount importance. Comprehensive management of the patient by a team of varies dental specialists can provide optimum health care of the dentition and supporting tissues of the mouth.[3]

General dentist is not only responsible for the diagnosis of periodontal diseases but also must make decisions about treatment and who is to implement it. When a patient presents with complex dental problems, a dentist must articulate his concepts of the problem, goals in seeking the care and must have a realistic concept of his own abilities and limitations. If the treatment plan has a significant periodontal component, the dentist must decide whether he has the required skills to treat the periodontal problem or if better care could be provided by a specialist.

It is not right to treat a disease without an adequate understanding of the disease process and its effect on the individual. When to treat and when to refer should be based on honest appraisal of skill levels and preferences of treatment. There are no rules for referring a patient and each dentist must be accountable with the decision to treat or refer. Also patient will be benefited since he is receiving the correct treatment

When to refer a patient to a periodontist

The question, ***'when to refer?'*** is a very individualistic for which there are no specific formulae that have been proven by the test of time.[4] Since many patients are affected by periodontal problems, the general dentist must first examine and evaluate the need for referral based on the severity and extent of the disease.[3] General dentist should be trained to perform basic periodontal therapy like scaling, root planning and curettage.[5] The reverse is certainly true in the treatment and management of more advanced disease states should be managed by a periodontist[3]

A general practitioner who performs the necessary treatment with the informed consent is bound to disclose to the patient if the treatment is not successful. He must refer the patient to a specialist as soon as he becomes aware that the therapy he has initiated is not proving to be effective as could be expected in the hands of a specialist.

If the dentist feels that he has the skills to manage the periodontal care but better care could be provided by a periodontist, he must determine whether the patient is likely to accept the referral and can afford treatment by a specialist. If a significant periodontal problem exists, he must first determine whether any aspects of the problem are acute /symptomatic in nature. Acute problems require immediate attention that might preclude further treatment planning. An acute periodontal abscess must be managed at the time of occurrence, while a diagnosis of refractory

periodontal disease may be reached only after treatment attempts have been completed. If the patient refuses the referral, the dentist must decide whether to treat a case he feels unequipped to handle well (which is unwise but sometimes necessary) or to refuse to accept the person as his patient.[6] The factors affecting decision to refer are given in Table 1.[7]

Factors affecting decision to refer[7]

A) GENERAL DENTIST'S	B) PATIENT'S	C) PERIODONTIST'S Selection of Periodontist)
• Knowledge and skills • Lack of success in closed instrumentation's and confidence in advanced periodontal therapy. • Personal ethical standards and a desire to share responsibility. • Business and economic pressures. • Desire to transfer a difficult patient. • Location of periodontist. • Discussion with colleagues • Prior experience with periodontists.	• Preference and finances. • Preconceptions / prejudices. • Confidence in the general dentist. • Discussion with other patients. • Location of periodontist.	• Knowledge, skill and qualification. • Communication abilities and rapport with general dentists. • Attitude and willingness to be flexible. • Tolerance, gentleness, compassion and concern for patient welfare. • Personality and staff. • Reputation and commitment • Fees • Office location and facilities • Availability in emergency

TWO SYSTEMS OF REFERRING:

1. CONSULTATION :

Consultation occurs when two or more doctors confer about the diagnosis or treatment of a patient condition. Consultants are responsible for carrying out the necessary diagnostic and treatment planning requests, returning the patient and information to the referring dentist.

2. TREATMENT:

Referral for treatment is process where diagnosis and management is done by a specialist. This process is very important to preserve doctor-patient relationships and doctor-doctor relationships.[8]

REFERRAL FROM A SPECIALIST TO A SPECIALIST:

The practice of modern dentistry is basically a multi-disciplinary domain. To make this practice really fruitful, patient should be managed comprehensively and systematically by different specialists. Clinical modalities such as advanced endo-perio lesions, crown lengthening procedures, bone grafting and implantology etc, require referral to a Periodontist. We can take a leaf out of the modern day dentistry in the west, which treats periodontology as an integral link of aesthetic dentistry. Periodontal consultation is necessary before orthodontic correction or a fixed prosthodontic rehabilitation.[8]

The systematic process of referral:

There should be a systematic way of referring a patient. General dentist cannot simply tell ***"go see a periodontist"*** A concise, relevant summary of oral health and dental history, physical and radiographic findings must be sent to a consultant before the actual visit by the patient. Nothing is more frustrating to any dentist than having patient say, ***'I don't know why I am here'***. It is not reasonable for the referring dentist to expect the consultant to build a patient relation from such an inauspicious beginning. The patient will be better managed if the periodontist receives the case early before any treatment is initiated by the dentist, because the dentist could institute treatment that conflicts with the periodontists choice.[3]

SUITABLE TIMING:

As soon as the dentist's diagnosis is completed and the extent of disease is determined, a judgment must be made regarding treatment. Delay in a referral could change a treatment situation into a hopeless one. Timely inclusion of a specialist in the therapy may preserve a patient's confidence as well as patient's dentition.[7]

SELECTION OF A PERIODONTIST:

A patient cannot rely only on his own resources to choose a specialist. Once having informed the patient of his need for special care, the dentist is obliged to assist the patient in making a prudent choice. Knowledge of the staff, facilities, location, doctor personality and his/

her philosophy of practice and patient management are necessary. It is wise to avoid giving too many details about a specialist skills and techniques to the patient, since the periodontist will discuss all pertinent facts with the patient. Any discussion of the fees involved in the periodontal treatment should be avoided.

Refer each patient to only one periodontist, as multiple referrals confuse patients and may dilute their trust.[2] The patient should be informed of the specialized additional training of the periodontist. Patient trust starts in the referring dentist office and building up trust always makes the profession look better.

TEAM APPROACH IN THE PROCESS:

The referral system will be successful only if communication is good. Referring dentist requesting the specialist to limit his/her scope of treatment will create uneasiness for the periodontist. When a periodontist is asked to treat selected teeth or region in oral cavity, it is known as ***'Prescription periodontics'***[2] Such dictations on what is to be done should be avoided. Referring dentist has the responsibility of allowing the periodontist to diagnose all periodontal problems of referred patient. Treatment can then be determined in consultation with the patient and the referring dentist.

The periodontist also has many responsibilities in the referral relationship. However, treatment does not always go exactly as planned. There is no room for fault and blame in these relationships. Periodontists should not be blamed and criticized by the general dentist when the referred patient does not return to the general office for continued restorative care after completion of the periodontal treatment. A clinician must remember that he/she cannot force patients to receive dental treatment, patients can make their own decisions and many patients choose to go elsewhere.[3]

LEGAL ASPECTS OF REFERRAL:

Periodontal referral is an ethical responsibility of the dentist, based on honest appraisal of skill levels and preferences of treatment. Each year, when malpractice statistics are compiled, failure to inform the patient of periodontal disease is high on the list of causes for lawsuits.[9] The absence of specialists in a particular geographic locale does not relieve a dentist of the legal duty to refer.[1] If the referral is refused, the reason should be recorded. The patient is a co-therapist in preventing and managing periodontal disease. Therefore a patient is legally obligated to follow a dentists responsible advice, instructions and specialty referrals.[1] A good dentist who deliver dental care with reasonable competence and who substantiate their treatment with well documented records have little to fear from litigation.

A successful referral system is based on good communication. Comprehensive periodontal therapy in a co-operative team of periodontist, dentist and patient shares the reward of addressing a health problem that has been grossly overlooked and ignored throughout the ages. Perhaps the application of the principle that "one should do to others as they would have others do unto them", is the key to unlocking the door to our common goal.

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A Retrospective Clinico-Statistical Analysis of Lip Mucoceles Occurrence in Children Below 16 Years Seen at a Government Hospital Based Paediatric Dental Clinic.

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ABSTRACT

The objective of this study is to report the occurrence, demographic and clinical findings of lip mucoceles in children. A restrospective study was conducted at the paediatric dental clinic situated at Hospital Sultanah Aminah, Johor Bahru. The period of study was 3 years beginning 2003 to 2005. Out of 1407 new cases seen over the period of study 17 (1.2%) patients presented with lip mucoceles. All lesions occurred in the lower lip. There was no sex or racial predilection. The average duration of the lesion prior to seeking treatment was 2.8 ± 2.8 months. Most patients (76.5%) first saw a medical practitioner for the problem. No spontaneous resolution of the lesions in any of the patients was noted. The preferred method of treatment of lower lip mucoceles in children is surgical excision of the involved minor salivary glands. Salivary gland mucoceles in children predominantly involve the lower lip and can be treated successfully by complete removal of the involved and associated minor salivary glands

Key words:
Mucoceles, Salivary gland, children

INTRODUCTION

Mucoceles are benign soft tissue lesions. Clinically they appear as raised, well demarcated, non tender, translucent swellings in the oral mucosa. Most lesions are bluish in color due to the mucinous content. Long standing lesions may present with a whitish keratinized surface. Typically the swelling can vary in size depending on the amount of saliva pooling beneath the mucosa. Mucoceles arise from the minor salivary glands. It is thought that trauma due to lip biting or other minor injury results in extravasation of mucous into the surrounding connective tissue. Two types of mucoceles have been described i.e. mucous extravasation type where mucous has extruded into the connective tissue and is surrounded by a granulation tissue envelope and mucous retention type where mucous is retained within the ductal epithelium. This classification is only of histological interest and does not influence the clinical course or management of the lesion.[1-4]

It has been reported that mucoceles have no sex or racial predilection. The most common site reported in the literature is the lower lip although other sites may be the buccal mucosa, floor of the mouth, ventral aspect of the tongue, palate and retromolar area. Its size at presentation can range from a few millimeters to over one centimeter in diameter.[2, 4]

Mucoceles are seldom self resolving. Treatment consists of removal in toto of the involved and associated minor salivary glands. It must be remembered that inadequate removal can result in recurrence of the lesion.[5-7]

A study was conducted at the paediatric dental clinic Hospital Sultanah Aminah Johor Bahru, to determine the occurrence, referral patterns and clinical features of lip mucoceles in children. This clinic is a referral centre and provides specialist oral care for children from 0-16 years of age.

MATERIAL AND METHOD

Treatment cards (L.P 8-2 Pin.7/97 and L.P 8- Pin. 6/89) of all patients seen at the clinic in the years 2003, 2004 and 2005 were retrieved. All cards of patients in whom a clinical diagnosis of lip mucoceles was made were then selected. Required data was recorded and subsequently analyzed.

RESULTS

The total number of new patients seen at the paediatric dental clinic from 2003 to 2005 was 1407. Of these 17 (1.2%) patients presented with lip mucoceles. Table 1 illustrates the demographical data of the patients.

Table 1: Demographic data of the patients presenting with salivary mucoceles

Patient No	Age	Sex	Race	Referred From	Site	Size (cm)	Duration (Months)	Treatment	Reccurrence 3 Months Recall
1	11	F	M	Medical officer	Lower lip	1.0	2	Excision LA	No
2	9	F	M	Medical officer	Lower lip	0.5	2	Excision LA	No
3	11	F	M	Medical officer	Lower lip	0.6	3	Excision LA	No
4	12	M	M	Medical officer	Lower lip	0.5	2	Excision LA	No
5	10	M	M	Medical officer	Lower lip	0.5	1.5	Excision LA	No
6	5	M	M	Dental officer	Lower lip	0.5	2	Excision LA	No
7	10	M	M	Medical officer	Lower lip	1.0	1	Excision LA	No
8	9	F	M	Medical officer	Lower lip	0.5	1	Excision LA	No
9	11	F	M	Medical officer	Lower lip	0.5	3	Excision LA	No
10	7	M	I	Medical officer	Lower lip	1.5	1	Excision LA	No
11	4	F	C	Dental officer	Lower lip	0.3	1	CO2 laser/ LA/ Sedation	No
12	11	F	M	Medical officer	Lower lip	0.5	4	FTA	No
13	10	M	I	Medical officer	Lower lip	1.0	1	Excision LA	No
14	4	M	I	Dental officer	Lower lip	1.0	3	Excision LA/ sedation	No
15	7	F	M	Medical officer	Lower lip	0.5	1	FTA	
16	5	F	M	Medical officer	Lower lip	0.3	?	CO2 laser/ LA/ Sedation	No*
17	11	F	M	Medical officer	Lower lip	0.5	6	Excision LA	No
18	3	M	M	Medical officer	Ant tongue	0.5	3	None	Resolved spontaneously
19	8	M	C	Medical officer	Ant tongue	0.7	1	None	Resolved spontaneously
20	13	F	M	Dental officer	Ant tongue	0.5	2	Laser ablation /LA	No
21	10	F	M	Medical officer	Ant tongue	0.5	1	Laser ablation /LA	No

* Recurrence at 3 months FTA-failed to attend M-Malay C-Chinese I- Indian

Demographic findings

The age of patients ranged from 4 to 12 years. The mean age was 8.6 ± 2.7 years. There were 7 males and 10 females with a male: female ratio of 1: 1.4. The patients consisted of 13 (76.5%) Malays, 3 (17.6%) Indians and 1 (5.9%) Chinese.

Clinical findings

14 (82.4%) patients were referred by medical colleagues and 3 (17.6%) patients were referred by dental colleagues. 13 (76.5%) patients gave a positive history of trauma to the lower lip, eight of whom had a lip biting habit. 4 (23.5%) patients did not give a known cause. The time from onset of lesion to consultation ranged from 1 month to 1 year. The mean duration was 2.8 ± 2.8 months. The size of the lesion at presentation ranged from 0.3 cm in diameter to 1.5 cm in diameter with a mean size of 0.67 ± 0.3 cm

Management

13 (76.4%) patients had excision of the lesion under local anesthetic with or without oral sedation. 2 (11.8%) patients had the lesion ablated using CO2 laser under local anesthetic and oral sedation. One patient was 4 years old and the other 5 years old. Both patients presented with lesions of about 0.3 cm in diameter. 2 (11.8%) patients failed to attend for treatment. Only 1 patient (5.9%) had a recurrence. This was the 5 year old female patient who had the lesion initially ablated with CO2 laser. A new lesion was noted two months later and was subsequently surgically excised under local anesthetic.

DISCUSSION

Mucoceles are not a common occurrence in children as commonly believed. In this study out of 1407 new patients seen over the period of study only 17 (1.2%) patients presented with lower lip mucoceles.

Mucoceles however make up a major component of soft tissue pathology seen in the oral cavity of children. In this study out of 59 oral pathological biopsies sent for histopathological examination during the same period, 17 (28.8%) were mucoceles. In the study by Jones AV (2006) whereby 4406 biopsy specimens in children from 0-16 years were analyzed over a period of 30 years, mucoceles comprised the largest single diagnostic group accounting for over 16% of the specimens. Other studies have reported this figure to range from 5%-21%.[1] As with other studies the most common site of mucoceles seen is the lower lip.[3,5,6] Out of 21 mucoceles seen over the study period, 17 (80.9%) were in the lower lip and 4 (19.1%) on the ventral aspect of the anterior tongue. No upper lip mucoceles were noted during the study period. According to Finkelstein MW et al (1984), 80% of patients seek treatment within six months of the onset of the lesion.[6] In this study the range was one month to one year with the average time being 2.8 ± 2.8 months. As with other reports this study did not find any sex or racial predilection for lip mucoceles. The male: female ratio being 1:1.4. 76.5% patients in this study comprised Malays, 17.6% Indians and 5.9% Chinese. This breakdown however does not reflect the racial population breakdown in the state of Johor. The low number of chinese patients seen in this study may be due to the management of some of these patients by the private sector. It is interesting to note from this study that 82.4% patients first seeked consultation with a medical doctor. It may be that the public may consider the lips as not being within the scope of care given by dental practitioners. The average size of the lesion at presentation was 0.67 ± 0.09 cm. As the lower lip is relatively exposed, it may be that lesions in the lower lip are often visible and seen early by either the patient or parents.

Excision of the involved minor salivary gland with associated glands in the vicinity of the lesion is the treatment of choice.[7] 13 (76.5%) of the patients in this study underwent excision of the lesion under local anesthetic. No recurrence was noted in all patients at 3 months recall. Surgical excision requires a certain degree of cooperation from the patient. It is important that the patient is able to remain relatively still for the procedure to be carried out successfully. Other techniques that have been described in the literature for the treatment of lip mucoceles are laser ablation[7] and cryosurgery.[8] It is the authors opinion that in the very young patient who is unable to give adequate cooperation for surgical excision laser ablation of the lesion may be considered. The disadvantage with laser ablation is that associated glands in the vicinity of the lesion may not be visualized and may inadvertently be traumatized. This may then result in a recurrence. It is therefore imperative that parents are always warned of the possibility of recurrences. In children however laser ablation is particularly advantageous as haemostasis is achieved without the need for suturing and postoperative pain is said to be minimal as compared with surgical excision.[7]

In this study two (11.8%) patients failed to attend for surgical excision of the lesion. It can only be inferred that the lesions either resolved spontaneously or that they had seeked treatment elsewhere. In conclusion lower lip mucoceles are the most frequent orofacial soft tissue pathology seen in the child population. In most instances diagnosis can be made with a great degree of accuracy based on clinical findings alone. Mucoceles can be treated with adequate surgical removal of the involved minor salivary glands. However the possibility of occurrence of new mucoceles or recurrent lesions after treatment should always be considered.

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The Prevalence of *Actinobacillus Actinomycetemcomitans* in a Healthy Malay Population in Malaysia

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ABSTRACT

***Actinobacillus actinomycetemcomitans* is considered a major pathogen in periodontal disease. The aim of this study was to determine the prevalence of *A. actinomycetemcomitans* from 46 subjects aged 20-24 years old of who were all periodontally healthy Malays.**

Key words:

Actinobacillus actinomycetemcomitans, periodontology, Malay, subgingival plaque, prevalence.

INTRODUCTION

Oral flora comprises a diverse group of organisms which includes bacteria, fungi, mycoplasmas, protozoa and possibly a viral flora.[1] Bacteria are by far the predominant group of organisms and there are probably 350 different cultivable species and a further proportion of uncultivable species, which are currently being identified using molecular techniques.[1] Oral bacterial flora can be classified primarily as gram-negative or -positive and secondarily as either anaerobic or facultatively anaerobic according to their oxygen (O_2) requirements.[1]

Actinobacillus actinomycetemcomitans falls into the gram-negative rod, facultatively anaerobic group and grows best in an anaerobic environment enriched with 5 - 10% carbon dioxide (CO_2) with optimal temperature of 37°C over a pH range of 7.0 - 8.5. *A. actinomycetemcomitans* is 1.0 - 1.5 x 0.4 - 0.5 μm in size and occurs singly, in pairs, or in small clumps2. The primary habitat of *A. actinomycetemcomitans* is most probably dental plaque in the gingival crevice.[2]

A. actinomycetemcomitans is considered a major pathogen in localized aggressive periodontitis previously known as localized juvenile periodontitis.[3,4] It was shown that some strains of *A. actinomycetemcomitans* associated with localized aggressive periodontitis produced a leucotoxin, which can lyse polymorphonuclear cells.[5] This organism has also been known to cause infective endocarditis.[6]

The prevalence of subgingival *A. actinomycetemcomitans* has been studied extensively. One study in Singapore in an ethnic adult Chinese population showed a high prevalence of *A. actinomycetemcomitans* (78%) in periodontally healthy patients.[7] Another study in Southern Thailand also demonstrated a high prevalence of *A. actinomycetemcomitans* (88%) in healthy patients and indicated this species as part of the oral flora for this population.[8]

However in Taiwan, results showed a 5.5% prevalence of *A. actinomycetemcomitans*, which increased after the eruption of first molars and peaked near puberty.[9] The same study reported no significant differences in the detection of *A. actinomycetemcomitans* in terms of gender, Plaque Index (PI) and Gingival Index (GI).[9]

Elsewhere, a cross-sectional study in an Australian population demonstrated recognized periodontal pathogen (*A. actinomycetemcomitans* – 22.8%) as part of the flora of subgingival plaque.[10] While in Indonesia, a study revealed that the prevalence of *A. actinomycetemcomitans* was 40%, male and female distributions being 52% and 33%, respectively.[11] The prevalence of *A. actinomycetemcomitans* may be associated with an increased chance of disease progression.[11]

Prevalence of subgingival *A. actinomycetemcomitans* in both periodontally healthy and diseased individuals in populations using various microbiological techniques differed from study to study. Much of the discrepancies between various data may be due to differences in techniques used.[12,13,14]

For this study, the conventional method of culture techniques combined with biochemical testing has been used. This investigation was conducted to determine the prevalence of *A. actinomycetemcomitans* as a human oral microflora in a Malay population that consisted of only periodontally healthy subjects.

MATERIALS AND METHODS

1. Patient selection

A total of 46 young adults of Malay origin aged 20-24 years old were drawn principally from the dental student population of Dental Faculty, Universiti Kebangsaan Malaysia. Subjects who had used systemic antibiotics in the previous six months or required antibiotic cover prior to sampling or smoked or were daily users of mouth rinse were excluded from the study.

Before collecting the dental plaque samples, the periodontal status of sample sites including Gingival Index (GI),[15] Plaque Index (PI),[16] Pocket Depth (PD) and criteria of the gingival appearance as stated below were recorded.

The healthy gingiva is pink, firm in texture, and extends from the free gingival margin to the mucogingival line. It has a knife-edged margin. The interdental papillae are pyramidal in shape and occupy the interdental space beneath the tooth contact points. Gingiva is keratinised and stippling is frequently present. The gingiva comprises free and attached gingiva. Free gingiva is the most coronal band of unattached tissue sometimes demarcated by the gingival groove. Attached gingiva is firmly bound to underlying cementum and alveolar bone, and extends apically from the free gingival groove to the mucogingival junction. The width of the attached gingiva varies considerably throughout the mouth.[17]

Subjects with PD ≤ 3 mm, mean PI ≤ 0.5, mean GI < 0.15 and no evidence of attachment loss were selected. Subjects that were selected in the study were in good health and all of them with the presence of first and second molars. Subjects' selection, history taking and clinical assessment were performed by the same examiner.

2. Collection of subgingival plaque samples

Prior to sampling, supragingival plaque was first removed from the site by means of prophylaxis or scaling and polishing or tooth-brushing. The site was then cleaned with cotton pellets and dried before sampling. In order to reduce bias and errors, only one trained examiner did the sampling. Here, the single blind method was used which means that the subject did not know the purpose of this research.

A subgingival plaque sample was obtained from either mesial or distal aspect of all first molars using a sterile Gracey curette (Hu-Friedy, Chicago, IL. USA).[10] In the periodontally healthy group, subgingival plaque was obtained from a site that did not show any sign of bleeding on probing.

3. Processing of subgingival plaque samples

Immediately, the sample was transferred into a vial tube containing Stuart's transport medium (Oxoid Ltd., Basingstoke, UK.). On the same day (not more than two hours after sampling), the sample was then spread onto the surface of a selective medium Tripticase Soy Broth with 75mg/l Bacitracin and 5mg/l Vancomycin (TSBV).[8] The TSBV (Scharlau Chemie, S.A. Barcelona) plate was then placed in an anaerobic jar (Oxoid Ltd., Basingstoke, UK) and stored in an incubator at 37°C for 3 - 5 days. *A. actinomycetemcomitans* grows best in an anaerobic environment enriched with 5 – 10% CO_2 compared to O_2. On the TSBV agar, *A. actinomycetemcomitans* would appear as white, translucent colonies with a star-shaped inner structure. They adhere to agar surface and are difficult to break up.

4. Biochemical testing

Biochemical tests were done to confirm the identification of *A. actinomycetemcomitans*.[18,19] These identifications were supported based on Bergey's Manual,[19] and included sugar fermentation and assimilation reactions, acid-end products of carbohydrate metabolism as well as enzyme profiling.

The catalase reaction test was performed after the tested organism was exposed to the air for 30 minutes. It was performed by mixing a part of the colony with one drop of 15% hydrogen peroxide (H_2O_2). The chemical reaction that occurred would be:

$2H_2O_2 \rightarrow 2H_2O + O_2\uparrow$ (the production of oxygen gas bubble)

The isolates that showed positive catalase reactions were gram-stained and inspected under the light microscope at 100X. In light microscopy, bacterial stains were used to visualize bacteria clearly and to categorize them according to staining properties. *A. actinomycetemcomitans* is a gram-negative bacterium. Gram-negative bacteria lose the violet stain during decolorization and are therefore counterstained with pink, the color of safranin stain, as observed under the microscope. At the same time, this catalase-positive and gram-negative isolate was subjected to further biochemical testing (oxidase test).

Oxidase test was done to confirm the presence of cytochrome enzyme from the bacteria. The oxidase reagent (tetramethyl-p-phenylene-diamine-dihydrochloride) is oxidized by this enzyme in which the reaction solution would change from colourless to purple in a few seconds. The cytochrome enzyme system is usually present only in aerobic organisms, producing a positive oxidase test result. Obligate anaerobes and a few certain facultative anaerobic organisms lack this oxidase activity.

The motility test was done to determine whether an organism is motile or nonmotile. Bacteria are motile by means of flagella. In this study, the isolate was incubated in agar media at room temperature (22°C) for 24 hours. Motile organisms would migrate from the inoculation line

and diffuse into the medium, causing turbidity. On the other hand, nonmotile organisms exhibit bacterial growth along the inoculation line whereas surrounding medium remains clear.

The isolate was also incubated on a common media MacConkey agar (Oxoid, Basingstoke, Hampshire). This medium contains crystal violet dye to inhibit the growth of gram-positive bacteria and fungi, and allows many types of gram-negative bacilli to grow. The pH indicator, neutral red, provides this medium with a differential capacity. Bacterial fermentation of lactose results in acid production, which decreases medium pH and causes the neutral red indicator to give bacterial colonies a pink to red color. Non-lactose fermenters remain colorless and translucent.

Carbohydrate fermentation tests were performed to determine the ability of the organism to ferment a specific carbohydrate incorporated in a basal medium producing acid or acid with visible gas. In this study, the Durham tube was included to test for gas production. Bacteria that ferment carbohydrate were usually facultative anaerobes. A variety of carbohydrates may be utilized such as lactose, sucrose, maltose and mannitol. Using a pH indicator (Andrade) with a specific carbohydrate, it can be determined whether the bacteria had degraded the carbohydrate to various end products by observing for a visible colour change in the medium.

Positive result of acid end products with variable gas production was pinkish red. Negative results ranged from yellow to colourless while delayed result was light pink in colour.

The urease test was done to determine the ability of an organism to split urea, forming two molecules of ammonia by the action of the enzyme urease resulting in alkalinity. The organism was inoculated into the urea broth and was incubated for 24 - 48 hours. Negative result showed no colour change (yellow-orange) while positive result showed intense pink-red colour throughout the broth.

The triple sugar iron (TSI) test principally is to determine the ability of organism to attack a specific carbohydrate incorporated in a basal growth media, with or without the production of gas, along with the determination of possible hydrogen sulfide (H2S) production. TSI contains three carbohydrates, which are glucose, sucrose and lactose (1:10:10) including the red phenol indicator. Fermentation occurs both aerobically (on the slant) and anaerobically (in the butt). In this study, we only focused on the hydrogen sulfide (H2S) presence, which was produced by *A. actinomycetemcomitans* in this media. Presence of H2S can be seen as a visible, black colour reaction along the inoculation line.

5. Antibiotic sensitivity reactions

Positive finding of *A. actinomycetemcomitans* was further tested by antibiotic sensitivity reaction. In this test, the isolate of positive *A. actinomycetemcomitans* colony was seeded over the entire surface of an agar plate and a drug-impregnated filter disc was applied. The antimicrobial discs diffuse into the media in a circle surrounding the discs. If the antibiotic is capable of killing the organism, the growth of the organism will be inhibited provided that the concentration of the antibiotic on the disc is sufficient. Large zones of inhibition indicate a higher level of antimicrobial activity or greater diffusibility of the drug. This organism is sensitive to a certain drug. The actions of specific antimicrobial drugs namely clindamycin, metronidazole, tetracycline, penicillin and erythromycin against *A. actinomycetemcomitans* can be measured quantitatively. This species is known to be sensitive to tetracycline6 (MIC < 1.5μg/ml) and amoxycillin (MIC < 0.5μg/ml), but it is resistant to metronidazole (MIC > 64μg/ml).

6. Data analysis

The clinical parameters at the baseline of the periodontally healthy subjects were recorded for this study. These were based on the characteristics of gingival appearance, pocket depth and all the inclusion criteria as stated above.

The microbiological data were analyzed for prevalence of *A. actinomycetemcomitans* investigated in the present study by establishing the proportion of subjects positive for this microorganism based on the biochemical tests after Bergey's manual. The proportion of positive cultivable *A. actinomycetemcomitans* was determined in terms of percentage.

RESULTS

A total of 46 subjects were recruited comprising 13 (28%) males and 33 (72%) females aged 20-24 years old. The subjects did not have medical and periodontal problems, had not used systemic antibiotics in the previous six months, and did not smoke. The resultant 46 subgingival plaque samples were cultured in order to determine the presence of *A. actinomycetemcomitans*. Two of the plaque samples (4.35%) were positive for *A. actinomycetemcomitans* and sensitive to tetracycline. **Figure I** shows the prevalence of *A. actinomycetemcomitans* as a normal constituent of human oral microflora percentage.

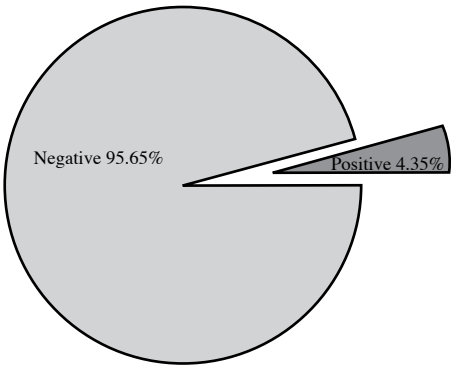

Figure 1: Prevalence of *A. actinomycetemcomitans* in a periodontally healthy selected Malay population.

The identification was based on the specific colony morphology on TSBV agar. Theoretically, TSBV yielded white, translucent colonies which have star-shaped internal structures. However, in the present study, the star-shaped internal structure was not readily found and was lost on subculture. In addition, *A. actinomycetemcomitans* adhered to the agar surface and were difficult to break up. Growth of *A. actinomycetemcomitans* was improved by CO_2. It did not grow on the common media, MacConkey agar.

Table 1 shows that *A. actinomycetemcomitans* was catalase-positive, oxidase-negative and nonmotile at the temperature of 22°C. This species fermented maltose and mannitol sugars without gas production, but it did not ferment lactose and sucrose. *A. actinomycetemcomitans* produced H_2S in the triple sugar iron media, but it was unable to split urea giving a negative result for urease test. These characterizations of *A. actinomycetemcomitans* were supported by Bergey's manual.[20]

Table 1: Result of biochemical tests for the identification of *A. actinomycetemcomitans*

No.	Biochemical tests	*A. actinomycetem-comitans*
1.	Motility at 22°C	-
2.	Catalase	+
3.	Oxidase	-
4.	Growth on Mac Conkey	-
5.	Growth improved by CO_2	+
6.	Lactose	-
7.	Maltose	+
8.	Mannitol	D
9.	Sucrose	-
10.	Urease	-
11.	H_2S	+

Colonies of gram-negative rods with negative catalase reaction were also observed and classified as belonging to the *Haemophilus* spp.[8] They are more like each other than the genera names they bear. In morphology, both organisms are small gram-negative coccobacilli, which grow adherent to each other and stick to the medium. Furthermore, growth of both organisms is improved by CO_2. Other species such as *Capnocytophaga* spp. which are gram-negative filaments and Neisseria spp. which are gram-negative cocci were also identified from the samples.[8] *A. actinomycetemcomitans* was sensitive to tetracycline. Tetracycline is a broad-spectrum antibiotic that is generally bacteriostatic (inhibits bacterial growth).

DISCUSSION

Using the cultural and selective medium (TSBV), our study revealed a low prevalence of *A. actinomycetemcomitans* (4.35%) in a periodontally healthy Malay population. Although the prevalence of *A. actinomycetemcomitans* in general has been extensively studied around the globe, there is still a lack of standards regarding the prevalence of this species as part of the human oral microflora. This species is believed to be associated with a distinct racial bias as well as many potentially virulent factors and virulent mechanisms.

The present study stood in contrast to a study in an ethnic adult Chinese population using polymerase chain reaction (PCR) technique. The study revealed a 78% prevalence of *A. actinomycetemcomitans* in periodontally healthy subjects in this population.[7] A study in Taiwan using the PCR technique, however, showed that the prevalence of *A. actinomycetemcomitans* on the permanent first premolar was only 5.5% in the school children.[9] This observation may suggest that the occurrence of *A. actinomycetemcomitans* may vary among races and countries. In addition, the subjects consisted of a different composition in terms of age and gender, where children were the subjects in the Taiwan study while adults were the subjects in the Chinese study. Nevertheless, the difference in sampling and methods of analysis may have caused variations in the first place, as the levels of sensitivity used were different. A different composition of subjects in terms of age and gender[12] could also have contributed to the variation.

In yet another study,[13] it was reported that in a Chinese population a prevalence of 13% for *A. actinomycetemcomitans* was obtained using conventional culture method. However, using checkerboard DNA-DNA hybridization[14] method, a prevalence of *A. actinomycetemcomitans* of 83.17% for the same Chinese population was reported. These two contrasting results clearly demonstrate the effect that different techniques can have on the outcome of a research.

In general, among the different methods for analysis including culture, DNA probing, PCR and ELISA, PCR has been proven to be highly sensitive, specific and efficient compared to the others.[21] For a large-scale study, PCR is the best method to be used. Furthermore, it can detect specific microorganisms. However, PCR may not be ideal for clinical monitoring of treatment outcomes and disease activity as it has no ability in differentiating serotypes and antibiotic sensitivity.

The enzyme-linked immunosorbent assay (ELISA) utilizing pathogen-specific monoclonal antibodies was also highly specific for all the concerned organisms tested as in a study that showed a comparatively high prevalence of 22.8% of *A. actinomycetemcomitans*.[10] The ELISA technique is

a modification of the immunofluorescent test in which the fluorescent dye tagged to the antibody is replaced by an enzyme. The organism binds to the antibody and the tagged enzyme, and the amount of bound enzyme can be demonstrated by reaction with the enzyme substrate. This technique however needs a large amount of viable microorganisms to be tested.

Cultural methods that have been used in the present study were conventionally popular but proved to be time-consuming and demanding. Culture data on larger populations are rare. Two studies using culture on selective medium, revealed 13% and 28% prevalence rates of *A. actinomycetemcomitans* in Chinese populations and adult Kenyan populations from small subject samples, respectively.[13,23]

Meanwhile, a recent report on the same Chinese population as previously mentioned, which had used checkerboard DNA-DNA hybridization in a larger sample size, revealed the prevalence rates of 88% and 92.7% for *A. actinomycetemcomitans*.[8,12] However, a methodological paper reporting a direct comparison between culture and checkerboard techniques revealed an underestimation in *A. actinomycetemcomitans* detection using DNA hybridization. The detection level in the checkerboard method is estimated to be 10^3-10^4 cells per sample, while selective media may detect even fewer than 100 cells per sample.[20] Ironically, TSBV agar also favors extensive growth of other bacterial species such as Neisseria spp.[8,24] that may render the identification of *A. actinomycetemcomitans* impossible. A comparison of all the studies performed by various researchers has been summarized in Table 2.

Table 2: Summary of the prevalence of *A. actinomycetemcomitans* of various studies and methods

Study	Method	Sample	Prevalence (%)
Tan *et al*., (2001)[6]	PCR	Periodontally unhealthy	69.0
Tan *et al*., (2001)[6]	PCR	Periodontally healthy	78.0
Yuan *et al*., (2001)[8]	PCR	Taiwanese school	5.5
Hamlet *et al*., (2001)[9]	ELISA	Australian	22.8
Timmermen *et al*., (2001)[10]	Immunofluorescence assay	Indonesian	40.0
Papapanou *et al*., (1997)[13]	Checkerboard DNA-DNA hybridization	Chinese, Thailand	83.17
Dahlén *et al*., (2002)[7]	DNA hybridization Checkerboard DNA-	Chinese, Thailand	88.0
Papapanou *et al*., (2002)[11]	DNA hybridization Checkerboard DNA-	Chinese, Thailand	92.7
Dahlén *et al*., (1995)[12]	Conventional culture	Chinese	13.0
Dahlén *et al*., (1989)[16]	Conventional culture	Kenyan adult	28.0

CONCLUSION

The low prevalence of *A. actinomycetemcomitans* (4.35%) in this study suggested that it may not be part of the normal constituent of human oral microflora among healthy Malays. Future studies could be performed on the same subjects employing more sensitive methods. Ideally however, a further prospective longitudinal study should be carried out on the positive subjects to ascertain the presence of periodontal disease progression.

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Radiographic Considerations in Endodontics

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ABSTRACT

Quality radiographs of diagnostic value are important in root canal treatment. The dentist who has knowledge and skills in the use of radiographs for diagnostic purposes has a professional responsibility to ensure that the radiographs are obtained with minimum risk of radiation dose to and for the benefit of the patient. This article reviews the effectiveness of radiography techniques required for successful root canal treatment with the patient's interest in mind. Awareness of effectual radiographic techniques, their constraints and applicable techniques for improvements are discussed. It seeks to reduce potentially harmful ionising radiation dose to patients and optimise the use of X-rays to produce diagnostic radiographs during root canal treatment.

Key words:
radiography, endodontics

INTRODUCTION

As people are getting aware and conscious of their appearance, the importance of teeth could not be more emphasised. Changes in diet and sugars intake together with improved education, knowledge and attitudes towards oral health have encouraged individuals to keep their teeth for as long as possible. Consequently, teeth with deep caries and non-vital pulp are more often than not being saved. This has become possible with the advent of endodontic treatment.

Successful root canal treatment (RCT) depends on several factors. Apart from knowledge and skills, the ability to obtain accurate radiographs is crucial. Good radiographs serve as the "eye" of the dentist during diagnosis, treatment and recall. As the number of RCTs being carried out by dentists increased considerably over past decades, the implication of ionising x-ray exposure to patients and dentists could not be ignored. From 1975 to 1990, the number of root canal treatment performed each year by NHS practitioners in England and Wales has risen from 5.4×10^5 to 1.2×10^6, an increase of over 100%.[1] There is no such record involving Malaysian dentists. However, current trend suggests that similar pattern may exist. As multiple radiographs are often implicated, the ability to take radiographs of high diagnostic value, at the first attempt, during various stages of treatment is important. With this in mind, the aim of this article is to update dentists on the effectiveness of the current widely employed radiography system with regards to endodontic treatment.

Recognition of the harmful effects of radiation and the risks involved led the International Commission on Radiological Protection (ICRP) to establish guidelines for limitations on the amount of radiation received by both dentists and the public.[2] The three important principles include a) *Justification* – no radiograph should be taken unless it is absolutely necessary and introduces net benefit to the patient; b) *Optimisation* – exposure dose should be kept as low as reasonably achievable (ALARA principle) to coincide with high image quality, taking economic and social factors into account; and c) *Limitation* – the dose equivalent to individuals shall not exceed the limits recommended by the ICRP. Dentists must become familiar with the magnitude of radiation exposure, its possible risk and methods used to affect exposure and reduce dose.

Prior to endodontic treatment, thorough examination of the mouth and teeth is recommended. History of trauma and discolouration of tooth should be noted. Dentists should be familiar with signs and symptoms arising from deep caries, fractured tooth, and pulpal inflammation. The presence of vital pulp should be checked, as radiograph alone may not disclose pathological signs especially in the early stage.

STEPS TO REDUCE RADIATION EXPOSURE

When taking radiograph, other parts of the body must be protected, except the teeth. Significant dose reduction can be further achieved by simple measures including:

a) *Careful patient selection (selection criteria)* – a decision has been made on a patient upon thorough examination that taking radiographs are necessary;[3]
b) *Use of high-speed films* – E speed film is almost twice as fast (sensitive) as D-speed film, whereas F-speed film requires about 75% the exposure of E-speed film and only about 40% that of D-speed. In practice, this means patients are exposed to radiation for only 0.2 second for E-speed film and 0.15 second for F-speed film without compromising image quality;[3]
c) *Field size trimming, long cone and collimation* – field size of radiation is constrained by collimation of the beam. Employing a rectangular collimation (which closely matched the film size 30mm x 40mm) can result in reducing 60% of x-ray dose. Use of long cone (at least 200mm) increases the distance between the radiation source and the skin, therefore deducting the size of the X-ray beam. This results in a smaller volume of tissue irradiated[4] and a more accurate image;[5]
d) *X-ray filtration* – absorbs low-energy photons whose penetrating power is limited and contributing nothing to film image, but which will be absorbed by the patient. Its use results in reduced exposure with no loss of radiological information;[4]
e) *Use of leaded aprons and collars* – protect vital organs such as thyroids, gonads and foetus against scattered radiation.[3]

RADIOGRAPHS IN STAGES OF ENDODONTICS

In this article, the various radiographs taken in different stages of RCT will be discussed under the following headings:

- *preoperative stage*
- *working length stage*
- *trial master Gutta-Percha stage*
- *obturation stage*
- *recall stage*

(A) Preoperative Stage

Accurate periapical radiograph is essential to aid diagnosis and inform dentists on the presence, extent and severity of periapical pathology. The projection of choice at this stage is the paralleling technique (Figure 1) over bisecting-angle technique (Figure 2). Although both techniques can provide similar diagnostic results when correctly adjusted,[5,6] there were more studies documenting on the effectiveness and superior diagnostic quality of periapical radiographs taken using the paralleling technique.[7,8,9] For best results, film holders and beam-aiming devices such as Rinn XCP should be used (Figure 3).[5,10] However, despite the evidence, variation exists between countries. In New Zealand, dentists favour both techniques equally for periapical view.[11] A survey involving 800 general dental practitioners in the UK and Wales showed 70% of dentists favoured bisecting-angle technique over paralleling technique for general periapical view. However, only over 20% use this technique for endodontic purposes.[12] In Turkey, a majority of dentists favoured bisecting-angle technique for almost all periapical radiographs.[13] In Malaysia, less than 30% of dentists in Kuala Lumpur and Selangor favoured bisecting angle technique. However, there was no conclusive data to indicate whether the rest favoured paralleling technique or others.[14]

The advantage of paralleling technique over bisecting-angle technique is attributed to its ability to produce a geometrically accurate image corresponding well to the true length of the tooth with minimal distortion.[1,5] This is important for several reasons. By obtaining accurate radiographic image, a dentist can make accurate periapical assessment of the tooth. As the technique is highly reproducible, it allows comparison with subsequent films possible. It is less likely than bisecting-angle technique to project superimposed image of bony structures down the apices especially in upper molar areas. For example, tthe image of zygomatic buttress is often superimposed with periapical anatomy when using bisecting-angle technique.[1] Also, the relative position of the film packet, teeth and x-ray beam are always maintained, irrespective of the head's position. This is helpful in patients with disabilities. The disadvantage of paralleling technique is technically borne. As films need to be placed parallel to the long axis of the tooth, its position in the maxilla is often at the height of the palatal vault in the midline. In the mandible, the film is often used to displace the tongue towards the midline. As a result, a patient with shallow palate or with relatively rigid tongue may not be able to cope without pain and discomfort.[15] Those with sensitive palate may retch, primarily when projecting posterior teeth. Edentulous patients with low palatal height and lingual sulcus depth would find this technique distressful.[10]

There are simple ways to overcome these problems such as by holding the film with a conventional pair of artery forceps or haemostat instead of film holders. When using haemostat, vertical angulation is achieved by aligning the long axis of cone with the end of the haemostat handle. The horizontal angulation is set at right angle to the long axis of the haemostat handle. Mesial and distal angulations could then be adjusted for parallax purposes. This will not only allow viewing of all canals in multi-rooted teeth but also help 'open up' narrow canals (Figure 4).[16] Other film holders may also be used such as Emmenix® and Worth film holder.[17] However care must be taken as the x-ray is now without beam-aiming device.

To be of diagnostic quality, a periapical radiograph should include the whole length of the tooth incorporating 3mm of periapical tissue.[1] For single-rooted tooth, one

Figure 1: Paralleling technique illustrates the parallelism between the long axis of the tooth and the film. The central ray is directed perpendicular to each.

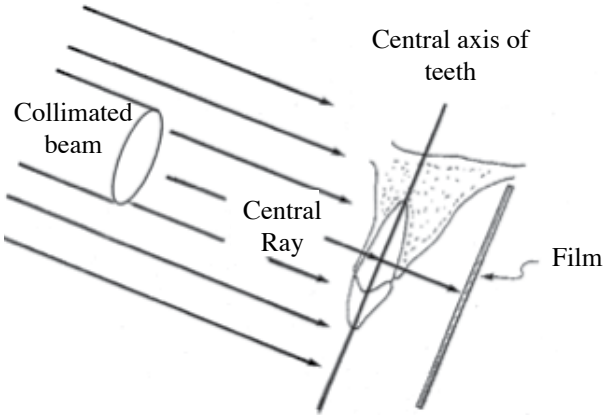


Figure 2: Bisecting-angle technique shows the central ray directed at a right angle to the plane that bisects the angle between the long axis of the tooth and the film.

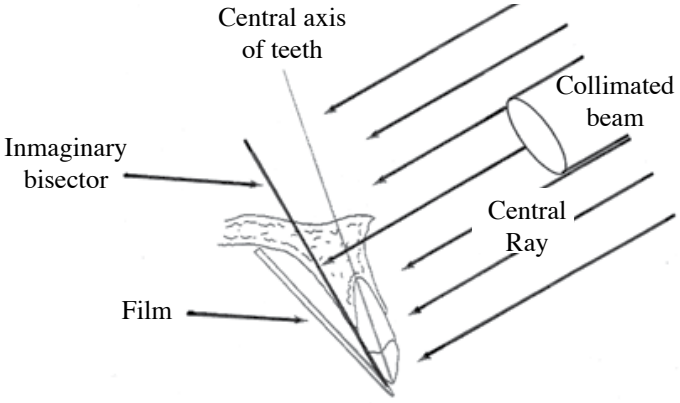
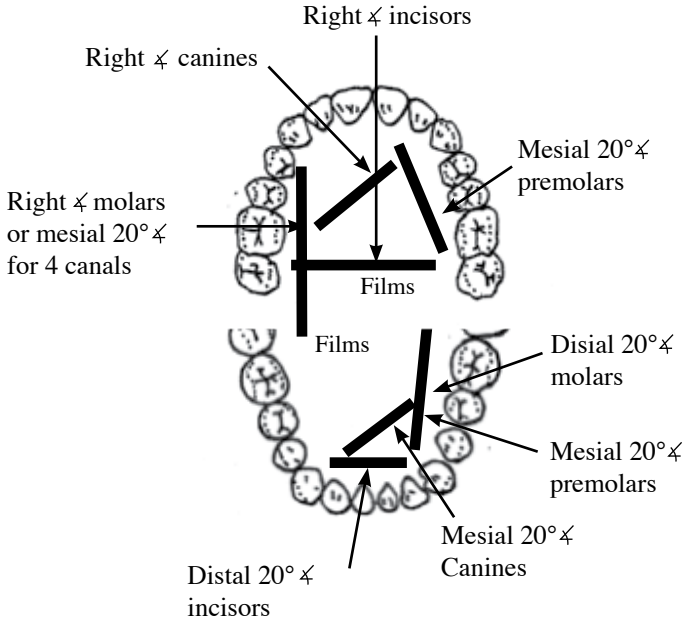


Figure 3: Rinn XCP Instruments for anterior teeth (left) and posterior teeth (right).

Figure 4: Correct film-cone placement on (a) the maxilla, and (b) the mandible when using haemostat. Note: the mesial projection is indicated for maxillary and mandibular premolars, mandibular canines and maxillary molars with mesiolingual canal. The distal projection is used for mandibular incisors and molars. In mandibular molars the distal angle effectively 'opens up' the mesial root due to the relative positions of the canals.

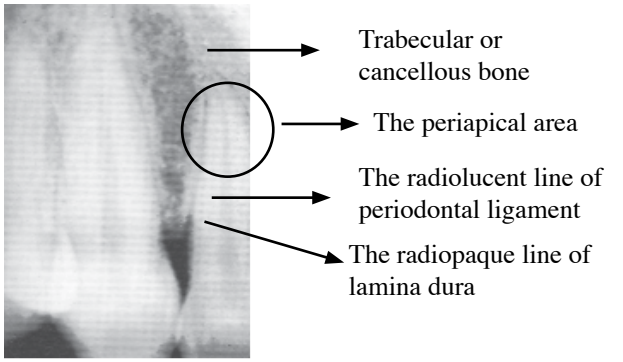


radiograph is usually sufficient. In multi-rooted teeth, the problem of superimposed roots can be solved by performing parallax technique where the x-ray tube is shifted slightly horizontally or vertically for the second radiograph.[17] Pre-operative radiograph is also useful to assess other factors that would influence the success of RCT such as the anatomy of pulp chamber including its size and presence of pulp stones and the root morphology including the number, width, size and shape of canals, presence or absence of root fracture and evidence of internal or external resorptions. It also allows an early estimate of root length prior to pulp extirpation.

Generally, dentists concur that intraoral radiographs are usually adequate to confirm clinical findings. However, there are times where other types of projection are necessary especially if the lesion is extensive. In dental abscess or acute exacerbation of chronic periapical periodontitis, a dental panoramic radiograph is sometimes required to assess the extent of bony destruction that is too large to be demonstrated on intraoral films.[18] However, under normal circumstances and as far as RCT is concerned, a dentist should not consider dental panoramic radiographs as an alternative to intraoral projections.

When viewing radiograph, care must be taken as periapical appearance on the radiograph may vary from one person to another, between different teeth and at different stages of disease. However, three most important features to observe are (Figure 5):-

Figure 5: Periapical radiograph showing the normal radiographic anatomy of periapical tissues.

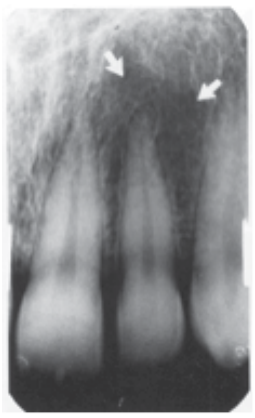


1. The radiolucent line representing the periodontal ligament space. It forms a thin continuous black line around the root outline. In the early stage of *acute pulpitis*, no changes are visibly evident until after several days to a week later when the infection spreads apically. When this happens, the radiolucent line would become wider and more noticeable (as seen in *acute apical periodontitis*). In severe chronic state, the radiolucent area may appear better defined, often surrounded by dense sclerotic bone (as seen in *periapical granuloma or radicular cyst*).[17] These changes should ideally be supported by clinical findings, as the appearance of the radiolucent line may also be physiological, for example, in people with heavy occlusion.[4]
2. The radiopaque line that represents the lamina dura: loss of continuity is often associated with acute periapical infection that may lead to abscess formation (as seen in *periapical abscess*).
3. The trabecular pattern and density of the surrounding bone: mandible and maxilla have different trabecular pattern with the former being relatively thicker and closely arranged together.[17] Area of periapical radiolucency involving bony trabeculae usually indicates active inflammatory process whose severity depends on fine balance between microorganisms' destructive activity and host's defence systems.[4] Therefore, it is important to differentiate between local trabecular variations and true pathology. There will always be cases that are difficult to interpret, but these can be resolved using clinical findings, and if necessary, a second radiograph with a different cone angulation.

Dentists must also bear in mind that periapical radiographs are subjected to anatomical shadows superimposed on the apical tissues, and they can either be radiolucent or radiopaque, depending on the structures involved. Although confusing at times, it is worth mentioning so as not to mistake a normal area of apical radiolucency for a pathological lesion:-

i. Radiolucent shadows–examples include superimposition of the maxillary sinus including sinus recess, the nasopalatine foramen and the mental foramina.[1] These intrabony cavities reduce total bone density and amplify the radiolucent effect of periodontal ligament. The radiolucent line may appear more widened, but will still be continuous and well demarcated at all times.[17] Such appearance could also be found at the lateral fossa between upper lateral incisor and canine. The region shows a diffuse radiolucency, which is formed by a depression in the maxilla (Figure 6). Similarly, the opposite is true for radiopaque line of the lamina dura. It becomes less obvious and in some, indiscernible.

Figure 6: The lateral (incisive) fossa is a diffuse radiolucency (arrows) in the region of the apex of the lateral incisor. It is formed by a depression in the maxilla at this region.



ii. *Radiopaque shadows*–examples include superimposition of the mylohyoid ridge, the body of the zygoma and areas of sclerotic bone such as *dense bone islands*.[19] Such radiopacities can complicate interpretation by obscuring the detailed shadows of the apical tissues.

As a summary, accurate radiographic interpretation requires not only a thorough knowledge of normal anatomy but also knowledge on the possible sequelae of pulpal necrosis. Although pulpal necrosis often results in periapical radiolucencies, the radiographic appearance actually reflects non-specific increase in bone resorption compared with deposition. However, caution must be expressed, as there are other conditions such as benign or malignant tumours that could take comparable resemblance to such lesion. Examples include osteosarcoma[20] and Langerhans cell disease.[21] Fortunately, these are uncommon. Nevertheless, keep an open mind when examining a radiograph and don't be afraid to reconsider diagnosis in the presence of further clinical findings. If in doubt, refer the patient for second opinion.

(B) Working Length Stage

The objective of determining the working length is to enable the root canal to be prepared as close to the cemento-dentinal junction as possible, or if this cannot be achieved to reach as far as a small instrument e.g. K-file size 06 or 08 could reach.[22] Ideally, the file should be equipped with a length indicator and is inserted 0.5-1 mm short of the working length estimated on the preoperative radiograph. For visual clarity, it should be of sufficient size e.g. size 15 or 20, so that its tip can be clearly identified on the film. Use of smaller file sizes can be erroneous, as it may not extend to the fullest extent of a radiologically visible canal.[23] Dentists who use digital intraoral x-ray system may encounter a similar problem where using file sizes smaller than 15 would not produce a discernable image.[24]

Ideal projection should reveal accurate position of the file in relation to the root apex. The bisecting-angle technique can produce good results but rely heavily on the skill and experience of the dentist in terms of placing the film and estimating the angles. Generally, this can be done by either asking the patient to support the film with an index finger or thumb, or by using film holders with fixed bisecting angle e.g. The Rinn instruments. Supporting the film with fingers is relatively quick and tolerable. However, care must be taken, as this method is not without flaws. Pressing the film hard against the mucosa will risk bending it, which results in elongated image on the film. Also, the film may slip away without notice. More importantly, the patient's forefinger or thumb is exposed to unnecessarily radiation hazard. As for the dentists, they have to estimate the vertical and horizontal angulations of the x-ray beam, which in practice is arbitrary and may lead to errors.[10] For example, if the x-ray beam is directed at an angle that is too large than perpendicular to the bisector (over-angulation), the image will be foreshortened. It makes interpretation difficult especially if the rubber dam clamp obscures the area of interest. Likewise, if it is inclined less than perpendicular to the bisector (under-angulation), the image will elongate and results in the apical area projected off the edge of the film. Both errors mask the true position of an endodontic instrument in relation to the root apex.[25] As a result, any decision to adjust the working length may run the risk of perforating the apex especially if this is done by inexperienced dentists.

To alleviate the problems, use of film holders are highly recommended.[20,26] It is also less likely for the x-ray beam to miss part of the film and result in partial image *(cone out)*.[9] However, caution is needed when projecting upper molar regions as some distortion may occur due to the different angulations of the palatal and buccal roots to the long axis of the tooth. This is because, as the x-ray tube is aligned to the plane that bisects the long axis of the tooth and the film, it is impossible to position it accurately for both roots. Subsequently, this may result in elongation of the palatal canal and shortening of the buccal canal. Fortunately, in practice the discrepancy is usually minor. On the other hand, the paralleling technique should give a more accurate and reliable result, as "working length" is more reproducible with this technique.[27] The presence of endodontic instruments, rubber dam and rubber dam clamp can be overcome by using a dedicated endodontic film holder e.g. Rinn Endoray. It accommodates the handles of endodontic files and the positioning of the holder using the clamp as guidance. The film packet holder allows parallel placement of the film with the tooth axis (Figure 7). In areas where its use may be difficult e.g. in upper maxillary anterior teeth with shallow palate, a tongue spatula or a pair of artery forceps may again be considered. Alternatively, the working length may also be determined by using an apex locator (Figure 8).

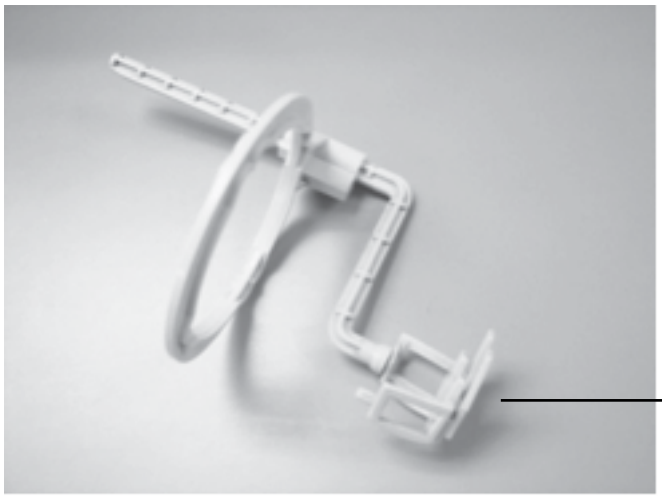
(C) Trial Master Gutta-Percha Stage

It is advisable that prior to obturation, the root canal preparation is verified by taking a radiograph with a root canal instrument e.g. obturation cones such as *gutta percha*, inserted to the full working length. This is essential to assess and confirm its position prior to cementation lest it extrudes the apical constricture. The size of the trial cone is usually similar to the master file. In the projection, the end point of this cone and the apex should be visible. As a general rule, the cone should not lie further than 1mm from the working length and follow the course of the original canal. This can be accurately verified by using the paralleling technique.[27]

(D) Obturation Stage

Obturation should be undertaken after completion of root canal preparation and when the infection is considered to have been eliminated. The objectives are to prevent the passage of microorganisms and fluid along the root canal system and to fill the whole canal, not only to

Figure 7: (i) Rinn Endoray® is designed specifically for endodontic radiography with film packet holder and beam aiming device. It fits over files, clamps, and rubber dams without touching the subject tooth (ii) Its placement in the mouth (Adapted from Nixon and Robinson, 1997).



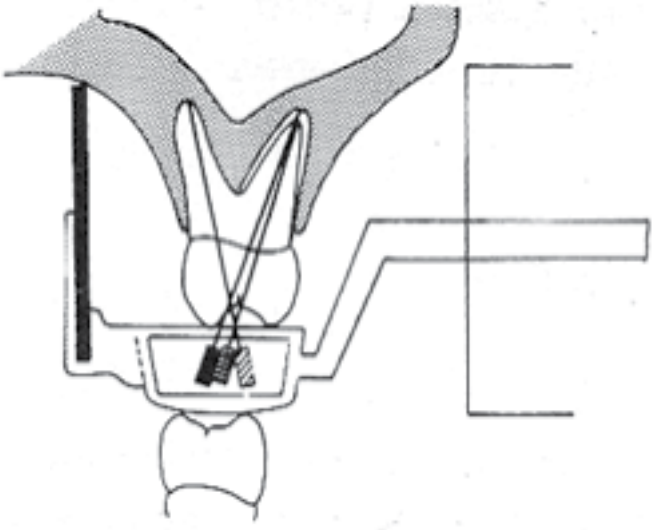


Figure 8. RootZX® Apex Locator is reliable in determining working length prior to taking radiograph.

block portals of exit to the periapex but also the dentinal tubules and accessory canals.[22] Ideally, a three-dimensional view of the root anatomy is required to assess the quality of condensation process and to confirm the above objectives have been fully met. However, a periapical projection by conventional X-ray machines is normally sufficed. As for the dentist, the importance of this film extends beyond the scope of treatment to include medico-legal grounds. It also serves as a baseline image against which later films can be compared. As a result, it is imperative that a good quality film is taken, processed and checked before the patient leaves the surgery. Ideally, this is done using a standardised procedure and the paralleling technique is preferable as it comes closest at achieving this.

(E) Recall Stage

There are various studies reviewing the peak incidence of healing and the peak incidence of emerging in chronic apical periodontitis. It was clearly documented that endodontically treated teeth present a high proportion signs of healing (89%) at one year after treatment.[28] Consequent to that evidence, a one-year follow-up radiography may be adequate for small symptomatic apical lesions. However, additional radiographs should be considered for teeth with large periapical lesions. With proper implementation, both techniques can be used although paralleling technique is preferred due to its consistency.

CONCLUSION

Dental radiography involves effective doses of only a few microsieverts. It is generally accepted that these doses are small, and therefore carry very low risk. However, in radiological protection, the cumulative risk remains an important issue. Therefore, it is prudent practice for a dentist to have adequate knowledge in dental radiography to prevent the unnecessary taking of radiographs or taking them repeatedly.

Recently, a hypothesis suggests that low doses of radiation stimulates beneficial changes known as Adaptive Response whose net benefit (usually involving DNA repair process) is called Hormesis. However, radiobiologists reiterate not to overlook its detrimental effect such as formation of simple DNA lesions, fragmentation of double strand DNAs and other complex lesions whose effects result in radiation-induced malignancies.[29,30]

Currently, no international or national organisations place any restriction on the levels of exposure used in diagnostic radiology. It only requires that they be justified and reasonable steps are taken to keep exposures as low as possible without compromising diagnostic efficacy. As dental exposures are believed to cause life time risk of cancer per exposure to be less than 1 in a million, caution must be expressed as risks are dependent markedly on age, sex and most importantly if the person is genetically predisposed to cancer.[29]

In view of this, radiation risks are reviewed continuously by international and national organisations such as the International Commission on Radiological Protection (ICRP), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the UK's Radiation Protection Division of the Health Protection Agency (Formerly the National Radiological Protection Board, NRPB) and the National Council on Radiological Protection and Measurement (NCRPM) in the USA.[30] In Malaysia, the Atomic Energy Licensing Act 1984 (Act 304) regulates the use of radioactive material, nuclear material, prescribed substance or irradiating apparatus for diagnostic or therapeutic purposes.[31] A licence is issued annually to registered medical practitioners, registered veterinary surgeons, radiologists, radiotherapists and registered dentists.

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MALAYSIAN DENTAL JOURNAL

The Occurrence of Patients Presenting with Broken/Lost Removable Appliances

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ABSTRACT

An audit of broken/lost removable appliances was carried out. This study aimed to measure the occurrence of broken/lost appliances over a period of 6 months. It also assessed whether there was any difference in the occurrence rate between patients who paid for treatment and those who received it free of charge. The results indicated that the total number of broken/lost removable appliances was 183, from a total of 472 appliances issued. For paying patients, 59 of 177 patients had at least one broken/lost appliance, giving an occurrence rate of 33.3%. For non-paying patients, 60 of 112 patients had at least one broken/lost appliance, giving an occurrence rate of 53.6%.

Key words:
Orthodontics, orthodontic appliances, removable

INTRODUCTION

Removable appliances have been used since the advent of modern orthodontics in the early 20th century. Development and use of these appliances was more extensive in Europe for both philosophical and economic reasons.[1]

The main difference between removable appliances as opposed to fixed appliances is that, they can be removed from the mouth. This is advantageous as this facilitates appliance cleaning as well as oral hygeine care. They can also be taken out for socially sensitive occasions and eating if necessary.

The disadvantages of removable appliances also stem from the fact that they can be removed by the patient. Hence, treatment success is even more dependent on patient compliance in wearing the appliance. According to one study, variables associated with compliance include the family background, parental support/ supervision, duration of treatment and dominance of provider.[2] Another problem is the inability of these appliances to effect precise tooth movements, as these movements are limited to tipping only.

As such, contemporary orthodontic removable appliances are used in three main areas:

- As active appliances to correct simple malocclusions.[3]
- In attempting growth modification using functional appliances,[4] for example the "Twin-Block".[5]
- In retention after the active phase of treatment, with retainers of various designs.[6]

Common appliance breakages include fracturing of the wires and baseplates connecting these wires. Broken or lost removable appliances may cause potential problems to the patient. This may be in the form of increased length of treatment and lost time/income from work, due to the need to attend at the orthodontic clinic for repair/replacement and potential relapse due to insufficient retainer wear. A study, albeit with fixed appliances, showed that the number of broken appointments and appliance repairs explained 46% of the variability of treatment duration and 24% of the variability of treatment effectiveness.[7] The service is also inconvenienced, as it increases the workload of the employees, and also incurs added costs to repair/replace the appliances.

In government orthodontic clinics, certain patients are exempted from paying for their orthodontic treatment, usually as a consequence of their employment status, whilst other patients have to pay a treatment fee.[8] It was perceived that patients, who do not pay for treatment, have a higher occurrence of broken braces, including removable appliances. A literature search has not identified any published local research in this particular area.

It was therefore proposed to audit the occurrence of this problem in the Orthodontic Unit of Klinik Pergigian Cahaya Suria, Kuala Lumpur.

Study aims

This audit aimed to evaluate:

1. The occurrence of broken/lost removable appliances over a study period of 6 months.
2. The difference in occurrence rate of broken/lost removable appliances of patients who did not pay and patients who paid a treatment fee.

Definitions and Outcome Measures

Removable appliances are defined as *all appliances that can be removed by the patient*. This includes active appliances, functional appliances and retainers.

Number of occurrences of broken or lost removable appliances is defined *as the total number of breakages/ losses occurring for any patient wearing removable appliances*.

Occurrence rate of broken or lost removable appliances is defined *as a/b x 100%* where a and b are defined as:

a. The number of patients experiencing breakages/ loss of their removable appliance during the study period.

b. The total number of patients issued with removable appliances during the study period.

MATERIALS AND METHODS

This was a retrospective study done at the Orthodontic Unit of Klinik Pergigian Cahaya Suria, Kuala Lumpur. Subjects for this audit were identified from the records in the unit's PG102 patient register.

Entries in this register listed all patients, who attended the orthodontic clinic, from January to December each year. All patients that attended the clinic, from January to June 2004, to have a removable appliance fitted, adjusted, repaired or replaced were identified. Case notes of all these patients were then traced and reviewed.

Entries in the case notes were used to identify the following variables:

- Patient Gender: Male or Female
- Patient Age: Subjects were classified according to their age, as at January 1st, 2004. The sample was classified into primary school children (<13 years old), secondary school children (13-18 years old) and adults (>18 years old).
- Paying category: The subjects in the sample were categorized according to their payment status, whether they paid for treatment or received treatment for free.
- Type of removable appliance issued: The appliances were categorized as active upper/lower removable appliances (URA/LRA), functional appliances or retainers.

The number of removable appliances issued, and the number of breakages/losses that occurred, during the study period was then counted.

Together with this, the number of breakages/losses of removable appliances and the number of patients presenting with breakages/losses, were categorized according to whether the patient paid for treatment or received treatment for free.

A single examiner examined all the case notes. Descriptive statistics were then applied to the data.

RESULTS

Sample size and gender of subjects

The total sample size was 289.

101 subjects (34.9%) were male and 188 subjects (65.1%) were female.

This is seen in Table 1.

Table 1: Sample size and Gender distribution

Gender	Number	Percentage
Male	101	34.9%
Female	188	65.1%
Total	289	100.0%

Age of subjects

There were 45 subjects (15.6%) aged below 13, 135 subjects (46.7%) aged 13-18 and 109 subjects (37.7%) above the age of 18 in the sample.

This breakdown is summarized in Table 2.

Table 2: Age of subjects as at January 1st, 2004

Age group	Number of subjects	Percentage
<13	45	15.6%
13-18	135	46.7%
>18	109	37.7%
Total	289	100.0%

Subject category

There were 112 subjects (38.8%) who had treatment for free. 177 subjects (61.2%) paid a treatment fee.

This is summarized in Table 3.

Table 3: Subject category according to payment status

Payment category	Number of subjects	Percentage
Non-paying	112	38.8%
Paying	177	61.2%
Total	289	100.0%

Type of removable appliances issued to subjects

In the sample, 108 subjects (37.4%) were given active upper/lower removable appliances (URA/LRA), 41 subjects (14.2%) were given functional appliances and 140 subjects (48.4%) were given retainers.

Table 4 summarizes this categorisation.

Table 4: Type of removable appliance given to subjects

Appliance type	Number of subjects	Percentage
Active URA/LRA	108	37.4%
Functional appliance	41	14.2%
Retainer	140	48.4%
Total	289	100.0%

Number of appliances issued and number of appliance breakages/losses

The number of appliances given to subjects in the sample, according to their payment status, was determined. This is summarized in Table 5.

Table 5: Number of appliances issued to subjects according to category

Subject category (N)	Number of appliances issued					Total issued
	1	2	3	4	5	
Non-paying (112)	54	45	6	5	2	192
Paying (177)	88	79	7	2	1	280
Total (289)	142	248	39	28	15	472

For subjects that had treatment free-of-charge, 54 subjects were given 1 appliance, 45 subjects were given 2 appliances, 6 subjects were given 3 appliances, 5 subjects were given 4 appliances and 2 subjects were given 5 appliances.

For subjects that paid for treatment, 88 subjects were given 1 appliance, 79 subjects were given 2 appliances, 7 subjects were given 3 appliances, 2 subjects were given 4 appliances and 1 subject was given 5 appliances.

The total number of appliances issued in the study period was **472**. **192 (40.7%)** appliances were issued to subjects that had treatment for free and **280 (59.3%)** appliances were issued to subjects that paid for treatment.

The total number of occurrences of broken/lost removable appliances is shown in Table 6. This total was **183**. The number of subjects that had treatment for free accounted for **94 (51.4%)** and subjects that paid for treatment, **89 (48.6%)** of the total number of occurrences.

Number of subjects experiencing broken/lost appliances

The number of subjects in the sample, experiencing broken/lost removable appliances, was also counted. This can also be calculated from Table 6. Common problems included breakage of the wires or baseplates and inadequate fit due to insufficient wear.

Table 6: Number of appliance breakages/losses occurring according to category

Subject category (N)	Number of times breakages/ losses occurring					Total breakages/ loss
	0	1	2	3	4	
Non-paying (112)	52	36	16	6	2	94
Paying (177)	118	38	14	5	2	89
Total (289)	0	74	60	33	16	183

For subjects that had treatment free-of-charge, 52 patients had no breakage/loss of their appliance, 36 patients had 1 breakage/loss of their appliance, 16 patients had 2 breakages/losses, 6 patients had 3 breakages/losses and 2 patients had 4 breakages/losses.

For subjects that paid for treatment, 118 patients had no breakages/losses their appliance, 38 patients had 1 breakage/loss of their appliance, 14 patients had 2 breakages/losses, 5 patients had 3 breakages/losses and 2 patients had 4 breakages/losses.

Therefore, the occurrence rate of broken/lost removable appliances was as follows:

For subjects that had treatment free-of-charge, **60** of **112** patients had at least 1 occurrence of broken/lost appliances, giving an occurrence rate of **53.6%**.

For subjects that paid for treatment, **59** of **177** patients had at least 1 occurrence of broken/lost appliances, giving an occurrence rate of **33.3%**.

DISCUSSION

Study findings

This audit found a high occurrence of breakages/losses with removable appliances which required repair or remake of the appliance.

Although patients given removable appliances were mostly from the paying category, a higher percentage of patients with appliance breakage/loss were from the non-paying category. This finding is also seen when comparing the total number of occurrences of broken/lost appliances to the number of appliances issued. Non-paying patients had a higher percentage of breakage/losses.

Other similar published studies were not found in the literature. Therefore it was not possible to say if this is comparable or different to situations elsewhere.

Possible explanations for breakage/loss of appliance

A possible reason for appliance breakages could be the improper construction of the appliance. Dental Technicians in the public sector are formally trained for a number of years and more recently, further post-basic training, for Orthodontic Technicians specifically, has been introduced. This should be encouraged.

However, improper construction does not explain the discrepancy in the occurrence rate of breakage/loss of appliances between paying patients and non-paying patients. Technicians are blind to the category of patient any particular appliance is for.

A possible explanation could be that non-paying patients are more careless with their appliances, as they know that even if they break/lose them, they do not have to pay for their repair/replacement. There is no fear of any penalty. Fee-paying patients might care more for their appliances, as they know that, should any problems occur, they will have to foot the cost of appliance repair/ replacement. However, this study did not investigate the reasons of breakage/loss of appliances, hence this is only an assumption and perhaps a topic of subsequent research. A multicentre, controlled clinical trial would be the format of choice, to improve the external validity of any such research.

Study design

This was a retrospective audit of all patients having removable appliances fitted, repaired or replaced, over a 6-month period, in a single clinic. There were a few cases where case notes could not be traced and there may have been instances where the attending clinician did not fully note the status of the appliance. These limitations could have resulted in an underestimate of the number of removable appliances issued and problems that occurred with them.

However, the total sample obtained was large. There were no attempts to bias the results, by leaving out patients suitable to have been included in this study. Any omissions, of any patients, were random. Hence, it is felt that the results obtained are a fair reflection of the actual clinical situation.

CONCLUSIONS

The conclusions of this audit, with reference to the study aims, are as follows:

1. The total number of occurrences of broken/lost removable appliances was **183**. Non-paying patients accounted for **94 (51.4%)** and paying patients, **89 (48.6%)** of the total number of occurrences.
2. The occurrence rate of occurrence of broken/lost removable appliances:
   For non-paying patients, **60** of **112** patients had at least 1 occurrence of broken/lost appliances, giving an occurrence rate of **53.6%**. For paying patients, **59** of **177** patients had at least 1 occurrence of broken/lost appliances, giving an occurrence rate of **33.3%**.

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Continuing Professional Development Quiz (CPD Points = 2)

Dear Colleagues,

In this issue of the MDJ, we are experimenting with setting up a column of Continuing Professional Development Quiz whereby you will get two CPD points by just trying out the quizzes. This is a self-administered test and is designed to help colleagues accumulate CPD points. Your feedback is greatly appreciated. The answers to these quizzes are available in the various articles contributed by Asst. Professor Dr. Raju Patil, Dr. Ganasalingam Sockalingam, Dr. Zamros Yuzadi, Dr. Lawrence Tan, Dr. Safar Bunyarit and Dr. Loke Shuet Toh. They were also the contributors of the quizzes.

Thank you.

Assoc. Professor Dr. Ngeow Wei Cheong,
Editor, Malaysian Dental Journal.

1) A dentist should refer a patient to a periodontist when
   A. Refractory periodontal disease occurs
   B. Special treatment needs arises
   C. There is limited skills and knowledge
   D. Issues of ethical and legal obligations arises
   E. All of the above

2) Referring dentist requesting a periodontist to limit the scope of treatment to particular region in the mouth is known as
   A. Prescription periodontics
   B. Instruction periodontics
   C. Subscription periodontics
   D. Distruction periodontics
   E. Discription periodontics

3. Which of the following sites may not present with minor salivary gland mucoceles?
   A. upper lip
   B. Lower lip
   C. Tongue
   D. Palate
   E. Attached gingiva

4. Which of the following do not characterise the clinical behaviour of minor salivary gland mucoceles?
   A. Mucoceles are always self resolving
   B. Mucoceles most commonly occur in the lower lip
   C. Mucoceles have no racial predilection
   D. Mucoceles have no sex predilection
   E. Mucoceles are benign soft tissue lesions

5. What is the main cause of foreshortening in the bisecting angle technique?
   A. Improper placement of the film.
   B. Improper horizontal angulation of the cone.
   C. Vertical angulation of the cone is too small or flat.
   D. Inexperienced dentists.
   E. Vertical angulation of the cone is too large.

6. Which of the followings usually is (are) associated with nonvital pulps of teeth?
   A. Hypercementosis.
   B. Cementoma (periapical cemental dysplasia)
   C. Periapical cyst.
   D. Periapical osteosclerosis.
   E. All of the above.

7. What is NOT a disadvantage of/problem with removable orthodontic appliances, as mentioned in the article?
   A. Limited tooth movement
   B. Breakage of appliance
   C. Oral hygiene
   D. Wear compliance
   E. Loss of appliance

8. Which statement is false? Diagnostic overlay partial denture:
   A. Has the same function as occlusal splint
   B. Is able to provide immediate aesthetic improvement and function
   C. Re-establish the occlusion by replacing missing teeth
   D. Allows the patient to become familiar with new vertical dimension of occlusion (VDO) before delivery of the definitive prostheses
   E. Is indicated for patients with severe tooth wear without loss of vertical dimension of occlusion (VDO).

9. Selective medium for isolation of *Actinobacillus actinomycetemcomitans* from clinical specimen is:
   A. mitis-salivarius-bacitracin agar.
   B. blood agar.
   C. MacConkey agar
   D. trypticase soy broth-bacitracin-vancomycin agar
   E. Sabouraud;s dextrose agar.

10. *Actinobacillus actinomycetemcomitans* is a major causative agent of
   A. dental caries.
   B. localized juvenile periodontitis.
   C. Vincent's angina.
   E. oral thrush.
   E. infective endocarditis.

11. Virulence factors of *Actinobacillus actinomycetemcomitans* is
   A. leucotoxin
   B. leucocidin.
   C. Hyaluronidase.
   D. Exotoxin.
   E. Cytotoxin.

12. Factor that NOT contribute to the prevalence of *Actinobacillus actinomycetemcomitans* among healthy population is:
   A. Gender.
   B. Immunocompromised patients.
   C. Isolation technique.
   D. Age.
   E. Race.

13. The Dental Health Component (DHC) of the Index of Orthodontic Treatment Need (IOTN) grades the need for treatment by assessing various aspects of the occlusion except:-
   A. measuring the contact point displacement of adjacent teeth
   B. measuring severity of spacing between adjacent teeth
   C. identifying the most severe occlusal trait as the DHC Grade
   D. ranking treatment need using a hierarchical scale based on five occlusal traits
   E. ranking overjet increase higher than crowding of teeth

14. All the statements below are true of the IOTN except:-
   A. Treatment need can be based on either the Aesthetic component or Dental Health Component
   B. The Dental Health Component grade is the sum of scores of measurements of the various individual occlusal traits
   C. Class III malocclusions are not included in the Aesthetic component
   D. Can be used in clinical cases or in study casts
   E. Masticatory and speech problems are taken into consideration in the Dental Health Component

ANSWERS:

1. E	2. A	3. E	4. A	5. E	6. C	7. C
8. E	9. D	10. B	11. A	12. B	13. B	14. B

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MALAYSIAN DENTAL JOURNAL

Aim And Scope

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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