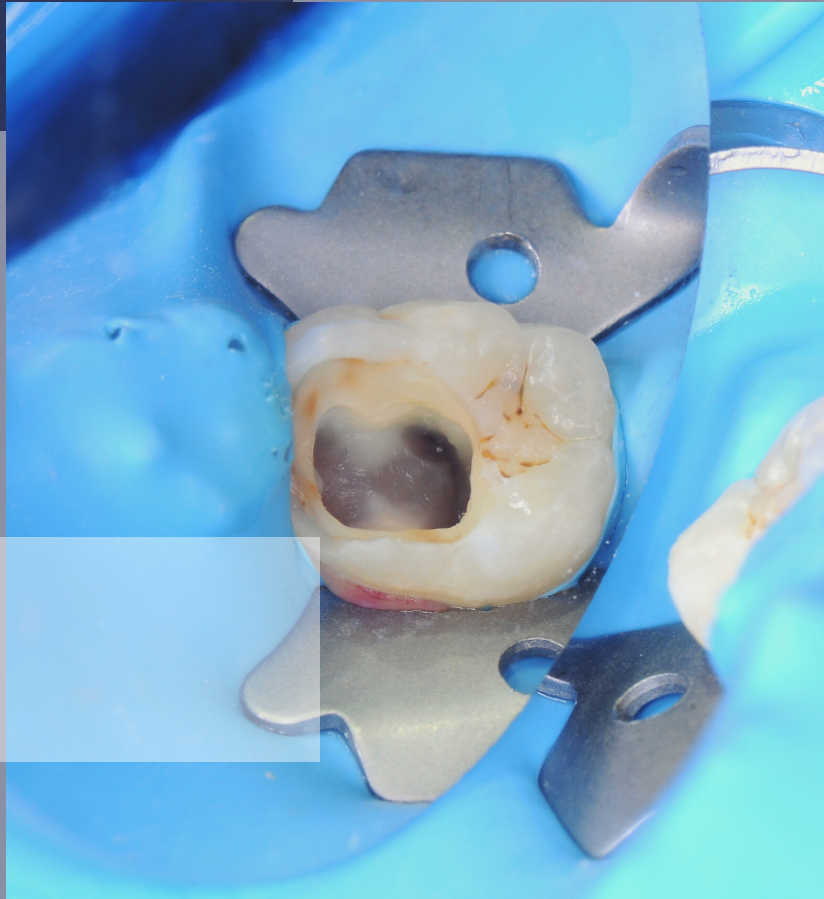


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EDITOR-IN-CHIEF
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Footnote

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MESSAGE FROM MAPD PRESIDENT



Dear colleagues,

First and foremost, I am immensely honoured to pen the foreword to the inaugural issue of Malaysian Journal of Paediatric Dentistry (MJPD). It is indeed a historic episode in the chapter of Malaysian Association of Paediatric Dentistry (MAPD) to finally have an official publication to call our own. No doubt this is a huge step for MAPD in marching forward for the advancement of the paediatric dentistry fraternity, particularly in Malaysia.

This journal will undoubtedly be an important avenue for practitioners of paediatric dentistry to promote the exchange of information, dissemination of knowledge and to keep abreast on all aspects of paediatric dentistry with emphasis on practice, science and research. As this is the maiden issue, the greater part of the submissions were received from local authors but I am certain, in the coming years, the Editorial Board will spare no effort to attract submissions from all over the world.

Science and knowledge has no borders. It is heartening to note that MJPD has embraced this principle and made the journal as an online and open-access journal. Certainly this will ease access to the papers and reach wider readership and reach to share the scientific knowledge and strengthen the evidence-based practice in the field of paediatric dentistry. Additionally this will facilitate submissions for future issues from various parts of the world.

This journal has also taken the bold move by giving the opportunity to young researchers to embark in the world of scientific publications. It is a move in the right direction that these young practitioners and researchers are given the encouragement and opportunity to publish, because indeed they are the future of paediatric dentistry.

Last but not least, I would like to congratulate the distinguished Board of Editors, headed by the Editor-in-Chief Assoc. Prof. Dr Annapurny Venkiteswaran, who had poured their heart and soul to take the MJPD from a mere idea to a reality. It was an arduous journey I am sure, but they have worked extremely hard and what we are seeing is the fruit of their labour. My gratitude too, to the numerous authors for their submission, support and trust to publish in a new journal and taking that first step together with us. Without them, we will not have this historical maiden issue.

As we welcome the New Year 2022, let us welcome the promising new horizon in paediatric dentistry with this inaugural issue of MJPD. And I am certain, it will only be bolder and stronger from this point on.

Dr Juanna Bahadun

President

Malaysian Association of Paediatric Dentistry

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MESSAGE FROM EDITOR-IN-CHIEF



Dear Colleagues,

The dawn of 2022 has brought much hope as we slowly return to some sense of normality after the pandemic. The past two years have been challenging but we did see a ray of light and a silver lining; Paediatric Dentists from all over the world started banding together and organising many online events. I clearly remember how the South Asian Association of Paediatric Dentistry (SAAPD) started the trend of international webinars and we hopped on the bandwagon and have been steering forward steadily since then too.

The idea to have our own publication is not a new one but the spark was lit during the 2021 Annual General Meeting & Scientific Conference. This conference showcased many research projects and case reports which were very interesting. The members felt that it was time that we had our own official publication which we could share with the world. We also aspired to encourage the young officers and students to embark on publication, with a little nudge and help along the way, of course.

I am honoured to be given the opportunity and trust to lead the first ever issue of Malaysian Journal of Paediatric Dentistry. I would not have been able to take this first step without the strong support of the entire editorial committee. A special mention goes out to our President, Dr. Juanna Bahadun, a visionary leader who has the capability to bring out the best in everyone. Our association is also blessed to have past-presidents who are still parenting and guiding us to achieve greater heights. I would also like to take this opportunity to thank all the local and international reviewers who have devoted their time and effort to making this publication a success.

We have a special Guest Editor for this issue, Prof Dr. Noraini Nun Nahar who is not only the first head of Paediatric Dental Service in the Ministry of Health, but also the founding President of Malaysian Association of Paediatric Dentistry. I hope you will enjoy this first volume and do look out for second issue which will be published in July 2022.

Annapurny Venkiteswaran

Editor-In-Chief

Malaysian Association of Paediatric Dentistry

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The Budding Tooth Germ to the Blooming Crown – Paediatric Dentistry in Ministry of Health



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FIRST initiated in the early eighties by the then Dental Division of the Ministry of Health, Paediatric Dentistry has come a long way. It was finally approved and recognised as a speciality by the Ministry of Health Malaysia in 1987. From the initiation stage, it faced challenges that actually propelled it forward to catch up with the two established dental disciplines, passing by the bud, early and late cap, and bell stages straight on to calcification and maturation.

The development of Paediatric Dentistry in Malaysia has undergone many phases. Although the first specialist in the discipline came back in 1986, the infrastructure was not made available and the service only started with the first Paediatric Dental Unit in the Ministry of Health with the opening of the Institute of Paediatrics HKL in 1991. Manned by the first gazetted specialist in the discipline, assisted by a dental surgery assistant with very basic equipment and resources, the 'child' overcame the teething problems, by using survival of the fittest approach. Thankfully our voice was well heard even though we were but a small unit.

A presentation was then made to the Ministry of Health for the Paediatric Dental Service to be a separate entity in 1996 especially with regards to finance and line of responsibility. Although the proposal was accepted, its implementation was postponed due to financial constraints. However, we never gave up and continued to carry on with whatever we had in hope of a brighter future for the specialty.

Since 1986, I was the sole representative of Paediatric Dentistry who attended meetings of the already established Oral Surgery discipline, together the pioneer of Oral Pathology, and henceforth the baby learned the tricks of the trade to be relevant and be an integral part of the Oral Healthcare System. I was fortunate to be joined by three specialists returning from training in United Kingdom eight years later. The team was slowly expanding and their postings in Johor Bharu (southern region), Ipoh (northern region) and Kuala Terengganu (east coast region) helped to establish paediatric dental service around the country.

In the meantime, from its existence as an autonomous unit under the then Dental Department Hospital Kuala Lumpur, rapid development of the Paediatric Dental Unit grew rapidly to the point that it was recognised as an independent clinical department in HKL in July 2003. The Head of the Department was also appointed to be in the management committee at the

Division, the Mesyuarat Jawatankuasa Dasar dan Pengurusan Kesihatan Pergigian, as well as the Jawatankuasa Kualiti. With this involvement, the platform was set to have our voice heard so that resource including manpower training can be streamlined effectively at the central level.

Henceforth, in tandem with the development of the country's Paediatric Healthcare, more scholarships were obtained to train young dental officers to specialize in Paediatric Dentistry locally and abroad. International networking and capacity building were the agenda of the day. The formation of the Malaysian Association of Paediatric Dentistry in 2007 boosted this opportunity when, with an empty coffer, we accepted the challenge to host the 6th Pediatric Dentistry Association of Asia (PDAA) Conference in 2008. With the inquisitive mind of a child without preconceived inhibitions, we came out triumphed and became the model for others.

Since then, the discipline has managed to get a steady number of scholarships from the Ministry of Health and Public Service Department. It is worth mentioning that in the year 2000, we received an offer of 6 scholarships and with our networking, The Eastman Dental Institute of the University College London, convened a special meeting to offer 7 places to our young dental surgeons to undertake the postgraduate training in Paediatric Dentistry the following year, subject to our candidates fulfilling the stipulated criteria for the programme. Apart from the UK, we have also sent our candidates to Hong Kong for their postgraduate education in this discipline.

In the meantime, financial aid and sponsorship were also obtained for our

specialists and teams to attend international conferences and clinical attachment for areas of special interest.

As for the Paediatric Dental Department HKL, with the vision to be the Centre of Excellence for Paediatric Dental Service in the region, it strove to be just that. Since 2004, the department had been awarded with various prizes and awards, among which are the Anugerah Professional CPD-Kehadiran Jabatan Terbaik for the year 2004 and 2005, Johan Anugerah Kualiti Pengarah for 2006, 2007 and 2013, Johan Departmental Specific Approach and Jabatan Terbaik Pemeriksaan Aset Alih Kerajaan, both for the year 2012.

A relatively small department compared to most other departments in HKL, this tooth germ has developed by leaps and bounds. From a humble beginning of a 3-member Unit in 1991, by the time I retired in 2015, the department had staff strength of 42, including 4 specialist posts.

Apart from being a tertiary referral centre for the dental management of children aged 16 years and below, the department also served as a training centre for post-graduate students, newly appointed dental officers, post-basic dental nurses and trainee dental surgery assistants. The department was and is still very actively involved in the multidisciplinary management of children with dento-facial anomalies and syndromes.

The department, now situated in the new Women and Children Hospital, Hospital Tuanku Azizah, under the leadership of my immediate successor Dr S Ganasalingam, and the current National Head of Service, Dr Bahrudin Saripudin, it continues to progress at both the hospital and national

levels in tandem with HKL as the country's premier hospital.

It continues to be the centre of excellence for paediatric dental service in the country, providing comprehensive oral health service system that is affordable, technologically-appropriate and patient-centred. The services

provided and the outcome are at par with other countries, developed or otherwise.

It has truly been an exciting journey watching the Paediatric Dental speciality bloom from its inception to the majestic crown it is today. May it continue to blossom and shine its ray of light on our young patients.



Figure 1: The Paediatric Dental Department, Hospital Tuanku Azizah, Kuala Lumpur (circa 2019)

Clinical Assessment of Retention in Hydrophobic and Hydrophilic Pit and Fissure Sealants

Vanishree H Shivakumar, Anand S Tegginamani, Prashant Choudhary, Rohmat Nursin, Donni Sonjaya

ABSTRACT

Introduction: Pit and fissure sealants are one of the most effective preventive dentistry measures. They have been demonstrated to be particularly efficient in preventing caries by blocking pits and fissures. The sealant effectiveness is mainly associated with their retention in the tooth surface.

Objective: To compare & assess the retention between hydrophobic and hydrophilic fissure sealants placed on permanent first molars.

Method: A total of 100 newly erupted upper & lower permanent first molars from 25 children were considered for the study. Teeth were separated into two equal groups. Group A with 50 right upper and lower permanent first molar teeth were sealed with for Conseal f sealant (SDI, Australia), and Group B with 50 left upper and lower permanent first molar teeth were sealed with Embrace Wet Bond (Pulpdent, USA) sealant. Clinical evaluation was carried out for all the teeth at the different time intervals of 3, 6 & 9 months.

Results: At the end of 9 months, out of 50 teeth in group A, 39 teeth showed complete retention compared to 45 teeth in group B. Partial loss of sealant was seen with 5 teeth in group A compared to 2 teeth in group B. Whereas only 3 teeth of group B showed missing sealant when compared to 6 teeth in group A.

Conclusion: Embrace Wet Bond sealant exhibited superior retention than Conseal f sealant when applied on both maxillary & mandibular first permanent molars over 9 months.

Keywords: *Embrace Wet Bond, permanent molars, pit & fissure sealants, retention*

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INTRODUCTION

Dental caries is the most frequent and widespread oral health condition in the world. It usually occurs in the first permanent molars in children, followed by the second molars.¹

Dental hygiene is more difficult because of its unique morphology, resulting in higher plaque formation. Occlusal pits and fissures encourage the accumulation of food debris and pathogens, which promotes decay. These teeth present a substantial treatment

challenge since they have a higher caries prevalence soon after erupting into the oral cavity.^{2,3}

In the material world of dental caries, newer technology and approaches have switched the focus from disease treatment to disease prevention. Various preventive interventions have been tried to protect the occlusal surfaces against dental caries such as fluoride application and plaque control approaches with their minimal effects.⁴ Pit and fissure sealant treatment is one of the most often utilised preventive dentistry approaches.⁵ They have been demonstrated to be particularly efficient in preventing caries by physically blocking pits and fissures.

The clinical success of pit and fissure sealants is dependent on the ability to maintain them on the tooth for a longer time.⁶ If the sealant has adhered to the tooth, the chances of secondary caries, recurrent caries, and their spread beneath the restoration are very low.⁷ To improve the longevity of adhesive systems, a variety of techniques and strategies have been explored.⁸

There are several types of resin-based materials available, each with its filler content, polymerization technique, and fluoride-releasing capacity. These sealants, on the other hand, have hydrophobic qualities that necessitate total moisture control, which limits their therapeutic use. Saliva contamination after enamel acid etching is the leading cause of sealant failure, especially in children with difficult behaviour and partially erupted teeth.⁸⁻¹³

Pulpdent introduced Embrace Wet Bond sealant in 2002, which is an innovative resin-based sealer. It contains di-tri and multifunctional acidic acrylate monomers with a hydrophilic-hydrophobic balance. The result

is a moisture-resistant resin sealant with hydrophilic qualities and a water balance that is designed to address the inadequacies of traditional resin sealants.¹⁴⁻¹⁶

As a result, the current study was conducted to compare and assess the clinical success of the retention rate between these conventional and hydrophilic sealants.

MATERIALS & METHOD

The present in vivo study has been carried out in the Faculty of Dentistry, SEGi University Kota Damansara, and was approved by the institutional Ethical Clearance Committee (SEGiEC/ SR/ FoD/ 16/ 2019-20).

A total of 25 healthy children aged between 6 to 9 years were selected. Details of the study objective were explained to the patient's parents & written consent was obtained from them. From all 25 children, a total of 100 newly erupted upper & lower permanent first molars from all four quadrants were considered for the study.

Caries-free molars with deep pits and fissures, discoloured deep pits and fissures, and completely erupted molars were included in the study. Whereas teeth with carious lesion, hypoplasia, self-cleansing occlusal surfaces, shallow pits & fissures & children with uncooperative behaviour were excluded.

Teeth were separated into two groups at random, with Group A having 50 right upper and lower permanent first molar teeth (teeth #16 & #46) for Conseal f sealant (Fluoride pit and fissure sealant, SDI), and Group B having 50 left upper and lower permanent first molar teeth (teeth #26 & 36) for Embrace Wet Bond sealant (Pulpdent Corporation, Watertown, USA).

The occlusal surfaces of teeth were thoroughly cleaned with the help of pumice & a rotating brush by a single operator. Cotton rolls with saliva ejector were used for the isolation technique. Acid etchant gel of 37% Ortho Phosphoric acid was applied with applicator tip on the pit & fissures up to 20 seconds & air-water syringe was used for 30 seconds to rinse the etchant gel. The etched occlusal surfaces were dried.

Group A samples (teeth #16 & 46) with matte frosty white occlusal surfaces were sealed with Con Seal f sealant by using an applicator tip. The entrapped air bubbles were removed by using a probe. Sealant was cured with a light cure unit for 20 seconds. The same procedures

were repeated for Group B samples (teeth #26 & 36) by placing Embrace Wet Bond sealant on the etched occlusal surfaces. Instructions were given to the patients to avoid drink or eat for the next half an hour.

Clinical evaluation of all the sealed teeth was done by recalling the patients at the interval of 3, 6 & 9 months for the sealant retention assessment. Single examiner carried out the visual & tactile examination of all the teeth with the evaluation of sealant retention at each time interval by utilizing Simenson's criteria.⁷ The Chi Square test and the Marginal Homogeneity post hoc test was used to statistically analyse the gathered data.

RESULTS

Comparison of retention of pit & fissure sealants between 2 study groups was done at the time interval of 3, 6 & 9 months by using Chi Square Test.

Assessment of retention at 3 months:

In group A, out of 50 teeth, 46 teeth showed complete retention (92%) with 4 missing sealants (8%) as compared to 49 teeth (98%) with only 1 missing sealant of 2% in group B (Table 1). The difference in the degree of retention between the 2 sealants was statistically significant with the p value of 0.17.

Table 1 Comparison Of Retention Of Pit & Fissure Sealants Between 2 Study Groups At 3 Months Period Using Chi Square Test

Retention	Group A		Group B		Total		χ^2 Value	P-Value
	n	%	n	%	n	%		
Complete Retention	46	92%	49	98%	95	95%	1.895	0.17
Partial Retention	0	0%	0	0%	0	0%		
Sealant Missing	4	8%	1	2%	5	5%		
Not Reported	0	0%	0	0%	0	0%		

Assessment of retention at 6 months:

At 6 months follow up visit, assessment of sealant retention with 16 teeth were not done as 4 patients did not report. 41 teeth of group

A sealant (82%) showed complete retention when compared to 45 teeth of group B (90%). The difference was statistically significant. Partial sealant retention was seen in 3 teeth (6%) of group A with no sealant loss in group

B. Only 1 tooth (2%) showed missing sealant in group B compared to 2 teeth (4%) in group

A (Table 2). This difference was statistically significant with the p value of 0.32.

Table 2 Comparison Of Retention Of Pit & Fissure Sealants Between 2 Study Groups At 6 Months Period Using Chi Square Test

Retention	Group A		Group B		Total		χ^2 Value	P-Value
	n	%	n	%	n	%		
Complete Retention	41	82%	45	90%	86	86%	3.519	0.32
Partial Retention	3	6%	0	0%	3	3%		
Sealant Missing	2	4%	1	2%	3	3%		
Not Reported	4	8%	4	8%	8	8%		

Assessment of retention at 9 months:

At the 9 months follow up visit, all 25 patients reported for sealant assessment. Out of 50 teeth in group A, 39 teeth showed complete retention (78%) compared to 45 teeth in group B (90%). Partial loss of sealant was seen

with 5 teeth in group A (10%) compared to 2 teeth in group B (4%). Whereas only 3 teeth of group B (6%) showed missing sealant when compared to 6 teeth in group A (12%). A statistically significant difference was seen with the p value of 0.26 (Table 3).

Table 3 Comparison of retention of Pit & fissure sealants between 2 study groups at 9 months period using Chi Square Test

Retention	Group A		Group B		Total		χ^2 Value	P-Value
	n	%	n	%	n	%		
Complete Retention	39	78%	45	90%	84	84%	2.714	0.26
Partial Retention	5	10%	2	4%	7	7%		
Sealant Missing	6	12%	3	6%	9	9%		
Not Reported	0	0%	0	0%	0	0%		

For both Group A & B, comparison of sealant retention between different time intervals and multiple comparisons of sealant retention between different time intervals were done by using Friedman's Test and Marginal Homogeneity post hoc Test, respectively. In Group A, the test results demonstrated a significant difference in the retention property

between different time intervals at $P=0.03$ and multiple comparisons between different time intervals showed that sealant retention between 3 & 9 months, showed a reduction in the complete retention from 92 to 78%, partial retention and missing sealant increasing from 0 to 10% and 8 to 12% respectively. This difference in the sealant retention property

between 3- and 9-months' time interval was statistically significant at $P=0.04$ (Table 4). Whereas in Group B, retention property between different time intervals at $P= 0.04$ and multiple comparisons between the sealant retention showed 98% to 90%. Partial

retention and missing sealant increasing from 0 to 4% and 2 to 6% respectively. This difference in the sealant retention property between 3- and 9-months' time interval was statistically significant at $P=0.20$ (Table 5).

Table 4 Multiple comparison of sealant retention between different time intervals in Group A using Marginal Homogeneity post hoc Test

Time	3 vs 6 Months	3 vs 9 Months	6 vs 9 Months
<i>P-Value</i>	0.06	0.04*	0.45

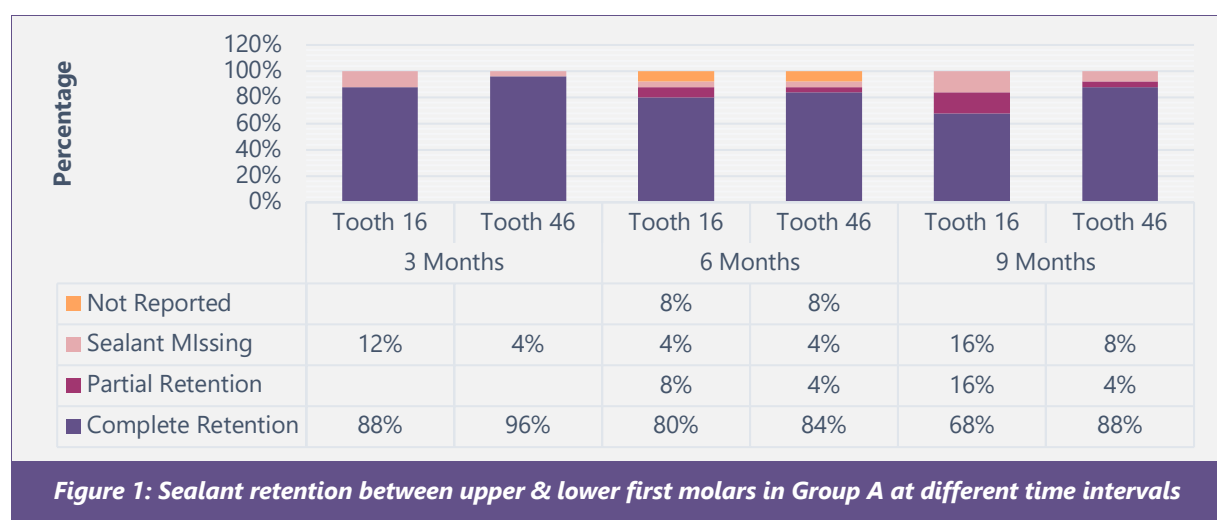
Table 5 Multiple comparison of sealant retention between different time intervals in Group B using Marginal Homogeneity post hoc Test

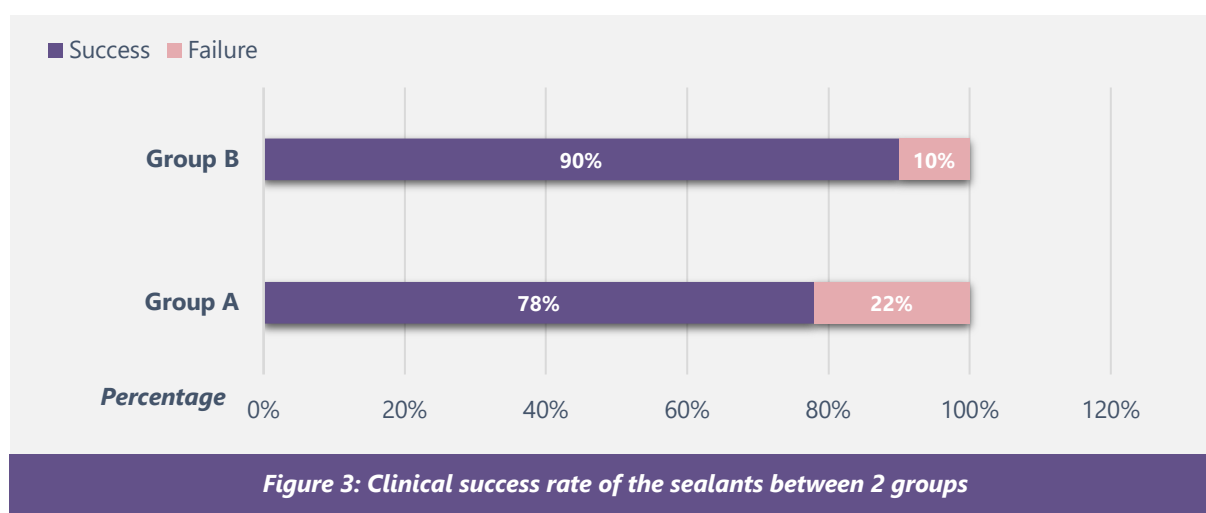
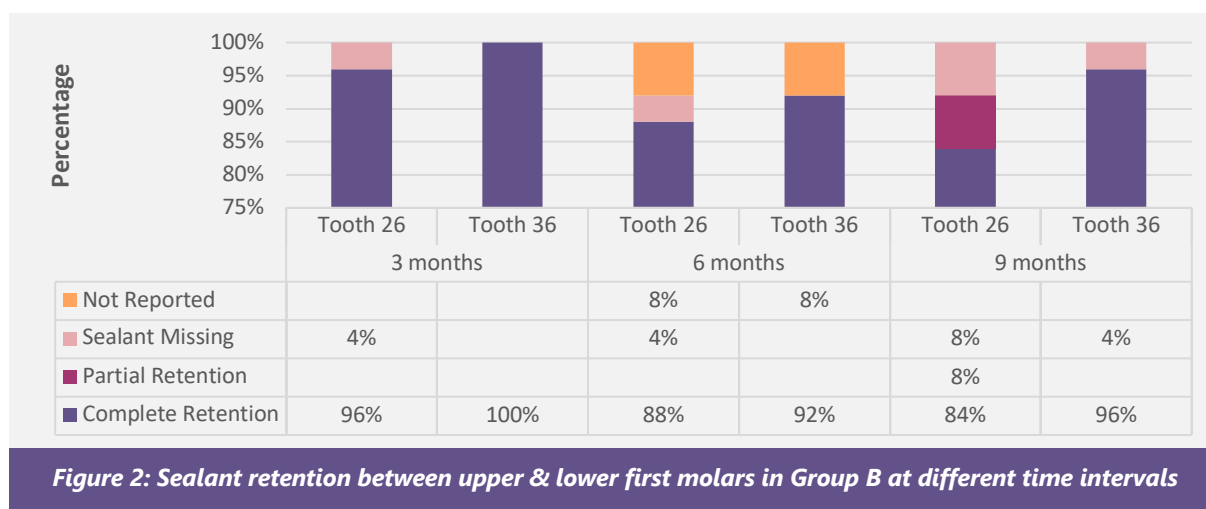
Time	3 vs 6 Months	3 vs 9 Months	6 vs 9 Months
<i>P-Value</i>	0.06	0.04*	0.20

Assessment of sealant retention on upper & lower molars in both Group A & B:

At different time intervals in group A, lower right permanent first molar had greater retention rate of 96%, 84% & 88% as compared to upper right first molar with retention rate of 88%, 80% & 68% at 3, 6 & 9 months respectively (Figure 1). Whereas, in Group B, lower left permanent molar showed highest retention of 100%, 92% & 96%

compared to upper left molar with their retention of 96%, 88% & 84% at 3-, 6- & 9-months' time interval respectively (Figure 2). Statistical significance was seen, where lower molars have shown a higher retention rate in both Group A & B compared to upper molars at different time intervals. However, retention was better and the overall 90% clinical success rate of the sealant was seen in Group B compared to 78% in Group A (Figure 3)





Dental caries is more likely to develop with the eruption of permanent teeth.¹⁷ It is eight times more likely to form in pits and fissures than on smooth surfaces. Pit and fissure decays account for 80 percent to 90 percent of overall caries status in permanent teeth and roughly 44% in primary teeth.¹⁸ Hence fissure sealant should be placed on these teeth as soon as possible to maintain them cavity-free. In addition, because the enamel of newly erupted teeth has not fully developed, they are more prone to caries. Pit and fissure sealants provide 100% caries protection on the occlusal surface if the sealant is retained

on the tooth surface.^{17,19} Commercially available sealants are usually technique sensitive hydrophobic resin sealants that are influenced by several factors, such as patient cooperation, operator variability, and contamination due to saliva & moisture in the operating field.²⁰

In the present study, children were followed up for 9 months for the assessment of sealants retention on permanent first molars. Group B samples showed a better clinical success rate as compared to Group A samples.

For Group A (teeth #16 & 46), a Conseal f sealant was placed which is fluoride-releasing, BIS-GMA (bisphenol A-glycidyl methacrylate) free, low viscosity (unfilled resin-based) sealant, and it has its unique UDMA (urethane dimethacrylate) resin system's lower shrinkage. To withstand surface wear, it contains fillers (7%) with a submicron filler size of 0.04 microns. It has been demonstrated to be useful in reducing the incidence of caries as it penetrates to the microporosities of the deep pits & fissures thereby helps in the prevention of caries and enhances the remineralization process.²¹

Whereas in Group B samples, a Hydrophilic sealant called Embrace Wet Bond was applied on teeth #26 & 46. It's a resin-based sealant that uses hydrophilic resin chemistry, and has no BisGMA or Bisphenol A,¹⁵ It can chemically bind even in the presence of humidity without a significant loss in micro tensile bond strength, implying that contamination was reduced. Its qualities of wet-bonding, stronger retention, better marginal seal, increased fluoride release, and reduced technique sensitivity can be very useful in situations when isolation techniques are difficult to follow.^{14,22,23}

In the present study, follow up of patients was done for 9 months, in which Group A (Conseal f), showed complete retention (78%) with 39 teeth compared to 45 teeth (98%) in group B (Embrace Wet Bond). Partial loss of sealant was seen with 5 teeth in group A (10%) compared to 2 teeth in group B (4%). Whereas only 3 teeth of group B (6%) showed missing sealant when compared to 6 teeth in group A (12%). These findings were found to be statistically significant with the p value of 0.26. The findings of this current study are consistent with the findings of another study, which revealed that Embrace Wet Bond had a

retention rate of 67 percent compared to Delton FS, which had a retention rate of 45.3 percent.²⁴

In the present study, there was no incidence on any caries occurrence was reported from both the Groups during follow up even though some of the teeth have shown partial and complete sealant loss, This might be predicated on the fact that the follow-up period was brief and that adequate oral hygiene was maintained.

Various studies have compared hydrophilic Embrace Wet Bond sealant with hydrophobic conventional sealants. Few of them have shown a greater clinical success rate for hydrophilic sealant. This can be attributed to its improved hydrophilic resin technology with chemical and micromechanical bonding to the tooth structure.^{22,23} Other studies have shown inadequate retention with Embrace Wet Bond sealant. This could be due to clinical handling errors and the inclusion of hydrophilic monomers in its composition, which lead to the formation of bonds in the presence of moisture, resulting in greater water sorption and increased dissolution in the oral environment. On contrary, few of them showed the results without any statistical significance between these two.²⁴⁻²⁶

Furthermore, when comparing mandibular first molars to maxillary molars, the present study found that mandibular first molars had higher sealant retention rates. This could be due to the sealant's ease of application on the teeth, such as direct visualization without any visual errors, more defined pits and fissures, and gravity-assisted flow.^{23,27,28} In contrast to this present study, some of the previous studies have reported a higher retention rate in maxillary teeth compared to mandibular teeth as more exposure to the oral environment that limited the retention of the

sealants.^{29,30} The use of Embrace Wet Bond sealants could be encouraged especially in high caries risk patients, excessive salivation, young children, children with uncooperative behaviour and partially erupted teeth & disabled children.³¹ In the current study, the 9-

month follow-up period is a significant flaw that could be regarded as insufficient. The current trial used a split-mouth design, it may have limited participation, which could have resulted in selection bias by including children who were not at high caries risk.

CONCLUSION

Embrace Wet Bond sealant applied on the first permanent molars exhibited superior retention as compared to Conseal f sealant

over a 9-month period. However, further clinical trials are encouraged for a longer time to examine their effectiveness with varying caries prevalence levels as caries advancement rates are difficult to predict.

CONFLICT OF INTEREST

The authors report no conflict of interest

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Evaluation of Ease of Removal of Different Herbal Based Intracanal Medicament: An In Vitro Study

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ABSTRACT

Introduction: Intracanal medicaments & effective irrigation are the contributing factors for the overall healing process of endodontic infection. Calcium hydroxide is proven to be highly effective in endodontic treatment. In dentistry, natural herbs have been widely used in various treatment procedures. Among them, *Moringa oleifera* & *Aloe vera* have proven their medicinal properties. However, there is not much information about the effect of these herbs on their ease of removal from the root dentin.

Objective: To evaluate and compare the ease of removal of these herbal based intracanal medicaments using a stereomicroscope.

Method: Thirty single-rooted premolar teeth were decoronated at the cemento-enamel junction. Canals were prepared using hand files till size 45, then randomly divided into 3 groups ($n = 10$); Group 1: Ca(OH)_2 saline paste, Group 2: Ca(OH)_2 *Moringa oleifera* paste, and Group 3: Ca(OH)_2 *Aloe vera* paste. The access cavity was sealed with Cavit™ and kept in the incubator at 37 °C. The intracanal medicament paste was removed after 1 week using a standardized irrigation solution. Root canals were sectioned bucco-lingually and subjected for the evaluation using a stereomicroscope at 25× magnification. Results were analysed using Kruskal-Wallis H Test and Mann Whitney Test with a p value <0.05 .

Results: A Kruskal-Wallis H test showed that there was no statistically significant difference in Ca(OH)_2 remnants between the three different materials, $\chi^2(2) = 0.035$, $p = 0.983$. The Ca(OH)_2 *Aloe vera* paste showed the highest residual remnants with statistically no significant difference with other two groups.

Conclusion: *Moringa oleifera* performed equally to saline and has a favourable outcome as compared to *Aloe vera* in terms of ease of removal from the root canal system, hence it is recommended as vehicle for future studies.

Keywords: *Aloe vera*, *Calcium hydroxide*, *Intracanal medicament*, *Moringa oleifera*

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INTRODUCTION

Root canal disinfection is one of the main goals of root canal treatment. Its success is attributed to proper biomechanical preparation. Failure to do so may lead to certain complications that could be mainly due to complexity of root canal or antibiotic resistance of bacteria in the canal space¹. During biomechanical preparation, the usage of files may not be able to effectively remove intracanal medicament which is used to disinfect the canal. Thereby, an additional technique such as irrigation with proper solution is needed to compensate for effective removal of residuals inside the root canal¹.

The most commonly used intracanal medicament is calcium hydroxide ($\text{Ca}(\text{OH})_2$) as it has proved to be highly effective in endodontic treatment. Calcium hydroxide is considered to be a strong alkaline material, having an average pH value of 12.5². With the high pH value, it is capable of neutralising bacterial toxins and promoting periapical repair³. Its success lies in the ability to dissociate into calcium ions (Ca^{2+}) and hydroxyl ions (OH^-). The alkalinizing action of OH^- triggers alkaline phosphatase enzymes, which stimulate formation of mineralised tissue, thus contributing in the repair process⁴.

The ionic dissociation relies on the vehicles added with calcium hydroxide paste as it should allow effective dissociation of the ions for proper action of calcium hydroxide⁵. Various ingredients such as saline, sterile distilled water, glycerine, propolis, chlorhexidine, anesthetic solutions and propylene glycol are commercially known vehicles for $\text{Ca}(\text{OH})_2$ intracanal medicament⁶. While these may be widely used in clinical

settings, an increasing number of researchers are showing interest in natural based vehicles as alternative materials in endodontics for their proven medicinal properties⁷⁻⁹, for instance, Aloe vera and Moringa oleifera.

Aloe vera is native to hot regions like Africa⁷ and can be easily found in Malaysia aplenty. Since ancient times, it has been hailed as a universal panacea for its use in cosmetology such as treating sunburn¹⁰ and moisturizing dry skin¹¹. In dentistry, Aloe vera is gaining attraction as an alternative ingredient for its favourable healing qualities⁷⁻¹². Jettanacheawchankit et al.(2009)¹² showed in their study that the polysaccharide found in Aloe vera induced cell proliferation by stimulating Keratinocyte Growth Factor-1 (KGF-1), Vascular Endothelial Growth Factor (VEGF), and type I collagen expressions which speeds up normal wound healing. A review article by Sujatha G et al.(2014)⁷ highlighted the usage of Aloe vera in dentistry as it has been proven to have antimicrobial, antifungal and antiviral properties.

Moringa oleifera, which originates from North India¹ commonly known as drumstick tree, has been used in ayurvedic medicine as it has proven antibacterial, antioxidant and anti-inflammatory properties¹³. Parts of Moringa oleifera, such as the roots and leaves have been traditionally used to treat oral-related ailments¹⁴. Saponins, tannins, flavonoids, phenolics, alkaloids, and triterpenoids are all found in Moringa oleifera leaf extract, which exhibits antibacterial activity⁹. Due to its biocompatibility and inherent antimicrobial properties, several in vitro studies^{1,13} have been carried out using different parts of Moringa oleifera as an intrapulpal medicament and irrigation in endodontic procedures.

In root canal treatment, all intracanal dressing should be removed from the canal walls prior to root canal obturation. In vitro studies have shown that residual remnants of the medicament influence sealer penetration into dentinal tubules³, hindering the bonding of sealers with root dentin¹⁵ and cause unfavourable interaction between the medicament and sealer¹⁶. Therefore, complete removal of intracanal medicament from the root canal system is significantly vital for a successful endodontic treatment. Studies have shown that calcium hydroxide pastes are not easily removed from the root canal¹⁷.

Thus, it is critical to explore alternative vehicles that could ease the removal of calcium hydroxide dressing from root canal walls, resulting in a better treatment outcome. The use of these herbs as carriers for calcium hydroxide were considered due to their antibacterial characteristics and biocompatibility. Several studies^{1,6,8,9,13} have been conducted to evaluate the properties of *Moringa oleifera* and *Aloe vera* both in vitro and in vivo, but very few studies^{1,6} have been published on the effect of these herbs on the ease of removal of calcium hydroxide paste from the root canal. Hence, the present study was to determine the use of *Moringa oleifera* and *Aloe vera* as vehicles in intracanal medicaments as alternative to saline and compare the Ca(OH)_2 remnants using stereomicroscope.

MATERIALS & METHOD

This research has been approved by ethics committee (SEGiEC/SR/FOD/36/2020-2021)

Thirty single rooted premolars with closed apices were collected for this study from Faculty of Dentistry, SEGi University. They were

obtained from adult patients requiring extraction for orthodontic reasons. Teeth that are double rooted, having dilacerations, root caries, fracture lines and blocked canals are excluded from this study. They were thoroughly cleaned from calculus deposits and then were stored in a container filled with pure 10% formalin solution at normal temperature until time of use. The teeth were transversely decoronated at cemento-enamel junction (CEJ) using a double-faced diamond disc (NTI® Interflex from Kerr Dental Malaysia) with a low speed lab handpiece with water coolant.

The working length of extracted premolars were established with size 15 K-file (Dentsply Sirona, Dentsply Sirona Malaysia) until they became visible through apical foramen and subtracting 1 mm from anatomical apex. The canals were enlarged up to size 45 K-file. Canals of all groups were irrigated with standardised 2mL of 5.25% sodium hypochlorite. Final rinse with saline was done to remove any remaining debris in the canal, followed by drying of root canals by sterile paper points¹

Moringa oleifera extract was collected from a local lab. The methanolic extract was obtained according to the method described by Bennour et al(2020)¹⁸. The leaves of *Moringa oleifera* trees cultivated in Bestari Jaya, Selangor (Malaysia) were collected in January 2021. The leaves were air-dried at room temperature until constant weight (18 days). The dried leaves were crushed using a mortar then passed through 1 mm sieve size to obtain a fine powder. Powdered dried leaves (25g) were extracted by maceration with 500mL of 70% methanol for 72 hours at room temperature with occasional shaking. The solution was filtered with Whatman No.1 filter paper. The extracts were then filtered using

the filter paper, concentrated at 40°C using a rotary evaporator (Buchi R-210 Rotavapor System, Malaysia) and freeze-dried for 24 hours. All freeze-dried extracts were diluted with 1% Dimethyl Sulfoxide (DMSO) to obtain concentration of 500mg/mL, whereas Aloe vera extract was obtained in a gel form from the natural plant leaf.

The teeth were randomly allocated into 3 groups (n= 10 teeth)

i) Group 1 (n=10) = Ca(OH)_2 saline paste

ii) Group 2 (n=10) = Ca(OH)_2 Moringa oleifera paste

iii) Group 3 (n=10) = Ca(OH)_2 Aloe vera paste

The intracanal medicaments were condensed into the canal with a finger spreader (Dentsply Sirona) at the level of the cemento-enamel junction. The access opening of the canals were sealed with at least 3mm Cavit temporary material (MD-Temp Plus from Meta Biomed Co Ltd). The teeth were placed in the incubator (Waterbath WNB14 from Memmert) at 37°C with 100% humidity for 1 week.

After 7 days, the teeth were removed from the incubator. The temporary restoration was excavated with a round bur on a high speed handpiece with water coolant. Intracanal medicaments from each canals were removed with size 25 K-file with filling motion. These

canals were irrigated with 10mL saline which is standardised for all. Each tooth was stabilised on a wax stabilizer and sectioned buccolingually with a double face diamond disc (NTI® Interflex from Kerr Dental Malaysia).

One half of the root was observed under stereomicroscope with 25x magnification for detection of remnants of intracanal medicaments inside the canal space. Scores were given using the "Grade Scoring System" introduced by Khademi et al (2015)¹⁷. In order to avoid bias, a single examiner graded the microscopic findings of the root canals.

i) 0 = The surface was not covered with intracanal medicament remnants

ii) 1 = $\frac{1}{3}$ of the surface was covered with intracanal medicament remnants

iii) 2 = $\frac{2}{3}$ of the surface was covered with intracanal medicament remnants

iv) 3 = The surface was covered by the intracanal medicament remnants

Data obtained from the microscopic examination were tabulated. The data was then analysed using SPSS version 22.0. The measurements were not normally distributed in some groups, so a nonparametric test Kruskal- Wallis H test was done. Then inter group comparison was done using Mann Whitney test. p value <0.05 was considered statistically significant.

RESULTS

The microscopic examination of teeth were scored between 0 to 3 in all three different groups. Moringa oleifera group and saline group had 1 tooth scoring 0 and 3 teeth scoring 3 (Figure 1). Aloe vera group had none scoring 0 and 2 teeth scoring 3 and had the highest number of teeth scoring 2 (Figure

1) as compared to Moringa oleifera group and saline group (Figure 2). A Kruskal-Wallis H test showed that there was no statistically significant difference in Ca(OH)_2 remnants between the three different materials, $\chi^2(2) = 0.035$, $p = 0.983$. (Table 1). Mann Whitney Test was done to assess the efficacy of each vehicle by comparing two vehicles at a time. The higher the sum of rank, the easier the material

was removed from the root canal. Saline performed better than Aloe vera while *Moringa oleifera* similarly outperformed Aloe vera (Table 2). In short, it was easier to remove calcium hydroxide remnants in groups with *Moringa oleifera* and saline vehicles

compared to Aloe vera. Though there was a difference in the mean rank among groups, the difference was not statistically significant.

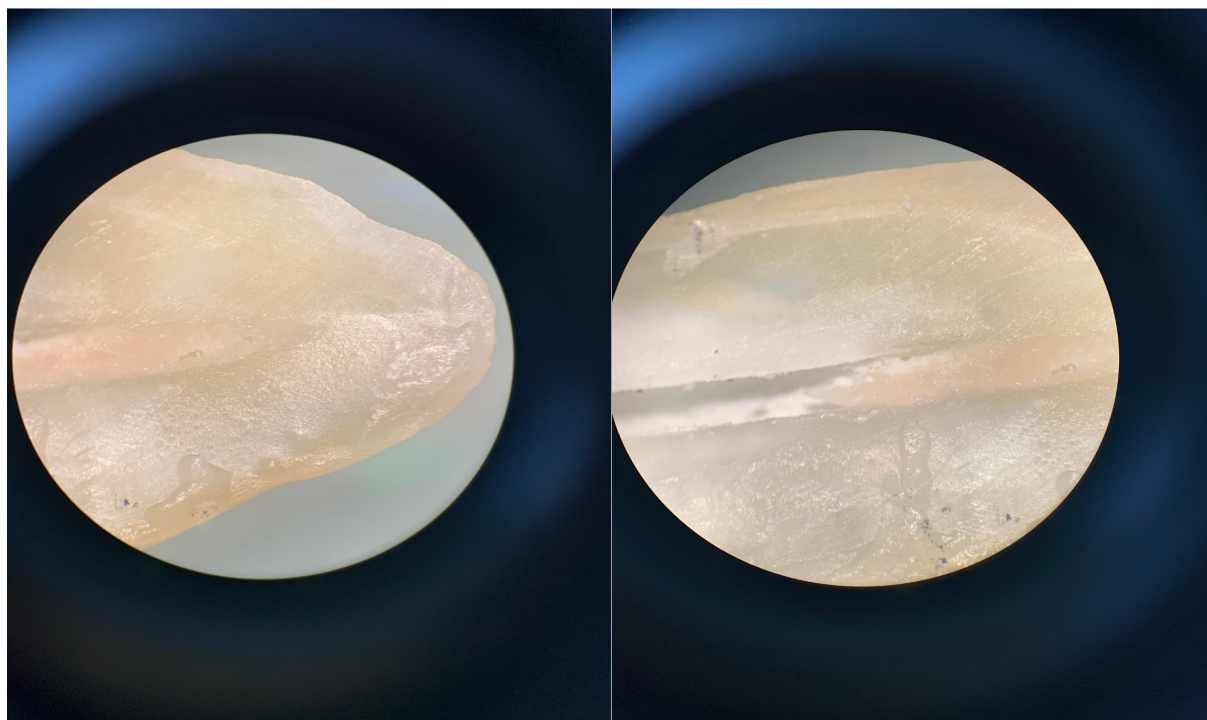


Figure 1 - Microscopic view of root canal scoring 3 and 2

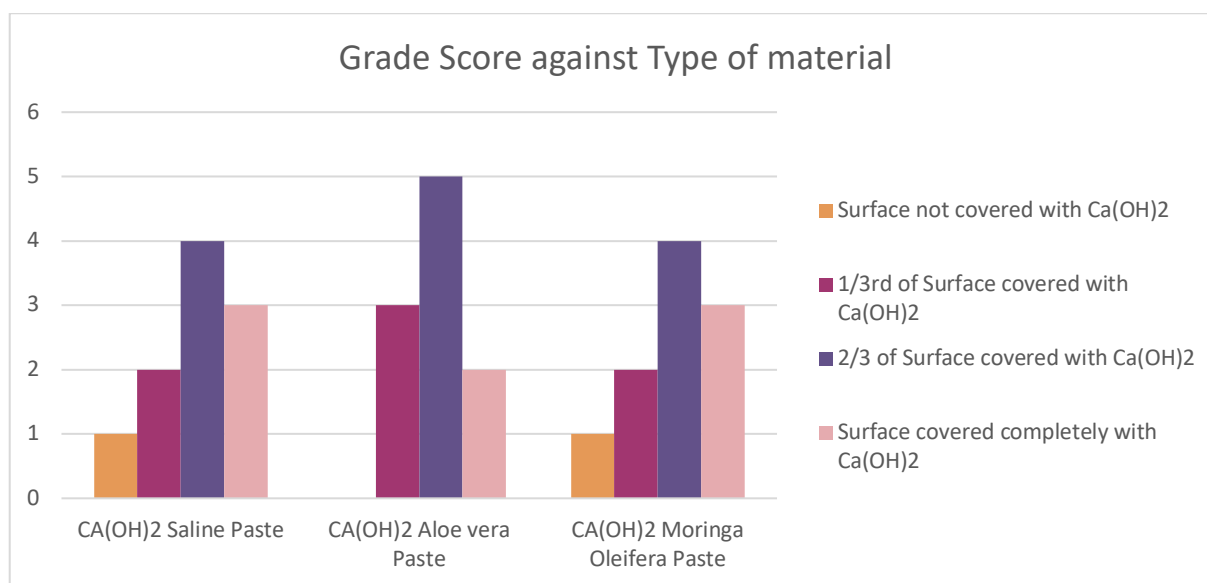


Figure 2 - Three groups showing the grades for remnants of calcium hydroxide in the root canal.

Time	N	Mean and S.D	p-value
<i>Ca(OH)₂ saline paste</i>	10	1.9 ± 0.994	Chi square value=0.035 p=0.983 p>0.05
<i>Ca(OH)₂ Aloe vera paste</i>	10	1.9 ± 0.738	
<i>Ca(OH)₂ Moringa oleifera paste</i>	10	1.9 ± 0.994	

Table 1 – Kruskal Wallis test for Comparing Ca(OH)₂ remnants among all three groups.

		N	Mean Rank	Sum of Ranks	p-value
Ca(OH) ₂ remnants	Ca(OH) ₂ saline paste	10	10.70	107.00	p=0.872 p>0.05
	Ca(OH) ₂ Aloe vera paste	10	10.30	103.00	
Ca(OH) ₂ remnants	Ca(OH) ₂ saline paste	10	10.50	105.00	p=1.000 p>0.05
	Ca(OH) ₂ Moringa oleifera paste	10	10.50	105.00	
Ca(OH) ₂ remnants	Ca(OH) ₂ Aloe vera paste	10	10.30	103.00	p=0.872 p>0.05
	Ca(OH) ₂ Moringa oleifera paste	10	10.70	107.00	

Table 2 - Comparison of Ca(OH)₂ remnants with different materials Mann Whitney Test for inter group comparison of Ca(OH)₂ remnants.

DISCUSSION

Refractory endodontic cases have always been a conundrum for dentists due to its elusive aetiology. Some researchers have attributed failure of root canal treatment to residual microbes in the dentinal tubules¹⁹, anatomic variation which impaired proper instrumentation and development of antimicrobial resistance²⁰. While various research was done on calcium hydroxide with different vehicles to potentiate its antimicrobial effect²¹, the role of vehicles in improving the effectiveness of removal of intracanal medicament from the root canal remains a puzzle.

Removal of calcium hydroxide is challenging even for experienced specialists and it has been known to leave residuals inside the root canal space even with effective irrigation¹⁷. As proven in in vitro study²², these remnants inhibit proper penetration of sealers into dentinal tubules which leave gaps and cause apical leakage in endodontically treated teeth. Furthermore, a study by Kim et al.(2002)²³ has proved that calcium hydroxide has its own drawbacks. When used as intracanal medicament with zinc oxide eugenol sealer in root canal obturation with gutta percha, there is increased risk of apical leakage. Additionally, calcium hydroxide is difficult to be mixed and inserted inside the root canal.

The poor handling property makes calcium hydroxide inferior compared to conventional pre-mixed intracanal medicaments despite its excellent antimicrobial property. For this reason, researchers have congregated their efforts to seek alternatives. Dausage et al.(2017)⁵ explored the possibility of using plant based vehicles such as papaya latex, coconut water and herbal extract ashwagandha with calcium hydroxide to

improve the diffusion of hydroxyl ions through dentinal tubules. In a recent study¹³, the use of *Moringa oleifera* as potential endodontic irrigant is explored. It is deemed sufficiently effective to kill *Enterococcus faecalis*, making it a safer alternative than sodium hypochlorite. However, further studies are necessary to study its toxicity effect. There are several other studies documenting the potential usage of *Moringa oleifera* in dentistry. One such study discussed about the effectiveness of *Moringa Oleifera* against cariogenic bacteria, *Streptococcus mutans*, the formation of cariogenic biofilm⁸ and its ability to remineralise enamel when used in substitution to fluoride varnish though mineralised layer formed is to be further investigated for its morphology, crystallinity and chemical composition²⁴.

Besides that, Aly et al.(2021)¹ studied the use of *Moringa oleifera* as an intracanal medicament which showed favourable outcome with its ease of removal from the root canal. It is to be highlighted that although there are studies that analysed the removal of calcium hydroxide with different alternative vehicles, the role of *Moringa oleifera* as a vehicle had yet to be assessed, hence we incorporated it in our research. In the present study, *Moringa oleifera* as a vehicle along with calcium hydroxide had performed similarly to the gold standard conventional mixture of saline and calcium hydroxide keeping in mind a small sample size was used. This may denote that *Moringa oleifera* has its perks, opening up possibilities for it to be used as plant based alternatives to various dental materials. *Moringa oleifera*, although had performed to the same level as conventional saline, taking in consideration its antimicrobial property and other benefits, *Moringa oleifera* is suggested to be an effective vehicle when used along with

calcium hydroxide drawing out the best of both sides.

Aloe vera is also among the natural based vehicles investigated in our study, However, it was not recommended to be used as an irrigant due to its gel-like consistency which impeded smooth flow inside the root canal space²⁵. A study by Batista et al.(2014)⁶ reveals that Aloe vera, when used along with calcium hydroxide intracanal medicament, had shown good handling properties including easy mixing, viscous texture after mixing and easy insertion into the root canal. Results have shown that Aloe vera expedites diffusion of hydroxyl ions into dentinal tubules, thus making it an ideal vehicle⁶. However, its ease of removal of calcium hydroxide remnants from the root canal space was not assessed. In our study, this varied as mixing of calcium hydroxide powder with Aloe vera was easy, though the mixture sets almost as fast as calcium hydroxide with saline mixture, which made insertion similarly difficult. Further research will be needed using Aloe vera in

various forms to see if the material behaves differently.

Apart from the usage of various materials, irrigation is also a factor when assessing the ease of removal of residual remnants from root canal space. In a study by Lins et al.(2015)²⁶, removal of intracanal medicament was harder, especially using manual mechanical agitation. Since our study utilised passive irrigation with mechanical removal using K-file, the results might improve if study was done using active irrigation with ultrasonic tip which can be further studied.

To sum it up, incorporating natural herbal based vehicles with calcium hydroxide intracanal medicament suggests several advantages. Hence, properties of these herbal based vehicles have to be further investigated. Additionally, the use of active irrigation and ultrasonic tips may be an ideal combination to aid in removal of residual remnants from root canal space, improving future prognosis of endodontic treatments.

CONCLUSION

To conclude, *Moringa oleifera* performs equally to saline and has a favourable outcome as compared to Aloe vera in terms of ease of removal from the root canal system. Despite the statistically insignificant result when the three groups are compared together, this study shed light on few properties related to the natural based vehicles. While both *Moringa oleifera* and Aloe vera dissolved easily when mixed with calcium hydroxide powder, *Moringa oleifera* was much easier to be inserted into the root canal while some difficulties were faced when handling calcium hydroxide mixed with saline

and Aloe vera samples during the insertion. Despite that, this study warrants further research to find conclusive evidence whether natural based vehicles perform differently than conventional ones.

In future, studies using a larger sample size would better support results of present study. More in vivo studies should be carried out to evaluate actual safety and healing properties along with toxicity and side effects of these herbal based vehicles. Standardising the maximum dosage, volume and concentrations of herbal extracts will be essential as well. Lastly, studies on multirrooted teeth or teeth with abnormal root morphology can be conducted.

CONFLICT OF INTEREST

The authors report no conflict of interest

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Knowledge, Attitude, and Practice of Fake Braces Among Secondary School Students

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ABSTRACT

Objective: Fake braces are non-genuine look-alike fixed orthodontics appliances that can damage teeth, oral tissues and pose a threat to general health. This appliance is used by teenagers and young adults, who demonstrate health risk behaviour. The objective of this study was to determine the knowledge, attitude, and practice of fake braces among secondary school students.

Method: A questionnaire-based survey was conducted among government secondary school students. The questionnaire consisted of thirteen close-ended questions, distributed in three domains of knowledge, attitude, and practice. The questionnaire also collected demographic and Socio-Economic (SE) data of the students. The percentages and proportions were used for data analysis. Chi-square test of independence and Odds Ratio (OR) was performed to determine whether gender or SE status influenced the likelihood of the event.

Results: Females showed higher odds of 1) having the knowledge about fake braces; 2) knowing the difference between fake braces and conventional braces; 3) having the attitude that fake braces could harm them; 4) perceiving the need for orthodontic treatment (OR 1.5, 1.6, 1.78, 1.78 respectively; $p < 0.01$). The odds of a student visiting a non-dentist for an orthodontic consultation and getting a fake braces treatment done showed SE predilection (OR 6.0 and 10 respectively; $p < 0.05$).

Conclusion: The study concludes that the crude prevalence of use of fake braces among secondary school students was 15 per 1000 population. The SE status and gender group were identified as influencing factors in the use of fake braces.

Keywords: Braces, Orthodontic Appliances, Schools, Risk Behaviour, Dentistry

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INTRODUCTION

Fake braces are non-genuine look-alike orthodontic appliances that are fixed to the teeth by an untrained and unlicensed person.⁽¹⁾ Fake braces are popularly known as "Fashion Braces" or "Faux braces" or "Do-It-Yourself (DIY) braces". The fake braces can be placed on the teeth by the wearer themselves at home or they can be fixed by fake dentists or quacks who work from beauty salons, or in hotel rooms.⁽²⁾ The use of fake braces started in Southeast Asia where it was referred to as "Behel".⁽³⁾ And now the trend has gradually spread globally. In Middle Eastern countries, the practice of fake braces is referred to as "Zeena" or "Tajmeli" (Malpractice). The clinical implication of fake braces has been reported from as far as South America too.⁽⁴⁾

The fake braces are commonly worn by teenagers and young adults.⁽⁵⁾ Numerous reasons have been identified for using fake braces. One of the foremost reasons cited in the literature was that the fake braces are seen as a cost-effective alternative to conventional orthodontic therapy (COT) for the correction of mal-aligned teeth.⁽⁶⁾ The COT is perceived as expensive because of its high demand, use of quality orthodontic accessories, the long-term follow-up to treatment, and specialist chairside time. The high cost of COT, its elective nature, and the belief that the treatment is expensive has made COT a sign of luxury and prosperity.⁽⁷⁾

This notion of luxury has in effect increased the use of fake braces as a symbol of status and socio-economic wellbeing.⁽⁸⁾ Apart from these, the use of fake braces as a fashion statement by celebrities has also increased the utilization of fake braces among teenagers

and young adults, who view the appliance as trendy and fun.⁽⁹⁾ Lastly, youths may wear fake braces under peer pressure.⁽¹⁰⁾

Given the background of fake braces which are placed by the untrained fake dentists, it is no surprise that damage to the oral tissues and general health of the wearer is inevitable. Literature has reported various complications arising from unwanted and uncontrolled tooth movement due to the forces exerted by the fake braces. Some of the reported complications are frank root exposure, fenestration, dehiscence, and tooth avulsion.⁽¹¹⁾

Life-threatening conditions arising from allergy and severe poisoning from the materials used in the placement of fake braces have also been reported.⁽⁴⁾ From the public health point of view, the practice of fake braces has a potential risk of spreading highly contagious infections like Acquired Immunodeficiency Deficiency Syndrome, Hepatitis B, and C.⁽¹²⁾ In the current scenario of the COVID-19 pandemic, the risk of utilizing the services of a fake dentist can have a detrimental effect on the national plan for the mitigation of the pandemic. Therefore, using fake braces can be considered a health risk behaviour.

To curb the menace of using fake braces, it is imperative to understand the extent of the problem in the community and the factors which are associated with it. Therefore, this study aimed to determine the knowledge, attitude, and practice of fake braces among secondary school students and to determine if gender or SE status were associated with the practice of using fake braces.

METHOD

A descriptive cross-sectional questionnaire-based study design was used to conduct this study. The convenience sampling technique was used to collect the data. Firstly, all the government secondary schools in Butterworth, Penang in Malaysia were identified. Next, all the students who were enrolled in these schools and were teenagers capable of taking their own decisions (Form 4 to 6 students) were invited to participate in the study. Students who did not give consent to the study or were absent on the day of the study survey were excluded from the study. At the end of the data collection at each school, educational brochures were distributed among the students to increase awareness about the harmful effect of fake braces.

A self-administered questionnaire was used for data collection. The questionnaire was developed by the authors after reviewing the literature. The developed questionnaire was divided into two sections. The first section contained the study information sheet, written informed consent, and the demographic details of the respondents. The demographic details included age, gender, and the average monthly family income of the respondents. For the analysis of socio-economic (SE) differences, the self-reported average monthly family income was categorized into three groups of Top 20 (T20), Middle 40 (M40), and Bottom 40 (B40).⁽¹³⁾

The second section of the questionnaire had three domains of knowledge, attitude, and practices of the use of fake braces. The knowledge domain had 4 questions; the attitude domain had 3 questions and the practice domain had 6 questions. All the questions were close-ended (Table 1, 2, and

3). The content and face validation of the questionnaire was done by the institutional faculty members and a pilot study was performed on 10 students to assess the reliability of the questionnaire using Test-Retest Reliability analysis. The Test-retest reliability coefficient obtained was 0.78 which indicated acceptable internal reliability of the questionnaire.

The privacy and confidentiality of the data were maintained by coding the questionnaire and its safekeeping. The study was conducted from June 2019 to October 2019.

The data analysis was performed with IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp. Descriptive statistics of proportion and percentages were used to analyse the data. The percentages were rounded off to the nearest whole number and therefore may not sum up to exactly 100%. Since the measurement of data was in categorical inputs, the Chi-square test of independence and Odds Ratio (OR) was performed to determine if there were any gender and socio-economic differences in the responses and the likelihood of the event. During analysis, if the number of responses was low, the data were grouped to perform the statistical tests. For example, to calculate the OR for socio-economic differences, the T20 and M40 were grouped as one group because B40 was a large group. The confidence limit was set at 95% with a two-tail significance of p-value equal to or less than 0.05 considered as statistically significant.

This study was approved by the Institutional Review Board of Penang International Dental College (Ref no.: PIDC/IRB/SRP/20/17) and was conducted with the permission of the Ministry of Education, Malaysia {Ref. no. KPM.600-3/2/3-eras(4298)}.

RESULTS

From the thirteen government secondary schools identified only ten school authorities allowed the authors to conduct the study (response rate 77%). The remaining three schools could not participate due to their exam schedules. Further students of Form 5 and Form 6 could not participate because they had examinations of Pentaksiran Tingkatan Tiga (PT3) and Sijil Pelajaran Malaysia (SPM).

Therefore, only Form 4 students participated from the ten schools. A total of 586 students were include in the study. The reported age of all the students was 16 years. Most of the respondents were females (62%). The student distribution based on the self-reported average monthly family income for T20, M40, and B40 was 10%, 34%, and 56% respectively. There was no statistical difference between the gender distribution and the family income group ($p=0.104$; $df2$) among the students.

Table 1 Response to question on knowledge domain. (n=586)

Questions	Response		Gender	SE
	Yes (%)	No (%)	differences [#]	differences [#]
			p-value	p-value
<i>Are you aware of Do-It-Yourself (DIY) braces?</i>	351 (60%)	235(40%)	0.009 (OR 1.5)	0.069
<i>Do you know the difference between actual braces and fake braces?</i>	273 (47%)	313 (53%)	0.006 (OR 1.6)	0.179

[#]Asymp. Sig. (2-sided) from the Chi-square test.

From Table 1, it can be observed that 60% of the respondents were aware of the fake braces and 47% knew the difference between COT braces and fake braces. The odds of females having awareness of fake braces and the knowledge of the difference between COT & fake braces was found to be 1.5 and 1.6 respectively. This difference was statistically significant. The internet and social media were reported to be the main source of information on fake braces (n= 315, 54%).

The other sources of information were from people / friends (n=218, 37%), and from news / articles (n=53, 9%). The knowledge of harmful side effects of fake braces on teeth and gums was reported by only 56% (n=331) of the respondents, while only 27% (n=160) knew about the harmful side effects of fake braces on general health. The remaining 16% respondents (n=95) reported that they did not know what the side effects were of using fake braces.

Table 2 Response to question on attitude domain. (n=586)

Questions	Response		Gender	SE
	Yes (%)	No (%)	differences [#] p value	differences [#] p value
Do you think fake braces can harm you?	490 (84%)	96 (16%)	0.011 OR 1.78	0.170
Is it essential to stop people from using fake braces?	581 (99.1%)	05 (0.8%)	1.00	0.204

#Asymp. Sig. (2-sided) from the Chi-square test.

Table 2 shows the results of the response analysis for the attitude domain. It can be observed that 84% of the respondents thought that fake braces could harm them and the odds of females having this attitude was found to be 1.78 compared to males, which was statistically significant. Most of the respondents (n=323, 55%) felt that the cost is a factor when people decide to wear fake

braces. Other reasons reported by the respondents for what makes people choose fake braces was, to look more appealing/fashionable/ trendy (n=210, 36%) and to have a higher status symbol (n=53, 9%). There was approximately 1% of respondents felt that it is not essential to stop people from using fake braces.

Table 3 Response to question on practice domain. (n=586)

Questions	Response		Gender	SE
	Yes (%)	No (%)	differences [#] p value	differences [#] p value
Do you want to get braces?	260 (44%)	326 (56%)	0.001 OR 1.78	0.446
Have you consulted anybody before wearing braces?	161 (27%)	425 (72%)	0.297	0.646
Are you wearing/ Have you worn any braces before?	54 (09%)	532 (91%)	0.884	0.772

#Asymp. Sig. (2-sided) from the Chi-square test.

Table 3 represents the respondents' answers to the questions on the practice of the use of fake braces. It was found that 44% (n=260) of the study population wanted to have orthodontic treatment. And females had statistically significant odds (OR=1.78) of wanting the braces treatment done. Among this 44% (n=260), 73% of respondents reported that they need braces treatment for correction of their mal-aligned / mal-occluded teeth, while only 21% wanted the treatment for improving their aesthetic and 6% wanted braces to look trendy. The proportion of respondents who had a consultation done for braces treatment were 161/586. And among those who had a consultation for getting braces, 91% (n=147) had consulted a qualified dentist while the rest 7% (n=14) had consulted a non-dentist. SE difference was found to be a statistically significant factor in deciding whom to consult. Among those who consulted non-dentist (n=14), 12 were from the B40 group and 2 were from the M40

group. No respondents from the T20 group consulted a non-dentist. This finding was further affirmed when the calculation of OR showed that the odds of respondents from the B40 SE group who would consult a non-dentist for braces treatment was 6.0. Of the 586 respondents, 54 (9%) reported that they had/are wearing braces. Of those who responded to wearing or have worn braces, 83% (n=45) reported that they have/had COT braces while the rest 17% (n=09) reported having/had fake braces. Among the 17% (n=9) of respondents who reported using fake braces, 8 were from the B40 group and 1 from the M40 group. This data was also statistically significant and the calculated Odds for respondents from the B40 SE group having/had fake braces was 10.0. There was no gender difference in this variable. Among those who responded that they want to get braces (n=260), 73% wanted it correct mal-occlusion, 54% wanted it for aesthetic appeal and 6% wanted it to look trendy.

DISCUSSION

Fashion braces or fake braces are appliances that mimic the fixed orthodontic appliances used by orthodontists to correct the misalignment of teeth. Ironically, only people with well-aligned teeth can wear these fake braces. Fake braces are available in a multitude of colours and designs including flower patterns, stars, and even cartoon characters such as Hello Kitty and Mickey Mouse which can be purchased from the free market in malls, night markets, and on Facebook, Instagram, and Twitter.⁽¹⁴⁾ Our study was an exploratory survey to determine the knowledge, attitude, and practice of fake braces among secondary school students and

to investigate whether gender and socio-economic circumstances influenced their knowledge, attitude, and practice of the use of fake braces.

Knowledge of fake braces: In the present study, approximately 50% of the students were aware of and knew the difference between fake braces and COT braces. Social media was found to be the major source of information. Many of the students also reported that they were aware of the ill effect of fake braces on oral and general health. The odds of females being more knowledgeable was higher than males. Women have been reported to be more interested in their dental appearance⁽¹⁵⁾ and had more interest in orthodontic treatment than men.⁽¹⁶⁾ Literature

reports that females were more critical in judging their dental appearance.^(17,18) In contrast to this in a study conducted in Sweden, found that men regarded dental appearance as more important than women.⁽¹⁹⁾ While other studies found that the gender differences were not significant.^(20,21) In a survey among members of the American Association of Orthodontists, it was reported that the age of people attempting to fix their teeth ranged from 8 years to 60 years and approximately 70% of these DIY patients seen by orthodontists belonged to a social media-friendly age group, between the ages 10 and 34.⁽¹¹⁾

Attitude on using fake braces: Most students in the present study reported that fake braces were harmful, and that people should be stopped from using them. In another study among Form 6 students in Malaysia, the level of awareness of risk from fake braces was reported to be low despite adequate awareness of orthodontic service.⁽⁹⁾ In a study conducted on awareness of fake braces among university students in Malaysia, the authors reported that only 35% of the respondents were aware of the dangerous side effect of fake braces.⁽⁶⁾

The respondents in our study reported that the cost of fake braces was a factor in why people choose them. In Malaysia, the cost of COT in private dental clinics can range from RM 4000 up to RM 8000. In government dental clinics, the cost was much less at about RM1000, but the waiting list was very long.⁽²²⁾ The high cost of orthodontic treatment in private and the long waiting time in government clinics may have instigated people to take orthodontic services from unregistered fake dentists who place fake braces. The reported cost of fitting fake braces ranged from RM50 to RM600, excluding the

cost of monthly maintenance.⁽²³⁾ The monthly maintenance cost for the fake dentists' fake braces differed according to the type of bands (power-O or power chain) used. The cost ranged from no charge at all up to RM120. The maximum cost to remove the bracket was RM10.⁽²³⁾ The fake braces which are available in the open market to buy are sold at very low prices ranging from RM 35 – RM 150 for both the arches and they come with a user manual for placement of the fake braces.⁽²⁴⁾ The high cost of COT has been repeatedly reported in the literature as a decisive factor when seeking orthodontic treatment from a qualified dentist.^(6,24-26)

The present study found that the main reason why the respondents were interested in orthodontic treatment was the correction of perceived malocclusion (spacing and/or overcrowding). This implies that there was a high perceived orthodontic treatment need by the respondents but may not require COT based on the IOTN index. In a study by Samsonyanová, 2014 the main reason for children to undergo orthodontic treatment was aesthetics.⁽¹⁰⁾ Crowding of the teeth and large overbite were reported as the main motivational factors. It is important to note that teenagers have imaginary audiences and literature reports that culturally better-looking people are regarded as friendly, more intelligent, more interesting, and more socially competent.⁽¹⁰⁾

The practice of fake braces: In the present study, 9 students among the 586 surveyed, self-reported having used/using fake braces. This calculates to a crude prevalence rate of use of fake braces in the present study population as 15 per 1000 population. This finding could not be compared with any other literature because of the lack of published epidemiological studies on the subject. The

socio-economic factor was found to affect the choice of the braces provider with odds of students from low SE choosing a non-dentist equal to 6. Not only this but the study also found that fake braces were commonly worn by students from the lower SE group. In a similar study, the authors reported that many of the subjects in the fake braces group had a family income of less than average, while 19.5% of them had an average of more than average family income.⁽⁸⁾

In Malaysia, only 180 orthodontists are registered with the Malaysian Association of Orthodontists.⁽²⁷⁾ So with an estimated population of Malaysia of 32.4 million⁽²⁸⁾, there is only 0.55 orthodontist per 100,000 Malaysians. Sorooshian, 2018 reported that the ratio of orthodontists to the populace in Malaysia was merely 1: 220,000.⁽²⁹⁾ The limited number of specialists is a contributory factor towards the inability to satisfy the demand for orthodontic treatment. And therefore, the supply and demand equation has made orthodontic treatment an expensive service in non-government clinics. This has resulted in

the utilization of services of a fake dentist and the use of fake braces complemented by the new trend for fashion braces.⁽²⁹⁾

While the present study highlighted gender and SE issues in the use of fake braces, there were a few limitations in the generalization of the results. The study coincided with the exam schedule which brought down the number of students who could have participated in the study. The self-reported response could have caused a reporting bias. The limitations were addressed by performing the statistical tests with a two-tail significance of p-value instead of one-tail significance.

This study identified students who used/were using fake braces. To further explore the reason why the students, engaged in the health risk behaviour of using fake braces, further study is required using focused group discussion to understand the socio-cultural background to better develop preventive programs. Also, further study is required to compare the perceived need for orthodontic treatment by the patient and their actual IOTN index.

CONCLUSION

The study concludes that the crude prevalence of use of fake braces among secondary school students was 15 per 1000 population. The SE status and gender group were identified as influencing factors in the use of fake braces. Fake braces are viewed as cheaper alternative to conventional orthodontic treatment, until a

mishap would occur. The health risk behaviour in the teenagers are high and therefore their perceived orthodontic treatment needs must be addressed by the dental profession and the barriers to COT must be resolved. Otherwise, they will experiment and resort to fake braces again and again.

CONFLICT OF INTEREST

The authors report no conflict of interest

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An Audit on the Standards of Record-Keeping for Intra-Oral Radiographs Taken in the Department of Paediatric Dentistry, Slim River Hospital

'Ain Nadzirah Bukhari, Thaarani Vijayakumar, Nur Najmina Nor Azman Shah

ABSTRACT

Introduction: Radiographs are an adjunct to achieving diagnosis. In the paediatric cohort this diagnostic tool should be judiciously used to prevent risks associated with ionizing radiation. Present guidelines by the FGDP UK underline that each radiograph ordered by the clinician needs grading and reporting. The National Guideline of Radiology Services in Malaysia mentions that clinicians are responsible for noting the findings of ordered radiographs.

Objective: To ensure clinicians comply with set standards of record-keeping when taking or ordering radiographs.

Methods: The protocol was submitted to the NMRR for registration and ethical review. A retrospective audit on case notes was carried out from August to November 2020. The first 25 case notes that fit the inclusion criteria were gathered in cycle 1 (1st August-30th September 2020). A second cycle of the audit was done from 15th October-30th November 2020.

Results: In cycle 1 none of the radiographs audited were graded and 84% (21) had the findings noted. Prior to cycle 2, a department CDE was organized and written reminders were posted on the offices of clinicians. Cycle 2 recorded 96% (24) of radiographs being graded and all of the notes had the findings recorded.

Conclusion: Cycle 2 recorded marked improvement in compliance of clinicians in the department to available guidelines. These results will be revisited periodically to ensure standards are maintained. A third cycle of this audit is currently underway and this will include auditing record-keeping of images ordered by clinicians in the department but taken off-site (i.e., CBCT imaging/radiographs taken in the ED).

Keywords: *record-keeping, paediatric, radiographs*

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INTRODUCTION

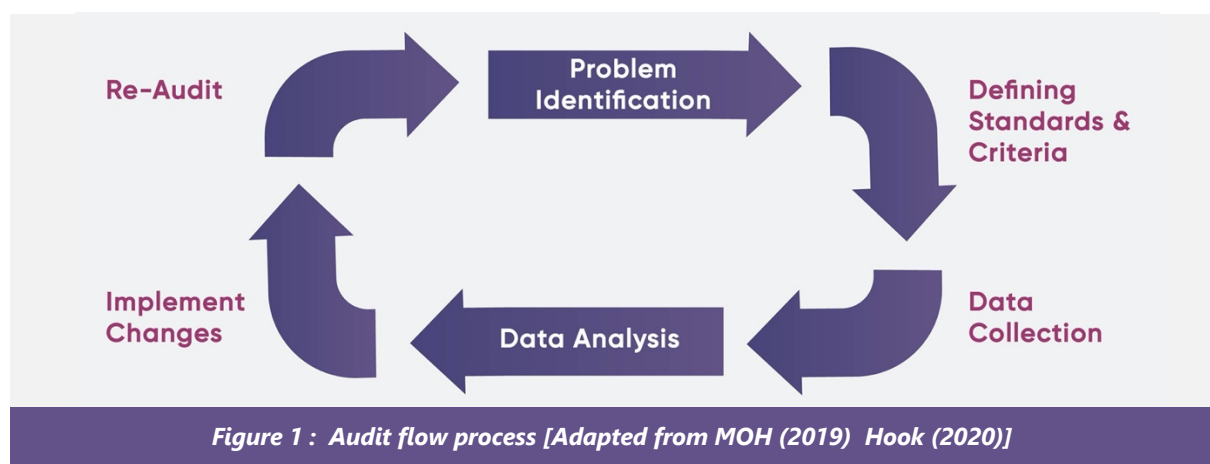
A clinical audit is a tool best utilized to improve current practice and to check if set standards are maintained in the team.¹ Audits play a major role in dental radiography with current regulations necessitating quality assurance programs in sites that possess radiographic equipment.²

Radiographic examination is fundamental for dental diagnosis, treatment planning and case outcome. In the paediatric cohort, they are used to diagnose and monitor oral diseases, periodic evaluation dentoalveolar trauma, as well as monitor dentofacial development and the therapy progress.³ Exposure to ionizing radiation even minimal can increase risk of stochastic effects, hence, it is crucial to justify each radiograph taken or ordered^{4,5}. Children are more vulnerable to radiation exposure than adults as radiation risks are higher for fast-dividing cells and tissues.⁶

The Good Practice Guideline for Clinical Examination and Record-keeping state that radiographs are a part of patient records and stringent quality assurance programme is set up where the radiographs are not only reported but also assessed for quality.⁷ A simple grading system (1 = no faults, 2 = faults but still of diagnostic value, 3 = of no diagnostic

value) should be utilized in patient notes.⁸ The National Radiological Services Operational Policy in Malaysia requires as well that all clinicians record findings of radiographs taken or ordered.⁹

The Department of Paediatric Dentistry in Slim River Hospital has been established since early 2018 however it has just received its very own intra-oral radiograph machine in October 2020. All intra-oral radiographs were previously taken in the Department of Oral and Maxillofacial Surgery Department at the same hospital. Based on the audit flow diagram provided by available literature (*Figure 1*)^{10,11} we identified an issue that needed to be addressed in the department. It was noted that patient case notes lacked reporting of the quality of the intra-oral radiographs taken as well as the findings themselves. This audit will help provide clinicians in the department a standard of record-keeping for radiographs and further improve clinical services provided. The aim of this study is to ensure that clinicians comply with set standards when taking or ordering intra-oral radiographs; each radiograph ordered by the clinician in the department has been graded for quality and findings reported in patient case notes.



METHODOLOGY OF AUDIT

The audit was registered with the National Medical Research Registration (NMRR) Malaysia and ethical approval was obtained from the Medical Research and Ethics Committee (KKM/NIHSEC/ P20-2364 (4)).

As there are no existing standards available for this study, a local standard was agreed upon; 100% compliance in grading and reporting intra-oral radiographs taken in the department.

The retrospective analysis of the first 25 case notes that fit the criteria was conducted in Department of Paediatric Dentistry Slim River Hospital during the period of August 2020 to September 2020 (first cycle) and October 2020 to November 2020 (second cycle). We included all intra-oral radiographs taken during that time-period and excluded any other form of imaging.

A data collection sheet was used (Figure 2) and results were tabulated and calculated as percentages using simple descriptive statistics.

ID	DATE	IOPA		BW		USO/LSO	
		GRADE	FINDINGS	GRADE	FINDINGS	GRADE	FINDINGS

Figure 2: Sample of data collection sheet

Once Cycle 1 was completed, the results were analyzed and an action plan was formulated to improve outcomes prior to starting Cycle 2. The action plan consists of a learning session for all clinicians in the department and verbal as well as written reminders were also given to

the clinicians in the department prior to starting Cycle 2 of this audit. A stamp as a pro-forma was fabricated to be used in the case notes once radiographs are taken to serve as reminder to clinicians (Figure 3).

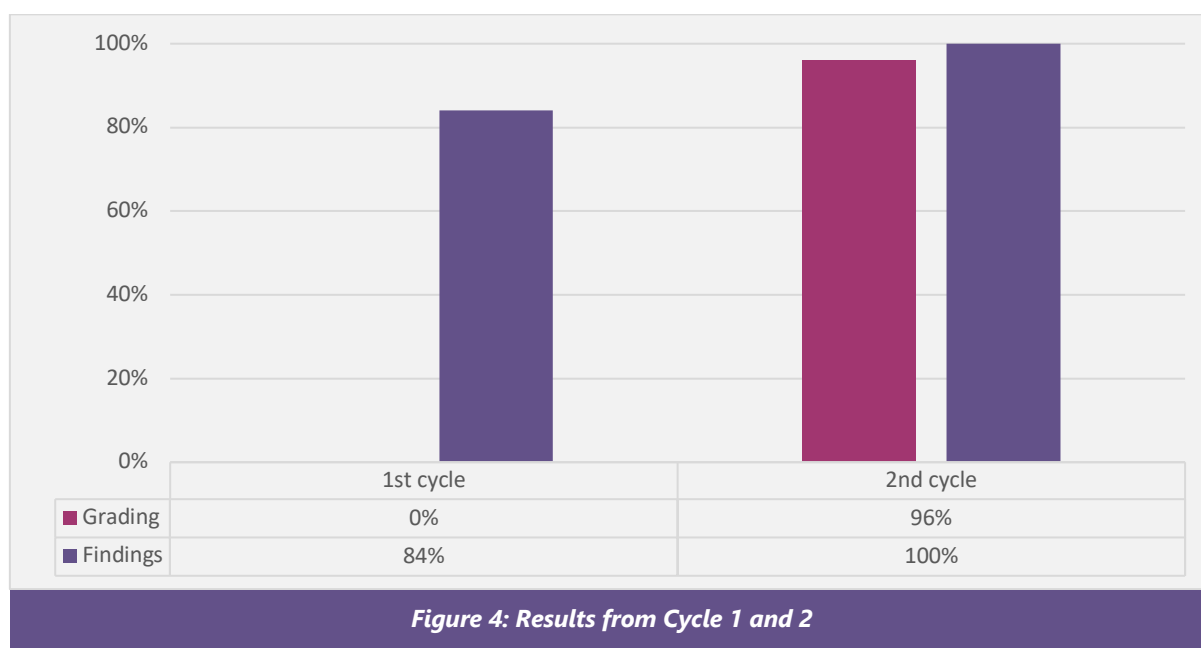
Ix :	10AA of 64
Grade :	1 (2) 3
Finding :	IOPA showing mixed dentition of 63 to half of 26 with visible crown of 23, 24, 25
SoC LD :	# restoration distally, ° PA lesion, intact MTA

Figure 3: Stamp Used as Pro-forma in Case Notes

RESULTS

Results from Cycle 1 revealed none of the radiographs audited were graded for quality while 84% (n=21) had the findings written in the case notes.

In cycle 2, 96% (n=24) of the radiographs were graded and all of the radiographs sampled had the findings recorded by the clinicians. The results for Cycle 1 and 2 are summarized in *Figure 4*.



DISCUSSION

Clinical audit is a statutory requirement¹² and utilized as a tool to improve clinical practice, and increase efficiency aside from providing better clinical outcomes. It should also provide learning opportunities for all staff involved in patient care.¹⁰ An audit can be conducted for almost any procedure and is required as part of clinical governance for radiographs.⁷

Record-keeping is vital as it not only forms the basis of good patient care but also provides integral legal defence for the clinician if the need arises. A radiological report can be in

handwritten in patient notes and serves to provide information for clinical care.¹³ Quality of the radiographs are graded based on clinical value of the image namely excellent (Grade 1), diagnostically acceptable (Grade 2) and unacceptable (Grade 3). The quality of the radiographs taken will demonstrate if the patient is gaining maximum benefit from the radiation exposure.⁷

Results of Cycle 1 highlighted inadequate record-keeping of radiographs in the department. A brainstorming session with clinicians proved to be a productive way of deciding how to reliably record the grades and report findings of radiographs in the case

notes. Brainstorming is an accepted method to generate a high number of ideas as a solution to a certain problem by enhancing communication. It enables members of an organisation to share ideas freely in a structured setting.¹⁵ Utilizing this process felt relevant as the session strengthened understanding that accurate record-keeping of radiographs was an essential process.

None of the radiographs audited were graded and only 84% had the findings reported in the case notes. As previously mentioned in this article, the radiation risk is age-dependent, being highest for the young and lowest for the elderly due to tissues of the younger cohort being more susceptible to it.⁷ As such, it is pertinent that all radiographs taken have their findings reported as this is fundamental to good clinical practice.^{7, 8,9,14} This was attributed to the high turn-over rate of clinicians in a new department. Many of the clinicians working in the department were recently graduated and have only just joined the service.

A learning session that outlines what was expected of them to write in patient case notes as well as a pro-forma in the form of a

stamp served as timely reminders. Introduction of prompts and reminders were successful in improving standards of record keeping in the second audit cycle. This finding is backed by previous studies that show well-placed prompts increase clinician awareness, leading to an improvement in record-keeping.¹⁶

The Department of Paediatric Dentistry in Slim River uses traditional film-based imaging, the grading method done was based on the previous guideline by the FGDP.⁷ However, with broad use of digital imaging systems, a new two-point grading scale was recommended, where images are graded as either 'diagnostically acceptable' ('A') or 'not acceptable' ('NA').⁸

In view of audit findings, the following suggestions are made:

- The audit should be regularly repeated in order to maintain good radiograph record-keeping.
- Continuing education on radiograph grading and radiograph findings to new clinicians.
- Implementation of pro-forma or stamp as a reminder to clinicians in case notes.

CONCLUSION

Appropriate justification, grading and reporting make a good radiograph record-keeping. It is common practice in developed

country to grade and report radiograph findings in case notes. Hence, it will help to maintain an optimum standard quality of radiograph record-keeping among clinicians.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Paediatric Cases Seen in Combined Clinic Sessions from Years 2017 to 2019 in the Dental Department of Selayang Hospital – A Retrospective Data Analysis

Thaarani Vijayakumar¹, Aminah Marsom²

ABSTRACT

Introduction: A combined clinic is defined as a clinic with a group of healthcare professionals that vary in expertise. Patients referred to this clinic generally have complex medical and/or dental conditions.

Objective: This study aims to audit the ages of patients, medical condition as well as types of cases seen in the combined clinic sessions held by the dental department of Selayang Hospital.

Methods: A retrospective data analysis of paediatric cases presented in the combined clinic of the dental department of Selayang Hospital was performed using case notes from years 1st of January 2017 to 31st of December 2019. Data collected include patient age, gender, referring clinician and types of cases.

Results: There were 89 cases seen in total, comprising of 44 males and 45 females. Medically compromised patients formed 11.3% from the total patients seen. Impacted teeth were the most common referral reason 62.5% with 19.3% of canines being the most common concern. Patients with oro-facial clefts were referred onto this clinic for orthognathic assessments (53.3%) and arterial bone grafts (ABG) (36.7%).

Conclusion: The majority of the paediatric cases referred to the combined clinic were for impacted teeth. Patients with oro-facial clefts were seen primarily for orthognathic and ABG assessments. A majority of the treatment planned for paediatric patients involved orthodontics and more than half of the cases seen were primarily referred by general dentists.

Keywords: *combined clinic, paediatric cases, multidisciplinary*

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INTRODUCTION

The clinical benefits of a multi-disciplinary or combined clinic model have been well

described in various literature¹. A combined clinic is defined as a group of healthcare professionals who have expertise in different areas of care to manage complex medical

conditions.² An integrated approach as a team results in improved patient outcomes.^{3,4} Additionally, these clinics have the added bonus of a cost-effective approach in patient care by providing opinions from various specialties in a single setting⁵. In the field of dentistry, the more commonly established combined clinics that involve the dental specialty are Combined Cleft Clinic and Hypodontia Clinics.⁶

The Dental Department in Selayang Hospital comprises of the Department of Oral and Maxillofacial Surgery and the Department of Paediatric Dentistry. The combined clinic sessions incorporate other specialties from various clinics such as Orthodontics, Periodontics and Restorative Dentistry. The patients seen in this clinic are children, adolescents as well as adults who require interdisciplinary discussion and management. The cases referred to this clinic will be presented and discussed amongst the specialists and the treatment options, cost, risks as well benefits of each treatment option will be explained to the patients and family members.

These sessions provide an avenue for the complex cases involving the paediatric cohort to be directly discussed among the various specialties. Patients' satisfaction and outcomes have proven to be superior in this practice model¹. The referred patients are first seen on the new patient clinic in the Paediatric Dental Department and if a patient is deemed to require the expert advice of other specialists, the patient is then referred to the

Combined Clinic. Cases that are commonly discussed in the paediatric group of patients are oro-facial clefts, facial skeletal discrepancies, abnormal oral habits and dental anomalies such as impacted teeth, hypodontia and supernumeraries among others.

Similar combined clinics are held in other dental department across Malaysia however there isn't any published information regarding treatment plans and outcomes. Data regarding cases seen on these clinics are readily available elsewhere. However, such studies are not available for reference to the referring healthcare professionals and the general public in Malaysia. The results from this retrospective analysis will contribute towards enriching the knowledge of the referring dentists on the types of cases seen on this combined clinic. Selayang Hospital being a teaching centre requires this data to serve as a reference tool for dentists within the Dental Department itself and this database would be useful for General Dental Practitioners to refer to for information regarding treatment options offered. The aim of this study is to determine the types of paediatric cases seen in the combined clinic sessions help by the dental department in order to provide information to referring dentists. The specific objectives include the following: i. to determine the demographic distribution of patients seen at combined clinic; ii. to determine the referral source and iii. to determine the types of treatment planned during these combined clinics.

MATERIALS & METHODS

Retrospective data collection was done using Combined Clinic attendance records,

computerised records and patient's notes from January 2017 to December 2019. All paediatric patients below age 16 years old referred to this clinic were included in this study. Since this is a combined clinic with adult

patients as well, the cases with adult patients were excluded. All details of the socio-demographic data, source of referral, medical history, diagnosis, treatment plan, specialities involved as well as outcomes were transferred to data collection sheets by the principle investigator. Available data were further divided into diagnoses such as presence of

oro-facial clefts, dental anomalies (e.g., impacted teeth, supernumeraries, hypodontia) and types of teeth that were frequently impacted. Ethical approval for this study was obtained from the Medical Research and Ethics Committee, Ministry of Health, Malaysia (KKM NIHSEC/P19-1990). Data was analysed using descriptive statistics.

RESULTS

There were 89 paediatric cases seen in total, comprising of 49.4% males and 50.6% females. Ages ranged from 7.2 years to 15.7 years with a median age of 12.3 years old. The racial

distribution is divided to Malay (56.2%), Chinese (31.5%) and Indians (12.3%) (*Table 1*). Twenty-eight percent of the patients had oro-facial clefts and 11.3% from the total patients seen were medically compromised.

Table 1 Demographic Data

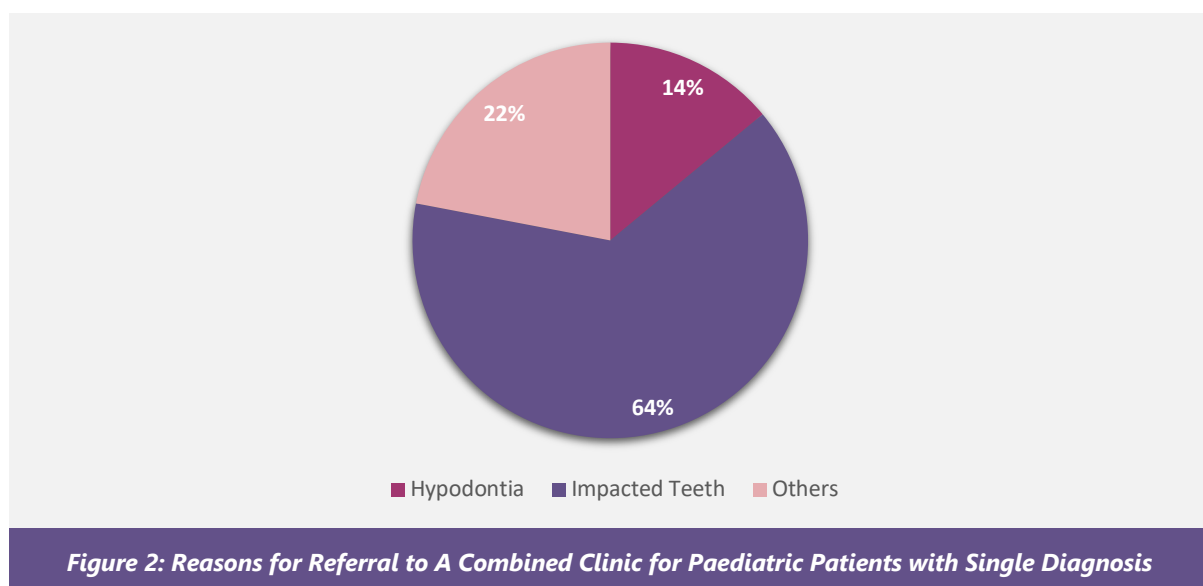
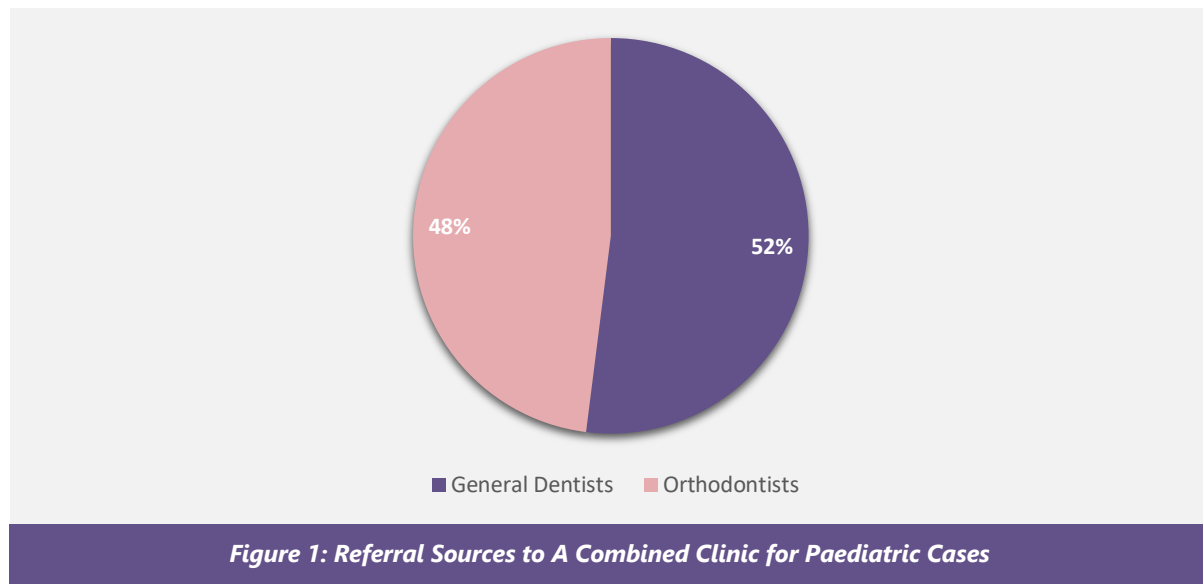
Characteristics	Frequency % (n)
Age	
≤5 years	0% (0)
6-10 years	51.7% (46)
11-16 years	48.3% (43)
Gender	
Male	49.4% (44)
Female	50.5% (45)
Ethnicity	
Malay	56.2% (50)
Chinese	31.5% (28)
Indians	12.3% (11)

Fifty-two percent of cases were initially referred by general dental practitioners and the remaining cases were referred by orthodontists (*Figure 1*). Patients referred to this clinic with a single diagnosis were at 32%

and multiple diagnoses numbered at 68%. Patients with a single diagnosis were referred for impacted teeth (64%), hypodontia (14%) and other diagnoses such as fused permanent teeth, syndromic patients with malocclusions

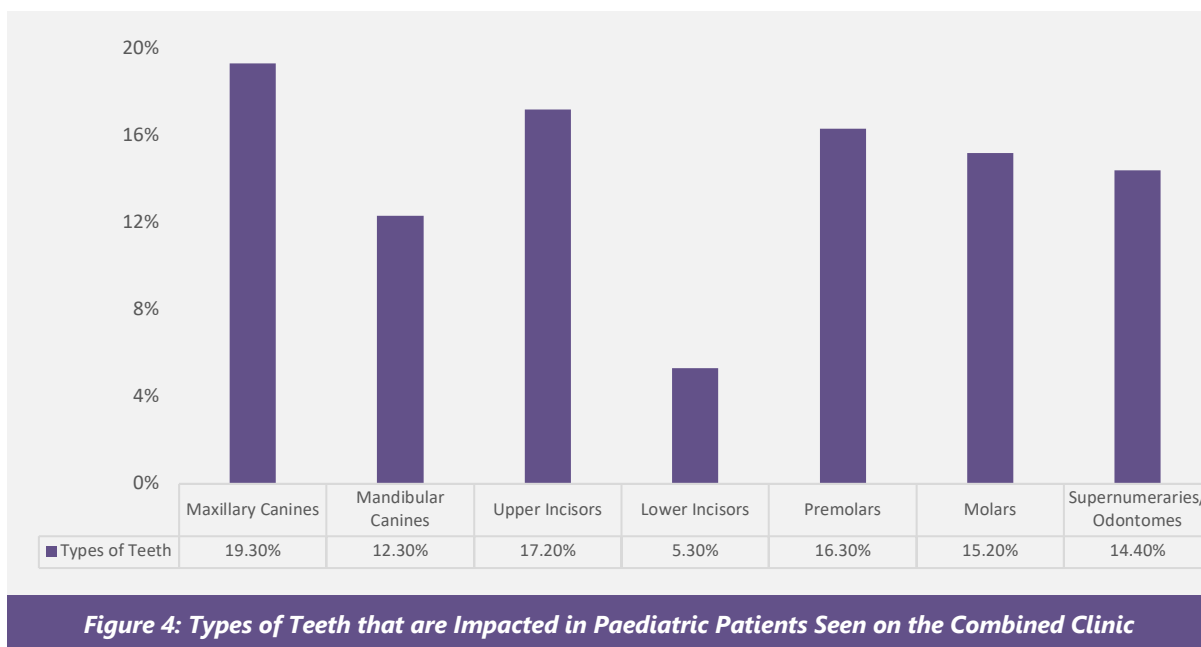
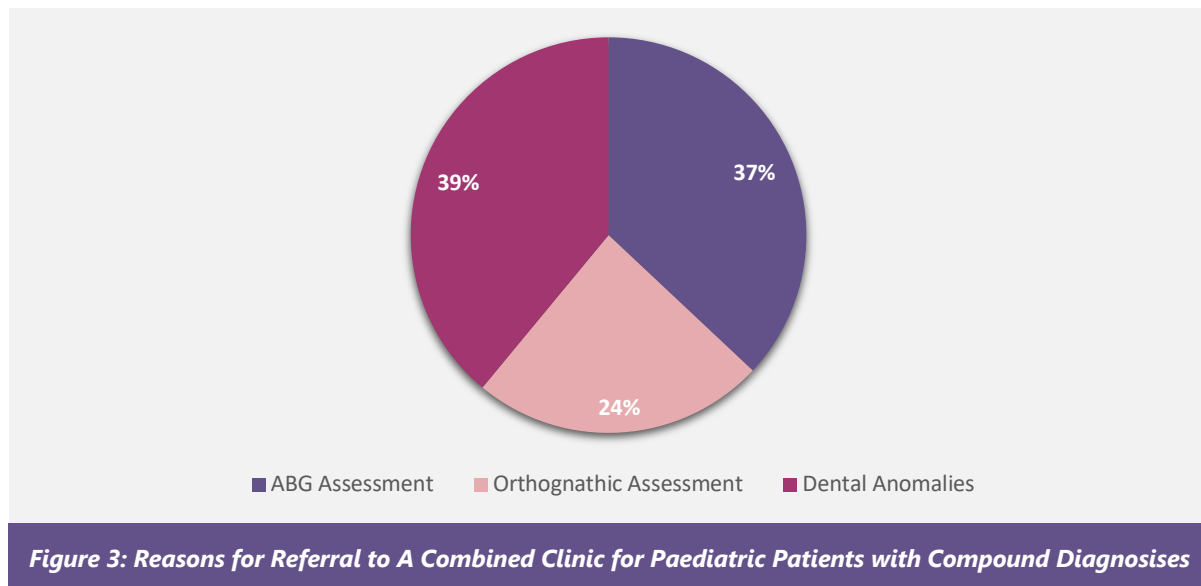
or ankylosed teeth (12%) (*Figure 2*). Impacted teeth in this group of patients comprised of impacted supernumeraries and/or

supplemental teeth (22%) and permanent teeth (78%).



Patients with compound diagnoses were patients with oro-facial clefts that were referred for alveolar bone grafts (ABG) assessments (36.7%), orthognathic assessments (24.3%) as well as dental anomalies (39%) (*Figure 3*). Dental anomalies in this cohort of patients were divided into impacted teeth (42.3%) of which 52% were

permanent teeth and 48% supernumeraries and/or supplemental teeth. Hypodontia was found in 57.7% of the patients with clefts. In this study, maxillary canines (19.3%), maxillary central incisors (17.2%) and premolars (16.3%) were the most common teeth that failed to erupt due to impaction (*Figure 4*).



Treatment outcomes from this clinic were grouped into several categories (*Table 2*). Majority of these cases were managed in combination with orthodontic management (81%). Forty-two percent of the paediatric cases referred to this clinic were for surgical

removal of impacted tooth, odontomes or supernumerary followed by orthodontic treatment. The second most common treatment was for expose and bond of the impacted tooth in combination with orthodontic management (39%).

Table 2 *Combinations of Treatment Plans for Paediatric Patients in Combined Clinic*

Treatment combinations	
Surgical removal of impacted tooth/supernumeraries/odontomes (Paediatric Dentistry) + Orthodontic management	42%
Exposure and bonding of impacted tooth (Paediatric Dentistry) + Orthodontic management	39%
Orthognathic assessment (Orthodontics + OMFS management)	11%
ABG assessment (OMFS management + Orthodontic management)	6%

DISCUSSION

A multidisciplinary clinic is a practical and efficient means of delivering patient care in addition to serving as an educational tool as well as providing a cost and time-saving method for patients with complex conditions in obtaining care.¹ Collins in an article mentioned the importance of multidisciplinary care in paediatric patients as it improves patient care as well as reduces the per capita healthcare cost. The team approach has helped make episodes of stressful childhood illnesses more tolerable to the patient as well as parents.⁷

The results in this sample indicate patients' racial percentages that are proportionate with racial distribution of population in this country. Both genders were equally represented in the combined clinic.

A large number of the paediatric cases seen on the combined clinic were initially referred by a general dental practitioner. The majority of children in Malaysia that attend public school obtain dental treatment from school dental services which are served by general dentists as well as dental therapists. These

healthcare personnel are the first to come into contact with any dental anomaly that a child may have and then they are subsequently referred to the relevant specialties.⁸

In most of the cases, multiple diagnoses were noted in patients with oro-facial clefts. This finding correlates with previous studies which indicated a higher prevalence of dental anomalies in children with cleft compared to the general population. These anomalies include variations in tooth size, shape, structure as well as eruption timing.⁹

The challenge for parents and caregivers in coordinating and attending numerous appointments should not be underestimated as individuals with oro-facial clefts will require long-term multidisciplinary care. Hence it is crucial that these patients are routed onto a clinic that can provide an integrated approach to assist them in minimizing their already numerous clinic visits.¹⁰

Our study showed the maxillary canine is the most commonly impacted tooth and this is supported by the theory that it has the longest and most complex eruption path before it emerges into occlusion.¹¹ This is the tooth most prone to be impacted second to third

molars.¹² The precise aetiology of impacted maxillary canines is unknown, however a study done by Jacoby¹² concluded that length discrepancy was a primary factor. Several other proposed factors include localized factors (ankylosis, cysts and absent maxillary lateral incisors, systemic factors (irradiation, systemic diseases) or genetic reasons (presence of clefts, hereditary).^{13, 14, 15}

Maxillary canine impactions may cause aesthetic problems, like tipping of adjacent teeth and midline deviations¹⁴, but they can also result in pathological presentations such as root resorption of adjacent teeth, formation of dentigerous cysts as well as infections.¹⁵ In a study done by Ericson and Kurol¹⁶ on 17 extracted incisors of children with impacted maxillary canines revealed all but 1 to have some degree of resorption. Hence it is vital that in maxillary canines that have the

potential to become impacted are referred to the relevant specialist clinics for further management.

Treatment options for the paediatric patients seen ranged from exposure and bonding of impacted teeth to its surgical removal and a majority of the patients got referred onto orthodontic services. Since most cases referred to this combined clinic have multiple diagnoses and needs combine expertise to manage these cases. This illustrates the need and necessity of having this type of clinic and to have collaboration amongst dental specialities. This is in-line with a commentary by Jones¹⁷ on multidisciplinary clinics for a multi-disciplinary approach allows complex treatment plans to be carried out as the care pathway is continually monitored by various specialities.

CONCLUSION

A multidisciplinary clinic delivers patient care by providing a cost and time-saving method for patients with complex conditions to obtain a comprehensive treatment plan. It also provides teaching and learning potential for the clinicians servicing it. The majority of the

paediatric cases referred to the combined clinic were for impacted teeth. Patients with oro-facial clefts were seen primarily for orthognathic and ABG assessments. A majority of the treatment planned for paediatric patients involved orthodontics and more than half of the cases seen were primarily referred by general dentists.

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Juvenile Psammomatoid Ossifying Fibroma: A Case Report

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ABSTRACT

We herein report a case of a 9-year-old girl with a rare aggressive juvenile psammomatoid ossifying fibroma (JPOF) which also presented with relapsed Wilms' tumour. Initially the lesion on the right mandible was suspected to be a metastasis of Wilms' tumour since it had spread to the right lung and liver which the Paediatric Oncology team had decided to not proceed with further treatment. Our team then proceeded with an incisional biopsy to confirm the metastasis hypothesis. However, histopathological examination reported a different type of tumour than expected (JPOF), which prompted a multidisciplinary team meeting. We then decided for surgical enucleation of the lesion despite patient being under palliative care, considering its rapid expansion and potential complications. Features of this case are discussed together with its implications, including the challenges we faced in managing the patient.

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INTRODUCTION

Benign fibro-osseous lesions (BFOL) are a clinically diverse group of bone disorders that share similar histological features and occur relatively commonly in the jaw. Common to all forms of BFOL is the replacement of normal bone with a tissue comprising collagen and fibroblasts containing varying amounts of mineralized substance, which may be bony or cementum-like in appearance. BFOL include developmental lesions, reactive or dysplastic processes, and neoplasms.^{1,2}

Ossifying fibroma (OF), fibrous dysplasia (FD), and osseous dysplasia (OD) are three forms of BFOL. Ossifying fibromas are divided to cemento-ossifying and juvenile clinicopathologic variants. Juvenile forms are further divided into juvenile trabecular ossifying fibroma (JTOF) and juvenile psammomatoid ossifying fibroma (JPOF).² They are found mostly in children below 15 years of age, though older patients can also be affected. The definitive diagnosis cannot be concluded based on histopathological features alone, rather, the final diagnosis is dependent on microscopic assessment

together with the clinical and imaging characteristics.¹

CASE REPORT

This is a case of a 9-year-old girl with relapsed Wilms' tumour with lung and liver metastasis who was initially referred to our centre for management of gum bleeding due to low platelet counts and presentation of right lower cheek swelling. The swelling over her cheek started about a few days before her first consultation, however there was no pain or discomfort. Gum bleeding had resolved after platelet transfusions. Her current issue was due to parents' concern with regards to the increase in the size of the cheek swelling.

Examination revealed a firm, 4x6 cm swelling over her right body of mandible. Extra orally it was non-tender to palpation, non-mobile, partially attached to the surrounding structures, similar in colour and temperature to the surrounding skin, and has no punctum or sinus tracts. Intraorally, there was raised buccal sulcus in relation to teeth 46, 85, 44 and 83 and all molar and premolar teeth showed grade II mobility. The mandibular swelling was tender on palpation, firm to bony hard in consistency, covered by normal mucosa and extended from the right retromolar to the mental region ipsilaterally and had caused expansion of the lingual and buccal cortical plates (*Fig. 2*). No other distant bones were involved, and no other abnormalities were found on general physical examination. There was no family history of skeletal disease. Contrast-Enhanced Computed Tomography of thorax, abdomen and pelvis shows an expansile lytic lesion with thinned cortex and enhancing soft tissue component in the body of right mandible measuring 2.9 x 3.1 cm, with the crown of an

unerupted tooth noted within. There was circumferential expansion of the mandible with sparing of the condyle (*Fig.3*). The radiological differential diagnosis of this lesion was an aggressive, expansile lytic lesion in the body of the right mandible, suggestive of metastases of Wilms' tumour or osteosarcoma. Subsequently, incisional biopsy of lesion was done under general anaesthesia by an intraoral approach. Operative findings of the lesion were a firm, whitish, fibrous growth with a matured coconut flesh like texture. Histopathological examination revealed the mass to be a benign fibro-osseous lesion – favouring cemento-ossifying fibroma (COF).

Patient was then reviewed with the Oral and Maxillofacial Surgery team one week post incisional biopsy, which showed increasing size of the cheek swelling with complaint from the parents expressing dissatisfaction with facial appearance and discomfort of the child. Intraoral surgical site showed good signs of healing, sutures were intact with no signs and symptoms of infection.

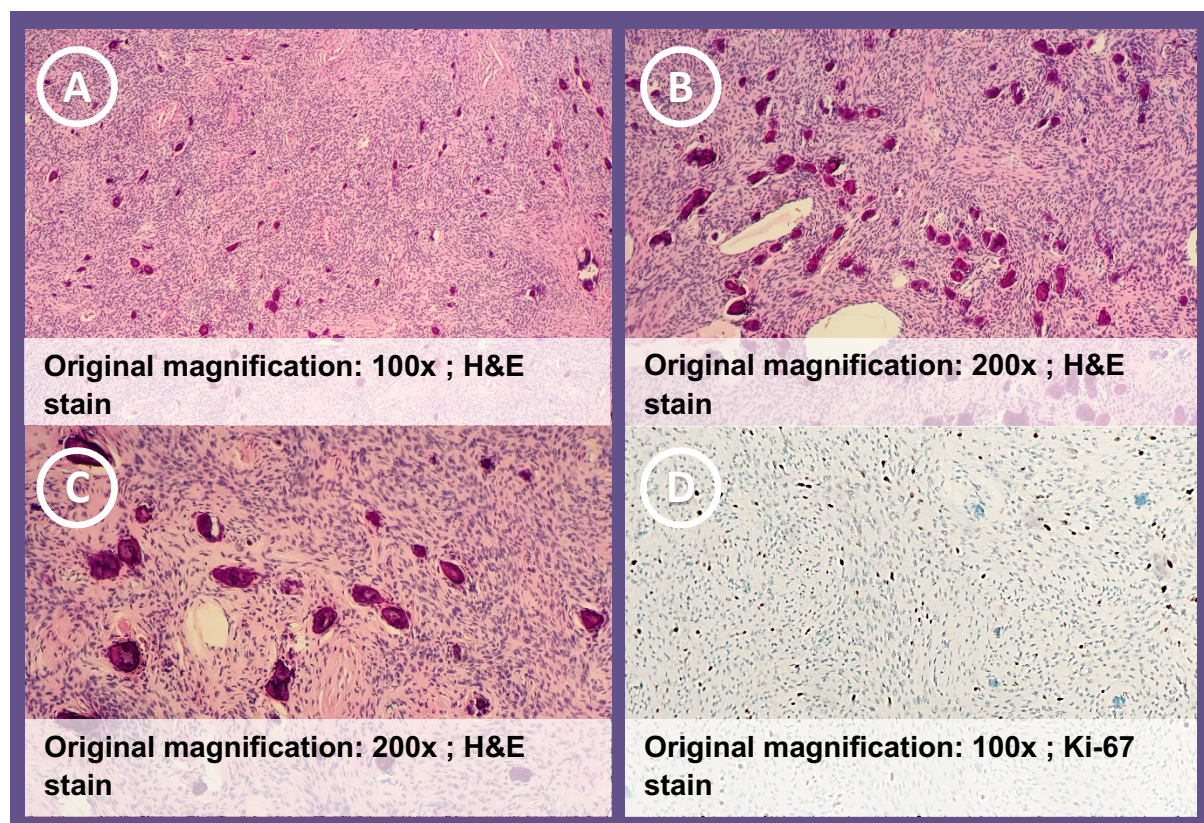
Due to the rapidly increasing size of the swelling, a second excisional biopsy/enucleation was agreed upon by a multidisciplinary team (MDT) consisting of the patient's oncologist, oral pathologist, oral & maxillofacial surgeon & paediatric dental surgeon, to confirm that the origin of the mandibular lesion is not a metastasis from the primary Wilms' tumour and to prevent a potential pathological fracture. A metastatic origin would entail a more aggressive treatment modality, whereas a reconfirmation of the initial COF finding would allow a more conservative approach. The extraoral swelling increased rapidly to a size of 6x6cm 3 weeks post incisional biopsy.

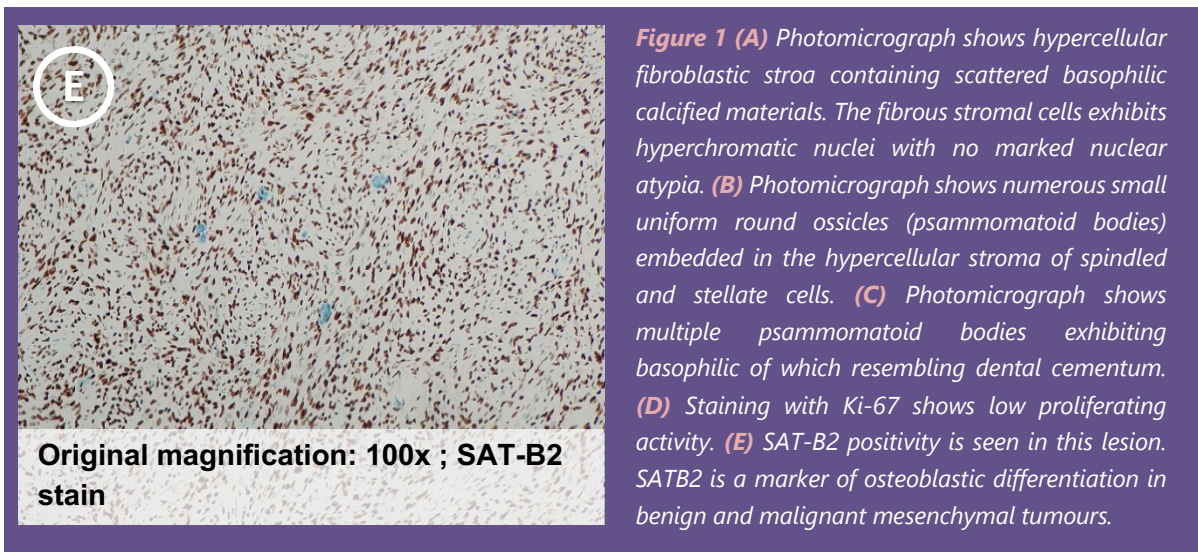
Dental panoramic tomogram (DPT) and Cone-beam computed tomography (CBCT) taken on the same day showed a large unilocular radiolucency, well defined in relation to 83 till 46 distal roots, and displacement of unerupted tooth 45 medially to unerupted 43, with root resorption of 85 noted. *Fig. 4(a) and Fig.5(a).*

Upon admission for her surgical enucleation biopsy 11 days later, a repeat CBCT was taken *Fig 5(b)*, and it shows increasing size of the lesion, and more resorption of the mandibular lower border can be seen. Routine full blood count, coagulation profile, liver function test, renal profile, thyroid function investigations and parathyroid levels were normal. The aforementioned procedure together with extraction of mobile teeth at the area of concern were done under general anaesthesia. Lesion was removed in toto,

measuring approximately 5.5cmx5cm. During removal of the lesion the mental nerve was noted and preserved. The lower border of mandible appeared intact; thus, no stabilization or fixation was required. The resultant bony cavity was then packed with bismuth iodoform paraffin paste (BIPP) to promote granulation and was changed on a weekly basis. (*Fig. 6*)

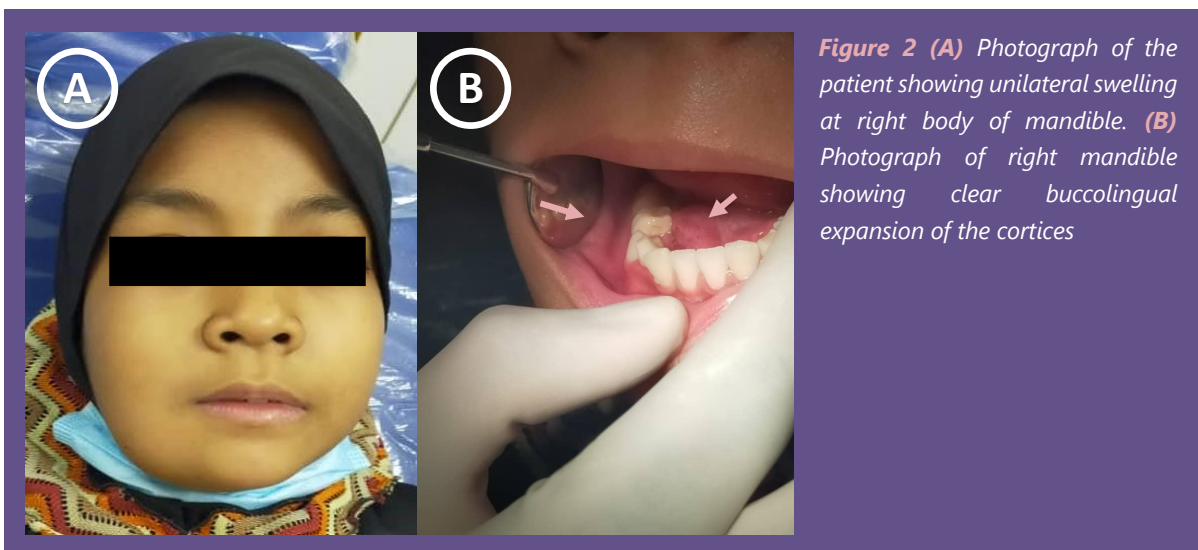
The histological features and immunohistochemical findings were similar with the previous biopsy, showing a benign fibro-osseous lesion - consistent with cemento-ossifying fibroma, however upon further correlation with the clinical presentation, radiological findings, and more detailed histopathological features it was more suggestive of a final diagnosis of Juvenile Psammomatoid Ossifying Fibroma. (*Fig. 1*





Due to histopathological findings, the same MDT decided that the enucleation of the lesion was considered sufficient and definitive. Upon subsequent reviews, there was reduction in size of the swelling extra orally, as well as the depth and width of the mandibular cavity indicated by the reduction in the length of BIPP pack replaced into the cavity.

Post-surgical follow up at 6 months showed slight facial asymmetry with significantly reduced right mandibular swelling and improving sensation on the right lower lip and right chin. Intraoral examination revealed a very shallow defect at the former surgical site with complete mucosal covering (Fig.7) Radiographic investigations also revealed excellent bone remodelling. Fig.4(b) and Fig.5(c).



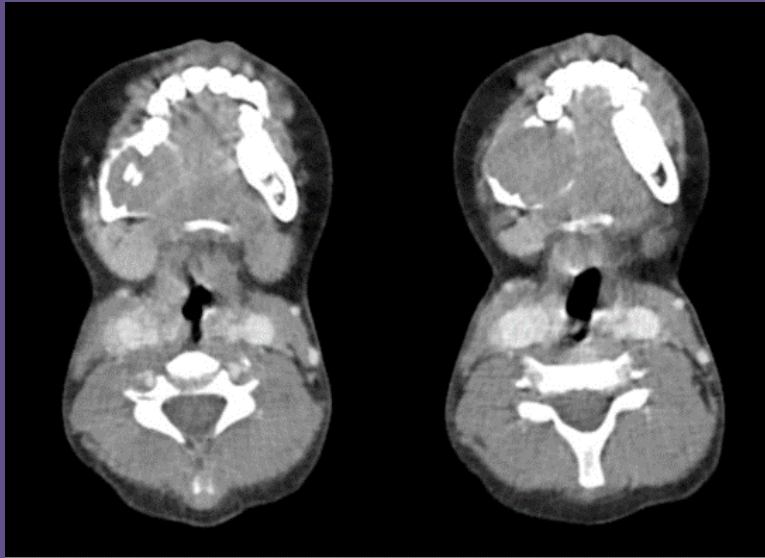


Figure 3 CT axial image showing expansile lytic lesion with thinned cortex and enhancing soft tissue component in the body of right mandible measuring 2.9 x 3.1 cm, the crown of an unerupted tooth is noted within



Figure 4 (A) Orthopantomogram (OPG) taken for the patient showing large radiolucency on right body of mandible with displaced unerupted second premolar **(B)** Orthopantomogram (OPG) taken for the patient during 6 months post-operative review showing bone remodeling



Cone Beam Computed Tomography (CBCT)

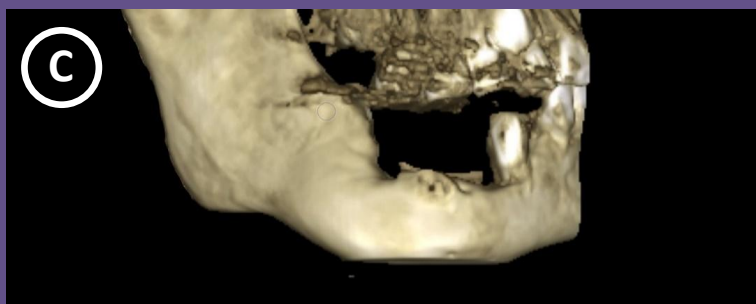
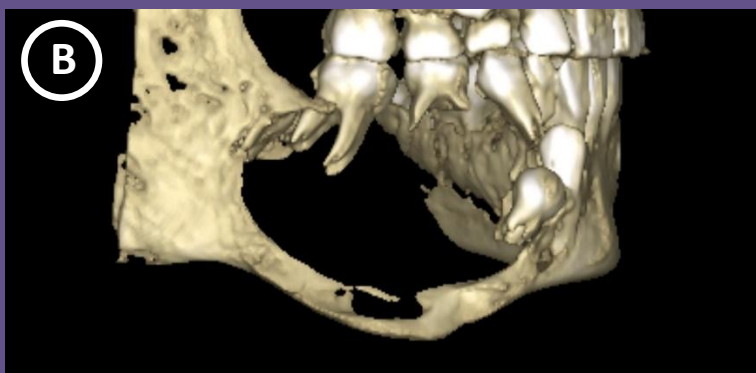
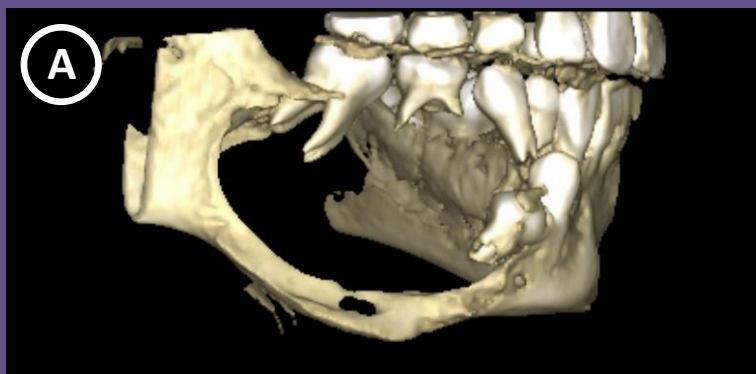
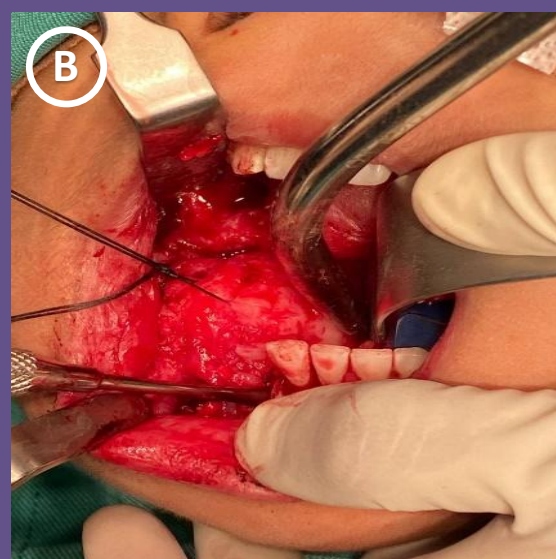
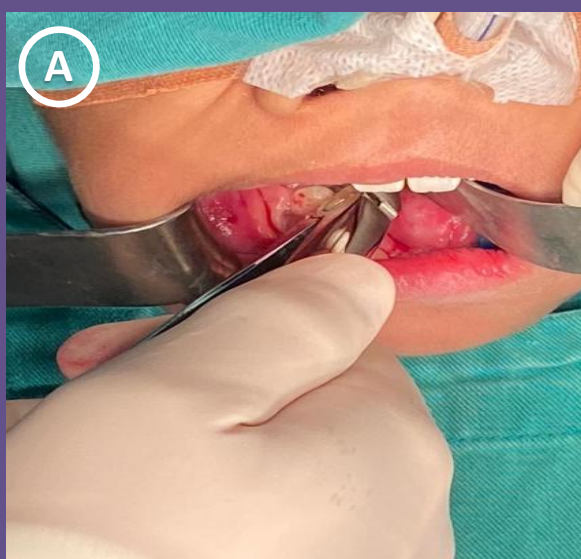


Figure 5 CBCT taken of (A) and (B) ten days apart showing aggressive and rapid bone resorption . CBCT taken of (C) showing bone remodelling at right body of mandible during 6 months post-operative review



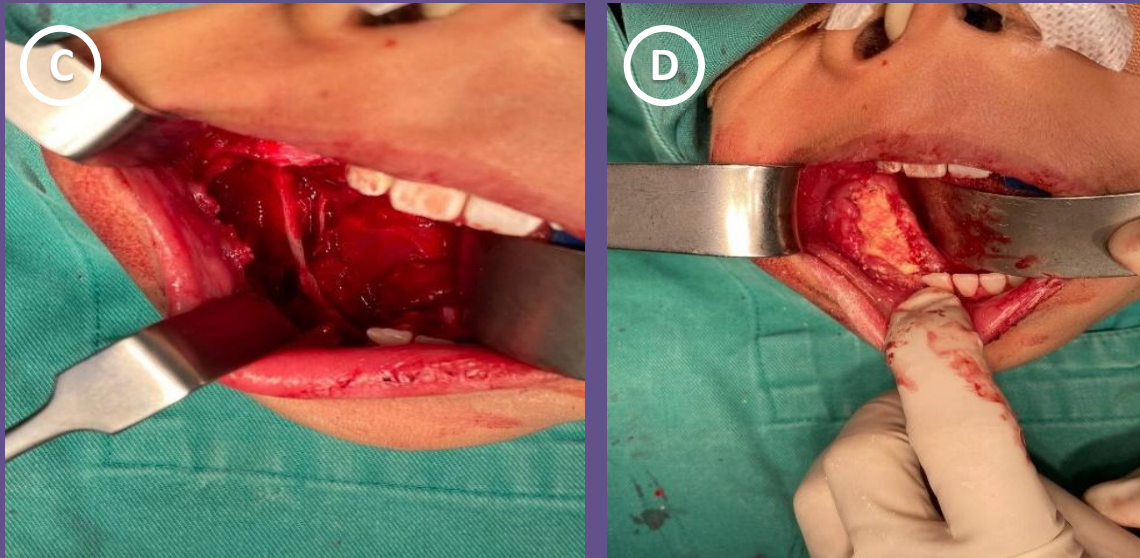


Figure 6 Surgical enucleation of the lesion **(A)** Incision made from mesial teeth of 41 to distal 46 and tooth extraction of 83,85,44,45 and 46 done. **(B)** Lesion removed in toto measuring approximately 5.5x5cm. **(C)** Enucleation and curettage done with preservation of Inferior alveolar neurovascular bundle and lower border of mandible. **(D)** Closure of the operative site with placement of BIPP into cavity.



Figure 7 6 months post-operative review

DISCUSSION

Based on latest WHO classifications, ossifying fibroma is defined as benign fibro-osseous neoplasm affecting the jaws and the craniofacial skeleton. The three clinicopathological variants that have been identified are ossifying fibroma of odontogenic origin – also called cemento-

ossifying fibroma (COF) – and two distinct juvenile ossifying fibromas (JOF); juvenile trabecular ossifying fibroma (JTOF) and juvenile psammomatoid ossifying fibroma (JPOF).¹¹ So far, there has been no national incidence of JPOF reported in Malaysia due to the rarity of OF.

Clinically, COF tend to occur more frequently in the mandible. In contrast, JOF shows

predilection towards paranasal sinuses, the periorbital region, and the maxilla.² Most cases of JPOF occur within the mean age range of less than 21 years old⁹. It appears as a gradually enlarging and aggressive lesion^{4,7} which has the capacity to grow larger and cause facial deformity if left untreated.¹⁰ In addition to that, JPOF induces bony expansion and may lead to pathological fracture of the affected bone, and it has higher potential to recur.¹⁰

Histologically, JOF are characterised by distinctive trabecular or psammomatoid matrix creation.⁵ Both subtypes have similar stroma, but JTOF consists of densely cellular fibrous tissue with little collagen, containing thin strand-like trabeculae of fibrillary osteoid and woven bone. JPOF is also densely cellular but contains spherical or lamellated calcifications (ossicles); the typical psammomatoid bodies.⁶ The trabecular form mainly affects the jaws while the psammomatoid type tend to develop on cranial bones, predominantly the sinonasal and orbital bones.^{2,6-9} The combination of both trabecular and psammomatoid patterns within the same tumour have also been cited.^{4,6}

The usual radiographical presentation of JOF are radiolucent and radio dense areas with thin sclerotic rims. It imitates other bony lesions such as fibrous dysplasia, COF, aneurysmal bone cyst, osteogenic sarcoma, and osteoblastoma. Due to marked destruction of adjacent structures, the aggressive lesions may mimic osteosarcoma radiographically⁹, which led to the initial radiological differential diagnosis of our patient.

However, histopathology determines the principle of diagnosing the variant of JOFs. Microscopically, JPOF is a non-encapsulated lesion characterized by the presence of concentric or laminated ossicles called psammoma bodies embedded in cellular stroma.^{11,12} Psammomatoid bodies are basophilic in nature and resemble dental cementum. The histopathological features of this case reported fibrous stroma containing numerous cementum-like mineralizations which are basophilic centrally.^{9,11,12} These features are found in our patient's specimen leading us to conclude with a final diagnosis of JPOF instead of COF.

A wide spectrum of tumours has been shown to be associated with hyperparathyroidism jaw tumour (HPT-JT) syndrome but most notable is the association with various renal lesions, which include Wilms' tumour¹³⁻¹⁵ In summary, the findings suggest that HPT-JT syndrome is an autosomal disorder characterized by parathyroid tumours, fibro-osseous lesions of the jaw, and various subtypes of renal tumours or cysts.¹⁶ This prompted us to check our patient's parathyroid hormone levels. However, our patient was noted to have normal parathyroid hormone and calcium levels indicating the jaw lesion may not be related to HPT-JT syndrome.

Finally, the treatment choice for JOF is highly influenced by the nature, size, and the site of the lesion.⁷ There is no consensus for the treatment of JOF cases. Radical resection, local excision conservatively or enucleation with curettage are among the widely practiced treatment options.^{7,10} In locally aggressive cases with rapid growth, total resection will usually be the treatment option.^{6,10,17} This is also quoted by Goulart-Filho et

al., as JOF has high potential for local recurrence (range between 20% and 90% of cases).¹⁸ In contrast, enucleation and thorough curettage is often adequate for small lesions. Large lesions might require en bloc resection or resection with reconstruction.⁷

Even though it's an aggressive lesion, we took a more conservative approach on this patient as she is currently under palliative management for her primary tumour. This

has been decided during an MDT discussion which agreed on enucleation and curettage of the bony lesion instead of jaw resection, which would not significantly affect her quality of life. Besides, an aesthetically acceptable result with significant bony regeneration and masticatory function was achieved. Upon subsequent reviews, patient is doing well with good clinical and radiographical findings as shown in *Figure 4(b), 5(c) and 7*.

CONCLUSION

JPOF is a rare neoplasm, and often mistaken for other types of BFOLs because of their similar clinical and radiological presentation. Nevertheless, the histological features are crucial in differentiating the diagnosis, and the treatment required. To date, no Malaysian data on incidences or published case reports of JPOF are known to the authors. Although

benign, JPOF can be locally aggressive. To date, there is no consensus for treatment of JPOF. Total resection is the typical choice in locally aggressive lesions. However, in this patient a more conservative treatment was done considering patient's comorbidities. Conservative approach resulted in excellent bone remodelling after 6 months. Therefore, enucleation of locally aggressive JPOF is a viable treatment option in this particular patient.

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