KNOWLEDGE ON WHITE SPOT LESIONS (WSL) AMONG FIXED ORTHODONTIC PATIENTS: A PILOT STUDY

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ABSTRACT

Introduction: The formation of white spot lesions (WSL) around fixed orthodontic attachments is a common complication during and following fixed orthodontic treatment. The objectives of this study were to determine patient's knowledge on risk of developing WSLs during fixed orthodontic treatment, to identify oral hygiene practice by the patients and preventive method given during treatment. Methodology: This is a cross-sectional observational study using questionnaires. Subjects were selected by convenience sampling from orthodontic patients who attended orthodontic specialist clinic in Faculty of Dentistry, USIM. Subjects who fulfilled the inclusion criteria were asked to answer the questionnaires. The knowledge assessments were on development of WSL during treatment and oral hygiene care in orthodontic patients. Results: A total of 32 subjects were given the questionnaires. Half of them did not know that wearing braces can cause formation of WSL around the brackets. For oral hygiene practiced, 96.9% brushed their teeth more than twice daily. About 75% of them stated that their orthodontists emphasized on tooth brushing technique. Conclusion: Most patients have fair knowledge about WSL as a complication of fixed orthodontic treatment and adequate oral hygiene practices. More education on awareness regarding the development of WSL during fixed orthodontic treatment will improve treatment outcome.

Key words: knowledge; white spot lesion; orthodontic

INTRODUCTION

White spot lesion is a demineralization process of tooth enamel that occur as a complication of fixed orthodontic treatment, especially when associated with poor oral hygiene. The acidic byproducts of the bacteria in plaque trapped around fixed orthodontic attachments are responsible for the enamel demineralization and thus lead to formation of white spot lesions (WSL) (Reilly et al 1985). White spot lesions (WSLs) appear as small lines around the brackets; in some patients, they are visible as large decalcified areas with or without cavitation. These can cause caries thereby leading to poor esthetics, patient dissatisfaction and legal complications (Zachrisson 1978, Ogaard 1988, Sangamesh 2011). The formation of WSL after treatment is discouraging to orthodontics in which the aim is to improve esthetics in the dento-facial region.

WSL develop in association with brackets, bands, arch wires, ligatures and other orthodontic devices that complicate conventional oral hygiene measures, leading to prolonged plaque accumulation. Orthodontists must take up the active responsibility to educate patients about the importance of maintaining good dietary compliance and excellent oral hygiene regime.

Clinically, formation of white spots around orthodontic attachments can occur as early as 4 weeks into treatment (Reilly 1985) and their prevalence among orthodontic patients ranges from 2% to 96% (Mizrahi 1982, Gorelick 1982, Mitchell 1992). The labio-gingival area of the lateral incisors is the most common site for WSL and the maxillary posterior segments are the least common site with males affected more in comparison with females (Zachrisson and Zachrisson 1971). Tufekci et al. (2011) concluded in his clinical study that a sharp increase in the number of WSLs occurred during the first 6 months of treatment then continued to rise at a slower rate to 12 months, thus in initial months of the treatment, critical evaluation of oral hygiene is recommended.

The aetiology of white spot lesions is commonly due to interactions of four factors which are bacterial plaque, fermentable carbohydrate, susceptible tooth and time. (Kamna et al 2013). Formation of white spot lesions around orthodontic attachments can occur as early as four weeks after the treatment. The mandibular first molars and maxillary lateral incisors were the most affected teeth in both treated and untreated groups (Alessandra et al 2012). Duration of orthodontic treatment also showed significant increase in the occurrence of white spot lesion (Sandhya et al 2013).

The risk of enamel demineralization during fixed orthodontic treatment can be prevented by improving patient oral hygiene using mechanical plaque control method and by enhancing the enamel resistance to the microbial acid by using topical fluoride and others. Patients were the most responsible for the prevention of white spot lesions therefore good communication needed to decrease incidence of WSLs in orthodontic population (Maxfield et al 2012).

Essamet and Darrout (2016) showed in their studies, subjects who recently received orthodontic treatment have more knowledge and awareness about orthodontic treatment than subjects who do not have orthodontic experience. But, what about the patients'

knowledge regarding the complications such as WSL that can possibly occur as a result of orthodontic treatment. This encouraged us to study the knowledge of patients whom are treated orthodontically regarding white spot lesions as one of the complication, because the level of knowledge in patients will determine the risk of developing white spot lesion. The results from the study also may help the clinician to develop a strategy in educating patients about WSL in the form of clinical guidelines.

Therefore, the objectives of this study are to determine patient knowledge on risk of developing white spot lesions during fixed orthodontic treatment, to identify oral hygiene practice by the patients and preventive method given during treatment.

MATERIALS AND METHOD

This is an observational cross-sectional study and conducted using questionnaires. The study was done in a university setting dental clinic. The samples collected were 32 patients and selected using convenience sampling among orthodontic patients who wear fixed appliances. The inclusion criteria was the orthodontic patients who have already worn the appliances at least for one month. The exclusion criteria were dental student, age less than 7 years old, patients with any congenital anomalies or medical problem and history of previous orthodontic treatment.

The questionnaires consisted of items on demographic data, knowledge regarding white spot lesion, oral hygiene regimen and preventive measurements. Questions were adapted from relevant published reports in the international journals. An information sheet explaining the need for the study and the procedure for responding to the questionnaire were enclosed. The questions were related to participants' age, race, sex, time span wearing braces and their knowledge regarding development of white spot lesion during fixed orthodontic treatment. The questionnaires included questions to assess participant's attitudes toward maintaining good oral health.

A photo showing appearance of WSL around the bracket was also included as an aid to answer the questions. Consent were obtained before answering the questionnaires. A pilot study was carried out on 10 volunteers who were wearing fixed appliances and fulfilled inclusion and exclusion criteria in order to validate the questionnaire before conducting the study.
Completed questionnaires were entered on an Excel spreadsheet and imported into Statistical Package for Social Sciences (SPSS) version for data statistical analysis.The results were analysed using SPSS on descriptive statistics.

RESULTS

A total of 32 patients participated in the study conducted. For demographic data, there were 75% female and 25% male subjects involved with their mean age of 19.5 years old. Majority of the subjects were Malays which are 87% and others were Indian (13%). Most of the subjects in this study have been wearing orthodontic fixed appliances for more than one year (59%) and 41% worn the appliances for less than one year. Refer Table 1.

Table 1: Demographic data of the participants

Mean age		19.5 years old
Gender	Male Female	24 (75%) 8 (25%)
Etnicity	Malay Chinese Indian	28 (87%) 0 4 (13%)

From the questionnaires that assessed their knowledge on risk of developing white spot lesion in orthodontic treatment, the equal amount of subjects knew that wearing braces or fixed orthodontic appliances can cause the development of the white spot lesions. More than half of the subjects (56.2%) knew that white spot lesion can cause cavity inside their mouth and 59.4% mentioned that difficulty to brush their teeth due to braces can cause white spot lesions. About 84.4% understand that poor oral hygiene will contribute to development of the white spot lesions. However, about 15.6% mentioned that duration of treatment can cause development of the lesion and only 25% can identify the white spot lesions in their mouth. Refer Table 2.

Table 2: Knowledge on the risk of developing white spot lesion among fixed othodontic patients.

	Yes	**No**
Do you know braces can cause white spot lesion	50% (n=16)	50% (n=16)
Do you know white spot lesion can cause cavity	56.2% (n=18)	43.8% (n=14)
Do you think difficulty in brushing	59.4% (n=19)	40.6% (n=12)

due to braces can cause white spot lesion		
Do you know poor oral hygiene can cause white spot lesion	84.4% (n=27)	15.6% (n=5)
Do you know long duration of orthodontic treatment can cause white spot lesion	15.6% (n=5)	84.4%(n=27)
Can you identify white spot lesion inside your mouth	25% (n=8)	75% (n=24)

Regarding their oral hygiene regimen, 96.9% brush their teeth more than twice daily. The remaining subjects brush only once. Other oral hygiene aids used among the subjects were mouthwash (50%), interdental brush (46.9%) and 3.1% used dental floss. Refer Table 3.

Table 3: Oral hygiene practice

Oral hygiene practice	n (%)
Brush ≥ 2 times	31(96.9%)
Brush once	1(3.1%)
mouthwash	16(50%)
Interdental toothbrush	15(46.9%)
Dental floss	1(3.1%)

Preventive measures given by orthodontists were recalled from the subjects. About 75% of the subjects mentioned that they were told regarding the complication of orthodontic treatment by the orthodontists. Tooth brushing techniques were shown to the patients according to 75% of the subjects. Selection of toothbrush and toothpaste were 25%, advice on using fluoridated mouthwash were 8% and advice on using interdental toothbrush were 15%. Refer Table 4.

Table 4: Preventive measures given by orthodontists

Preventive Measures	**Yes**	**No**
Tooth Brushing technique	75%	25%
Selection of toothbrush and tooth paste	25%	75%
Advice on flouridated mouthwash	8%	82%
Advice on interdental toothbrush	15%	85%
Advice on complication of treatment	75%	25%

DISCUSSION

In the present study, it was found that half of the subjects were aware that having fixed orthodontic treatment can cause white spot lesions on their teeth. More than half of the participants (56.2%) knew that white spot lesions can cause development of caries or cavity inside their mouth. The findings showed that patients have knowledge regarding white spot lesions. However, to compare the results, there are no previous studies found to assess the awareness regarding risk of developing white spot lesion in orthodontic treatment. Majority (84.4%) of the subjects knew that poor oral hygiene due to difficulty in brushing can cause white spot lesions. This is supported by a study done by Jena and Duggal (2006) stated that the presence of orthodontic attachments makes tooth cleaning more difficult and predisposes to plaque accumulation on the tooth surface. It also restrict the self-cleansing action of the tongue, lips and cheek to remove food debris from the tooth surface. Another study also has shown that fixed orthodontic appliance induced a rapid increase in the volume of dental plaque and that such plaque has a lower pH than in non-orthodontic patient. The plaque retentive properties of fixed appliance predispose patient to an increase in cariogenic risk.(Summit et al 2006, Kamna et al 2013, Ogaard1989). The results also shown that the participants could not identify the lesion by themselves and do not aware that duration of treatment can affect their teeth.

Regarding oral hygiene regimes practiced by patients, about 96.9% patients brush their teeth twice or more daily. The most common used oral hygiene aid is the mouthwash, followed by interdental brush and lastly dental floss with percentage of 50.0,

46.9 and 3.1 respectively. Hence, the most commonly used oral hygiene aid among the participants is the mouthwash together with toothbrushing. Thus, it can be stated that oral hygiene regimen practiced by patients is relatively good which indicates that they have awareness to maintain good oral hygiene during the treatment. A study mentioned that practice of good oral hygiene regimen is more important in orthodontic patients treated with fixed appliances than in non-treated individuals (Kamna et al 2013). Inadequate of good oral hygiene can lead to plaque accumulation, gingivitis, tooth decay (caries) and periodontitis which can prolong or may lead to discontinuation of orthodontic treatment.

About 75.0% of the orthodontist emphasized on toothbrushing technique followed by interdental brush, selection of toothbrush and toothpaste and lastly used of fluoride mouthwash. The most frequent OHI given by orthodontist is toothbrushing technique. The same result also demonstrated by a study done among Syrian orthodontists. In the study, toothbrushing becomes the most frequent OHI given by orthodontist which is about 97.0%. Then, it is followed by fluoride mouthwash, chlorhexidine mouthwash , oral irrigator, disclosing tablet, floss and lastly is the electric toothbrush (Dannan 2008). It is supposed that orthodontist may have to mention fluoride mouthwash because of the well-known effect of fluoride in reducing the prevalence in reducing dental caries and gingival inflammation (Boyd 1992, Denes and Gabris 1991). It is the responsibility of an orthodontist to minimize the risk of the patient having decalcification as a consequence of orthodontic treatment by educating and motivating the patients for excellent oral hygiene practice (Kamna 2013). Patients cooperation also very important over prolonged treatment, to maintain adequate oral hygiene and correct oral hygiene practice inspite of all the knowledge of orthodontic treatment complications.

CONCLUSION

According to the results from this study, it can be concluded that most patients have fair knowledge about WSL as a complication of fixed orthodontic treatment and has fair oral hygiene practice despite of orthodontists have given adequate information and prevention method. The patients who worn fixed appliance in this dental clinic need to emphasize more on education and knowledge regarding the risk of development of WSL during orthodontic treatment in order to achieve best result with less complication following the treatment. Other methods for patients' motivation should be taken into consideration.

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