

The prevalence of enamel white spot lesions before and after fixed orthodontic treatment among patients attending Shorish Dental Center



Sulaimani Dental Journal

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Abstract

Objectives: This study was done to determine the prevalence of WSLs among orthodontic patients visiting Shorish Dental Center in Sulaimani City during 4 months (1st June 2013- 30 sep 2013) requiring fixed orthodontic treatment.

Materials and Methods: Six hundred and seventy patients (223control and 447study groups) who attended orthodontic department of Shorish Dental Center during 4 months were included in this study. The presence of white spot lesions was determined by visual examination in two groups of patients. The study group consisted of patients who did wear fixed orthodontic appliance, and the control group consisted of patients who didn't having their braces placed on their teeth.

Results: Out of 477 orthodontic patients, 148 cases presents WSL, and their prevalence was equal to (31%). Conclusion: The development of white spot lesion during orthodontic treatment with fixed appliance was not a significant clinical problem and its prevalence didn't affect by the age and the gender of the patients, suggesting that any preventive therapy provided appeared to be effective.

Conclusions: Fixed orthodontic appliance was not a critical factor that contributed to the development of WSL. The age and the gender of the patient didn't play a role in the prevalence of the WSLs.

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Received: August 2014

Accepted: February 2015

Keywords: white spot lesion, fixed orthodontic treatment.

Cite this article as: Fatehulla KhS, Hamasaeed OS, Abdulateef DS. The prevalence of enamel white spot lesions before and after fixed orthodontic treatment among patients attending Shorish Dental Center. Sulaimani Dent J. 2015;2(1):57-60.

Introduction:

The term of white spot lesion was formulated as 'the first sign of a caries lesion on enamel that is attributed to demineralization of enamel and can be detected with the naked eye.(1)It presents itself as milky white opacity when located on smooth surfaces.(2)

Enamel demineralization is a significant risk associated with orthodontic treatment when oral hygiene is poor. Prevention of demineralization during orthodontic treatment is one of the greatest challenges faced by clinicians despite modern advances in caries prevention. The development of white spot lesions (WSLs) is attributed to prolonged plaque accumulation around the brackets of fixed orthodontic appliance followed by acid production and loss of calcified tooth substance.(3-7)

Fixed orthodontic appliances make conventional oral hygiene procedures more difficult, and they also increase the number of plaque retention sites on the surfaces of the teeth that are normally less susceptible to caries development.(8)

Gorelick et al., in their study reported a 49.6% incidence among patients treated with bonded orthodontic attachments. White spot lesions have the potential to develop within 4 weeks of the initiation of the orthodontic treatment,(9,10) and can lead to frank cavitations if not arrested. The characteristic altered tooth surface may present an esthetic problem even more than 5 years after treatment.(11)

Early detection of WSLs during orthodontic treatment is of great importance, as it would allow

clinicians to implement preventive measures to control the demineralization process before lesions progress. (12)

It has been generally accepted that the combined application of fluoride regimens, oral hygiene instructions, and dietary control can contribute greatly to the inhibition of demineralization during fixed-appliance treatment.(13,14)

This study was done to determine the prevalence of WSLs among orthodontic patients visiting Shorish Dental Center in Sulaimani City during 4 months (1st June 2013- 30 sep2013) requiring fixed orthodontic treatment.

Materials and Methods:

This cross-sectional clinical study involved 670 patients of both genders attending Shorish Dental Center in the city of Sulaimani, Iraq during 4 months (1st June 2013 – 30 Sep 2013) who required orthodontic therapy. The sample was divided into two groups, Group I (study group) comprised of 223 subjects who were undergoing active fixed orthodontic treatment for a period of 6 months and over; Group II (control group) comprised of 447 subjects who were patients who had for the need for orthodontic intervention but the treatment had not yet commenced. A verbal informed consent explaining the study design and the purpose was obtained from every patient prior to their participation in the study then the photograph was taken for each case.(Fig. 1).

The following inclusion and exclusion criteria have been applied:

The inclusion criteria of the subjects included for the Control group subjects was subjects with mild to moderate crowding and undergoing procedures for pre-orthodontic diagnostic evaluation.

The inclusion criteria of the subjects included for the Study group subjects was:

1. Subjects who undergoes orthodontic treatment with stainless steel brackets only for about 6 months and over.

The exclusion criteria for the selection of patients were:

1. Patients underwent orthodontic treatment for less than 6 months.
2. Patients with mixed dentition.
3. Patients on long-term medication for the systemic illness.
4. Subjects with fixed functional appliances, extensive use of appliance attachments other than the base arch-wire (e.g. coil springs, arch wire sleeves, multi-loop arch wires, etc).

The procedure was done by two independent observers who did the clinical and visual examination of the labial surfaces of the maxillary and mandibular anterior teeth, labial surfaces of the premolars and the occlusal surfaces of the molars respectively to record the existence of WSL.

The WSL index (Gorelick et al., 1982) was used for visual evaluation of the buccal surfaces of the anterior teeth, premolars, and first molars in the maxilla and mandible. The scoring was as follows: 0: no visible white spot or surface disruption (no demineralization); 1: visible WSL that covered less than one-third of the surface, without surface disruption (mild demineralization); 2: visible WSL that covered more than one-third of the surface, with a roughened surface but not requiring restoration (moderate demineralization); and 3: visible cavitation, requiring restoration (severe demineralization). Teeth with a score of 0 were considered not to have WSLs, and teeth with a score of 1 or 2 were considered to have WSLs.



Figure 1. Patient with WSL on the labial surfaces of maxillary right canine, premolars, the maxillary left lateral incisor and premolars.

The statistical analysis was done by SPSS 13 statistical software.

Results:

The prevalence of WSL among orthodontic patient (study group) and control group. There were 148 cases with WSL out of 477 orthodontic patients, and their prevalence was equal to (31%). While the prevalence of WSL in the fcontrol group was less (27.4%) with 61 cases having WSL out of 223 patients. The difference in the prevalence of WSL in both groups were not significant statistically (p=0.465) as showed in Table 1.

The prevalence of WSL according to age, gender and duration of the orthodontic treatment. According to age group, the prevalence of WSL was higher in 12-19 year age group (17.8%) than other age groups(20-29 and above 30) (8.8%, 4.4%), however, the difference was not significant statistically (P=0.07). Regarding gender, females show higher prevalence (18.9%) than males (12.1%) with (p=0.29) which means non statistically significant. According to the duration of treatment, the difference in prevalence rate between patients treated for less than 1 year (11.1%) and those patients who treated for more than 1 year (19.9%) with p=0.063 (greater than 0.05)which was also non significant statistically.

Table 1: The prevalence of white spot lesion in both groups (study group and control group)

Groups	Total No.	Prevalence of WSL No. (%)	Chi Square	P- value
Study group	477	148 (31%)	X ² =0.534	P=0.465 NS*
Control Group	223	61 (27.4%)		

P= probability of the result
*NS= not significant

Table 2: The Prevalence of white spot lesion according to different criteria (age group, gender and duration)

Variable	Subgroups	Total no. (out of 477 cases)	Positive WSL No. (%)	Chi-square	P value
Age group	12-19y	297	85 (17.8%)	X ² =3.28	P=0.07 NS
	20-29y	148	42 (8.8%)		
	above 30y	32	21 (4.4%)		
Gender	Male	164	58 (12.1%)	X ² =1.14	P=0.29 NS
	Female	313	90 (18.9%)		
Duration	< 1 y	212	53 (11.1%)	X ² =3.45	P=0.063 NS*
	≥1y	265	95 (19.9%)		

P=probability of the result *NS=not significant

Discussion:

In the current study, 31% of orthodontic patients developed WSLs. It is possible that the numbers of WSLs were overestimated because of a possible eruption of teeth or vertical changes of the gingival margins, which could have made them appear to have worsened during treatment. The results of this study was in contrast with other investigator who reported 23% prevalence by Katie et al(15) and %26 by Lovrov et al. (16)whereas Chapman et al.(17) reported

Slightly higher results (36%), but they use smaller sample size. Gorelick et al.(3) in 1982 reported a prevalence of about 50% in their study, which examined the presence of WSLs at the end of orthodontic trefatment. This might be because detecting WSLs during active treatment can be challenging for the clinician. The clinical crown must be free from plaque and debris, and the presence of excess gingival tissue can make visualization of WSLs difficult.

Due to more frequent gingival bracket placement on the premolars, as well as to gingival hyperplasia and inflammation that resulted from poor oral hygiene in this area, it was possible to examine only the maxillary anterior teeth. Since the molars were not taken into consideration in this study due to the varied use of molar bands or bondable molar tubes, the prevalence of WSL might be still high as the molars are also found to be most affected teeth with WSL as reported by Ogaard (7) in 1989.

Furthermore, to detect incipient WSLs, the tooth must be air-dried. If these steps are not followed, a WSL could easily be overlooked. Therefore, a thorough examination of each patient should be done at each appointment, and each patient should receive a customized oral hygiene treatment regimen to halt the progression of any demineralization,

When considering the gender basis, the statistically insignificant value (p>0.05) of prevalence rate also

rules out the role of gender biasing in the process of white spot lesion, similar findings were described by Gorlick; et al(3) in 1982 and Boersma(18) in 1983. Studies reporting significant sex differences all indicate that males are at greater risk of developing WSLs than females. (17,19) This may relate to motivation and compliance rather than real gender-based difference.

The inference of the study results clearly indicate that the age of the patient does not play a role in the prevalence of the WSLs ($p > 0.05$). This is suggestive of the fact that the process of enamel demineralization is not dependent on the subject's age, this finding is in accordance with Nandikola et al (20) in 2012.

There is a consensus between authors whether the time span of orthodontic treatment will affect the development of WSL. Lovrov et al. (16) in 2007 found no correlation between treatment time and WSLs. According to our findings there is a non-significant relationship between length of treatment time and the prevalence of white spot formations.

Conclusions:

Fixed orthodontic appliance was not a critical factor that contributed to the development of WSL. The age and the gender of the patient didn't play a role in the prevalence of the WSLs.

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