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Developing white spot lesion (WSL) in patients with Fixed orthodontic appliance in Erbil city of Iraq

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الخلاصة

الاهداف: الهدف من هذه الدراسة المقطعية هو تحديد مدى انتشار البقع البيضاء (WSLs) فى المرضى الذين يعانون من أجهزة تقويم الأسنان الثابتة فى أربيل ، العراق. **المواد وطرائق العمل**: أجريت هذه الدراسة المستعرضة على ٢٠ موضوعًا (٧ ذكور - ١٣ إناث)) تتراوح أعمارهم ما بين ١٢-٣٤ عامًا أثناء علاج تقويم الأسنان الثابت ، وقد تم فحص كل سن فى أربعة أرباع بالعين المجردة للكشف عن مدى انتشار WSLs من ١ إلى ٦ أشهر من مدة العلاج. **النتائج**: انتشار WSL حسب العمر ، الجنس ، ومدة علاج تقويم الأسنان. كان متوسط عمر الذكور ١٩.٤٣ (S.D = 6.37) وكان متوسط عمر الأنثى ١٩.٠٠ .(S.D = 7.37) واعتبر الفرق غير ذات دلالة إحصائية (قيمة .(P> 0.05 فى الزيارة الأولى ، تكون الأسنان المتأثرة فى الغالب هى الكلاب العلوية اليمنى ، الكلاب العلوية اليسرى ، والقواطع الجانبية العلوية اليسرى ، أما فى الزيارة الثانية ، فإن الأسنان الأكثر إصابة هى الكلاب العلوية اليسرى ، والساق الوحشى العلوى الأيسر ، والقلب الأيمن السفلى. فى الزيارة الثالثة ، تكون الأسنان المتأثرة فى الغالب هى الكلاب العلوية اليسرى العليا ، القواطع الجانبية اليسرى العليا ، الكلاب السفلى اليمنى ، أما فى الزيارة الرابعة ، فإن الأسنان الأكثر إصابة هى الكلاب العلوية اليسرى والقزحية الجانبية اليسرى العليا. **الاستنتاجات**: واحد وعشرون نقطة خمسة وعشرون فى المئة من المرضى وضعت WSLs خلال علاج تقويم الأسنان. وكانت WSLs أكثر تواترا فى الفك العلوى من الفك السفلى. أنها وقعت فى كثير من الأحيان على الناب الفك العلوى الأيسر والفك العلوى الأيسر القاطعة. لم يكن هناك فرق إحصائى كبير بين الجنسين ، حيث كان لدى الإناث ٦٥٪ من النساء اللائى كن لديهن نسبة نمو أعلى من الذكور بنسبة ٣٥٪ القيمة (P <0.05)

ABSTRACT

AIMS: of this cross sectional study is to specify the occurrence of white spot lesion (WSLs) in patients with orthodontic attachment in Erbil, Iraq. **MATERIALS AND METHODS:** This cross-sectional study was carried out on 20 subjects (7 male – 13 female) their age ranged between 12-34 years old. During fixed orthodontic treatment each tooth in four quadrants was examined by naked eye to detect the occurrence of WSLs from the 1 month to 6 month of treatment duration. **RESULTS:** The prevalence of WSL according to age, gender, and duration of the orthodontic treatment. The mean age of male were 19.43 (S.D= 6.37) and the mean age of female were 19.00 (S.D= 7.37) ; but statistically calculated non- significant (P-value >0.05). In the first visit the mostly affected teeth are upper right canine, upper left canine, and upper left lateral incisor, In second visit the most affected teeth are upper left canine, upper left lateral incisor, and lower right canine. In the third visit the mostly affected teeth are upper left canine, upper left lateral incisor, and lower right canine, In the fourth visit the most affected teeth are upper left canine and upper left lateral incisor. The frequency of WSLs increased with each visit of orthodontic treatment, the maximum occurrence of WSLs was found in the sixth visit (21.25%) followed by fifth visit (21%), fourth visit (19.25%), third visit (16.25%), second visit (13.75%), and finally first visit (7.25%). The mean of all visit equal to 16.45%.**CONCLUSION**: 21.25% of patients in developing WSLs during orthodontic treatments were more attend in the upper than lower arch; they occurred most often on the upper left canine and upper left lateral incisor. There was statistically no significant male and female difference, females had a 65% of developing WSLs than males 35% (P-value <0.05).Key words: Coenzyme Q10; Wound healing; Wound contraction ratio.

Key words: white spot, lesion, fixed appliance

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INTRODUCTION

The white spot lesion define as the first point of a caries bound on surface of teeth that can be seen with unaided eye that appears itself as a milky white opacity when located on smooth surface (Summitt *et al*, 2006). White discoloration of enamel can be arranged as dental fluorosis, opacity, or WSL. A set of criteria have been developed to recognize between fluorosis and opacity. Fluorosis is white/ yellowish lesion that is not well defined ,blends with normal enamel, and has uniform distribution in the mouth. Non fluoride opacity have a well determined, are more differentiated form around enamel, often located in the middle of the tooth, and randomly distributed (Moghaddam *et al,*2013 .Creation of white spots during orthodontic treatment can occur as early as 4 weeks into processing and their prevalence among orthodontic patients ranges from 2% to 96%. The labial surface of lateral incisors in gingival is the most common site for WSL and the upper posterior segments are the least common site, with males affected more in comparison with females (Joshua *et al,*2010).

The aim of the present study is to determine the prevalence of white spot lesion (WSLs) in patients with fixed orthodontic appliances in Erbil, Iraq.

MATERIALS AND METHODS

For this study we taken consent from the Ethics commission in Hawler Medical University , college of Dentistry . The subjects comprised of all types of malocclusion with first month to sixth month of treatment duration in at least 20 patients, their age ranged between 12 to 34 years old attending to dental clinic. They were permanent residence in Erbil city.

All patients concerted to contribute in this survey ;General question were asked to the patients about; name, age, gender, address and telephone number. (Appendix-1).Materials used are teeth ,brackets ,distilled water and cotton role ; instruments used dental unit , dental probe (disposable) ,dental mirror (disposable) ,tweezers (disposable) and camera (shofu eye special class II).

Subjects were comfortably seated and asked to irrigate with distilled water to remove food debris and contaminated material (sticky foods) using air spray in order the teeth to be dried . Then each tooth in four quadrants , from central incisors to second premolar, was examined by naked eye to detect the prevalence of WSLs from the 1 month to 6 month of treatment duration. The patients' examination was performed in the dental clinic to detect the presence of WSLs. The teeth looked-on for examination from 2nd premolar to 2nd premolar in upper

and lower arch .Teeth were air dried with triple syringe to remove saliva . Molars were excluded from the study as many molar teeth were banded obviating the visibility for WSL. just tooth surfaces gingival to the arch wire were examined for the presence of WSLs, as this is the area most prone to demineralization during orthodontic treatment. The teeth were optically examined on buccual surface after removing plaque with the help of instrument or distilled water and air water spray drying. Statistical analysis began by entering the data on computer using Microsoft Excel program. Data analysis calculated with SPSS version 21.The results were represented and arranged in tables, figures showing statistical analysis: t-test, rates and percentages.

Appendix (1): case sheet for patient (1st visit before placement of fixed appliance and counted these WSL excluded from the data collection) (followed for 6 months).

Name :			Patient number:				
Age :	Gender:	Occupation :	Address:				
Tel. No. 1-			2-				
Teeth	No. of WSLs (1st visit)	No. of WSLs (2nd visit)	No .of WSLs (3rd visit)	No. of WSLs (4th visit)	No. of WSLs (5th visit)	No. of WSLs (6th visit)	No. of WSLs (7th visit)
11=							
12=							
13=							
14=							
15=							
21=							
22=							
23=							
24=							
25=							
31=							
32=							
33=							
34=							
35=							
41=							
42=							
43=							
44=							
45=							

RESULTS

The sample studies were 20 subjects from 1 month to 6 months of orthodontic treatment duration. The prevalence of WSL according to age, gender, and duration of the orthodontic treatment. The mean age of male were 19.43 (S.D= 6.37) and the mean age of female were 19.00 (S.D= 7.37). The difference was considered as statistically non- significant (P-value >0.05). As shown in Table (1).

Table (1): Relationship between gender and age of patients.

Variable	Gender	N	Mean	Std. Deviation	P-Value	T-test
Age	Male	7	19.43	6.37	0.89	Non Significant
	Female	13	19.00	7.37		

Prevalence of WSL among quadrants: First and second visit:

In each appointment teeth affected by white spot lesion are shown in Table (2), within the first visit the mostly affected teeth are upper right canine, upper left canine, and upper left lateral incisor, In second visit, the severity of affected teeth changes among the teeth, the most affected teeth are upper left canine, upper left lateral incisor, and lower right canine.

Table (2): WSL at first and second visits of patients.

Teeth/first visit	**No.**	**Teeth/quadrant**	**%**	**Most affected Teeth**
First quadrant	9	100	9	Most affected teeth are upper right canine, upper left canine, and upper left lateral incisor.
Second quadrant	9	100	9	
Third quadrant	8	100	8	
Fourth quadrant	3	100	3	
Total	29	400	7.25	
Teeth/Second visit	No.	**Teeth/quadrant**	%	**Most affected Teeth**
First quadrant	11	100	11	Most affected teeth are upper left canine, upper left lateral incisor,and lower right canine.
Second quadrant	16	100	16	
Third quadrant	14	100	14	
Fourth quadrant	14	100	14	
Total	55	400	13.8	

No.: Number of white spot lesions ; **Teeth/quadrant** = total 400 teeth /100 in each quadrant. Third and fourth visit.

In the third visit the mostly affected teeth are upper left canine, upper left lateral incisor, and lower right canine, In the fourth visit the most affected teeth are upper left canine and upper left lateral incisor.

Table (3): WSL on third and fourth visits of participants.

Teeth/Third visit	**No.**	**Teeth/quadrant**	**%**	**Most affected Teeth**
First quadrant	18	100	18	Mostely affected teeth are upper left canine, upper left lateral incisor,and lower right canine.
Second quadrant	21	100	21	
Third quadrant	15	100	15	
Fourth quadrant	11	100	11	
Total	65	400	16.25	
Teeth/Fourth visit	No.	**Teeth/quadrant**	%	**Most affected Teeth**
First quadrant	21	100	21	The most affected teeth are upper left canine and upper left lateral incisor.
Second quadrant	27	100	27	
Third quadrant	18	100	18	
Fourth quadrant	11	100	11	
Total	77	400	19.3	

No.: Number of white spot lesions ; **Teeth/quadrant** = total 400 teeth /100 in each quadrant.

Fifth and sixth visit

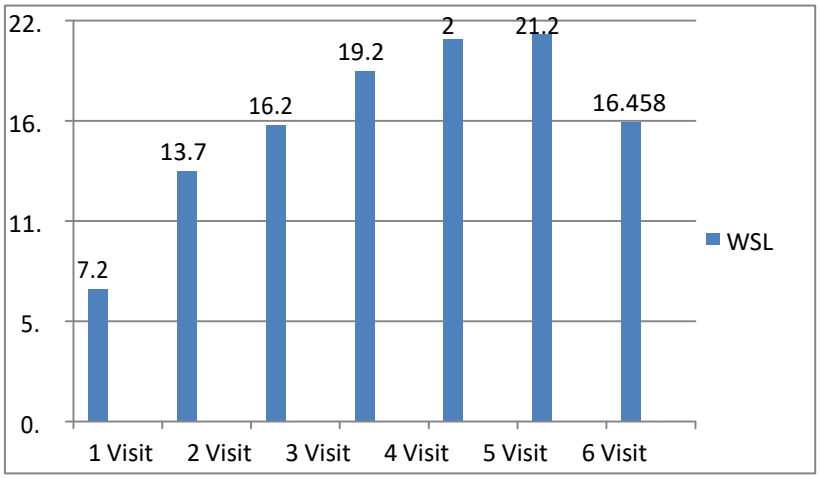
In the fifth visit the most affected teeth are upper left canine, and upper left lateral incisor, in the sixth visit the most affected teeth are upper left canine, upper left lateral incisor, and upper right canine.

Table (4): Development of WSL on fifth and sixth visits.

Teeth/fifth visit	**No.**	**Teeth/quadrant**	**%**	**Most affected Teeth**
First quadrant	27	100	27	The mostely affected teeth are upper left canine and upper left lateral incisor.
Second quadrant	28	100	28	
Third quadrant	18	100	18	
Fourth quadrant	11	100	11	
Total	84	400	21.0	
Teeth/sixth visit	No.	**Teeth/quadrant**	%	**Most affected Teeth**
First quadrant	28	100	28	Mostely affected teeth are upper left canine,upper left lateral incisor,and upper right canine.
Second quadrant	28	100	28	
Third quadrant	18	100	18	
Fourth quadrant	11	100	11	
Total	85	400	21.3	

No.: Number of white spot lesions ; **Teeth/quadrant** = total 400 teeth /100 in each quadrant.

The prevalence of WSLs on different visit of orthodontic patient is shown in Figure (1). The frequency of WSLs increased with each visit of orthodontic treatment, the greatest prevalence of WSLs was found in the sixth visit (21.25%) followed by the fifth visit (21%), fourth visit (19.25%), third visit (16.25%), second visit (13.75%), and finally first visit (7.25%). The mean of all visit equal to 16.45%.



Figure(1): :Representing the occurrence of WSLs on different visits among orthodontic patients

DISCUSSION

In this study , 7.25% of teeth had a visual WSL during first months of fixed appliance treatment this rate accreted to 21.25% for the sixth month of fixed appliance treatment . period of fixed appliance at 6 month The are higher predominance of WSLs suggests that demineralization can quickly become a concern in the presence of fixed appliances when oral hygiene is poor. According to (Ogaard *et al*,1988),milky appearance become noted after one month of bracket placement but the cavitation may be occur after 6 month ; we have similar results ,with 36% of patients having visible WSLs , which increased to 46% in the 12 months of management (Champan *et al*, 2010). Therefore, it is important for orthodontists to avow poor oral hygiene soon , so that preventive measures can be established before WSLs become growth. Developing WSLs during fixed appliance treatment can be dispute for the dentist. The clinical crown should be clean without calculus , plaque and debris, and the presence of gingivitis can make imaging of WSLs not

easy. Moreover , to detect incipient WSLs, the tooth must be not covered with saliva (dried) . If not performed these steps, a WSL could easily be hidden. Hence , inspection of these steps should be performed with each appointment for fixed appliance treatment , and each patient should receive a purpose-designed improvement oral hygiene regimen to half the advancement of any cavitation.WSLs affected by many factors like:

Gender

Female patient with WSLs during fixed appliance become higher (65%) than male (35%) however statistically nonsignificant P-value <0.05. The result in line with (Akin *et al*, 2013) showed that development WSLs have not related to gender. Contrarily, was described by (Gorelick *et al*, 1982) they discovered the outcome to be 54% for girls while 44% for boys . This may refer to obedience and encouragement rather than real gender- based difference.

Age: The result of this cross sectional study showed that there were statistically no significant difference among age of patients in WSLs progress . Similarly with (Sagarika *et al*, 2012) stated that the age of patient was not a significant factor in the occurrence of WSLs. Contrarily; with (Akin *et al*, 2013) oral hygiene and age of patient were significant factors in growth WSLs.

Duration of treatment: This survey finds that appreciable hypocacification occurred at six months after bracket placement. Same result, finding by (Julien *et al*, 2013). According to (Richter *et al*, 2011) indicated that duration of treatment collinear(one-dimensional linear), with increase white spot lesion, means as treatment increase WSLs increase also but (Akin *et al*, 2013) announced time of duration treatment have not crucial factor in WSLs progress . (Gorelick *et al*, 1982) were unable to establish the length of treatment time with progress WSLs.

Teeth involved: In this study there was a high occurrence of WSLs appeared on maxillary left canines and maxillary left lateral incisors.Our results are in line with (Khalaf *et al*, 2014) who showed that the upper canines were the most affected teeth and then lateral incisors. (Julien *et al*, 2013) also indicated that in the upper arch WSLs 2.5 times more than the lower arch that they occurred most often on the maxillary laterals, maxillary canines and mandibular canines.

CONCLUSION.

1. 21.25% of patients in developing WSLs during orthodontic treatments.
2. The upper arch more developed WSLs than the lower arch; they occurred most frequently on the upper

left canine and upper left lateral incisor.

3. Statistically Gender has no any role in the development WSLs however, clinically significant, female, 65% and male 35% (p-value<0.05).

4. Duration of fixed appliance treatment also showed significant increase in the occurrence of WSL.

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