

PREVALENCE OF WHITE SPOT LESIONS DURING THE PROCEDURE OF FIXED ORTHODONTIC TREATMENT

Saibel Farishta, * Saurabh Sharma, ** Shalabh Baxi, *** VP Abhishek Sahu, †
Shweta Singh, †† Karanprakash Singh †††

* Professor & Head, Department of Orthodontics, Government Dental College & Hospital, Raipur, Chhattisgarh, India

** Senior Lecturer, Department of Orthodontics, Maitri College of Dentistry & Research Centre, Durg, Chhattisgarh, India

*** Senior Lecturer, Department of Orthodontics, Government Dental College & Hospital, Raipur, Chhattisgarh, India

† MDS, Consultant, Department of Orthodontics, V Smile Dental Centre, Raipur, Chhattisgarh, India

†† Senior Lecturer, Department of Orthodontics, Government Dental College & Hospital, Dhamtari, Chhattisgarh, India

††† Reader, Department of Public Health Dentistry, Luxmi Bai Institute of Dental Sciences & Hospital, Patiala, India

ABSTRACT

Objective: The most frequently seen negative effect during orthodontic procedure using fixed appliances is the progress of initial carious lesions. The objective of this paper is to evaluate patients with white spot lesions and its relation to fixed orthodontics. **Methods:** The cross-sectional study was conducted among 380 orthodontic patients including 219 (57.6%) boys and 161 (42.4%) girls. The study participants were also separated into 3 groups. The WSL index was used for visual evaluation of buccal surfaces of anterior teeth, premolars, and first molars. Same examiner correlated WSLs with Oral hygiene index simplified (OHI-S). Frequency, Mean and Standard Deviation was calculated and the level of significance was at 0.05. **Results:** The overall occurrence of white spot lesions was 151 (39.7%) which was further categorized into Boys 67 (17.6%) and Girls 84 (22.1%). The prevalence of white spot lesions was recorded at different points in time i.e. before the start of orthodontic treatment (7.9%), after six months (14.1%) and after twelve months of therapy (17.7%). Spearman's correlation showed a significant positive correlation of WSLs with poor oral hygiene index. **Conclusion:** The study showed high prevalence of white spot lesions during orthodontic procedure. The incidence of lesions indicated significant relation duration of treatment and oral hygiene status. So, patients with orthodontic treatment should obtain proper oral hygiene treatment to discontinue the progress of demineralization..

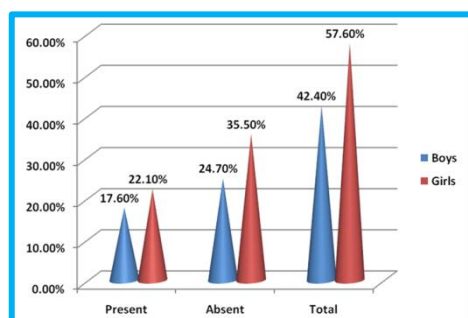
KEYWORDS: Orthodontic treatment; plaque; prevalence; white spot lesions

INTRODUCTION

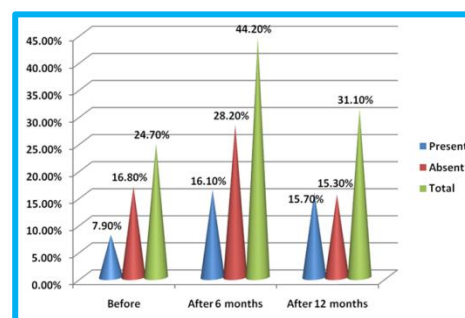
White spot lesions (WSL) are one of the most undesired iatrogenic drawbacks of orthodontic therapy with fixed appliances. Orthodontic patients are more susceptible to the development of white spot lesions than untreated patients.^[1] The presence of bands & brackets impairs oral hygiene status and increases the chances of plaque retention on such sites.^[2,3] As a result of increased level of plaque accumulation on teeth surface, dental caries causing microorganisms are raised in the oral environment that subsequently lower the pH of the preserved plaque on the teeth surface contiguous to orthodontic bands & brackets delaying remineralization and leading to decalcification.^[4] Initial decalcifications on enamel surface can be seen as early as four weeks after the beginning of orthodontic treatment.^[5] Incipient lesions are characterized by their opacity, mineral loss, and decrease of fluorescence radiance when compared to healthy enamel surfaces. Many incipient enamel lesions have an opaque milky white appearance due to an optical phenomenon caused by mineral loss in the surface and sub-surface that alters the refractive index and increases the scattering of light in the affected area, all resulting in greater visual enamel opacity.^[6] White spot lesion (WSL) may cease from further progression upon removal of orthodontic appliances as the cariogenic environment is made unavailable. But esthetically, they are unlikable mainly if they are extensive.^[7] The present study was carried out to evaluate the prevalence of white spot lesions in patients undergoing orthodontic treatment.

MATERIALS & METHODS

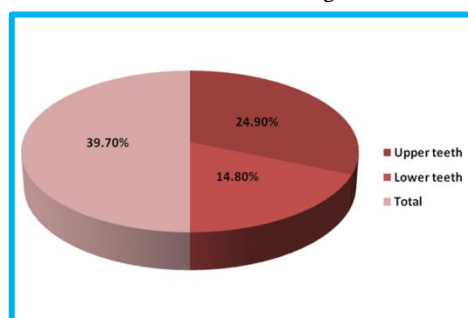
The cross-sectional study was conducted among patients coming to orthodontic clinics in the city



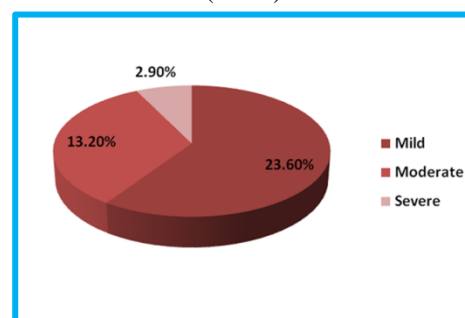
Graph 1: Prevalence of White Spot Lesion formation in relation to gender



Graph 2: Percentage of White Spot Lesions (WSLs)



Graph 3: Teeth assessment of White Spot Lesions (WSLs)



Graph 4: Showing degree of severity of white spot lesions among all the patients

and department of orthodontics in dental college, Raipur. The total sample was compromised of 380 including 219 (57.6%) Boys and 161 (42.4%) Girls. The study participants were also separated into 3 groups as; Group I consisted of 94 patients before the start of treatment, Group II comprised of 168 patients who had been undergoing orthodontic therapy for 6 months and Group III comprised of 118 patients who were undergoing this therapy 12 months back. The entire selected sample, fulfilled the following criteria as: no previous history of orthodontic, absence of any congenital anomalies. Patients with any kind of systemic disease, any dental problems, cysts, or ongoing medication for a chronic disease were excluded from the study.

Study Design

All the three groups were examined for the presence of white spot lesions. The WSL index (Gorelick *et al.*, 1982)^[8] was used for visual evaluation of the buccal surfaces of the anterior teeth, premolars, and first molars in both maxilla and mandible. The scoring criteria was as follows: 0 for no visible white spot lesion (no demineralization); 1 for visible WSL that covered less than 1/3rd of the tooth surface (mild demineralization); 2 for visible WSL that covered more than 1/3rd of the tooth surface, with a

roughened surface (moderate demineralization); & 3 for visible cavitations, (severe demineralization). The examination scoring was performed under direct illumination using a dental chair light after drying the teeth with compressed air for five seconds. All the participants were examined by the same examiner to avoid intra examiner errors.^[8] Same examiner recorded the oral hygiene status of all the participants with Oral hygiene index simplified OHI-S, that includes debris index simplified (DI-S) and calculus index simplified (CI-S). These indices were calculated by adding the scores of 6 index teeth surfaces & then dividing by number of teeth examined. The scores are assessed as: Good - 0.1-0.6; Fair -0.7-1.8; and Poor - 1.9-3.0 for both debris and calculus index. After that both individual scores are added up to get the total OHI-S index score and evaluation of OHI-S is as: Good - 0.1-1.2; Fair -1.3-3.0; and Poor - 3.1-6.0.^[9]

Data Analysis

SPSS version 16.0 (SPSS, Chicago, IL, USA) was used for analysis of data. Frequency, Mean and Standard Deviation was calculated. Chi-square test, and ANOVA test were used to analyze the data and the level of significance was at 0.05.

Table 1: Mean scores of patients with WSLs at different points of time

Duration of treatment	No	Mean	Std. Deviation	F	Sig.
Before	94	.32	.469		
After 6 months	168	.36	.482		
After 12 months	118	.51	.502	4.734	0.009
Total	380	.40	.490		

Table 2: Frequency of patients with WSLs in relation to oral hygiene index

White spot lesions			
OHI	Present	Absent	p-value
Good	3 (0.8%)	110 (28.9%)	
Fair	92 (24.2%)	100 (26.3%)	0.000
Poor	56 (14.7%)	19 (5.0%)	
Total	151 (39.7%)	229 (60.3%)	

Table 3: Showing correlation of WSLs with oral hygiene index

		OHI	DEGREE
Spearman's rho	Correlation Coefficient	1.000	.579(*)
	Sig. (2-tailed)		.000

* Correlation is significant at the 0.01 level (2-tailed)

RESULTS

The study subjects were between the age groups of 14-22 years. The overall occurrence of white spot lesions was 151 (39.7%) which was further categorized into Boys 67 (17.6%) and Girls 84 (22.1%) as shown in Graph 1. There were no differences between girls and boys ($p=0.522$). The prevalence of white spot lesions was recorded at different points in time i.e. before the start of orthodontic treatment (7.9%), after six months (14.1%) and after twelve months of therapy (17.7%) (Graph 2). The findings were significant at all the intervals ($p=0.004$). It was found that most of the lesions were seen in the upper labial surface of the teeth (24.9%) as compared to the lower surfaces (14.8%) as mentioned in Graph 3. Graph 4 showing degree of severity of white spot lesions as 23.6% having mild, 13.2% with moderate and 2.9% with severe degree of demineralization. Similarly mean value of lesion was obtained at different intervals among the study subjects and found that average of scores significantly increased with the duration of treatment ($p=0.009$) as mentioned in Table 1. It was also shown that severity of white spot lesions was increasing as the status of oral hygiene index was turning down. Similarly spearman's correlation showed that with every "1" score

increase in oral hygiene index, there is "0.579" elevation in the degree of severity of WSLs (Table 2 & Table 3).

DISCUSSION

The present survey indicates that white spot lesions remain a significant problem during orthodontic management. Overall prevalence of WSLs among the study participants was 39.7%. The prevalence of WSLs among orthodontic patients ranged from 0 to 97% as shown by many studies.^[10,11] But recent investigations had shown the incidence of WSLs among orthodontic populations as 73-95%, which is much higher than the present data.^[12,13] The results were non-significant in relation to gender while considering the prevalence of WSLs and these findings were similar to the results of Sagarika et al in Indian population.^[14] However some studies reported significant gender differences and indicated that males are having greater risk of developing lesions.^[11,15] The upper teeth surfaces were most commonly affected with WSLs compared to lower teeth surfaces. Similarly, Gorelick *et al.*,^[8] showed maxillary lateral incisor as well as canines as the most common affected teeth surfaces. The evolution of appliances resulted in the change in sites of occurrence from the posterior to anterior. Whereas, Bach mentioned

prevalence of lesions on first molars, that followed maxillary central and lateral incisors, mandibular incisors, second molars and lastly canines and premolars. Tufekcia et al indicated that there is no significant difference in the prevalence of WSLs during orthodontic treatment in relation to teeth.^[12] The study showed various degrees of severity of white spot lesions as 23.6% subjects having mild, 13.2% having moderate and 2.9% having severe degree of demineralization. Whereas Akin et al showed that 35% of patients had mild WSLs, and the remaining WSLs were severely affected, either with severe WSL (25%) or with cavitation (5%).^[16] It has been stated that the progress of white spot lesions under fixed orthodontic bands is a tremendously rapid procedure, even when cement that containing fluoride is used for bonding. Fixed orthodontic appliances serve as plaque retention sites, and, in case of poor oral hygiene, plaque accumulates and along with this acidogenic bacteria cause marked demineralization of enamel. The incidence of WSLs was increasing with the duration of treatment in the present data and similar correlation was seen in Lucchese et al study in 2012.^[17] The higher occurrence of WSLs after 6 months of orthodontic therapy confirms that demineralization can speedily become a concern with fixed appliances when the oral hygiene index of the patient is poor. In an another study by Tufekcia et al found that, 38% of subjects had WSLs after 6 month of treatment and the number increased to 46% by 12 months. Only 11% of the control group (i.e. before the start of treatment) had at least one white spot lesion. Gorelick et al presented prevalence of around 50% lesions in their study, at the end of orthodontic treatment.^[8] A higher prevalence may be attributed to the extent of the orthodontic management. It was also showed that significant decalcification occurs within 6 months after fixed orthodontic bonding.^[12] The present data also revealed that oral hygiene status had a strong and significant correlation with the prevalence of white spot lesions. It is well known that poor oral hygiene was an important risk factor in the formation of WSLs. Julienna et al found WSLs in only 17% of patients with good oral hygiene index, compared to 24% with fair and 38% with poor oral hygiene status.^[18]

CONCLUSION

The study showed that 39.7% of patients developed white spot lesions during orthodontic procedure. Its prevalence was almost double in the maxillary teeth than mandibular. There was no significant difference in relation to gender, but the incidence of lesions increasing with the duration of treatment. Furthermore, WSLs, showed a significant correlation with oral hygiene status. So, patients undergoing orthodontic treatment should receive proper oral hygiene treatment to stop the progress of demineralization.

CONFLICT OF INTEREST & SOURCE OF FUNDING

The author declares that there is no source of funding and there is no conflict of interest among all authors.

BIBLIOGRAPHY

1. Enia M, Bock N, Ruf S. White-spot lesions during multibracket appliance treatment: a challenge for clinical excellence. *Am J Orthod Dentofacial Orthop* 2011;140:17-24.
2. Agrawal A, Kausal SR, Soni UN, Toshniwal NG, Misal AN. White spot lesions: formation, prevention and treatment. *Int J Dent Health Sci* 2015;2(2):380-4.
3. Paris S, Meyer-Lueckel H. Masking of labial enamel white spot lesions by resin infiltration-a clinical report. *Quintessence Int.* 2009;40:713-8.
4. Bishara SE, Ostby AW. White Spot Lesions: Formation, Prevention, and Treatment. *Semin Orth* 2008;14:174-82.
5. Willmot DR. White spot lesions after orthodontic treatment. *Semin Orthod* 2008; 14:209-19.
6. Hu W, Featherstone JDB. Prevention of enamel demineralization: An in vitro study using light-cured filled sealant. *Am J Orthod Dentofacial Orthop* 2005;128:592-600.
7. Artun J, Brobakken BO. Prevalence of carious white spots after orthodontic treatment with multibonded appliances. *Eur J Orthod* 1986;8:229-34.
8. Gorelick L, Geiger AM, Gwinnett AJ. Incidence of white spot formation after bonding and banding. *American Journal of Orthodontics* 1982;81:93-8.
9. Greene JC, Vermillion JR. The simplified oral hygiene index. *J Am Diet Assoc* 1964;68:7-13.

10. Ogaard B. White spot lesions during orthodontic treatment: mechanisms and fluoride preventive aspects. *Semin Orthod* 2008;3:183-93.
11. Chapman J, Roberts WE, Eckert GJ, Kula KS, Gonzalez Cabezas C. Risk factors for incidence and severity of white spot lesions during treatment with fixed orthodontic appliances. *Am J Orthod Dentofacial Orthop* 2010;138:188-94.
12. Tufekci E, Dixon JS, Gunsolley JC, Lindauer SJ. Prevalence of white spot lesions during orthodontic treatment with fixed appliances. *Angle Orthod* 2011;2:206-10.
13. Lovrov S, Hertrich K, Hirschfelder U. Enamel Demineralization during Fixed Orthodontic Treatment - Incidence and Correlation to Various Oral-hygiene Parameters. *J Orofac Orthop* 2007;68:353-63.
14. Sagarika N, Suchindran S, Loganathan SC, Gopikrishna V. Prevalence of white spot lesion in a section of Indian population undergoing fixed orthodontic treatment: An in vivo assessment using the visual International Caries Detection and Assessment System II criteria. *Journal of Conservative Dentistry* 2012;15(2):1004-8.
15. Boersma JG, van der Veen MH, Lagerweij MD, Bokhout B, Prahl-Andersen B. Caries prevalence measured with QLF after treatment; with fixed orthodontic appliances: influencing factors. *Caries Res* 2005;39:41-7.
16. Akin M, Tazcan M, Ileri Z, Basciftci FA. Incidence of white spot lesion during fixed orthodontic treatment. *Turkish J Orthod* 2013;26:98-102.
17. Lucchese A, Gherlone E. Prevalence of white-spot lesions before and during orthodontic treatment with fixed appliances. *European Journal of Orthodontics* 2012;8:1-5.
18. Julienna KC, Buschang PH, Campbell PM. Prevalence of white spot lesion formation during orthodontic treatment. *Angle Orthod* 2013;83:641-7.