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### PREVALENCE WHITE SPOT LESIONS (WSL) IN PATIENTS WITH FIXED ORTHODONTIC APPLIANCES

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Prevalence white spot lesions (WSL) in patients with fixed orthodontic appliances

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**Abstract:**

*This article presents prevalence white spot lesions in patients with fixed orthodontic appliances. Due to low hygiene levels associated with orthodontic treatment development of enamel demineralization increases significantly. The widespread problem of WSL development is an alarming challenge and warrants significant attention from both patients and providers, which should result in greatly increased emphasis on effective caries prevention. 53 patients aged 10-50 years were examined and divided into 2 groups. In 6 months and 12 months groups the percentage of patients with at least 1 lesion was 44% and 21% respectively. Detection of demineralization areas can be complicated for orthodontists. Consequently, on every visit the teeth surfaces of each patient must be carefully examined, and every patient must receive the necessary type of treatment to prevent the process of demineralization and cavity formation.*

**Key words:** white spot lesions, orthodontic treatment, oral hygiene, dental plaque

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**INTRODUCTION:**

Due to low hygiene levels associated with orthodontic treatment development of enamel demineralization increases significantly. Despite up-to-date caries prevention techniques, the problem is still relevant [1]. Development of white spots is associated with prolonged adhesion of dental plaque especially around brackets [7]. Fixed orthodontic appliances make hygiene procedures more complicated and even increase dental plaque retention on the teeth' surfaces, normally less predisposed to caries [8].

After fixation of orthodontic appliances bacterial flora composition changes dramatically. There are great numbers of acidogenic bacteria, especially Streptococcus mutans and Lactobacilli [9]. They promote plaque pH decrease in orthodontic patients to a greater numbers, than in patients not receiving orthodontic treatment [10]. For this reason, caries development in orthodontic patients occurs more rapidly. Normally, caries development takes about 6 months, although in patients with fixed orthodontic appliances white-spot lesions become visible after 1 month in case of low oral hygiene. White spot lesions tend to occur around brackets, especially near the gingiva [3,7,11].

A review of available literature on the white spot lesions prevalence showed, that detection of lesions takes place after the end of treatment. The prevalence varies, depending on investigative techniques. Using visual analysis data, Gorelick et al. showed, that by the end of treatment about 50% of patients were diagnosed with single or multiple white spot lesions [3]. Using quantitative light-induced fluorescence, Boersma et. al.[4], investigated WSL prevalence at final treatment stages and found that 97% of patients had single or multiple sites of demineralization. In light of these researches, it is possible to draw a conclusion that demineralization lesions are an important clinical problem, that leads to failed esthetic outcome with a consequent invasive treatment-restoration.

Although previously it was observed that WSL may occur in 1 month after orthodontic appliances fixation, their development and prevalence in various time intervals remains underexplored [2]. Early detection of WSL during orthodontic treatment is very important, so it allows clinical specialists to conduct preventive and therapeutic measures in full and on time [9]. In that manner, the goal of current research is to identify WSL prevalence in orthodontic patients receiving treatment for 6 and 12 months, using visual analysis data.

**MATERIALS AND METHODS:**

Patient selection was based on inclusion/exclusion criteria. Selected patients were over age 10, receiving orthodontic treatment with fixed orthodontic appliances (bracket-systems). The patients with non-carious enamel lesions (fluorosis, hypoplasia), restorations, and other lesions by the beginning of treatment were excluded. In all patients informed consent was obtained retrospectively.

The research was conducted after orthodontic archwires and fixtures removal (elastics, ligatures) and mechanical plaque removal. After cleaning procedure, patient rinsed mouth with distilled water for 5 seconds.

Before visual analysis, all maxillary and mandibular teeth were isolated from saliva with cotton rolls and dried with chip blower. Surfaces around brackets were thoroughly examined.

Demineralization lesions evaluations was carried out using ICDAS II index [5,6]. Areas of interest included vestibular teeth surfaces with fixed orthodontic elements. Codes criteria:

- 0 – Intact surface;
- 1 – Early visible enamel changes (after extended drying)
- 2 – Visible enamel changes;
- 3 – Localized enamel destruction (with no clinical visual dentine inclusion)

Vestibular surfaces evaluation was also carried out using simplified Silness-Löe index [7]. Codes criteria:

- 0 – No debris present;
- 1 – Slight amount of debris;
- 2 – Thin debris layer at the cervical area of tooth, significant amount on the probe tip;
- 3 – Visible significant amount of debris.

**RESULTS:**

53 patients aged 10-50 years were examined and divided into 2 groups. Patients were divided into two groups of treatment period of 6 months (from 6-12 months) and 12 months (more than 12 months). In the first group included 14 patients (6 female, 8 male). Second group included 39 patients (23 females, 16 males).

Visual data on demineralization lesions prevalence is presented in Table 1. In 6 months and 12 months groups the percentage of patients with at least 1 lesion was 44% and 21% respectively.

**Table 1: Demineralization lesions prevalence in 6 months and 12 months treatment groups.**

Treatment duration	Present demineralization lesions		Absent demineralization lesions	
	n	%	n	%
6 months	11	79	3	21
12 months	25	56	14	44

Table 2 represents demineralization lesions location in patients, that received orthodontic treatment for 12+ months period. It is seen that maxillary teeth are more predisposed to demineralization lesions development. In particular maxillary incisors are affected in 57% of patients, premolars – 50%, molars

– 36%, and canines – 29%. Demineralization lesions prevalence in mandibular teeth is mostly presented in molars – 43% and in premolars – 29%. Frontal maxillary teeth are least predisposed to demineralization lesions development.

**Table 2: demineralization lesions location in patients**

Location	Maxillary, n patients (%)	Mandibular, n patients (%)
Incisors	28(57%)	1(7%)
Canines	14(29%)	2(14%)
Premolars	27(50%)	4(29%)
Molars	15(36%)	6(43%)

ICDAS II calculation revealed direct correlation between treatment duration and demineralization lesions prevalence.

**Table 3: ICDAS II data in patients from 2 treatment groups.**

		6 months	12 months
Maxillary	Incisors	1	2
	Canines	0	1
	Premolars	0	2
	Molars	1	2
Mandibular	Incisors	0	1
	Canines	0	1
	Premolars	1	2
	Molars	0	2

**Table 4: Silness –Löe index data in patients from 2 treatment groups.**

Index value	6 months, patients n	12 months, patients n
0	4	1
1	6	20
2	2	7
3	2	11

**CONCLUSIONS:**

Research results show that areas of demineralization are still a significant problem during orthodontic treatment despite the development of modern prophylactic hygiene products and improvement of adhesive systems. Fixed non-removable orthodontic appliances accumulate a lot of plaque around its elements. Violation of oral care leads to formation of demineralization areas within 4 weeks. As the research showed us, during first 6 months 21% of patients started to have at least one demineralization area, in increase of treatment terms the quantity of patients with affected areas increased to 44%.

Detection of demineralization areas can be complicated for orthodontists. Clinical crown of the tooth must be cleaned of dental deposits, overhanging edges of adhesive material and proliferations of inflamed gingiva. During examination of the side teeth we encountered the difficulties of visual assessment of vestibular teeth surface due to its close location to the braces and small distance between gingiva surface and the fixed bracket. Vestibular surface of anterior teeth is the most informative area as the gingival surface of the side teeth was covered with proliferated inflamed gingiva. In such cases, Sarver D.M. recommends to use laser gingivotomy for better access to the surface of a tooth. Furthermore, for detection of demineralized areas the surface of a tooth must be carefully dried and there must be a good access of light for its visual examination. While non-complying one of the above points the area of demineralization can be easily missed. Consequently, on every visit the teeth surfaces of each patient must be carefully examined, and every patient must receive the necessary type of treatment to prevent the process of demineralization and cavity formation.

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