Original Article

# Distribution of White Spots after Debanding in Orthodontic Patients

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## Abstract:

**Statement of problem:** Fixed orthodontic appliances can interfere with removing bacterial plaques from dental surfaces which can ultimately lead to white spot formation.

**Purpose:** The aim of this study was to evaluate the quantity of white spots and areas of decalcification following fixed orthodontic treatment.

**Materials and Methods:** A total of 100 patients undergoing or scheduled for fixed orthodontic treatment were divided into two groups. Group A consisted of fifty volunteers before the initiation of therapy and group B included fifty patients at the end of their treatment. In group A, the buccal surfaces of the first molars in each quadrant were examined for the presence of enamel decalcifications. After removing the orthodontic bands in group B, the buccal surfaces of the first molars in each quadrant were examined for white spots. Gender, oral hygiene level, plaque index, type of cement and duration of treatment were recorded for all patients. Binomial logistic regression, chi-square and Mann-Whitney U-tests were used for statistical analysis.

**Results:** The number of white spots in group A was 28 (14%) which was significantly lower than group B with 83 (41.5%) decalcified lesions ($P<0.01$). Oral hygiene and duration of treatment had a significant effect on the occurrence of white spots ($P<0.05$).

**Conclusion:** The results showed that patients with orthodontic bands are at higher risk for white spot formation and good oral hygiene demonstrates a protective effect on their reduction. Both professional and daily oral hygiene measures can decrease the cariogenicity of bacterial plaques in these patients.

**Key Words:** White spots; Orthodontic treatment; Debanding

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## INTRODUCTION

Due to the progressing improvement of orthodontic techniques, the demand for such treatments has increased especially in women. In spite of their advantages, these methods may have a number of side effects such as decalcification and formation of white spots following debanding [1-3].

White spots or incipient caries are chalky-colored and detectable when the involved tooth is dry [3]. These lesions should be differentiated from enamel hypocalcifications and are reported to develop under fixed orthodontic appliances in about 50-70% of the patients on enamel surfaces in company with old bacterial plaques [1,3-5]. Caries formation

on facial tooth surfaces can compromise esthetics, which is considered as one of the main goals of orthodontic therapy [1,6]. Loose orthodontic bands and fixed appliances interfere with removing bacterial plaques from dental surfaces and can ultimately produce white spots [1]. Fluoride therapy and dental health education are effective for the reduction of these lesions in orthodontic patients [2]. White spots have been shown to increase in the absence of fluoride therapy [7].

Glass ionomer cements protect the enamel against decalcification under and around orthodontic appliances [2]. The aim of this study was to determine the distribution of white spot formation in patients experienced fixed orthodontic therapy in comparison to patients scheduled for initiation of treatment and also to determine the effect of glass ionomers and zinc phosphate cements on the development of white spots.

## MATERIALS AND METHODS

For evaluating the distribution of white spots and decalcifications in fixed orthodontic treatment, two groups of patients were randomly selected from those referred to the Department of Orthodontics, School of Dentistry, Isfahan University of Medical Sciences. All participants were matched according to age and sex. Group A consisted of fifty volunteers scheduled for initiation of fixed orthodontic therapy. The buccal surfaces of the first molars in each quadrant were examined for the presence of white spots. Group B included fifty patients at the end of their treatment with bands on all four first molars. After debanding, the composite and cements were removed and all tooth surfaces were polished. The buccal surfaces of the first molars in each quadrant were examined in order to detect white spot formation using a mirror and an explorer before and after drying. A total of 400 teeth in 100 patients were examined in both groups.

Data associated with sex, oral hygiene level, plaque index, duration of treatment and cement type were collected. Oral hygiene levels were categorized as very good, good, moderate and weak as follows: very good = no bacterial plaques; good = presence of bacterial plaques on interproximal surfaces and in less than one third of buccal and lingual surfaces; moderate = presence of bacterial plaques on more than one-third or less than two- third of buccal and lingual surfaces; poor = presence of bacterial plaques on two-third or more of the buccal and lingual surfaces. White spots were compared between the maxilla and mandible employing binomial logistic regression tests and different cement types and different treatment periods were compared using chi-square test. Oral hygiene was considered as a potential confounder in both groups and was compared by Mann-Whitney U-test.

## RESULTS

The number of decalcified areas in group A was 28 (14%) which was significantly lower than group B with 83 (41.5%) white spots ($P<0.01$).

A comparison of the number of these lesions in the mandible and maxilla of both study groups is shown in Table I. The difference observed between mandibular and maxillary white spots was significant ($P = 0.038$).

Glass ionomer (GI) and zinc phosphate (ZnP) cements were used in twenty-nine (116 teeth) and 21 (84 teeth) patients, respectively. White spot frequency was 46.6% in the GI and 37.07% in the ZnP groups. A significant difference was not observed in the distribution

**Table I:** Distribution of white spots (WS) in maxillary and mandibular first molar of study groups.

| | Maxillary WS | | | | Mandibular WS | | | |
|---|---|---|---|---|---|---|---|---|
| **Group** | 0 | 1 | 2 | Total | 0 | 1 | 2 | Total |
| **A** | 43 | 7 | 0 | 7 | 31 | 17 | 2 | 21 |
| **B** | 31 | 12 | 7 | 26 | 10 | 23 | 17 | 57 |

of white spots between the two types of cements (P= 0.232).

The average treatment period was 24 months ranged between 12 to 36 months. The frequency of white spots was 44.5% in patients with less than 24 months treatment period and 55.4% in patients with more than 24 months treatment period. The differences were significant (P<0.01).

The distribution of oral hygiene levels in the study groups are shown in Table II. A significant difference was not seen between the two groups (P= 0.476). Oral hygiene levels of 64% of the patients in group A and 54% of the patients in groups B were above moderate. A comparison of the percentage of white spots in the different oral hygiene levels is shown in Figure 1. The differences between the "very good" and "good" levels with the other two levels were significant (P<0.01).

## DISCUSSION

Overall the frequency of white spots was significantly higher in group B which emphasizes the influence of orthodontic appliances in increasing white spots. This finding is in accordance with the results reported by Gorelick et al [3]. The number of white spots in mandibular molars was significantly higher than maxillary molars (Table I). This may be associated with the location of salivary glands which results in accumulation of a greater amount of saliva around maxillary molars causing increased mineralization of these teeth. Previous investigations have also reported similar findings [3].

In spite of the fact that the prevalence of white spots was higher in teeth cemented with zinc phosphate cement (10%), the difference between zinc phosphate and glass ionomer cementation was not significant in the present study. Previous investigations have shown that glass ionomers have cariostatic effects due to their fluoride release and can consequently decrease the incidence of white spots [1,8]. On the other hand Donly et al [9] in their study on artificial caries-like lesions demonstrated a statistically significant reduction in lesions exposed to glass ionomer as compared to zinc phosphate cement (P<0.005). This difference could be attributed to the cariostatic property of glass ionomer [9]. Therefore, the use of glass ionomer materials for band cementation or bonding of brackets, and brushing with fluoridated dentifrice can be suggested. This can increase fluoride release from the cement around the brackets and enhance the uptake of fluoride during brushing. The final result might be further fluoride release leading to reduction of white spot formation.

**Table II:** Frequency of oral hygiene levels in groups A and B

| Group | Very good n (%) | Good n (%) | Moderate n (%) | Poor n (%) |
|---|---|---|---|---|
| **A** | 18 (36) | 14 (28) | 11 (22) | 7 (14) |
| **B** | 15 (30) | 12 (24) | 14 (28) | 9 (18) |

White spots significantly increased in cases with longer treatment periods which were in contrast to the findings of Southard et al [10] who did not find a significant correlation between caries incidence and duration of orthodontic treatment.

According to the results of present study patients under orthodontic therapy (group B) revealed lower oral hygiene levels as compared to group A, but the difference was contrast to the findings of Southard et al [10] who did not find a significant correlation between caries incidence and duration of orthodontic treatment.

According to the results of present study patients under orthodontic therapy (group B) revealed lower oral hygiene levels as compared to group A, but the difference was not significant (P>0.05). This showed that the two groups had similar oral hygiene levels. On the other hand the frequency of white spots was significantly higher in group B under-

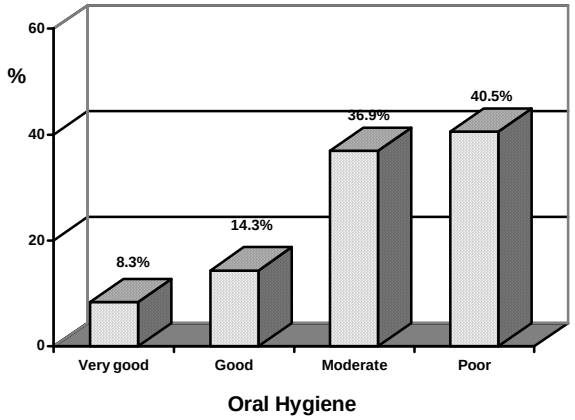


**Fig. 1:** Comparison of the percentage of white spots in different oral hygiene levels.

going orthodontic treatments with bands on all first molar teeth. This could be correlated to plaque accumulation around brackets which causes demineralization of the surrounding enamel and hence increases white spots.

The level of oral hygiene had a significant impact on the level of white spots formed during orthodontic treatment. The highest number of white spots was observed in patients with poor oral hygiene (Fig. 1). Although optimal caries prevention strategies during orthodontic treatment have not been fully explained, the use of toothpastes and gels with high fluoride concentrations (1500-5000 ppm) has shown a tendency towards inhibition of demineralization [11]. A significant increase in plaque index scores was observed after three months of active treatment with fixed orthodontic appliances. A failure to follow basic preventive measures may increase the risk of enamel decalcification in some patients undergoing orthodontic treatment with fixed appliances [12], so the higher level of bacterial plaque formation in patients with lower hygiene levels is expected.

It has been shown that when using fluoridated elastomeric ligatures, stretching can increase the concentration and amount of fluoride release. Therefore their application is recommended for the reduction of white spots [13].

## CONCLUSION

Results of present study showed that patients with orthodontic bands are at higher risk of white spot formation and good oral hygiene could have a protective effect on their occurrence. Professional care and daily oral hygiene could decrease the cariogenicity effect of bacterial plaques in patients.

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