

Review Article

Prevention of white spot lesions during orthodontic treatment: A review

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Abstract: White spot lesion (WSL) is one of the potential complications of fixed orthodontic treatment associated with poor oral hygiene. The formation of WSL after completion of orthodontic therapy is discouraging to a specialty whose goal is to improve esthetics in the dento-facial region and it lead to patient dissatisfaction and legal complication. This article discuss the formation, prevention of white spot lesion during orthodontic phase.

Keywords: White spot lesion, Chitosan, fluoride varnish, Argon-laser.

INTRODUCTION

Enamel decalcification or white spot lesion (WSL) is one of the potential complications of fixed orthodontic treatment associated with poor oral hygiene. Fejerskov et al. defined "white spot lesion" as 'the first sign of carious lesion that is visible to naked eye' and is used alongside the terms "initial" or "incipient" lesions[1]. The white appearance of these lesions is due to the loss of mineral crystals of the enamel surface or subsurface. Increased surface roughness, loss of shine and changed pattern of light refraction results in milky white opacities on tooth surface [2].

Orthodontic treatment with fixed appliances increases the risk for development of WSL. Bands and brackets increase the retention of plaque and food on smooth tooth surfaces that encourages the formation of white spot lesions[3]. WSLs are areas of enamel decalcification typically found around the periphery of bracket bases. Despite intensive efforts to educate patients about effective oral hygiene procedures, enamel demineralization associated with fixed orthodontic appliances remains a significant clinical problem. A review of literature showed 2% to 97%, of WSL prevalence associated with orthodontic treatment [4-6]. The formation of WSL after completion of orthodontic therapy is discouraging to a specialty whose goal is to improve esthetics in the dento-facial region and it lead to patient dissatisfaction and legal complication [7].

Orthodontists should be proactive and take active responsibility to prevent the development of WSL by

educating their patients about the importance of maintaining an excellent dietary compliance and oral hygiene regime. Oral hygiene regime must include topical fluoride agents such as fluoridated toothpaste, fluoride containing mouth rinse, gel and varnish to prevent or minimize the formation of WSL during orthodontic treatment[8].

In present article we discuss the formation, prevention of white spot lesion during orthodontic phase.

FORMATION OR ETIOLOGY OF WHITE SPOT LESIONS (WSL)-

WSL can occur on any tooth surface in the oral cavity where the plaque is allowed to develop and remain for a period of time. After bonding of fixed appliance in patients' oral cavity, the microbial flora of the oral cavity undergoes a drastic change. The level of acidogenic bacteria in plaque significantly increases after bonding, mainly *Streptococcus mutans* and *Lactobacilli*. These acidogenic bacteria lower the pH of the oral cavity in orthodontic patients as compared to non-orthodontic patients. Thus due to acidic pH, caries susceptibility increases and teeth become more prone to white spot lesion.

PREVENTION OF WSL

Following method should be carried out to prevent WSL

1. Patient education

The main responsibility of preventing WSLs is on patients; however, cooperation between the patient, parents, orthodontist and general dentist is necessary for the prevention and treatment of these lesions. The most important prophylactic measure to prevent the occurrence of WSLs in orthodontic patients is implementing a good oral hygiene regimen. Good oral hygiene is thus more important in orthodontic patients treated with fixed appliances than in non-treated individuals. Mechanical plaque control by proper tooth brushing is of paramount importance. A modification of the standard toothbrush, use of disclosing solutions, and use of floss can help patients in attaining good oral hygiene. Use of power toothbrush or daily water irrigation in combination with manual tooth brushing may be a more effective method in reducing plaque accumulation than manual tooth brushing alone.[9] Besides oral hygiene at home, professional prophylactic cleaning is designed to reduce the bacterial load, enhance the efficacy of brushing and facilitate cleaning by the patient. Professional tooth cleaning two or three times a year maintains a healthy mouth and reduces the risk and number of teeth with caries.

2. Dentifrices

Dentifrices normally contain either sodium fluoride, monofluorophosphate, stannous fluoride, amine fluoride, or a combination of these compounds. Fluoride concentration below 0.1% in dentifrices is not recommended for orthodontic patients. This is because an appropriate level of fluoride ions is needed to provide an anticaries benefit by promoting enamel remineralization. Stannous fluoride also has plaque-inhibiting effect by interfering with the adsorption of plaque bacteria to the enamel surface [10, 11]. Tin atoms in stannous products also block the passage of sucrose into bacterial cells, thus inhibiting acid production [12].

3. Mouth Rinses

In less patient compliance, dentifrice alone cannot prevent demineralization, and supplemental source in the form of mouth rinses is recommended. Fluoridated mouth rinses containing 0.05% sodium fluoride when used daily, showed significant reduction in lesion formation beneath bands. These mouth rinses are generally combined with antibacterial agents such as chlorhexidine, triclosan or zinc to improve their cariostatic effect.[12]

4. Fluoride in Bonding Agents

In general, the duration of orthodontic treatment makes the patient more prone to caries. As a result, continuous fluoride release from the bonding system around the bracket base would be extremely beneficial. Glass ionomer cements (GICs) were used as orthodontic bonding adhesives to take advantage of

their chemical bonding to tooth structure and sustained fluoride release following bonding. In an attempt to increase the bond strengths of GICs, resin particles were added to create resin modified GIC bonding systems. These adhesives release fluoride as do conventional GICs but also have higher bond strength [13, 14].

5. Fluoride varnish

Fluoride varnishes should be used in weakly-motivated patients. The professional application of fluoride varnish is a preventive method requiring little patient compliance only attendance at the dental practice. In addition to the fluoride mechanisms mentioned previously, the application of a fluoride varnish provides a protective coating over the tooth surface which decreases enamel solubility [15]. Fluoride varnish adheres to the enamel surface longer than other topical fluoride products and has been shown to be superior to the use of sodium fluoride and monofluorophosphate toothpastes, weekly acidulated phosphate fluoride gel application and daily sodium fluoride rinses because of its ability to increase fluoride uptake in enamel in vitro [16]. Advantages of the fluoride varnish over other topical fluoride regimens include providing fluoride protection of enamel despite patient noncompliance and delivering the fluoride in a sustained manner over a longer period of time.

6. Antimicrobial agents:

Antimicrobial agents such as chlorhexidine can change the ecology of the biofilm and can effect dental caries and therefore, are beneficial for patients with poor oral hygiene.[17] Application of 0.2% chlorhexidine (CHX) twice daily each time for 60 seconds is recommended in patients who are not cooperative for using other preventive measures. Chitosan is another antimicrobial agent [18]. It is a bio poly-amino-saccharide with bacteriostatic, bactericidal, anti-plaque and anti-calculus properties. It increases the salivary secretion and flow and decreases demineralization by preventing phosphate release from the tooth structure [19, 20]. study shows that four weeks application of chitosan toothpaste decreases the plaque index by approximately 70% and the microbial index by approximately 85%.18,19 One study showed that its application for 60 days decreased demineralization around brackets [21].

7. Argon-laser enamel surface attenuation

The results of recent studies would suggest that argon laser may be used to prevent enamel decalcification by altering the crystalline structure of enamel [22-24]. It has been reported that enamel exposure to argon laser irradiation results in the alteration of the surface characteristics of the enamel by creating micro spaces that stabilize ions during an acid attack rather than allowing them to be lost from the enamel [23]. The

available calcium, phosphate and fluoride ions in saliva may then precipitate into these micro spaces, increasing the resistance of the enamel to demineralization and increasing the uptake of minerals from saliva [24]. Further in vivo and in vitro studies are required in order to establish the optimal fluence (energy density) for argon laser administration in order to simultaneously prevent enamel decalcification and achieve curing of bonding cements [23].

CONCLUSION

White spot lesions are a common negative sequel of fixed orthodontic appliance therapy. But white spot lesion can be prevented, for that orthodontist must educate the patient regarding the importance of maintaining good oral hygiene. Fluoride is the most important agent to prevent decalcification and restrict lesions from progressing. Oral hygiene regime must include topical fluoride agents such as fluoridated toothpaste, fluoride-containing mouth rinse, gel and varnish to prevent or minimize the formation of WSL during orthodontic treatment.

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