



White Spot Lesions Related to Orthodontics: A Review

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Abstract

White spot lesions are opacities occur by demineralization of enamel under the surface and cause esthetic problems. Orthodontic treatment enlarges the probability of white spot lesion occurrence by producing areas difficult to clean and prone to plaque accumulation around orthodontic attachments. Therefore, application of suitable methods for prevention of these lesions during orthodontic treatment and performing appropriate therapies after orthodontic treatment is important for obtaining favorable results and patient satisfactio.

Keywords: Enamel Demineralization; Oral Hygiene; Plaque Accumulation; White Spot Lesion

Abbreviations

CPP: Casein Phosphopeptide; ACP: Amorf Calcium Phosphate.

Introduction

When bacterial plaque remains on the enamel surface for an extended period of time, white spots begin to appear. Based on their position, shape, and dimensional stability over time, aberrant enamel calcification of developmental origin is not the same as the white spots resulting from the decalcification process [1]. If WSLs are not successfully prohibited and the patient feels that the white spots are unsightly, treatment of WSLs is required. Prior to initiating orthodontic therapy, the physician ought to utilize intraoral photos to record the degree and character of white tooth loss. A cautious approach ought to be used when treating WSLs [2].

Relationship of White Spot Lesions with Orthodontics

During orthodontic treatment, WSL is detected in up to 50% of patients, which raises the number of bacteria near orthodontic attachments [3]. According to Gorelick L, et al. [1] the features of the tooth surface, salivary access, and the space between the gingiva and brackets are the reasons behind the development of white spot lesions. There was no correlation between the development of white lesions and the presence of lingual retainers.

Incidence of White Spot Lesions

The most affected teeth are upper lateral incisors, upper canines, lower canines and lower first molars respectively [1].

Classification of White Spot Lesions

First Classification of White Spot Lesions in Orthodontics was according to their Visual Size. This Classification was made according to the Width of Opacity Formed on Enamel Surface [4]:

Class 0: Not a bit or less than 1 mm opacity

Class 1: Opacity covers 1/3 of tooth surface

Class 2: Opacity covers 1/3 to 2/3 of tooth surface

Class 3: Opacity covers wider than 2/3 of tooth surface

Classification by Gorelick L, et al. [1] according to Both Size and Intensity of Lesions:

Class 1: No white spot lesion formation

Class 2: Mild white spot lesion present

Class 3: Severe white spot lesion present

Class 4: Cavitation is present in addition to white spot lesion

Evaluation of White Spot Lesions

Specific and rapid evaluation of white spot lesions during orthodontic treatment is important for doing defensive, preventive and corrective therapies. Two steps are required in the assessment of white spot lesions. The first step is evaluation of decalcification and the second step is evaluation of severity of a lesion. Severity is assessed according to the brightness and size of a discoloration [5].

Prevention of White Spot Lesions

White lesions resulting from orthodontic treatment decreases rapidly after removal of orthodontic appliances within 12 months and may decrease up to 50% within 24 months. The degree of remineralization varies between individuals and different regions within the mouth [6]. Prevention of white spot lesions includes two fundamental methods. First is during orthodontic treatment, second and the best method to prevent white spot lesions is before they develop. The first method is to strengthen remineralization process. The second method is to prevent demineralization on tooth surface. There are some methods for increasing remineralization and decreasing demineralization in patients undergoing orthodontic treatment like oral hygiene motivation, regular professional oral hygiene appointments, usage of topical agents and orthodontic adhesives involving fluoride [7].

Oral Hygiene Motivation

If patient has good oral hygiene then Ph level not exceeds the critical level in early stages of acid attacks. However, if patient's oral hygiene is poor, permanent mineral loss can be observed around braces, as these areas remain below critical pH level for a long time [8].

Removal of dental plaque is done by two methods, mechanical and chemical. Mechanical method includes brushing of tooth.

Mouthwashes involving different ingredients that provide Chemical method includes mouthwashes involving different ingredients that reduces bacterial count by 99.9% [9].

Usage of Agents with Fluoride:

- To reduce enamel tendency to demineralization fluoride application is a commonly used method [10].
- Cariogenic bacteria forms organic acids which causes decrease in pH level of plaque, which results in fluoride diffusion into enamel from plaque and saliva in response. Displacement of hydroxyl ions of enamel structure with fluoride causes existence of fluorapatite crystals. This new crystal form is more resistant to acid [11].
- Fluoride also affects the activities of cariogenic bacteria and prevents formation of caries [12].

Usage of Agents with Casein Phosphopeptideamorf Calcium Phosphate (CPP-ACP): Anticariogenic potentials of four different type of cheese was compared by Harper DS, et al. [13] each containing different levels of phosphate, fat, protein and calcium. It was concluded that cheese with the most protective properties against caries formation was the one that involves the greatest amount of casein phosphoproteins and calcium phosphate in its content. Acid casein can reduce formation of caries when added into toothpastes. However, the amount of casein influences the taste of any toothpaste. The anticariogenic mechanism of CPP-ACP can be summarized as increasing the level of calcium phosphate in plaque, reducing demineralization and increasing remineralization of enamel [14].

Usage of Antimicrobial Agents: Formation of dental plaque cannot be prevented by Chemotherapeutic agents but they can be used to remove microorganisms, which is one of the main factors that cause enamel demineralization. Benzalkonium chloride and Chlorhexidine and are the most preferred antimicrobial agents for this purpose [15].

Usage of Xylitol: Xylitol shows anti-cariogenic effect by restrict caries lesion. This effect is based on the fact that it is a non-fermentable sugar and it obstructs the growth of *Streptococcus mutans* [16].

Treatment of White Spot Lesions

Topical Fluoride Application: First step of the treatment of white spot lesion is topical fluoride application on lesions. Application of fluoride in high concentration provides remineralization on lesion surfaces. However untreated parts may remain in deeper layers of lesions and continue to create aesthetic problems [2]. Acid etching followed by fluoride application facilitates remineralization [17].

Dental Bleaching: Bleaching can be applied to white spot lesions areas, following natural remineralization which occurs by itself without any intervention. This method can be applied overnight at home or by a professional in dental office by using gel bleaching systems involving different

dosages of hydrogen peroxide with the help of transparent trays in patients suffering from yellowish discoloration [8]. Knosel M, et al. [18] checked the effect of bleaching on inactive white spot lesions and intact enamel surrounding them following orthodontic treatment. Distinct color changes were observed in both white spot lesion area and intact enamel.

Casein Phosphopeptide-Amorphous Calcium Phosphate (CPP-ACP) Application:

- Reynolds and Black [14] found that CPP-ACP obtained from milk affected caries development.
- Free calcium and phosphate ions in CPP-ACP can be easily transferred to enamel surface. Reynolds EC [19] reported that using a solution containing 1% CPP-ACP increased calcium level by 144% and phosphate level by 160% in oral environment, which led to decrease in mineral loss by 51% due to consumption of sugary solution.
- CPP-ACP increases amount of calcium and phosphate ions above the critical level required for remineralization. Thus, it exhibits anticariogenic effect [14].

Microabrasion: Microabrasion is a method of controlled removal of enamel surface by applying different mixtures. Outer surface of enamel is rich in fluoride and more resistant to external factors, that's why less enamel is removed in the first step of microabrasion [20]. The most common method of microabrasion is polishing labial/buccal surface of teeth with a rotating device by using a gel formed mixture of 18% hydrochloric acid and medium grained pumice [21].

Conclusion

Prevention and treatment of white spot lesions are Oral hygiene motivation, topical fluoride agents, casein phosphor peptide calcium phosphate agents, antimicrobial agents, tooth bleaching, microabrasion and resin infiltration. These methods should be used to reduce the risk of lesion formation. Early treatment with the suitable technique is recommended to acquire healthier and more aesthetic results. More treatment options of white spot lesion are needed in future.

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