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Prevention and Management of White Spot Lesions in Orthodontic Patients

Puja kumari[1], Varun gupta[2], Neha agrawal[3], Rajat sriwastva[4], Arindam sarkar[5], Kanupriya[6]

Abstract

One of the most common problem which occur in the orthodontic patients are white spot lesions,that formed around the orthodontic attachments.It can occur during treatment and follow up, which affect the results of successful treatment[1]. So, these problems should be minimized during the treatment for successful results.The formation of these lesions on the enamel surface during fixed orthodontic treatment is not due to a single factor but affected by multiple factors. By maintaining excellent oral hygiene by the patients, formation of this lesion can be reduce. Fluoride in the various forms like toothpaste, gel, solution, fluoride varnish and topical cream contribute to the process of remineralization of enamel and also help to reduce the development of white spot lesions.

Keywords White lesions, Oral hygiene, Demineralization, Fluoride, Dental plaque.

Introduction

The formation of white spot lesions on the enamel surface and Enamel discoloration occurs frequently both during and after orthodontic treatment. Maxillary lateral incisors and mandibular canine are more prone teeth.This lesion mainly affects the distogingival area of the teeth [2]. The prolonged accumulation of plaque is one of the most common and important causes for these unwanted lesion. In orthodontic patients, the presence of brackets, attachments, wires, rings and ligatures increases the risk of accumulation of plaque on the labial surface of crowns [3].Poor oral hygiene can also leads to accumulation of plaque which ultimately,cause demineralization of enamel and finally produces white spot lesion. Hence the responsibility of a good Orthodontist is to educate the patients about the importance of maintaining good dietary compliance and excellent oral hygiene regime.

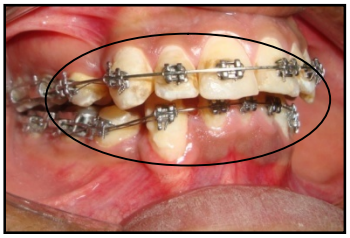

Figure 1*:* White spot lesion develops irt 11, 12, 13, 15 and 21 during treatment after 6 months.

Prevalence of white spot lesions arising during fixed appliance therapy widely ranges from 2% and 96% [4-6]**.**

[1,2,4,,5,6] PG student

[3]Reader, Dept. of Orthodontic and Dentofacial orthopedics, Rama Dental College, Hospital and Research Centre,,Kanpur, Uttar-Pradesh, India.

After 1 month of bracket placement with poor oral hygiene, white spot lesion can become visible around the brackets of appliances, and caries formation may occur in 6 months on the demineralized enamel surface. Maxillary anterior mainly lateral incisors are the most common site,whereas the maxillary posterior segments are least common site for the development of white spot lesion.Males are more affected than females [7].

Definition

The term white spot lesion defined as- “the first sign of caries like lesion on enamel that can be detected with the naked eye [8, 9].

The white spot lesion has also been defined as "subsurface enamel porosity from carious demineralization" that presents itself as "a milky white opacity when located on smooth surfaces” [8, 9].

Etiology

The appearance of white spot lesions (WSLs) on the enamel surface during fixed orthodontic treatment is multifactorial. Most common factors responsible for the development of white spot lesion are bacterial plaque, fermentable carbohydrates, a susceptible tooth surface and a sufficient period of the time [1].

Microbial factors.

Common microbes responsible for white spot lesions are Streptococcus Mutans and Lactobacillus .[10-12]

Salivary factors

Saliva are important factor for both enamel demineralization and remineralization .These action of saliva are influenced by factors like pH, rate of flow and buffer capacity. Saliva is also necessary for the delivery of fluoride ions to the enamel surface. Adequate flow of the saliva is considered an

important factor for the prevention and management of enamel demineralization because it helps in the physical cleansing of carbohydrates from the tooth surfaces and also due to its anti-microbial activities.Maxillary anterior teeth are the most common sites for demineralization because more exposed to dietary carbohydrate with less exposure to saliva, so white spot lesion is common on the labiogingival surface of these teeth. Low pH of the plaque necessary for the demineralization of enamel surface because it is not compensated by the buffering capacity of the saliva.

Oral hygiene

Poor oral hygiene is the most important cause for development of white spot lesions because it make tooth cleaning more difficult and also restricts the self-cleansing action of the tongue, lips, and cheek .So there is more prevalnce of cariogenic bacteria in patients undergoing orthodontic treatment.[13]

Diet

Carbohydrate rich diet makes the enamel more vulnerable to white spot lesion by increasing enamel demineralization [1].

Alteration of the oral environment

As we know in orthodontic patients ,orthodontic attachments and brackets altered the oral environment by restricting cleaning action of teeth,tongue and lips .This altered environment is responsible for increases the colonization of microbes (S.mutans and Lactobacilli) [10-18] and plaque accumulation. Gingival side of the brackets is more affected by the plaque deposition [19]. Another important factor which altered the oral environment are types of material used for ligating the teeth, elastomeric rings exhibit a greater number of cariogenic microorganisms than the stainless steel ligature wires [17-20].

Prevention and Management

The risk of enamel demineralization during fixed orthodontic treatment can be prevented by:

1. Using mechanical plaque control methods for improvement of oral hygiene.
2. Using topical fluoride for enhancing the enamel resistance to microbial acid.
3. Additional methods can also be used for the prevention of enamel demineralization in orthodontic patients.[21]

1. Mechanical plaque control

Proper tooth brushing is important mechanical plaque control methods [23]. A modification of the tandard toothbrush, use of disclosing solutions, use of floss also helps in attaining good oral hygiene [22-24].

2. Enhancing enamel resistance using topical fluorides

Topical fluoride having cariostatic effect due to calcium fluoride (CaF2) formation on the enamel surface [24]. Proper oral hygiene maintenance, along with daily use of topical fluoride, is found to important method for reducing enamel decalcification [5-22]. Patient compliance need for the application of topical fluoride agents in home. So, different non-compliant topical fluoride has been also implemented to prevent enamel demineralization around orthodontic brackets. When topical fluoride is applied to the tooth surface (enamel/dentin), a CaF_2 -like material builds up in plaque or in incipient lesions, which acts as a reservoir and releases fluoride ions when the pH is lowered during a caries attack.

3. Different modes in which fluorides have been documented to prevent WSL are as follows:

Fluoride Mouth Rinse

0.05% or 0.2% of sodium fluoride can be used for daily mouth rinse and/or weekly with acidulated phosphate fluoride (1.2%) rinse have been found to reduce the incidence of enamel demineralization during active fixed orthodontic treatment [25-27].

Fluoride Gel

0.4% of Stannous fluoride gels can also be used for reducing the enamel demineralization during orthodontic treatment by orthodontic the patients [28].

Fluoride Toothpaste

The regular use of fluoride toothpaste is a very common recommendation by the orthodontist, but it is shown to be inefficient in inhibiting white spot development around the orthodontic brackets.

Fluoride Varnish

Duraphat (5% NaF), fluorprotector (1% difluorosilane and 0.1% F), duraflor (5% NaF) are the commonly used Fluoride varnishes to prevent the enamel demineralization [29].

Pit and Fissure Sealant

It is a noncompliance method for preventing enamel demineralization Pit and fissure sealants applied to

the labial enamel surface adjacent to the bonded orthodontic brackets [30].

Fluoride in Luting Cement

Cement containing fluoride for banding like GIC can be used to prevent the enamel demineralization, especially in orthodontic patients. Both zinc polycarboxylate and resin-modified GIC are fluoride-releasing cement, but demonstrated less enamel demineralization than the zinc phosphate cement [31].

Fluoride in Bonding Agents

Bonding agents like resin-modified GIC and Bioactive glass (BAG) materials have the potential for decreasing enamel decalcification by releasing fluoride [32].

Fluorides in Elastomers

Elastomeric modules having fluoride-releasing properties can be able to reduce plaque accumulation and enamel decalcification around the orthodontics brackets. Even the fluoride release from a fluoride-containing elastic chain was high for the 1st week and decreased significantly after that [33-36].

Use of Fluoride Containing Antibacterial Adhesives

The antibacterial activity of 12-methacryloyloxydodecylpyridinium bromide incorporated in the antibacterial adhesive systems demonstrated inhibition of caries formation, especially along the enamel margins [37].

Recommendations

We can suggest some recommendations based on the literature data that will lead to prevention of WSL:

• To motivate patients with fixed orthodontic appliances for proper maintenance of oral hygiene

• To educate the patients to brush teeth properly twice in a day.

• 0.05% NaF use for daily fluoride mouth rinse .

• To use the glass ionomer cement for rings and bracket bonding because it is fluoride-releasing cement.

•Mouth paste or microabrasion can be used if white spot lesions appear tooth are present

Conclusion

White spot lesions (WSLs) are one of the most common complications occurs during the fixed orthodontic treatment. It is the responsibility of an orthodontist to minimize the risk of the patient having decalcification as a consequence of orthodontic treatment by educating and motivating the patients for excellent oral hygiene practice.Demineralization which occurs during orthodontic treatment is a major clinical problem for the dentist and the patients. The presence of fluoride even in small concentrations is necessary to inhibit cavities.

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