

White Spot Lesions In Orthodontics

Dr. Shaistha Anjum Moquddam

Asst. Professor

Dept. of Orthodontics & Dentofacial Orthopaedics, M.A Rangoonwala College of Dental Sciences & Research Center, Pune (Maharashtra)

Dr. Ashwini Darekar

Asst professor

Dr. Shirin Basade

Asst. Professor

Abstract

As oral hygiene becomes more difficult in patients with fixed orthodontic appliances, the decalcification of the enamel surface adjacent to these appliances is prevalent. Decalcification is manifested as a white spot lesion (WSL) and orthodontic patients develop significantly more WSLs than nonorthodontic patients. If WSLs are left untreated, they may progress to produce carious cavitations and may also present esthetic problems. Thus, the prevention, diagnosis, and treatment of WSLs is crucial to minimize tooth decay as well as tooth discoloration that could compromise the esthetics.

Introduction

The term white spot lesion is defined as 'the first sign of a caries lesion on enamel that can be detected with the naked eye that presents itself as a milky white opacity when located on smooth surfaces

White discolorations of enamel can be classified as dental fluorosis, opacities, or WSL. A set of criteria have been developed to differentiate between fluorosis and opacities. Fluorosis is a white/yellowish lesion that is not well defined, blends with normal enamel, and has symmetrical distribution in the mouth. Nonfluoride opacities have a more defined shape, are well differentiated from surrounding enamel, often located in the middle of the tooth, and randomly distributed.

Incidence

In general, the prevalence of WSL in patients after orthodontic treatment varies from 15% to 85%, with most studies reporting 50% to 70%, commonly affecting maxillary lateral incisors, maxillary canines, and mandibular premolars. The incidence was highest in the labio-gingival area of the maxillary lateral incisors and lowest in the maxillary posterior segment. The reported incidence and prevalence of WSL between males and females have been found to be inconclusive. No significant differences between the right and left sides of the maxilla and mandible were noted.

Mechanism of Formation of WSL

Patients undergoing treatment with fixed orthodontic appliances have a rapid increase in the volume of dental plaque. The levels of acidogenic bacteria is elevated, especially *Streptococcus mutans* and *Lactobacillus*. *S. mutans* colonize over the retentive areas of orthodontic appliances and surrounding enamel surfaces. *Lactobacillus* is responsible for the progression of the carious lesion. Their presence in large numbers is indicative of the necessary condition for dental caries to exist. *S. Mutans* and *Lactobacilli* produce organic acids in the presence of fermentable carbohydrates which lowers the pH. Sucrose

plays an important role in plaque formation inducing the formation of a cariogenic plaque.

Cariou decalcification occurs when the pH drops below the threshold for remineralization and creates an alteration in the appearance of the enamel surface which is visualized as WSL such lesions can be clinically noticed within 4 weeks. WSL makes the affected area softer than the surrounding sound enamel, making the tooth more prone to caries. There is about 10% reduction in the mineral content of enamel in these incipient carious lesions. This makes the affected teeth more susceptible to enamel loss while debonding. Fast developing white spots may remineralize almost completely within a few weeks of the removal of the cariogenic challenge. However, lesions that develop slowly take a longer period to remineralize. Micro-leakage around orthodontic brackets can be another cause for the formation of WSL. The teeth expand and contract when they are heated and cooled by the ingestion of hot or cold foods. The linear thermal coefficient of expansion of enamel, ceramic/ metal brackets and the adhesive systems do not match. This repeated expansion and contraction at different coefficients results in fluids being sucked in and pushed out at the margins of the bracket. In comparison with ceramic brackets, the metal brackets are associated with more micro-leakage. Metal brackets contract and expand more than ceramic brackets, enamel, or the adhesive systems, producing microgaps between the bracket and the adhesive system causing leakage of oral fluids and bacteria beneath the brackets, leading to the formation of WSL.

Risk Factors for WSL

If the pH of plaque remains low for a prolonged period of time, the environment becomes conducive for long periods of demineralization with short periods of remineralization, resulting in frank carious lesions. Risk factors for the development of incipient caries during orthodontic treatment are young age (preadolescents), number of poor oral hygiene citations during treatment, unfavorable clinical outcome score, white ethnic group, and inadequate oral hygiene at the initial pretreatment. Factors such as the patient's medical history, dental history, medication history, diet; salivary flow rate, levels of calcium, phosphate, and bicarbonate in saliva, fluoride levels and genetic susceptibility also play an important role. There is a poor correlation between length of treatment time and the incidence of number of white spot formations.

Prevention of WSL

1. Patient Education

Twice daily tooth brushing is recommended by many clinicians as an

essential part of a daily plaque control programme for all orthodontic patients. Many manual and electric toothbrushes are available, with conflicting reports of the effectiveness of the two types of brushes.

2. Fluoride Toothpaste, Mouthrinses & Gels

Studies have shown that decalcification is a significant risk during fixed orthodontic treatment. Current evidence suggests that topical fluoride treatment (TFT) is beneficial in preventing the development of WSL during orthodontic treatment. When it is applied on the tooth surface, calcium fluoride (CaF₂) 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. Implementing a good oral hygiene regimen including proper tooth brushing with a fluoridated dentifrice is the most important prophylactic measure. Fluoride concentrations of less than 0.05% are beneficial in reduction of the carious lesions. Evidence suggests that reduced demineralization and enhanced remineralization can occur with toothpaste containing 500ppm fluoride.

When fluoride ions are incorporated into the surface of enamel, it forms a fluorapatite crystal structure that has lower solubility in the oral environment compared with hydroxyapatite. Fluoroapatite helps in reducing tooth decay by remineralization of small decalcified areas and reduction in the formation of new lesions. In addition, stannous fluoride may have a plaque-inhibiting effect by interfering with the adsorption of plaque bacteria to the enamel surface. Atoms of tin in stannous products block the passage of sucrose into bacterial cells and thus inhibit acid production.

Fluoridated mouth rinses containing 0.05% sodium fluoride used daily have been shown to significantly reduce lesion formation beneath bands. Chemical agents such as chlorhexidine or benzydamine used in the form of mouth rinses or oral sprays are useful adjuncts in plaque and inflammation control. These mouth rinses have been combined with antibacterial agents such as chlorhexidine, triclosan or zinc to improve their cariostatic effect. Chlorhexidine mouthwash used as a complement to fluoride therapy has demonstrated demineralization-inhibiting tendencies in patients with fixed orthodontic appliances.

Patients is instructed to use chlorhexidine rinse available in nonalcohol formulations for patients with xerostomia or saliva dysfunction for 30 seconds once a day before bedtime, because saliva flow diminishes overnight and the concentration of the drug in the oral cavity remains high until morning. A 14-day regimen is usually recommended.

3. Fluoride Varnishes

An in-office application of a high concentration of fluoride in the form of a varnish can be beneficial. It eliminates the need for patient cooperation that is required with fluoride rinses. The American Dental Association's Council on Scientific Affairs recommends application of 'in-office fluoride varnish at six-month intervals for moderate and high-risk patients'. It has been reported that the application of a fluoride varnish resulted in a 44.3% reduction in enamel demineralization in orthodontic patients. Acid-resistant coatings of calcium fluoride or titanium fluoride on the enamel surface and the use of fluoride in combination with different antimicrobials have been suggested to improve the cariostatic effect of fluoride at low pH. Varnish forms of the other antibacterial solutions such as benzydamine, triclosan, and xylitol could be helpful for suppressing levels of oral mutans or the other microbes for long periods, when used before the placement of fixed orthodontic appliances. In contrast to one-time topical application in high doses, a long-term, low-dose fluoride availability might increase the caries-resistant fluorapatite concentration in enamel, helping the prevention and reduction of demineralization

4. Casein Phosphopeptide-Amorphous Calcium Phosphate

Enamel demineralization might be prevented by the application of products containing casein phosphopeptides amorphous calcium phosphate (CPP-ACP). CPP-ACP is a nanocluster that binds calcium and phosphate ions in an amorphous form. CPP-ACP has been shown to adhere to the bacterial wall of microorganisms and tooth surfaces. When an intraoral acid attack occurs, the calcium and phosphate ions are released to produce a supersaturated concentration of ions in the saliva, which then

precipitates a calcium-phosphate compound onto the exposed tooth surface.

5. Fluoridated adhesive & Argon-Laser

The introduction of fluoride-releasing adhesive systems, resin composites, and glass ionomer cements for bracket bonding offered a means of fluoride delivery adjacent to bracket-enamel interface independent of patient cooperation. In an attempt to increase the bond strength of GIC's, resin particles were added to their formulation to create resin modified Glass Ionomer (RMGI) bonding systems. These adhesives release fluoride like conventional GIC's and can also be used successfully to bond orthodontic brackets because of their relatively higher SBS. Because of the recent improvements in the fluoride-releasing capabilities and the SBS of RMGI, it has been suggested that these adhesives should be used more widely in bonding orthodontic brackets in the future. However a recent study concluded that it is impossible to make recommendations on the use of fluoride-containing orthodontic adhesives during fixed orthodontic treatment. A fluoride releasing antibacterial bonding agent has been developed by combining the physical advantages of dental adhesive technology and antibacterial effect. The antibacterial activity of 12 methacryloyloxy-dodecyl-pyridinium bromide (MDPB) incorporated in the antibacterial adhesive systems demonstrated inhibition of caries formation, especially along the enamel margins.⁸ Incorporating MDPB into self-etching primer and adhesive resin has demonstrated in vitro antibacterial activity, bonding ability, cytotoxicity, and pulpal response. It was confirmed that MDPB-containing primer has got antibacterial effects in vivo when used in animal models. Finally, use of argon laser to cure composite resins has demonstrated its ability to alter the enamel, rendering it less susceptible to

demineralization. It was also shown that combining laser irradiation with fluoride treatment can have a synergistic effect on acid resistance preventing formation of WSL and dental caries. Research has shown that exposing the teeth to an argon laser for 60 seconds at the time of appliance placement reduced lesion depth by 91.4% and lesion area by 94.6% when compared with untreated control teeth.

Conclusion

WSL on the enamel surface adjacent to fixed orthodontic appliances is an important and prevalent iatrogenic effect of orthodontic therapy. The components of the appliance and the bonding materials create stagnation areas for plaque accumulation and bacterial colonization. The subsequent acid production by the acidogenic bacteria leads to enamel decalcification. The orthodontist must educate the patient regarding the importance of maintaining good oral hygiene and dietary regime. 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.

References

1. Sangamesh B., Amitabh Kallury: Iatrogenic effects of Orthodontic treatment Review on white spot lesions International Journal of Scientific & Engineering Research Volume 2, Issue 5, May-2011
2. TR Sudjalim, MG Woods, DJ Manton : Prevention of white spot lesions in orthodontic practice: A contemporary review: Australian Dental Journal 2006;51:(4):284-289
3. Samir E. Bishara and Adam W. Ostby: White Spot Lesions: Formation, Prevention, and Treatment Semin Orthod 2008;14:174-182.
4. Thomas M, Graber, Robert L. Vanarsdall: orthodontics current principles and techniques third edition

news update

Dental Camp organized by Daya Foundation

Daya Foundation organized a Oral Hygiene Dental Camp at Dr. Sachdeva Dental Aesthetic & Implant Centre, Delhi.

300 Kids Screened & Oral Hygiene Kit along with Gift, Certificates & Souvenirs were given in the camp.

The main objective of the camp was to provide basic dental health education to the

kids and motivate dental hygiene maintenance.

As per Dr. Rajat the basic Objective of this camp is:

1. This camp is carried out with the curiosity to find out the prevalence of dental diseases in children with deciduous dentition and early mixed dentition.

2. To identify the method to motivate dental health in young generation and cultivate dental hygiene for the future society.
3. It was a program with a lecture note and a screening camp, the lecture note was about the dental health, brushing methods and was delivered by dental auxiliaries and dentists.

