IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 7 Ser. 12 (July. 2024), PP 19-21
www.iosrjournals.org

Effectiveness Of Mouthwash Preparations InReducing Whitespot Lesions In FixedOrthodontic Patients-Review

Silvy Alex[1], Jacob John[2], Navin Oommen Thomas[3]
Postgraduate Student, Department Of Orthodontics, Pushpagiri College Of Dental Sciences, Thiruvalla)
Head Of Department, Department Of Orthodontics, Pushpagiri College Of Dental Sciences, Thiruvalla)
Reader, Department Of Orthodontics, Pushpagiri College Of Dental Sciences, Thiruvalla)

Abstract
During and after fixed orthodontic treatment, one of the biggest challenges is the decalcification of enamel around the appliances, which manifests as white spot lesions (WSLs). The objective of this article is to present a summary of the data demonstrating the efficiency of the most popular mouthwashes in treating white spot lesions. This article aims to provide an overview of the evidence of the effectiveness of the most widely used mouthwashes in managing white spot lesions.

Keywords*: Demineralization, mouthwashes, oral hygiene, orthodontic treatment, white spot lesions (WSLs).*

Date of Submission: 21-07-2024 Date of Acceptance: 31-07-2024

I. Introduction

Enamel decalcification is a significant problem during fixed orthodontic treatment, especially in patients with poor oral hygiene. The earliest sign of this enamel decalcification; in orthodontic patients, is usually seen as white spot lesions (WSL) on the enamel around brackets on surfaces generally not susceptible in non-orthodontic patients. White spot lesions (WSL) are defined as the "subsurface enamel porosity from carious demineralization'' that presents itself as 'a milky white opacity when located on the smooth surfaces'[1]. The dissolution is caused by organic acids produced by bacteria in the plaque[2]. The plaque provides a source of acid production by the Streptococcus mutans and Lactobacilli in the presence of fermentable substrate [3,4.]

Orthodontic appliances create habitable niches , in particular brackets, for the growth of Streptococcus mutans[5-8]. Metallic brackets and bands are known to have the highest surface tension and adhesion of cariogenic Streptococci to brackets are strongly influenced by the surface characteristics of brackets rather than a bacterial strain or saliva coating [9]. Hence the treatment with fixed appliances causes specific changes in the oral environment, such as an increase in plaque accumulation and a decrease in pH[10]. Besides these orthodontic attachments, one of the main causes for plaque accumulation and colonization of Streptococcus mutans is poor oral hygiene which is further accentuated in fixed orthodontic patients[11]. For these reasons, orthodontic patients are at greater risk of developing white spot lesions than nonorthodontic patients.

Prevalence of white spot lesions in orthodontic patients

White spot lesion is a precursor for enamel caries which develops as a result of an interrupted process with periods of demineralization and remineralization[12]. Areas most commonly affected by white spot lesions are cervical regions of posterior teeth around bands and lateral incisors of both arches and canines[13,14].In a study by Gorelick et al, the incidence of white spot lesions after debonding was reviewed for individual teeth [15]. The maxillary lateral incisors had the highest incidence of decalcification (21 %), which was three times as frequent as that found for the central incisors. In the study by Ritcher AE et al, 72.9% of patients developed at least 1 white spot lesion during orthodontic treatment[16]. The overall frequency of white spot lesions resulting from fixed appliance therapyis estimated to be between 2% and 96%[17].

Development and Distribution of White Spot Lesions

Fixed orthodontic appliances make it more difficult to clean your teeth and provide locations where plaque can collect. The saliva and oral musculature's innate self-cleaning capabilities are hindered by the uneven surfaces of brackets, bands, and wires. This promotes the buildup of plaque and the colonisation of aciduric bacteria, which eventually causes active lesions known as white spot lesions. If left untreated, these lesions can progress to cavitated caries lesions.

Within the oral cavity, white spot lesions can arise on any tooth surface if a microbial biofilm has been permitted to form and persist for some time. Variables related to the patient, such as medication history, medical history, dental history, food, salivary levels of calcium, phosphate, and bicarbonate, fluoride levels, and genetic

vulnerability, also influence their development.

The demineralization and remineralization of enamel is a dynamic and ongoing process that can evolve from initial demineralization to noncavitated lesions and ultimately to cavitated lesions. The entire thickness of the enamel, including the dentin's outer layer, may undergo demineralization before the hypermineralized enamel surface layer is removed or cavitated. The chalky look of the white spot lesion is merely an optical illusion brought on by mineral loss in the enamel's surface and subsurface.

Prevention and Management of White Spot Lesions

Various methods have been introduced and tried for the reduction and treatment of WSLs before and after orthodontic treatment over the years. The preventive strategies for WSLs mainly target the host factors, dietary factors, and removal of the plaque biofilm. They encompass mainly the use of topical fluorides, dietary monitoring, and chemical and mechanical plaque control. The most important measure to prevent the white spot lesion is by educating the patient about the importance of maintaining a high standard of oral hygiene and implementing a good oral hygiene regimen.[18,19]

Mechanical removal of dental biofilm is still considered the main method. Nevertheless, orthodontic appliances protect the dental plaque from the cleansing effects of brushing and mastication, allowing the undisturbed plaque to induce gingivitis, white spot lesions, etc. Hence improved antimicrobial solutions are urgently needed to prevent biofilm-related complications of orthodontic treatment. Chemical plaque control methods are available in the form of paste, gel, mouthwash, varnish, etc. Mouth rinses have been introduced as an effective method for reducing dental plaque accumulation, and orthodontic patients are prescribed various chemical agents such as chlorhexidine, Listerine, fluoride, probiotics, cetylpyridinium etc[20,21]. Adhesive cement in the form of glass ionomer cement and resin-modified composite, fluoride-releasing auxiliaries such as elastomeric chains, and ligature ties have been tried in the past. Administration of casein phosphopeptide amorphous calcium phosphate and argon lasers for enamel remineralization has been studied.

Effectiveness of mouthwashes

Mouthwashes, commonly referred to as mouthrinses, are aqueous liquid solutions that lower oral microbiota while preventing, treating, and curing oral disorders such as periodontitis, gingivitis, erosion, halitosis, and mucositis. Applications for mouthwash fall into two categories: therapeutic and preventive. Antiplaque chemicals, for example, not only prevent but also aid in the treatment of periodontal disorders. A single product can serve two purposes. It is not solely related to the amount of active ingredients in mouthwashes; rather, it is influenced by usage frequency and, of course, one's present state of health. Long-term use is necessary for prevention, although short usage is typically enough for treatment. In addition, it serves as a means of alleviation for specific disorders, preoperative or postoperative management, and aesthetic dentistry (whitening and stain prevention).

Fluoride mouthwashes

The most common fluorine component found in mouthwashes is sodium fluoride. Other fluoride compounds include monofluorophosphate, aluminium fluoride, calcium fluoride (uncertain solubility in mouthwashes), potassium fluoride, stannous fluoride (unstable in mouthwashes), olaflur, and nicomethanol hydrofluoride. Their ability to release free fluoride anions and their solubility determine the mode of action.

According to Alexander SA et al. exposures to fluoride preparations help shield patients undergoing orthodontic therapy from developing moderate to severe demineralization [22]. Dentifrice and over-the-counter rinses work very well to stop demineralization, but solutions with high fluoride concentrations offer more protection. According to a pilot study, using products containing AmF/SnF2 following the insertion of fixed orthodontic appliances may have positive clinical effects on gingival health and plaque accumulation[23].

The way that fluoride is administered matters: a patient's regular usage of a fluoride mouth rinse will maximise its effectiveness.

Chlorhexidine mouthwashes

In cases when patients have not adhered to previous oral hygiene regimes, chlorhexidine mouthwashes may prove advantageous when incorporated into a rigorous, brief routine aimed at prevention white spot caries lesion. Patients with fixed orthodontic equipment have shown demineralization-inhibiting tendencies while using while using chlorhexidine mouthwash in addition to fluoride therapy. When compared to standard oral hygiene procedures alone, orthodontic patients may benefit from using mouth rinses containing chlorhexidine, according to the results of the Anderson GB et al investigation [24]. It was shown that patients who used the chlorhexidine rinse had less plaque retention. There is less bleeding, according to the gingival indices that were also obtained. The idea of using a chemical agent to improve oral health has been around for a while, and in orthodontic patients who already have gingivitis, the need for such an agent is even greater. The usage of the

chlorhexidine gluconate mouthwash was found to significantly reduce plaque formation, gingival inflammation, and gingival bleeding, according to the findings of Brightman LJ et al[25]. All products containing chlorhexidine have the disadvantage ofstaining teeth, which some patients may find uncomfortable.

Essential oils

Various trade names for a variety of essential oil mouthwashes that contain active components like thymol, menthol, and eucalyptol are available. Their antibacterial and anti-inflammatory qualities are largely responsible for their efficacy. According to a comprehensive analysis assessing the effectiveness of essential oil mouthwashes, people with gingivitis can reduce plaque and gingival inflammation more effectively with these mouthwashes than with placebo or mechanical plaque control[26]. Chen Y et al came to the conclusion that the essential oil mouth rinse and the FM (fructus mume (FM) extract–containing mouth rinse) both significantly reduced gingival bleeding in orthodontic patients without changing their microbiological profiles[27]. The use of Salvadora persica extract was linked to a significant decrease in the cariogenic bacterial count and plaque score in the systematic review by Jassoma et al [28]. Studies are still undergoing the application of therapeutic compounds derived from natural products such as plant, animal, microorganism and marine organisms in the treatment of oral diseases.

Cetylpyridinium chloride

A 2021 systematic review found that cetylpyridinium chloride (CPC) effectively controls plaque and gingival inflammation at interproximal sites [29]. A meta-analysis of eight studies showed a significant reduction in plaque index scores and gingival index scores when using CPC mouthwashes compared to placebo groups. However, there was high heterogeneity in both analyses. A previous (2008) systematic review suggested that CPC- containing mouth rinses provide a small but significant benefit in reducing plaque accumulation and gingival inflammation[30]. CPC-containing mouthwashes also have antimicrobial activity, potentially preventing dental caries. However, evidence specific to CPC's effectiveness in vivo is lacking. CPC is also known to inhibit volatile sulphur compounds, but limited clinical trials exist. According to Erbe C et al in a 4-week study showed statistically significantly greater plaque and gingivitis reductions for the oscillating-rotating electric brush technology when combined with oral irrigation and 0.07% CPC alcohol-free mouth rinse in comparison with prophylaxis and manual brushing in orthodontic patients wearing fixed appliances[31].

II. Conclusion

Mechanical removal of biofilm through brushing and dental floss is the most effective method for oral disease prevention, but orthodontic patients struggle with maintaining hygiene. Chemical agents should be considered for improved hygiene. Despite numerous mouthwashes and components, there is limited information about them. It is recommended not to multiply individual mouthwash products beyond medical necessity without scientific proof. Future studies should involve high-quality randomized controlled clinical trials with larger sample sizes and longer follow-up periods.

References

[1] Summit Jb, Robbin Jw, Hilton Tj, Schartz Rs. Fundamentals Of Operative Dentistry: A Contemporary Approach, 3RD Edition Chapter 1, Pg.2- 4.

[2] Featherstone Jd. The Science And Practice Of Caries Prevention. The Journal Of The American Dental Association. 2000 Jul 1;131(7):887-99.

[3] Lundström F, Krasse B. Streptococcus Mutans And Lactobacilli Frequency In Orthodontic Patients; The Effect Of Chlorhexidine Treatments. The European Journal Of Orthodontics. 1987 Jan 1;9(1):109-16.

[4] Chang Hs, Walsh Lj, Freer Tj. Enamel Demineralization During Orthodontic Treatment. Aetiology And Prevention. Australian Dental Journal.1997 Oct;42(5):322-7.

[5] Årtun J, Brobakken Bo. Prevalence Of Carious White Spots After Orthodontic Treatment With Multibonded Appliances. The European JournalOf Orthodontics. 1986 Nov 1;8(4):229-34.

[6] Gwinnett Aj, Ceen Rf. Plaque Distribution On Bonded Brackets: A Scanning Microscope Study. American Journal Of Orthodontics. 1979 Jun1;75(6):667-77.

[7] Mizrahi E. Enamel Demineralization Following Orthodontic Treatment. American Journal Of Orthodontics. 1982 Jul 1;82(1):62-7.

[8] Årtun J, Thylstrup A. A 3-Year Clinical And Sem Study Of Surface Changes Of Carious Enamel Lesions After Inactivation. American Journal OfOrthodontics And Dentofacial Orthopedics. 1989 Apr 1;95(4):327-33.

[9] Eliades T, Eliades G, Brantley Wa. Microbial Attachment On Orthodontic Appliances: I. Wettability And Early Pellicle Formation On BracketMaterials. American Journal Of Orthodontics And Dentofacial Orthopedics. 1995 Oct 1;108(4):351-60.

[10] O'reilly Mm, Featherstone Jd. Demineralization And Remineralization Around Orthodontic Appliances: An In Vivo Study. American Journal Of Orthodontics And Dentofacial Orthopedics. 1987 Jul 1;92(1):33-40.

[11] Derks A, Katsaros C, Frencken Je, Van't Hof Ma, Kuijpers-Jagtman A. Caries-Inhibiting Effect Of Preventive Measures During Orthodontic Treatment With Fixed Appliances. Caries Research. 2004;38(5):413-20.

[12] Willmot D. White Spot Lesions After Orthodontic Treatment. Inseminars In Orthodontics 2008 Sep 1 (Vol. 14, No. 3, Pp. 209-219). Wb Saunders.