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WHITE SPOT LESIONS: PREVENTION AND MANAGEMENT DURING THE ORTHODONTIC TREATMENT

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Abstract
The formation of white spot lesions, or enamel demineralization, around fixed orthodontic attachments is a common complication during and following fixed orthodontic treatment, which marks the result of a successfully completed case. This article is a contemporary review of the risk factors and preventive methods of these orthodontics scars. Preventive programmes must be emphasized to all orthodontic patients. The responsibility of an orthodontist is 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. Prophylaxis with topical fluoride application should be implemented: high-fluoride toothpastes, fluoride mouthwashes, gels and varnishes during and after the orthodontic treatment, especially for patients at high risk of caries.

Key words: white spot lesions, oral hygiene, topical fluorides.

Introduction

The term "white spot lesion" (WSL) is defined by Fejerskov et al. [1] as "the first sign of caries lesion on enamel that can be detected with the naked eye" and is used alongside the terms "initial" or "incipient" lesions. Enamel decalcification in the form of white spot lesions is a common negative sequel of orthodontic treatment in the absence of proper oral hygiene. They appear as small lines along the bracket periphery and in a few patients as large decalcifications with or without cavitations. The presence of white spot lesions after removal of orthodontic appliances is a discouraging finding to a specialty whose goal is to improve facial and dental aesthetics. This article examines the prevalence, distribution and formation of white spots after orthodontic treatment and reviews their prevention and management in the post-orthodontic phase.

Clinically, formation of white spots around orthodontic attachments can occur as early as 4 weeks into treatment and their prevalence among orthodontic patients ranges from 2% to 96%. The labio-gingival area of the lateral incisors is the most common site for WSL and the maxillary posterior segments are the least common site, with males affected more in comparison with females [2]. Tufekci et al. concluded in his clinical study that a sharp increase in the number of WSLs occurred during the first 6 months of treatment and continued to rise at a

slower rate to 12 months, thus in the initial months of the treatment critical evaluation of oral hygiene is recommended [3].

Mizrahi [4], in a study using the opacity index scoring system, showed that the incidence and severity of white spot lesions occurred on both the labial and the lingual surfaces of teeth. There was a significant increase in the prevalence on the cervical and middle thirds of the crowns. The WSLs predominantly appear on the lower and upper premolars, first molars, maxillary and mandibular lateral incisors and lower canines as a change of tooth structure around the brackets basis or between the brackets/bands and the gingival margin in the cervical region and middle third of the teeth, under the orthodontic wires. The frequency of WSLs in orthodontically treated patients was in order: lateral incisors, canines, first premolars, 2nd premolars, central incisors. Other previous studies showed similar results, except those finding that the maxillary central incisors had a greater frequency of WSLs than did the maxillary second premolars. No significant differentces were found in WSLs incidence and prevalence between the right and left sides of the maxilla and mandible [5–7].

A review of available literature on the prevalence of WSLs revealed that most relevant studies reported the presence of these lesions at the completion of orthodontic treatment. Depending on the examination technique used, the prevalence of WSLs varies. Gorelick et al. [8], in their study using the visual examination technique, reported that 50% of patients had one or more WSLs at the end of treatment. Boersma et al. [9], using quantitative light fluoroscopy, investigated the prevalence of WSLs at the end of orthodontic treatment and reported that 97% of subjects had one or more lesions. In light of these studies, one may conclude that demineralization is a significant clinical problem resulting in an unacceptable aesthetic presentation that, in some severe cases, may require restorative treatment.

The first clinical evidence of the demineralization is the WSL, which can potentially become a cavitated carious lesion extending even into the dentin. WSLs are non-fluoridated opacities having a more defined shape and are well differentiated from surrounding enamel which is often located in the middle of the tooth. The WSL has been defined as a "subsurface enamel porosity from carious demineralization" presenting itself as a "milky white opacity" when located on smooth surfaces. Beside that fact that WSLs are a first step to destructtion of the teeth, this enamel demineralization associated with fixed orthodontic appliances means other significant clinical problem for the orthodontists [10]. After the introduction of orthodontic fixed appliances into the oral cavity, a rapid shift in the bacterial flora of plaque occurs. Higher levels of acidogenic bacteria are present in the plaque, most notably Streptococcus mutans and Lactobacilli. High levels of bacteria are capable of decreasing the pH of plaque in orthodontic patients to a greater extent than in non-orthodontic patients [11]. Therefore, the progression of caries is faster in patients with full orthodontic appliances. WSLs can become noticeable around the brackets within one month of bracket placement, although the formation of regular caries usually takes at least six months. These lesions are commonly seen on the buccal surfaces of teeth around the brackets, especially in the gingival region [12].

Prevention and Management of White Spot Lesions (WSLs)

Patients wearing orthodontic appliances should be considered as patients at risk, for whom a preventive, prophylactic approach should be implemented before, during and after the orthodontic treatment [13, 14].

During the orthodontic treatment

The risk of enamel demineralization during fixed orthodontic treatment can be prevented by: improving patient oral hygiene with mechanical plaque control methods, using bonding agent with fluoride, enhancing the enamel resistance to the microbial acid by using topical fluoride and additional methods using different mechanisms.

Oral hygiene control

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 modi-

fication of the standard toothbrush, use of disclosing solutions, and use of floss can help patients in attaining good oral hygiene. Use of a 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 [15].

Zabokova [16] in her study concluded that improvement of oral hygiene was detected in the group where preventive treatment with Fluorogal was implemented statistically significant difference between medium values of the simplified oral hygiene index (OHI-S) before and after orthodontic treatment, which was not the case with control group. This finding might be a result of explanation in the way of maintenance of oral hygiene (adequate and not adequate oral hygiene). The subjects treated with dental cream (GC Tooth Mousse) had signifycantly decreased the oral hygiene index at the end of orthodontic treatment (1.49) in comparison with the beginning of the treatment, where the average monthly value of the index of oral hygiene was 1.55.

Besides oral hygiene at home, professsional 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. It allows proper cleaning of the areas that are hard for the patient to brush. The coronal surfaces can be polished using fluoridated pastes of progressively finer particle size, and elastomer polishing cups or brushes, to impede the mechanical retention of bacteria [17].

Fluoride in Bonding Agents

In general, the duration of orthodontic treatment makes the patient an increased caries risk for a prolonged period of time. 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 [18, 19]. It was found that light-cured pit and fissure sealants placed on the labial surface adjacent to bonded orthodontic brackets were 80% effective in preventing demineralization *in vitro* and required no patient compliance [20].

Enhancing Enamel Resistance Using Topical Fluorides

The favourable action of fluorides is now well established. Different modes in which fluorides have been documented to prevent WSL are as follows: Fluoride Mouth Rinse, Fluoride Gel, Fluoride Toothpaste, Fluoride Varnish, Fluoride in Bonding Agents and Fluorides in Elastomers. The fluoride ion has a preventive effect against caries. It modifies bacterial metabolism in dental plaque by inhibiting some enzyme processes, inhibits the production of acids by acting on the composition of the bacterial flora and (or) on the metabolic activity of micro-organisms, and reduces demineralization and favours the remineralization of early carious lesions by exerting a remineralization effect, especially at low concentrations [21].

Fluoride enhances enamel remineralization following orthodontic treatment. The cariostatic effect of topical fluoride is primarily due to calcium fluoride (CaF2) formation. It has been documented that a high fluoride concentration in the enamel is less important than a moderate increase in fluoride concentration in oral fluid. Proper oral hygiene maintenance, combined with daily use of topical fluoride, is found to signifycantly reduce enamel decalcification. When topical fluoride is applied on 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 [22–24].

Fluoride mouth rinses

Fluoridated mouth rinses containing 0.05% sodium fluoride used daily have been shown to significantly reduce lesion formation beneath bands. While the proper use of these products provides the patient with increased caries protection, patient compliance is required to use mouth rinses. These mouth rinses have been combined with antibacterial agents such as chlorhexidene, triclosan, or zinc to improve their cariostatic effect.

Home use of topical fluoride agents needs patient compliance. As a result, different non-compliant topical fluoride delivery measures have been implemented to prevent enamel demineralization around orthodontic brackets. After a systematic review, Benson recommended that the best method to prevent enamel demineralization during fixed orthodontic treatment is the daily use of 0.05% NaF mouth rinse [25]. However, Hirschfield advocated the use of an acidulated phosphate fluoride (APF) mouth rinse to make enamel more resistant to orthodontic induced decalcification [26]. Geiger et al. reported a 25% reduction in the number of WSLs using fluoride rinse [27] It was also found that following 2 weeks use of sodium fluoride (NaF) mouth rinse, with one rinse per day, fluoride concentration in the saliva increased significantly [28]. A daily mouth rinse with NaF (0.05% or 0.2%) and/or weekly rinse with AFP (1.2%) have been found to reduce the incidence of enamel demineralization during active fixed orthodontic treatment [29].

Fluoride toothpastes

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. As orthodontic patients are at an increased caries risk, an appropriate level of fluoride ions is needed to provide an anticaries benefit by promoting enamel remineralization. Thus for orthodontic patients fluoride concentration below 0.1% in dentifrices is not recommended. This is because when fluoride ions are incorporated into the surface of enamel, a fluoroapatite crystal structure is formed that has a lower solubility in the oral environment compared with hydroxyapatite. Fluoride toothpastes containing either sodium fluoride, monofluorophosphate, stannous fluoride or a combination of these compounds are recommended.

Fluoride varnishes

Fluoride varnishes should be used in weakly-motivated patients in an intensive treatment schedule (three days running), repeated every three or four months, or at least twice or three times a year. The varnishes are thus used as a preventive measure to reduce demineralization of the enamel around the brackets, promote the remineralization of the carious lesions and avert further lesions. Fluoride varnishes (Fluor Protector* with 1% difluorosilane and 0.1% F, Duraphat* with 2.2% F, Bifluoride* with 5% F) are usually applied twice a year on specific areas with incipient lesions on smooth surfaces. These varnishes were developed to adhere to the enamel surface for long periods (up to 12 hours or more) and release their fluoride slowly on the enamel surfaces [30]. The use of fluoride varnishes has proven to be a feasible and safe method of fluoride application. 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. It has been reported that the application of a fluoride varnish resulted in a 44.3% reduction in enamel demineralization in orthodontic patients.

Azarpazhooh et al. [31] concluded that over the 3-year follow-up period, application of fluoride varnish every 6 months was the most cost-effective method for high- and medium-risk groups. He also concluded that the slow release of fluoride was seen for periods of up to 6 months with Durafluor and Duraphat and the greatest release occurred in the first 3 weeks and a more gradual release thereafter. On the basis of this observation, he supported the recommendation of a twice-yearly application of single-dose preparations. In contrast, some studies advocate that an application every 90 days (trimonthly) would be sufficient to promote adequate protection [32]. Demito et al. found there was an increase of 32% in demineralization in areas where varnish was not applied in comparison with a 30–50% reduction in WSLs in areas where Duraphat was applied twice annually [33].

Zabokova [34] in her study concluded that the level of fluoride in enamel before and after bonding the brackets with composite resin (Dentaurum, Germany), and application of a fluoride varnish was significantly increased. Thus, the amount of fluoride in enamel before fixing the brackets was 614 ppm. After 30 days of fluoride varnish application the amount of fluoride in enamel was 844 ppm, which was statistically significantly higher than the initial coverage of fluoride in enamel. These results confirmed that fluoride varnish application is a simple and fast technique that could be useful

in preventing enamel demineralization associated with orthodontic treatment.

Use of Casein Phosphopeptides Amorphous Calcium Phosphate

Enamel demineralization might be prevented by the application of products containing Casein Phosphopeptides Amorphous Calcium Phosphate (CPP-ACP). Reynolds reported that CPP-ACP, which is derived from milk casein, was capable of being absorbed through the enamel surface and could affect the demineralization-remineralization processes [35]. Recently, research has shown that this activity is due to a part of the casein protein called CPP, which carries calcium and phosphate ions 'stuck' to it, in the form of APP [36]. This complex of CPP-ACP is an ideal delivery system for bio-available calcium and phosphate ions. The proposed anticariogenic mechanism of CPP-ACP involves the incorporation of the nanocomplexes into dental plaque and onto the tooth surface, thereby acting as a calcium and phosphate reservoir. CPP-ACP has been shown to adhere to the bacterial wall of microorganisms and tooth surfaces [37]. 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 [38]. A few studies showed that daily applications of the remineralizing cream could reverse the severity and visual appearance of postorthodontic WSLs more effectively than fluoride toothpaste. The use of CPP-ACP can be more beneficial than fluoride rinse for postorthodontic remineralization [39–42].

After the orthodontic treatment

The treatment ends when the planned result has been achieved. After the removal of the brackets, not much is known about the treatment and healing of WSLs. Although the role of saliva in the physiological regression of the WSLs is not to be ignored, many of the lesions remain stable [43]. Often the first approach to eliminate WSLs is remineralization. There are several professionally and home applied products in different forms: solutions, varnishes, cream pastes and chewing gums for topical remineralization treatment. They all contain fluorides and/or casein phosphopeptide-amorphous calcium phosphate, with evidence for varying degrees of success to be found in the dental literature [44]. Remineralization procedures require following strict oral hygiene measures, repeated multiple applications, a treatment plan that could take a long period of time and first of all, the compliance of a motivated patient. After debonding and using a strict protocol for remineralization, the lesion progression is usually limited with persistence of the WSLs, leading to aesthetic impairment. Typically, if the lesion is deep, only the superficial layer is remineralized, leaving the porous body of the lesion reflecting its white colour from below. Further, if the porous lesion is stained by discolouring agents introduced into the oral cavity and the remineralization treatment does not resolve the problem, tooth whitening could be used, but will require retreatment in time [45].

In one of the first clinical trials of CPP-ACP cream used specifically for treatment of postorthodontic WSLs, Bailey et al. [46] reported that use of CPP-ACP cream enhanced the regression of WSLs compared with a placebo. However, more recent clinical investigations show less promising results. In a prospective, randomized, and blind clinical study, Beerens et al. [47] compared a fluoride-containing CPP-ACP paste with a control paste in 54 subjects. After a 3-month treatment period, they found no advantage in the use of the fluoridated CPP-ACP paste over regular oral hygiene in WSLs regression as measured by Quantitative Light-induced Fluorescence. Similarly, Bröchner et al. [48], in a prospective clinical trial using non-fluoridated CPP-ACP paste, found WSL regression to be comparable with traditional toothpaste after a 4-week treatment period.

The paedodontist should then carry out a careful examination of the entire mouth to diagnose and treat: any proximal caries; any caries that have formed under the molar bands and in areas where brushing between the brackets and the gingival festoon has been deficient. Traces of demineralization, which cannot be foreseen, are often discovered at the end of treatment, requiring continued preventive fluoride treatment. In this case it is important to make topical applications of fluorides in a solution, gel or varnish to facilitate surface remineralization of incipient carious lesions [49, 50]. Another study concerning remineralization with fluoride after removal of orthodontic devices has shown that the use of a fluoride toothpaste twice a day leads to remineralization after 2 months, and

combining fluoride toothpaste and fluoride gels speeds up remineralization (1 month) [51].

Conclusion

WSLs are one of the common complications of fixed orthodontic treatment.

The responsibility of an orthodontist is 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.

Prophylaxis with topical fluoride application should be implemented: high-fluoride toothpastes, fluoride mouthwashes, gels and varnishes during and after the orthodontic treatment, especially for patients at high risk of caries.

REFERENCES

1. Fejerskov O, Nyvad B, Kidd EAM. Clinical and histological manifestations of dental caries. In Fejerskov O, Kidd EAM, editors. Dental Caries. The disease and its clinical management. Copenhagen: Blackwell Munksgaard. 2003; pp. 71–99.
2. Joshua A, Chapman W, Eugene R, Eckert GJ, Kula KS, González-Cabezas C. Risk factors for incidence and severity of white spot lesions during treatment with fixed orthodontic appliances. Am J Orthod Dentofacial Orthop. 2010; 138: 188–94.
3. Tufekci E, Dixon JS, Gunsolley JC, Lindauer SJ. Prevalence of white spot lesions during orthodontic treatment with fixed appliances. Angle Orthod. 2011; 81: 206–10.
4. Mizrahi E. Enamel demineralization following orthodontic treatment. Am J Orthod. 1982; 82: 62–7.
5. Arends J. Orthodontic appliances and enamel demineralization. Part 1. Lesion development. Am J Orthod Dentofacial Orthop. 1988; 94: 68–73.
6. Adebayo OA, Burrow MF, Tyas MJ. Bond strength test: role of operator skill. Aust Dental J. 2008; 53: 145–50.
7. Mitchell L. Decalcification during orthodontic treatment with fixed appliances-an overview. Br J Orthod. 1992; 19: 199–205.
8. Gorelick L, Geiger AM, Gwinnet AJ. Incidence of white spot formation after bonding and banding. Am J Orthod. 1982; 81: 93–8.
9. Boersma JG, van der Veen MH, Lagerweij MD, Bokhout B. Caries prevalence measured with QLF after treatment with fixed orthodontic appliances: influencing factors. Caries Res. 2005; 39: 41–7.
10. Øgaard B, Bishara SE, Duschner H. Enamel effects during bonding-debonding and treatment with fixed appliances. In: Graber TM, Eliades T, Athanasiou AE: Risk Management in Orthodontics: Experts Guide to Malpractice. Hanover Park, IL, Quintessence. 2004; 19–46.
11. Lundstrom F, Krasse B. Streptococcus mutans and lactobacilli frequency in orthodontic patients: the effect of chlorhexidine treatments. Eur J Orthod. 1987; 9: 109–16.
12. Mattoush TJ, van der Veen MH, Zentner A. Caries lesions after orthodontic treatment followed by quantitative light fluorescence: a 2-year follow-up. Eur J Orthod. 2007; 9: 294–8.
13. Ardu S, Castioni, Benbachir N, Krejci I. Minimally invasive treatment of white spot enamel lesions. Quintessence Int. 2007; 38: 633–6.
14. Corry A, Millett DT, Creanor SL, Foye RH, Gilmour WH. Effect of fluoride exposure on cariostatic potential of orthodontic bonding agents: an in vitro evaluation. J Orthod. 2003; 30: 323–9.
15. Harvey WJ, Powell KR. Care of dental enamel for the orthodontic patient. Aust Orthod J. 1981; 7: 70–6.
16. Zabokova-Bilbilova E, Sotirovska-Ivkovska A, Stefanovska E: The Importance of Proper Oral Hygiene in Patients Undergoing Treatment with Fixed Orthodontic Appliances. Balk J of Stom. 2013; 17(3): 138–43.
17. Øgaard B, Rolla G, Øgaard B. Oral microbiological changes, long-term enamel alterations due to decalcification, and caries prophylactic aspects, in Brantley WA, Eliades T, eds: Orthodontic Materials: Scientific and Clinical Aspects. Stuttgart, Thieme. 2001; 123–142.
18. Freeman JE, Shannon IL. Addition of stannous fluoride to acid etchant in direct bonding procedures. Intern J Orthod. 1981; 19: 13–17.
19. Cehreli Z C, Kecik D, Kocadereli I. Effect of self-etching primer and adhesive formulations on the shear bond strength of orthodontic brackets. Am J Orthod Dentofacial Orthop. 2005; 127: 573–9.
20. Garcia-Godoy F. Shear bond strength of a resin composite to enamel treated with an APF gel. Pediatric Dentistry. 1993; 15(4): 272–4.
21. Davidson CL, Bekke-Hoekstra IS. The resistance of superficially sealed enamel to wear and carious attack in vitro. J Oral Rehabilitation. 1980; 7: 299–305.
22. Heinig N, Hartmann A. Efficacy of a sealant: study on the efficacy of a sealant (Light Bond) in preventing decalcification during multibracket therapy. J Orofacial Orthop. 2008; 69: 154–67.
23. Kitasako Y, Burrow MF, Nikaido T, Tagami J. The influence of storage solution on dentin bond durability of resin cement. J Dentistry. 2000; 16: 1–6.
24. Shungin D, Olsson AI, Persson M. Orthodontic treatment-related white spot lesions: a 14-year prospective quantitative follow-up, including bonding material assessment. Am J Orthod Dentofacial Orthop. 2010; 138: 136–8.
25. Benson PE, Pender N, Higham SM. Quantifying enamel demineralization from teeth with orthodontic brackets – a comparison of two methods. Part 2: validity. Eur J Orthod. 2003; 25: 159–65.
26. Hirschfield RE. Control of decalcification by use of fluoride mouth rinse. ASDC J Dent Child. 1978; 45: 458–60.
27. Geiger AM, Gorelick L, Gwinnett AJ, Griswold PG. The effect of a fluoride program on white spot formation during orthodontic treatment. Am J Orthod Dentofacial Orthop. 1988; 93(1): 29–37.

28. Chadwick BL, Roy J, Knox J, Treasure ET. The effect of topical fluorides on decalfication in patients with fixed orthodontic appliances: a systematic review. Am J Orthod Dentofacial Orthop. 2005; 128: 601–6.
29. Gwinnett AJ, Buonocore MG, Sheykoleslam Z. Effect of fluoride on etched human and bovine tooth enamel surfaces as demonstrated by scanning electron microscopy. Arch Oral Biology. 1972; 17: 271–8.
30. Adriaens ML, Dermaut LR, Verbeeck MH. The use of "Fluor Protector", a fluoride varnish, as a caries prevention method under orthodontic molar bands. Eur J Orthod. 1990; 2: 316–19.
31. Azarpazhooh A, Limeback H. Clinical efficacy of casein derivatives: a systematic review of the literature. J Am Dental Association. 2008; 139: 915–24.
32. Vivaldi-Rodrigues G, Demito CF, Bowman SJ, Ramos AL. The effectiveness of a fluoride varnish in preventing the development of white spot lesions. World J Orthod. 2006; 7: 138–44.
33. Demito CF, Rodrigues GV, Ramos AL, Bowman SJ. Efficacy of a fluoride varnish in preventing white-spot lesions as measured with laser fluorescence. J Clin Orthod. 2011; 45: 25–9.
34. Zabokova-Bilbilova E, Bajraktarova B, Sotirovska-Ivkovska A, Georgiev Z: Dental enamel around fixed orthodontic appliances after fluoride varnish application. Acta morphologica. 2012; Vol. 9(1): 45–9.
35. Reynolds EC. Casein phosphopeptide-amorphous calcium phosphate: the scientific evidence. Adv Dent Res. 2009; 21: 25–9.
36. Shen P, Cai F, Nowicki A, Vincent J, Reynolds EC. Remineralization of enamel subsurface lesions by sugar-free chewing gum containing casein phosphorpeptide-amorphous calcium phosphate. J Dent Res. 2001; 80(12): 2066–70.
37. Cross KJ, Huq NL, Stanton DP, Sum M, Reynolds EC. NMR studies of a novel calcium, phosphate and fluoride delivery vehicle – (S1) – casein (59–79) stabilized amorphous calcium fluoride phosphate nanocomplexes. Biomaterials. 2004; 25: 5061–9.
38. Iijima Y, Cai F, Shen P, Walker G, Reynolds C, Reynolds EC. Acid resistance of enamel subsurface lesions remineralized by a sugar-free chewing gum containing casein phosphopeptide-amorphous calcium phosphate. Caries Res. 2004; 38: 551–6.
39. Kecik D, Cehreli SB, Sar C, Unver B. Effect of acidulated phosphate fluoride and casein phosphopeptide-amorphous calcium phosphate application on shear bond strength of orthodontic brackets. Angle Orthod. 2008; 78: 129–33.
40. Uysal T, Amasyali M, Ozcan S, Koyuturk AE, Akyol M, Sagdic D. In vivo effects of amorphous calcium phosphate-containing orthodontic composite on enamel demineralization around orthodontic brackets. Aust Dent J. 2010; 55: 285–91.
41. Ellwood R, Fejerskov O, Cury JA, Clarkson J. Fluorides in caries control. In Fejerskov O, Kidd E. Dental caries. The disease and its clinical management. Oxford: Blackwell Munksgaard. 2008; 287–327.
42. Andersson A, Skold-Larsson K, Hallgren A, Petersson LG, Twetman S. Effect of a dental cream containing amorphous cream phosphate complexes on white spot lesion regression assessed by laser fluorescence. Oral Health Prev Dent. 2007; 5: 229–33.
43. Featherstone JD. The science and practice of caries prevention. J Am Dent Assoc. 2000; 131: 887–99.
44. Mota SM, Enoki C, Ito IY, Elias AM, Matsumoto MA. Streptococcus mutans counts in plaque adjacent to orthodontic brackets bonded with resin-modified glass ionomer cement or resin-based composite. Braz Oral Res. 2008; 22: 55–60.
45. Willmot DR. White spot lesions after orthodontic treatment. Semin Orthod. 2008; 14: 209–19.
46. Bailey DL, Adams GG, Tsao CE. Regression of post-orthodontic lesions by a remineralizing cream. J Dent Res. 2009; 88(12): 1148–53.
47. Beerens MW, van der Veen MH, van Beek H, ten Cate JM. Effects of casein phosphopeptide amorphous calcium fluoride phosphate paste on white spot lesions and dental plaque after orthodontic treatment: a 3-month follow-up. Eur J Oral Sci. 2010; 118: 610–17.
48. Bröchner A, Christensen C, Kristensen B. Treatment of post-orthodontic white spot lesions with casein phosphopeptide-stabilised amorphous calcium phosphate. Clin Oral Investig. 2011; 15: 369–73.
49. Kumar VLN, Itthagarun A, King NM. The effect of casein phosphopeptide-amorphous calcium phosphate on remineralization of artificial caries-like lesions: an in vitro study. Aust Dental J. 2008; 53: 34–40.
50. Nyvad B. The role of oral hygiene. In Fejerskov O, Kidd E. Dental caries. The disease and its clinical management. Oxford: Blackwell Munksgaard. 2008; 257–64.
51. Sudjalim TR, Woods MG, Manton DJ. Prevention of white spot lesions in orthodontic practice: a contemporary review. Aust Dent J. 2006; 51: 284–9.

Резиме

БЕЛИ ТОЧКЕСТИ ЛЕЗИИ: ПРЕВЕНЦИЈА И КООРДИНИРАЊЕ ЗА ВРЕМЕ НА ОРТОДОНТСКИОТ ТРЕТМАН

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Белите точкести лезии на емајлот околу фиксните ортодонтски апарати претставуваат честа компликација за време и по завршувањето на ортодонтскиот третман. Трудот ги ана-

лизира факторите на ризик од кариес и мерките за превенција од појава на бели точкести лезии. Во превентивната програма треба да бидат вклучени сите пациенти подложни на ортодонтски третман преку нивна едукација и мотивација за одржување солидна орална хигиена. Потребна е и апликација на топикални флуоридни препарати и тоа: флуоридни пасти за заби, водичка за плакнење, флуоридни гелови и лакови за време и по завршувањето на ортодонтскиот третман, особено кај пациентите со висок ризик од кариес.

Клучни зборови: бела точкеста лезија, орална хигиена, топикални флуориди.