

Case Report Article

Bleaching and enamel microabrasion in the smile esthetics: a case report

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Abstract

Introduction: The color change of teeth is frequent in the dental office and has important role in smile harmony. Objective: To discuss through case report the dental bleaching technique associated with enamel microabrasion to remove localized white spots on the maxillary incisors and canines. **Case report:** Patient, female, aged 18 years, attended the Clinic of the University of Ribeirão Preto complaining about the negative aesthetics of her smile due to the presence of white spots on teeth #13, #12, #11, #21, #22 and #23. After detailed anamnesis and clinical examination, the spots were diagnosed as enamel demineralization caused by cariogenic challenge occurred during the use of orthodontic brackets. Dental bleaching technique with 38% hydrogen peroxide was applied followed by enamel microabrasion with 6.6% hydrochloric acid and silicon carbide paste. After absolute isolation, 1 mm thick paste was applied on enamel stain with the aid of resin composite polishing abrasive rubber. Each application was followed by copious washing and analysis of the stain removal with wet enamel surface. In total, six applications of 10 seconds each were used. Finally, enamel polishing was executed with felt discs and diamond paste, and topical application of fluoride. **Conclusion:** It was concluded that bleaching associated with enamel microabrasion technique is a safe, simple, and effective option for solving the esthetics of teeth with white spots.

Introduction

Dental caries is a multifactorial chronic disease caused by acids produced by bacterial metabolism that diffuse through and dissolve the dental tissues [14]. Initially, bacteria colonize the enamel acquired pellicle and ferment available carbohydrates, leading to the formation of organic acids, such as lactic, formic, acetic, and propionic acid [15], which promotes pH reduction of the oral cavity. The drop in pH makes the oral environment unsaturated regarding the tooth, which results in loss of dental tissue ions to the environment. With the concentration of ions in the oral environment, pH increases returning the ions from oral fluid to dental tissues [15]. The imbalance between de and remineralization processes, with a predominance of demineralizing episodes, over time, leads to the emergence of incipient lesions in enamel, the white spot lesions [31].

Some clinical situations, the use of fixed orthodontic appliances favors the development of caries, since they create biofilm stagnation areas and limits the natural defense mechanisms of self-cleaning, such as the friction of the muscles at the dental surface and the action of saliva [23]. Thus, white spot lesions are frequently observed in the dental clinic in patients with this appliance type, especially in the area around the brackets and under orthodontic bands, because of the difficulty of cleaning.

Even after the removal of the appliance and remineralization of enamel surface, the white spot lesions are still visible clinically [17, 33], adversely interfering with the smile aesthetics and taking patients seeking dental therapy more frequently, to remove surface staining of the teeth for aesthetic reasons.

Attempting to recover the smile aesthetics, some procedures have been suggested. Small stains and defects of the enamel surface, regardless of etiology, can often be removed with local action of acid and/or abrasive materials.

The enamel microabrasion is a conservative technique that removes only a small layer of enamel surface by the action of abrasive agents [22, 29] effectively, safely, and permanently [22]. Enamel microabrasion is indicated for the aesthetic treatment of white spots due to fluorosis, remineralized post-orthodontic treatment demineralization white spot, localized hypoplasia resulting from dental trauma or infection, and idiopathic hypoplasia where discoloration is limited to the most superficial layer of enamel [22].

Because of the wear promoted on the enamel surface by microabrasion, the teeth may have a darkest staining due to the reflection of the dentin color [29]. Consequently, many times this technique is associated with tooth whitening with excellent cosmetic results [18, 28, 29].

Thus, this study aimed to discuss through a case report the esthetics recovering by dental bleaching associated with enamel microabrasion technique.

Case report

A female, aged 18 years, attended the clinic of the Dentistry Course at the University of Ribeirão Preto (Unaerp) with complaint of lack of aesthetic in anterior teeth, which had a bilateral, white, and opaque spots (figure 1).



Figure 1 - Frontal view of the occlusion

The first appointment consisted of a careful anamnesis seeking to identify the factors that led the patient to have the enamel changes, followed by a thorough clinical examination of the spots. The clinical aspect, added to the clinical history, led to the diagnosis of enamel demineralization caused by cariogenic challenge occurred during the use of orthodontic brackets. An evaluation of the initial color was performed with the aid of Vita Classic®, scale and the recorded shade was A2 (figure 2).



Figure 2 - Initial color assessment with Vita Classic scale

A further examination was carried out, by focusing the LED light from a light-curing unit (Ultraled, Dabi Atlante, Brazil) on the palatal surface to observe by transillumination and predict the caries lesion depth (figure 3). The cervical third was the most affected by the spots, however they were superficial.

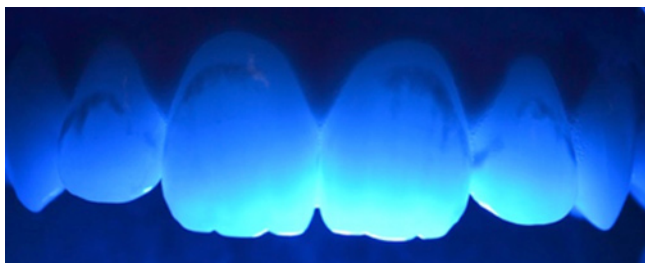


Figure 3 - LED light application on the palatal surface

The proposed treatment planning was in-office bleaching associated with enamel microabrasion because it is a more conservative treatment with good results.

Initially, for tooth whitening, with the aid of a lip retractor, the gingival barrier (Opal Dan®, Ultradent Products Inc., USA) was applied (figure 4).



Figure 4 - Gingival barrier application

The 38% hydrogen peroxide gel (OpalescenceBoost PF®, Ultradent Products Inc., USA) was applied on the teeth previously isolated (figure 5) at 3 applications of 15 minutes.



Figure 5 - Whitening gel after application

After the first appointment, the color was assessed again, and the new color was shade A1 (figure 6).



Figure 6 - Final color after tooth whitening

The enamel microabrasion was proposed because it is a more conservative treatment with good results, performed 15 days after the bleaching appointment.

Initially, the gingival tissue was protected with rubber dam in the area comprising the teeth that would be treated (figure 7). The patient's eyes were protected with glasses and a previous prophylaxis with pumice and water was carried out.



Figure 7 - Rubber dam

Subsequently, the paste for the chemical-mechanical abrasion containing 6.6% hydrochloric acid (HCl) and particles of silicon carbide (Opalustre®, UltradentProducts Inc., USA) was applied onto the white spots.

To assist in the removal of stains, the superficial wear was performed with abrasive rubber for resin composite polishing associated with the paste. Five applications were executed per tooth (figure 8).



Figure 8 - Paste application with abrasive rubber

Soon after, the application of the paste was made using a wooden spatula rubbing the area with a circular motion for 10 seconds on each tooth in areas hard to reach (figure 9). Two 10-second applications were performed on each tooth.



Figure 9 - Paste application by wooden spatula

Finally, rubber cups (OpalCups®, Ultradent Products Inc., USA) at low speed (figure 10) were used. We performed five more applications of the paste abraded with circular movements under slight pressure for 10 seconds on each tooth.



Figure 10 - Paste applied with rubber cup

At the end of each period, the teeth were copiously washed with water and a new assessment was performed, keeping the tooth wet.

After the microabrasion procedure, which was completed in a single clinical appointment, tooth polishing was executed with felt disc and diamond paste (Polimax, TDV, Brazil) (figure 11). Then, topical neutral fluoride (Flugel, DFL, Brazil) was applied for 5 minutes (figure 12).



Figure 11 - Tooth polishing with diamond paste and felt disc



Figure 12 - Fluoride topical application

Figures 13 and 14 show the final aspect after tooth whitening and enamel microabrasion procedures.

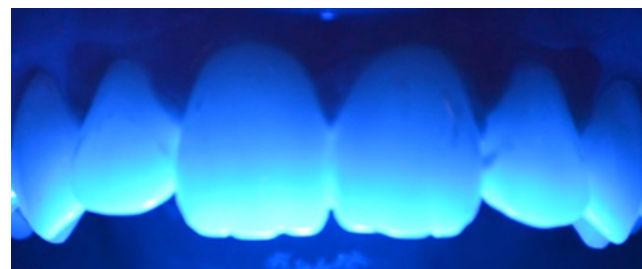


Figure 13 - Transillumination after the procedures



Figure 14 - Final clinical aspects

Discussion

The white spot lesions in dental enamel have varied etiology, which may be of extrinsic or intrinsic origin. Changes in enamel translucency and/or texture may occur by numerous factors, such as hypoplasia, hypomineralization, fluorosis, pigmentation by drugs, and demineralization by caries [22]. For each one of these cases, different clinical behaviors may be necessary. Thus, the correct differential diagnosis is essential for treatment success.

Enamel demineralization is an extremely common side effect of the orthodontic treatment with fixed appliances [23]. The enamel structure with respect to its shape and organization is changed due to the contact with acids originating from human bacterial metabolism [10]. Over time, this process continues by increasing the volume of intercrystalline spaces that are now occupied by air. The difference between the refractive indices of light through the air ($n = 1$) and the enamel ($n = 1.62$) makes the white spot lesions as opaque white to the human eye [10]. Once the causal factor was removed and conditions balanced between episodes of de and remineralization, the process can be stopped and the white spot lesions become inactive [31]. However, the whitish aspect, although smooth and shiny, may still remain clinically visible [21], interfering with the smile esthetics.

Surface stains and enamel irregularities often lead patients to seek intervention to improve the smile and, in these cases, several treatments are possible. The enamel microabrasion is one of the most suitable resources for these cases [22], because it is considered a safe and effective technique [29].

Moreover, the microabrasion can be combined with tooth bleaching still favoring esthetics [28-30].

In this case report, aiming at reducing the contrast between the white spot lesions and healthy tooth surface [9, 24], the whitening of tooth surfaces with 35% hydrogen peroxide was indicated previously to the microabrasion. Although some studies indicate that tooth whitening should be performed after enamel microabrasion [28, 30], it was shown that permeability to hydrogen peroxide of the enamel subjected to microabrasion is greater [8]. Because the patient's age and the possible damage to pulp by greater penetration of the bleaching agent, we opted to perform tooth whitening before microabrasion. Furthermore, tooth bleaching was carried only on the anterior teeth because the patient had numerous enamel cracks in premolars associated with sensitivity.

Different procedures have been proposed for tooth whitening and at-home and in-office techniques are widely used in dental practice [6]. In this case report, because of the patient's choice, we opted for in-office tooth whitening technique. Although the effectiveness of both is similar [5, 6], in-office technique has become popular because high-concentration hydrogen peroxide gel can be applied and results in faster tooth whitening [5], attracting the interest of patients. In this technique, significant whitening results can be seen after just one treatment session [5, 12], but it requires longer clinical time or several shorter appointments [32]. The longer clinical application time or the need for more appointments has been associated with dentinal sensitivity [19]. In this case report, three bleaching gel applications for 15 minutes were applied at one clinical appointment, but despite the longer clinical time, sensitivity did not occur. Different desensitizing agents such as potassium nitrate, amorphous calcium phosphate, and sodium fluoride [20] have been included in the composition of bleaching agents to minimize the side effects of sensitivity [5]. The bleaching agent employed in this case report is composed by 3% potassium nitrate and 1.1% fluoride ions, with neutral pH, which can directly influenced on the non-occurrence of sensitivity.

After bleaching, microabrasion of the remineralized white spot lesions was performed. The efficacy of microabrasion depends on the substrate's level of lesion [26], because the changes must show hard texture and affect the superficial layers of enamel for the technique to be most successful [3, 28]. To predict the depth of the spots, it has

been suggested lighting through LED light [2]. The altered tissue allows greater light scattering, which makes its transmission rate lower than healthy tooth structures [27]. Therefore, the altered area appears darker after transillumination [27]. The darker the lesion, the greater is the lesion depth [2].

In general, the procedure consists of the clinical association between demineralization and surface abrasion of stained enamel to expose a subsurface layer without color change in a single appointment [26, 28].

Many products based on phosphoric acid or hydrochloric acid associated with abrasive agents has been proposed for microabrasion, and studies show the effectiveness of the technique regardless of the selected agent [1]. According to Bassir and Bagheri [4], hydrochloric acid-based products help to reduce the clinical time for effective removal of the stains. Thus, in the present study, we employed 6.6% hydrochloric acid and silicon carbide as abrasive paste. Furthermore, the use of its product was associated with an enamel wear thickness of 10%, which makes the procedure safer and more conservative [26]. The performance of sequential microabrasion procedures decreases the surface roughness [26]. Therefore, we decided to carry out six applications of six seconds each. The optical effects on dental tissue is changed after the microabrasion, since a prism-free and densely packed enamel layer due to abrasive remnants and smear layer impregnated in the micro pores created by the acid [11] is formed after treatment [13] and the modified refraction of light masks the subsurface spot [13].

Despite of the compression of the prisms, the surface roughness of the enamel increases after microabrasion [7, 26]. Thus, after microabrasion procedures, surface polishing is indicated. When microabrasion is performed with 6.6% hydrochloric acid and silicon carbide paste as abrasive, the application of diamond paste associated with felt discs is sufficient to restore the surface smoothness of treated enamel [7, 16, 26].

Conclusion

Based in the case reported herein, the performance of tooth whitening associated with enamel microabrasion for treating white spot lesions is a safe and effective method to reach the smile esthetics.

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