

Microabrasion and dental bleaching for the treatment of dental fluorosis

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Introduction: The search for dental cosmetic procedures associated with the incidence of changes in enamel surface contributed to the emergence and associations of minimally invasive techniques in order to solve these cases.

Case report: Presents a conservative approach to reverse aesthetic alterations

caused by enamel staining, in which it was decided to associate the microabrasion with a paste of pumice stone and 37% phosphoric acid gel, with in-office bleaching with 35% hydrogen peroxide (Whiteness HP Maxx, FGM). **Results:** It was observed a successful combination of the mentioned techniques to re-

store the smile esthetics. **Conclusion:** Since well planned, according to the etiology, intensity of discoloration and depth of the lesion, the application of microabrasion and dental bleaching is a viable option in the treatment of enamel stains. **Keywords:** Tooth bleaching. Dental enamel. Enamel microabrasion.

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INTRODUCTION

Enamel microabrasion is a dental procedure that consists in the removal of spots or superficial alterations on the dental elements.¹ Surface blemishes and irregularities on the surface of the enamel are common complaints of the patients who request a dental intervention to harmonize the smile.

This technique is mainly indicated for patients with fluorosis, hypoplasia, imperfect amelogenesis and mineralized white spots, especially those located in an esthetic area.² The principle of this technique is the association between the erosive action of an acid, associated with an abrasive agent. From the mixture of 37% phosphoric acid (H_3PO_4) and pumice stone³ or hydrochloric acid (HCl) and pumice⁴ or 6,6% hydrochloric acid and water-soluble silicon carbide (SiC) microparticles, a paste is obtained.⁵ This paste can be administered with aid of a wooden spatula,⁶ plastic spatula,⁷ wooden wedge,⁸ sandpaper strips,⁹ Robinson brush¹⁰ or abrasive rubber cup² in a low-rotation handpiece for 10 seconds. These applications must be repeated for a maximum of 10 times until the disappearance or softening of the spots.¹¹ After each application, abundant washing with water should be performed.⁹

Esthetic problems related to stains in the enamel can be solved using this technique, in a conservative and low-cost way. Additionally, microabrasion does not require cavity preparation or use of restorative material, besides being a safe and effective procedure.⁷ Even better results can be obtained if microabrasion is associated with other esthetic treatments, such as tooth whitening,¹² because each technique has its own advantages and, when associated, the individual imperfections are minimized.⁷

Tooth whitening is ineffective against white spots, which can be eliminated or attenuated by

microabrasion, because this technique offers more localized results. Therefore, by using the correct execution of both procedures, it is possible to offer the patient the maximization of the final result⁷. However, a detailed anamnesis, combined with a meticulous clinical examination, should be performed to correctly indicate the treatment.¹³

The objective of the present study was to demonstrate, through the report of a clinical case, the removal of white spots resulting from dental fluorosis on the enamel, associated with whitening of yellowish teeth by the techniques of enamel microabrasion and dental whitening, respectively.

CASE REPORT

The patient was a 21-year-old woman who sought dental care, reporting dissatisfaction with the esthetics of her smile. After careful anamnesis and clinical examination, a satisfactory oral health was observed. However, it was identified that the dental elements presented a yellowish coloration and opaque whitish spots, especially in the anterior elements, which was diagnosed as dental fluorosis.

The fluorotic spots of the patient were considered mild, according to the Dean index,¹⁴ because they presented superficially on the dental enamel and affected less than 50% of the vestibular face of the affected teeth. Thus, a treatment plan was elaborated, proposing to perform the enamel microabrasion as a conservative option for the removal of the spots, followed by an in-office tooth whitening to improve the yellowish aspect of the smile (Fig 1). The present clinical case was previously approved by the ethics committee under number CAAE: 53694316.1.0000.5048.

After explaining the procedures to the patient, a prophylaxis was carried out using pumice stone and water, with the aid of a rubber cup, washing

and drying the dental elements. This procedure was followed by an absolute isolation to avoid possible lesions in the perioral tissues (Fig 2).

To perform the microabrasion technique, a paste was obtained from the mixture of 37% phosphoric acid (Condac 37 - FGM, Joinville, SC, Brazil) and pumice stone (SS White - Rio de Janeiro, RJ, Brazil). This paste was of small granulation, manipulated in dappen pot in the proportion of 1:1.¹⁵ The paste was applied on the dental enamel after drying with air jets. The application of the paste on the whitish spots was performed with the aid of a rubber cup and a micromotor at low speed, with constant and rotating movements. Three sessions of ten applications (for a maximum period of ten seconds) were carried out (Fig 3).

Following each application of the paste, the teeth were washed with abundant water for 20

seconds. At the end of each session, the enamel was polished with aid of the felt disk and diamond paste (Diamond Excel - FGM) to restore the natural brightness and smoothness of dental surfaces (Fig 4). Then, fluoride and potassium nitrate were applied in the form of a gel (Desensibilize KF 2%, FGM) for 1 min to avoid dentin sensitivity (Fig 5).

Fluorides act by obliterating open dentinal canaliculi¹⁶ and thus, minimizing nerve responses as the contact of fluids with the pulp chamber is avoided.^{17,18,19} On the other hand, potassium nitrate acts by reducing the excitability of the nerve fibers present in the pulp²⁰ as it diffuses them through hard dental tissues.²¹

Three weeks after the microabrasion conclusion (Fig 6), the patient underwent a whitening treatment with 35% Hydrogen Peroxide (Whiteness HP-FGM). This treatment consisted of two sessions



Figure 1: Initial aspect of the smile.



Figure 2: Absolut isolation of the operatory field.



Figure 3: Application of the abrasive paste with the aid of a rubber cup.



Figure 4: Application of the diamond paste with the aid of the felt disc.

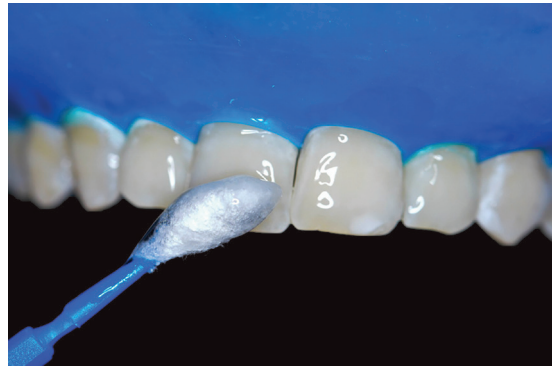


Figure 5: Application of neutral fluoride gel.

with 3 applications of 15 min each, to remove yellowish aspect of the dentin and obtain a more harmonic coloration and lighter dental elements. Prior to the whitening procedure, the color of the tooth was determined according to the Vita Classical® scale (Vita®) (Fig 7). The treatment interval chosen in this work aimed to provide enough time for the remineralization of the enamel surface.⁶

The protection of the oral tissues was performed by using a labial retractor, suction of high power and photopolymerizable gingival barrier, properly adapted and without flaws (Top Dam - FGM).

Dental fluorosis is a deficiency in the enamel mineralization that is caused by daily fluoride intake during dental development.²² It is known that the teeth affected by fluorosis present defects and / or spots of low mineral content with variable textures and increased porosity.^{23,24} Therefore, we opted for

the application of an adhesive system to the white spots of greater depth resulting from fluorosis, to prevent the direct contact of the peroxide with the hypomineralized enamel surface (Fig 8).

The whitening gel was handled and applied according to the manufacturer's recommendations, without the use of any light source (Fig 9).

With the aid a microbrush, the gel was applied and moved to release the oxygen bubbles that remained on the surface of the tooth, avoiding their contact with the surface of the enamel. After the last application, neutral fluorine was applied to prevent dentin sensitivity and promote enamel remineralization.

At the end of the treatment, it was observed a change in the color from A2 to A1 (Fig 10), indicating an improvement in the smile esthetics (Figs 11, 12, 13 and 14).



Figure 6: Final aspect of the smile after the sessions of enamel microabrasion.



Figure 7: Tooth color check using the Vita Classical® scale (Vita®).

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Figure 8: Application of the photopolymerizable gingival barrier and adhesive system in the resistant spot .



Figure 9: Application of 35% Hydrogen peroxide.



Figure 10: Final color check using the Vita Classical® scale (Vita®).



Figure 11: Final aspect of the in-office tooth whitening.

RESULTS AND DISCUSSION

Excess consumption of fluoride due to ingestion of public water, supplements, and fluoride-containing formulas by the mother during pregnancy can cause a calcification disorder of the enamel known as dental fluorosis.^{25,26} This phenomenon results in an enamel with more proteins and less minerals, besides being more porous and defective in the formation of the crystals of hydroxyapatite, compared to a normal enamel.^{26,27} The mechanism by which fluoride causes porosity remains to be fully elucidated.¹³ However, the degree of severity of the lesions is determined by the amount ingested, duration of exposure of the dental germ to the fluoride ion during the formation process, enamel mineralization and developmental period at which the exposure occurs. In addition, this lesion can be classified as: questionable, very mild, mild, moderate or severe.⁶

Currently, techniques such as tooth whitening,^{9,6} microabrasion,^{9,10,11} macroabrasion^{12,15} and direct²⁵ or indirect restorations^{10,25} are indicated for the treatment of dental stains. In cases where the enamel is not excessively damaged, less invasive techniques, including microabrasion as the first treatment option,^{6,9,10} are employed to avoid integration into a repetitive restorative cycle.¹²

The main limitations for the use of this technique are the severity, depth and degree of staining of the spots.²⁶ Thus, the deeper the stain, the greater the dental wear, which can become excessive, with cavity formation and dentine exposure. In these cases, a restorative treatment is indicated.^{25,26}

The mechanism of action of enamel microabrasion is associated with the abrasive and erosive effects of the products used in this technique. It's worthy to mention that several agents in distinct combinations can be used (e.g. 37% Phosphoric acid associated with pumice stone; hydrochloric acid associated with the silicon carbide).²⁷ Nevertheless, several experiments have been conducted to determine an ideal composition for the blend used in this technique, so that they provide satisfactory results without damaging the tooth structure.

Phosphoric acid is a safe, efficient and easily accessible alternative for professionals.^{12,15} This acid presents less caustic and erosive effects associated with a lower volatilization, when compared to the hydrochloric acid. Therefore, it can be considered less harmful to oral tissues, reinforcing the choice and use of this product in the present case.^{2,3} This acid was associated with

pumice stone (extra fine granulation) in equal volumetric proportions, resulting in a homogeneous paste^{6,10} for application on the dental surface. The deposition of these products on the surface of the enamel aid in the camouflage of deeper and microabrasion-resistant spots.

In each application of this paste, 10 to 30 µm of dental enamel are removed, with an average of 250 µm removed every 10 applications, which represents up to 60% of the enamel thickness.^{28,29} Histological studies demonstrate that this is enough to eliminate the most frequent spots.^{26,28,29} However, after each session of microabrasion, it is necessary to polish the remaining dental enamel with fine-grained discs or felt disc, ending with the application of topical fluorides in neutral gel for 1 min to aid and accelerate the process of enamel remineralization. This procedure reduces the interprismatic spaces, creating a highly mineralized and densely compacted layer, which confers new texture and brightness conditions to the dental surface.^{6,26}

A correct application of the microabrasion technique promotes satisfactory results, resulting in minimization of the stains in an effective, safe and atraumatic manner.^{6,10,27} On the other hand, favorable results are directly related to an adequate indication of this technique, which limited to superficial spots on the dental enamel.^{10,26,28}

This work demonstrated that the microabrasion technique efficiently removed the fluorotic spots. However, the patient reported dissatisfaction with the yellowish color of her teeth. In fact, the microabrasion process causes a reduction of the enamel surface revealing the yellowing of the dentin.^{1,13} Thus, a dental whitening with 35% Hydrogen peroxide (Whiteness HPMmaxx, FGM) was proposed and started three weeks after the conclusion of the microabrasion treatment. The tooth whitening was carried out in 3 applications during

2 sessions to recover the harmony of the color of the teeth, seeking the satisfaction and self-esteem of the patient. This range was used because previous studies suggest it presents sufficient time for a complete remineralization of the enamel surface.^{1,7}

Conservative treatments, such as tooth whitening and enamel microabrasion may be beneficial in cases of mild fluorosis.¹¹ In addition, these techniques can be used in association to effectively treat discoloration and demineralization of enamel.^{2,8} Thus, the combination of tooth whitening and enamel microabrasion is effective when the yellow color of the dentin is evidenced after the superficial removal of the enamel.⁹

The dental whitening does not cause significant additional damage to the enamel after the microabrasion procedure. Therefore, it does not influence the hardness and roughness of the tooth surface.² However, the patient reported sensitivity after this this treatment, which may have occurred due to the movement of the dentinal fluid inside the tubules.^{2,13} In fact, in the whitening process, byproducts of the acid penetrate in the dentinal canaliculi, reaching the dental nerve endings and triggering a temporary thermal sensitivity. Usually, a painful sensation does not cause damage to the pulp tissue and ceases by itself after the treatment and / or by the use of desensitizing agents.^{2,8}

CONCLUDING REMARKS

The association of tooth whitening with the microabrasion technique is a simple procedure. The treatment preserves the dental structure and has a relatively low cost, as well as excellent results for the removal of enamel spots, such as those resulting from dental fluorosis. Whenever possible, minimally invasive procedures should be used as the first treatment option, in cases where the presence of white spots causes esthetic discomfort to the patient.

References:

- Sundfeld RH, Rahal V, Croll TP, De Alexandre RS, Briso AL. Enamel microabrasion followed by dental bleaching for patients after orthodontic treatment – case reports. *J Esthet Restor Dent.* 2007;19(2):71-7; discussion 78.
- Franco LM, Machado LS, Salomão FM, Dos Santos PH, Briso AL, Sundfeld RH. Surface effects after a combination of dental bleaching and enamel microabrasion: an in vitro and in situ study. *Dent Mater J.* 2016;35(1):13-20.
- Bağlar S, Çolak H, Hamidi MM. Evaluation of novel microabrasion paste as a dental bleaching material and effects on enamel surface. *J Esthet Restor Dent.* 2015 Sept-Oct;27(5):258-66.
- Jahanbin A, Ameri H, Shahabi M. Management of post-orthodontic white spot lesions and subsequent enamel discoloration with two microabrasion techniques. *J Dent Shiraz Univ Med Sci.* 2015;16(1):56-60.
- Pini NI, Sundfeld-Neto D, Aguiar FH, Sundfeld RH, Martins LR, Lovadino JR, et al. Enamel microabrasion: an overview of clinical and scientific considerations. *World J Clin Cases.* 2015 Jan 16;3(1):34-41.
- Hermes SR. Microabrasão do esmalte dental para tratamento de fluorose. *RGO.* 2013 Jul-Dez;61 Supl 0:427-33.
- Sundfeld RH, Croll TP, Briso AL, Alexandre RS, Sundfeld Neto D. Considerations about enamel microabrasion after 18 years. *Am J Dent.* 2007 Apr;20(2):67-72.
- Pini NIP, Costa R, Bertoldo CES, Aguiar FHB, Lovadino JR, Lima DANL. Enamel morphology after microabrasion with experimental compounds. *Contemp Clin Dent.* 2015 Apr-June;6(2):170-5.
- Catelan A, Pini NIP, Hernandez NMP, Lima, DANL, Aguiar FHB. Técnicas minimamente invasivas para resolução estética de manchamentos dentais. *Arch Health Invest.* 2014;3(4):1-8.
- Prado RNS, Zeidan LC, Lotufo MA, Rodrigues JA. Limites da microabrasão do esmalte dental: relato de caso. *Rev Saúde.* 2014;8(1-2):30-6.
- Oliveira LMX, Novaes Júnior JB, Barreiros ID, Paiva SM, Martins CC. Tratamento de fluorose dentária moderada com a técnica de microabrasão de esmalte com ácido clorídrico 6% e carbeto de silício: relato de caso clínico. *Arq Odontol.* 2014;50(3):142-8.
- Ramos CM, Bim Junior OB, Borges AFS, Wang I, Mondelli RFL. Microabrasion technique for enamel with fluorosis: a case report utilizing two distinct pastes. *Braz Dent Sci.* 2013;16(3):84-9.
- Castro ALS, Mendes CMC. Microabrasão e clareamento em dentes com fluorose: relato de um caso clínico. *Rev Ciênc Méd Biol.* 2014;13(3):403-8.
- Pinto VG. Saúde bucal coletiva. São Paulo: Ed. Santos; 2013. v. 6.
- Andrade SSM, Sampaio RC, Oliveira QES, Miranda CB. Microabrasão do esmalte para remoção de manchas de fluorose dentária: relato de caso. *Rev Dental Press Estét.* 2015 Jul-Set;12(3):102-9.
- Tay LY, Kose C, Loguercio AD, Reis A. Assessing the effect of a desensitizing agent used before in-office tooth bleaching. *J Am Dent Assoc.* 2009 Oct;140(10):1245-51.
- Tam, L. Effect of potassium nitrate and fluoride on carbamide peroxide bleaching. *Quintessence Int.* 2001 Nov-Dec;32(10):766-70.
- Cummins D. The efficacy of a new dentifrice containing 8.0% arginine, calcium carbonate, and 1450 ppm fluoride in delivering instant and lasting relief of dentin hypersensitivity. *J Clin Dent.* 2009;20(4):109-14.
- Peixoto LM, Daleprane B, Battitucci MHG, Sanglard L, Pazinato FB. Tratamento da hipersensibilidade dentinária cervical. *Rev Bras Pesq Saúde.* 2010;12(2):69-74.
- Haywood VB, Caughman WF, Frazier KB, Myers ML. Tray delivery of potassium nitrate-fluoride to reduce bleaching sensitivity. *Quintessence Int.* 2001 Feb;32(2):105-9.
- Matis BA, Cochran MA, Eckert GJ, Matis JL. In vivo study of two carbamide peroxide gels with different desensitizing agents. *Oper Dent.* 2007 Nov-Dec;32(6):549-55.
- Aoba T, Fejerskov O. Dental fluorosis: chemistry and biology. *Crit Rev Oral Biol Med.* 2002;13(2):155-70.
- Bardal PA, Olympio KP, Buzalaf MA, Bastos JR. Dental caries and dental fluorosis in 7-12-year-old schoolchildren in Catalão, Goiás, Brazil. *J Appl Oral Sci.* 2005 Mar;13(1):35-40.
- Gonini CAJ, Morita MC. Dental fluorosis in children attending basic health units. *J Appl Oral Sci.* 2004;12(3):189-94.
- Cordeiro RG, Torno V. Tratamentos estéticos e conservadores para a fluorose dental. *Rev Fac Odontol Lins.* 2012;21(2):47-51.
- Ramalho KM, Aranha ACC, Eduardo CP, Rocha RG, Bello-silva MS, Lampert F, et al. Quantitative analysis of dental enamel removal during a microabrasion technique. *Clin Lab Res Den.* 2014;20(3):181-90.
- Fragoso LS, Lima DA, de Alexandre RS, Bertoldo CE, Aguiar FH, Lovadino JR. Evaluation of physical properties of enamel after microabrasion, polishing, and storage in artificial saliva. *Biomed Mater.* 2011 June;6(3):035001.
- Lynch CD, McConnell RJ. The use of microabrasion to remove discolored enamel: a clinical report. *J Prosthet Dent.* 2003 Nov;90(5):417-9.
- Price RB, Loney RW, Doyle MG, Moulding MB. An evaluation of a technique to remove stains from teeth using microabrasion. *J Am Dent Assoc.* 2003 Aug;134(8):1066-71.