

Resolution of a fluorosis case through the association of minimally invasive techniques: microabrasion and tooth bleaching

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Color changes may interfere with smile balance and they represent a clinical challenge to dentists. Dental fluorosis originates from intrinsic factors and it is a disorder of enamel formation during the phase of teeth development, resulting in the change of enamel color. This clinical case report aimed to present the resolution of a case of dental fluorosis through the association of minimally invasive techniques, namely microabrasion and tooth bleaching. A 27-year-old male patient sought the dental clinic of the School of Dentistry of Piracicaba (FOP - UNICAMP, Brazil) presenting striped and symmetrical white stains and generalized chromogenic biofilm. After anamnesis and clinical examination, the patient was diagnosed with fluorosis stains. Initially, adequacy of the oral environment was performed with prophylaxis and supragingival scraping. Then, the enamel microabrasion technique was performed with 6% hydrochloric acid associated with silicon carbide (Whiteness RM - FGM) and supervised at-home bleaching was performed with 16% carbamide peroxide (Whiteness Simple 16% - FGM). In conclusion, the treatment performed reestablished the aesthetics and harmony of smile color with minimally invasive procedures without causing tooth sensitivity.

Keywords: Tooth bleaching. Enamel microabrasion. Fluorosis, dental.



Introduction

Dental fluorosis occurs due to the excessive intake of fluoride above the adequate limit and for a long period during the phase of teeth development, resulting in the malformation of tooth enamel. Clinically, fluorosis is presented as opaque stains that go from small transverse streaks up to large opaque areas in homologous teeth, with white, yellowish, or brownish colors, and even surface erosion, varying according to the degree of severity^{1,2}.

Several techniques are indicated for the treatment of fluorosis, from conservative methods such as microabrasion associated or not with tooth bleaching to more invasive methods such as restorations with composite resin, infiltrating resin, veneers, laminates, and ceramic crowns. For the correct treatment indication, a precise diagnosis of the type and depth of the stain is required, which varies according to the severity of fluorosis²⁻⁴.

The microabrasive agents used for the microabrasion procedure are 6% hydrochloric acid associated with silicon carbide, which is found commercially, or a combination of pumice stone with 37% phosphoric acid, performed in-office^{5,6}.

The minimally invasive treatments have been the first option in the scope of aesthetic dentistry, as long as the clinical case allows their indication. Thus, this study aims to report the association of two techniques based on such principle for the resolution of a dental fluorosis case.

Case report

A 27-year-old male patient sought assistance at the dental clinic of the School of Dentistry of Piracicaba (FOP - UNICAMP, Brazil) because he was unsatisfied with the striped white stains associated with yellowish areas in the buccal aspect of his teeth (Figure 1A). After anamnesis and clinical examination, the patient was diagnosed with stains due to dental fluorosis and generalized chromogenic biofilm (Figure 1B).

Initially, the adequacy of the patient's oral environment was performed with supragingival scraping aided by Duflex periodontal curettes (SS White, Rio de Janeiro, RJ, Brazil) and prophylaxis was performed with pumice stone (SS White, Rio de Janeiro, RJ, Brazil), water at the ratio of (2:1), and rubber cup (KG Sorensen, Barueri, SP, Brazil) coupled with a low-rotation contra-angle handpiece (Kavo do Brasil, Joinville, SC, Brazil).

After these procedures, the patient was instructed on the required oral hygiene care, toothbrushing, and use of dental floss. Next, the transillumination technique was performed to assess the depth of superficial and deep stains (Figures 1C and 1D) using a LED light-curing unit of 5 W with blue light emission, wavelength of 470 nm, and power of 1200 mW/cm². Hence, considering the age of the patient and the depth of the stain, the more conservative treatment was selected based on a combined approach of enamel microabrasion with at-home bleaching using 16% carbamide peroxide.

Prior to treatment, the initial color of the patient was recorded, but determining the color tends to be harder in teeth with fluorosis due to the polychrome of the dental

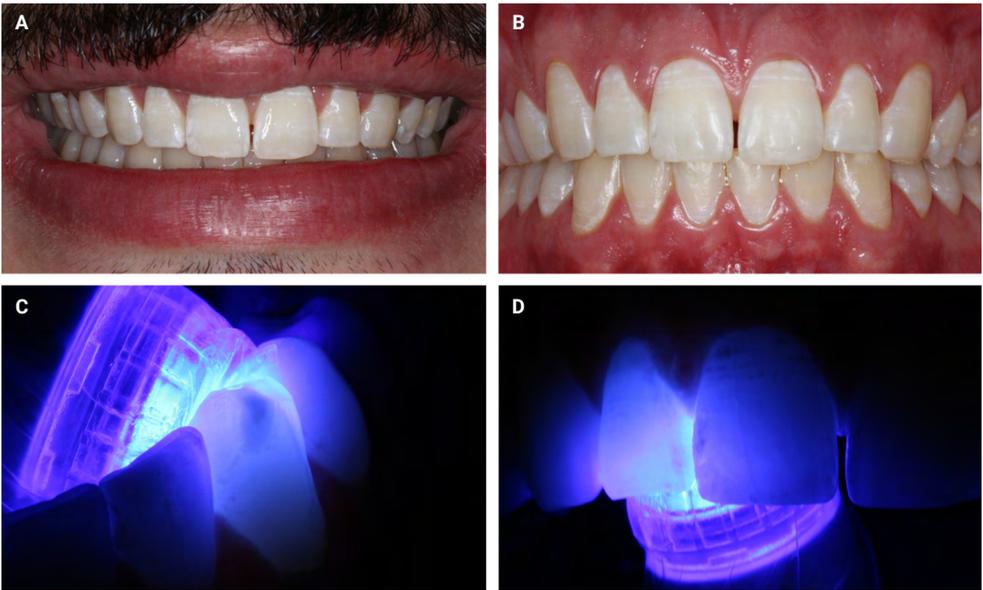


Figure 1. A: Initial smile, front view; B: Patient presented with white enamel stain on the maxillary and mandibular teeth; C and D: Transillumination to evaluate the staining. After this process it was observed that the upper central incisors, showed superficial stains and tooth 33, demonstrated deep stain.

elements. Tooth color was chosen with the help of a VITAPAN™ Classical visual color scale (VitaZahnfabrik, Bad Säckingen, Germany). The upper teeth presented color A1 for incisors and A2 for canines, while the lower teeth presented color A3 for incisors and A3.5 for canines (Figures 2A, 2B, 2C, and 2D).

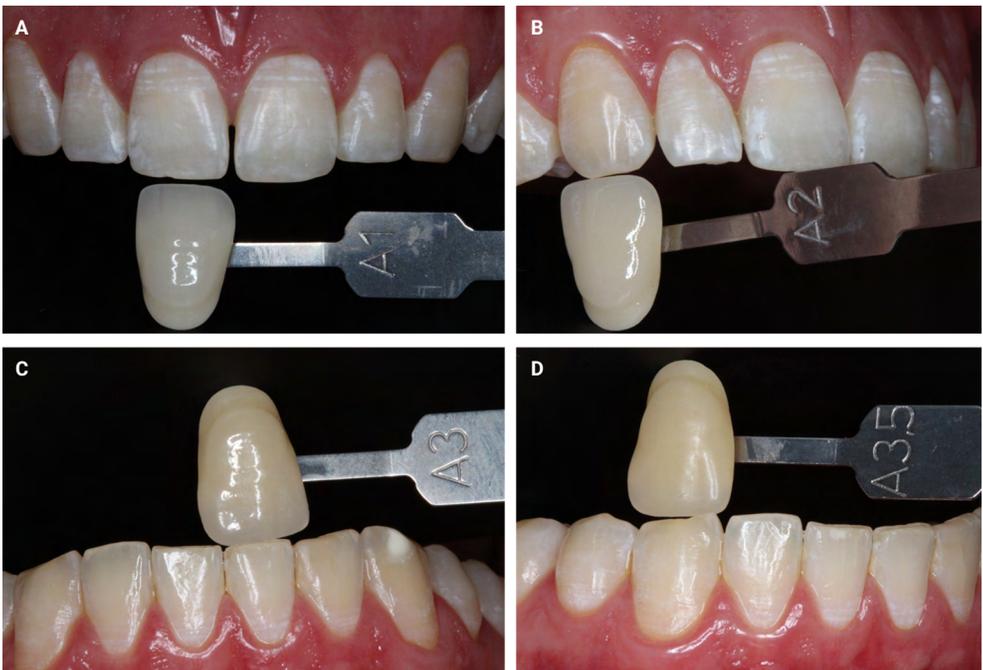


Figure 2. A, B, C, and D: Initial color registration with the VITAPAN® Classical visual vision.

Microabrasion was performed before tooth bleaching for better controlling stain removal, due to the higher contrast of the stain with the healthy tooth. The following materials were used for this procedure: Young metal archwire (Golgran, São Caetano do Sul, SP, Brazil), rubber mat (Madeitex, São José dos Campos, SP, Brazil), 14A and 26 Duflex clamps (SS White, Rio de Janeiro, RJ, Brazil), and dental floss (Hillo, Nilópolis, RJ, Brazil), for the absolute isolation of the surgical area and the protection of soft tissues (Figures 3A and 3B).

The abrasive agent (Whiteness RM, FGM, Joinville, SC, Brazil) was handled according to manufacturer's instructions, applied (Figure 3C) on the stained enamel surface and rubbed from 5 to 10 seconds aided by a rubber cup (KG Sorensen, Barueri, SP, Brazil) coupled with a low-rotation contra-angle handpiece (Kavo, Joinville, SC, Brazil) (Figure 3D). The microabrasive agent was applied 10 times in only one session. Immediately after this, the product was removed from the tooth surface with abundant wash and disposable suction device (SS Plus do Brasil Ltda, Maringá, PR, Brazil) coupled to a high-power compressor (Figure 3E). The need for either applying more of the product or not with the wet tooth surface was assessed.

At the end of the microabrasion procedure, the tooth surface was polished with diamond paste (Diamond Excel, FGM, Joinville, SC, Brazil) in a felt disc (Diamond Flex, FGM, Joinville, SC, Brazil) (Figure 3F) and then it was washed to remove the product. Later, a colorless neutral fluoride gel (2% NaF, Nova DFL, Jacarepaguá, RJ, Brazil) was applied for four minutes (Figures 3G and 3H).

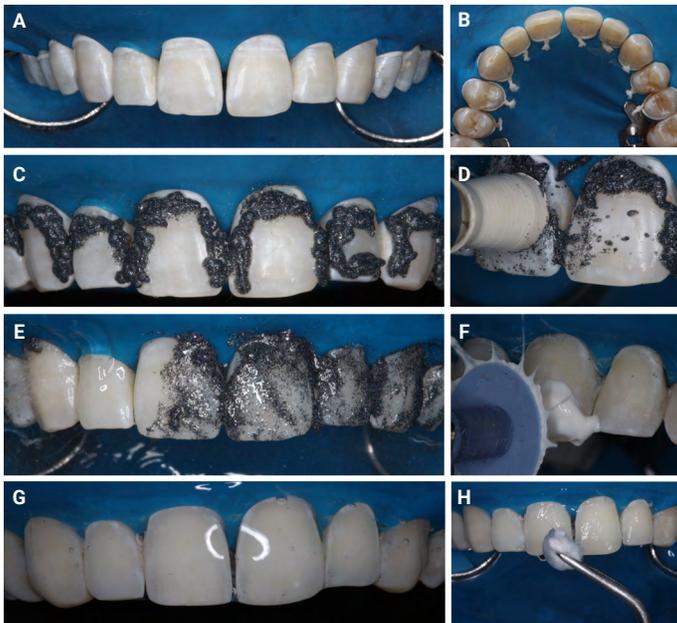


Figure 3. A: Absolute isolation (front view); B: Absolute isolation (palatine view); C and D: Application of Whiteness RM abrasive agent with rubber cup in enamel stained surfaces; E: Cleaning of the abrasive agent; F: Surface polishing with diamond paste and felt disc; G and H: Application of neutral fluorine gel (2% NaF) for 4 minutes.

The second aesthetic treatment performed for resolving this case was at-home tooth bleaching, which was performed one week after the microabrasion session. This technique was performed through alginate molding of the patient (Hydrogum, Zhermack Clinical, Italy) and after obtaining the mold, it was poured with type III plaster stone (Herodent Tipo III, Coltene, Rio de Janeiro, Brazil), thus originating the models of the upper and lower arches (Figure 4A). After cutting out the models, an EVA plate (Whiteness Placas para Moldeiras, FGM, Joinville, SC, Brazil) and a vacuum plasticizer (Plastvac P7, Bioart, São Carlos, SP, Brazil) (Figure 4B) were used to produce the individualized impression trays. After producing and cutting out the impression trays (Figure 4C), their adaptation and comfort in the mouth of the patient were verified (Figure 4D).

The bleaching agent used was 16% carbamide peroxide (Whiteness Simple, FGM, Joinville, SC, Brazil), which was applied in an impression tray (Figure 4E) for four hours daily according to the manufacturer's protocol, for four weeks. After finishing the bleaching procedure, two weeks were waited to reassess the color obtained. The upper incisors and canines presented color B1 (Figures 4F and 4G), the lower incisors presented color B1 (Figure 4H), and the lower canines presented color A2 (Figure 4I), providing uniformity in tooth color when compared to the smile before the treatments performed (Figures 5A, 5B, and 5C).

The patient received and signed an Informed Consent Form so his images and other clinical information were reported in the journal.

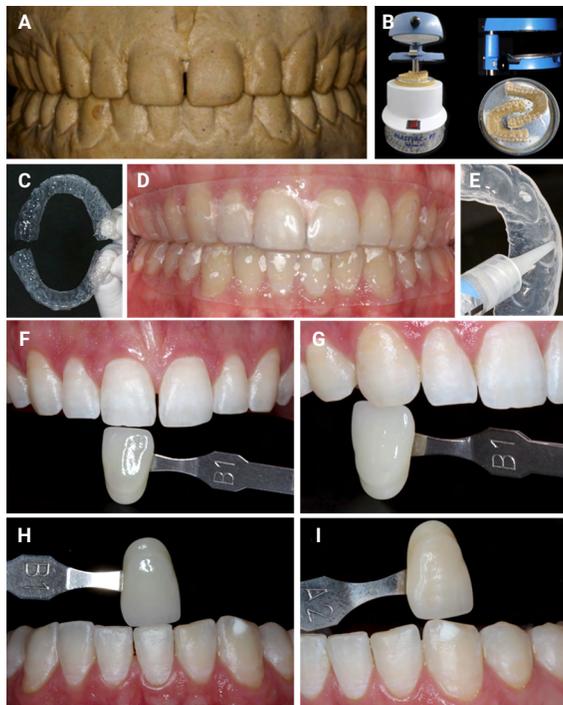


Figure 4. A: Plaster model; B: Preparation of individualized trays and vacuum plasticizer; C: Tray cutting; D: Checking the adaptation of the tray in oral cavity; E: Application of the bleaching agent in tray; F, G, H, and I: Final color registration with the VITAPAN® Classical visual vision.



Figure 5. A: Initial smile; B: Smile after microabrasion treatment; C: Final smile after bleaching treatment.

Discussion

Enamel microabrasion is a conservative technique for removing stains or surface defects in tooth enamel⁷. The abrasive products associated with acids allow, among other possibilities, performing conservative clinical procedures and achieving immediate and lasting results, with limited loss of tooth enamel⁸.

The microabrasion technique is indicated for the aesthetic treatment of fluorotic white stains, mineralized white stains caused by demineralization from caries or post orthodontic treatment, localized hypoplasia from dental trauma or infections, and idiopathic hypoplasia in which discoloration is limited to the most superficial layer of tooth enamel⁹. Clinically, it is difficult to diagnose with precision the actual depth of the intrinsic stain in tooth enamel^{9,10}. Therefore, this case report presented a method for analysis of enamel hypoplasia that uses transillumination technique with a LED light-curing followed by a combination of enamel microabrasion with carbamide peroxide at-home tooth bleaching. These association of techniques showed good results. Transillumination procedure is simple and easy to perform and it helps to differentiate deep from superficial stains, as well as guiding the professional to choose the most adequate treatment for the stained tooth surface.

However, the location of the stain in the middle and/or cervical third of the tooth leads to a better indication for the abrasive technique, considering that the incisal third is usually more translucent and that any enamel surface removal in this area may become apparent. Besides stain location, another factor that aids the indication of such technique is the transillumination procedure, which is characterized by showing, with light reflection through teeth, the changes in enamel and dentin, favoring the interpretation process¹¹⁻¹³. This can be used to estimate the lesion depth, as a darker color indicates deeper staining¹⁴. Park et al.⁴ described the utility quantitative light-induced fluorescence (QLF) to determine the depth of the stains. The QLF is used to analyze the enamel fluorescence through a computer program (QA2 v1.18, Inspektor Research Systems BV) that measures the white stain. However, QLF also have limitation as it is not indicated in the analysis of for interproximal lesion.

In the clinical case presented, enamel microabrasion was indicated successfully, because it allowed removing the changed and/or stained tissue with minimal abrasion of the stained surface. This technique used hydrochloric acid at low concentration (6%) associated with particles of silicon carbide, which is commercially available^{9,14,15}.

The enamel microabrasion involves minimal enamel loss (25 a to 200 micrometer) when performed correctly, being considered a safe, conservative and atraumatic method⁹. However, the thickness of the cervical enamel region is smaller. Therefore,

care should be taken with the pressure used during the microabrasion procedure in these regions so that the higher the pressure, the greater the amount of enamel removed. In addition, microabrasion enamel wear depends on the time, the number of applications and acids concentration^{9,14}.

In case the stains may not be fully removed, other clinical procedures may be applied, among which are direct restorations and bleaching procedures¹⁶. In this context, tooth bleaching is considered the most conservative aesthetic treatment option¹⁷; however, peroxide cannot remove white stains in enamel, but only reduce the contrast of the stain with the healthy tooth, making the stain any less apparent.

A rather common adverse effect of the tooth bleaching technique is tooth sensitivity. Although sensitivity is slightly observed in at-home treatments with carbamide peroxide at low concentration after microabrasion, such technique is the most indicated, because it provides a more conservative treatment to an enamel that has already been minimally abraded^{18,19}. Thus, at-home bleaching with 16% carbamide peroxide was indicated in this case. Either during or after microabrasion and tooth bleaching, the patient did not report the occurrence of tooth sensitivity.

Based on the results obtained, it may be concluded that the association of microabrasion and at-home tooth bleaching techniques was effective for clinical resolution and aesthetic reestablishment, without causing tooth sensitivity.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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