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CASE REPORT

doi: 10.14295/bds.2017.v20i2.1292

# Enamel microabrasion associated with resin infiltration technique: a clinical report

Microabrasão do esmalte associada à técnica de infiltração de resina: Relato clínico

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## ABSTRACT

The generalized presence of stains, particularly on anterior teeth, provides an unaesthetic appearance with a negative impact on the patient. The aim of this paper is to report a case of severe chromatic alterations treated with enamel microabrasion associated with infiltration of low-viscosity resin. The intense brownish pigmentation and white spots of fluorosis lose their whitish appearance and look similar to sound enamel. This association of techniques, which might be an alternative to white-masking of intense pigmentation, showed optimal aesthetic results.

## KEYWORDS

Aesthetics; Brown pigmentation; Enamel microabrasion; Low-viscosity resin.

## RESUMO

A presença generalizada de manchas, particularmente nos dentes anteriores, proporciona uma aparência antiestética com impacto negativo sobre o paciente. O objetivo deste trabalho é relatar um caso clínico de severas alterações cromáticas e tratadas com microabrasão de esmalte associada à infiltração com uma resina de baixa viscosidade. A intensa pigmentação acastanhada e as manchas brancas de fluorose perderam a sua aparência esbranquiçada e se assemelharam ao esmalte sadio. Essa associação de técnicas, que pode ser uma alternativa ao mascaramento em pigmentações intensas, mostrou ótimos resultados estéticos.

## PALAVRAS-CHAVE

Estética; Pigmentação marrom; Microabrasão de esmalte; Resina de baixa viscosidade.

## INTRODUCTION

The development of hard dental tissue defects disturbs the dental matrices and mineralization during odontogenesis [1]. These defects may compromise the appearance of dental elements, affecting patients' self-esteem and quality of life. Intrinsic stains are among these factors that compromise the oral appearance, including intrinsic stains [2,3].

Intrinsic stains may be resolved aggressively by the removal of several millimeters of tooth surface to replace with an adequate thickness of direct/indirect material to hide stains and rebuild the tooth [4] However, they may also be removed more conservatively by microabrasion and resin infiltration. Microabrasion is a technique that enables the removal of white, yellow, and brown dental enamel stains of intrinsic character [3], obtaining satisfactory cosmetic results with little dental wear [2,5-7]. In addition to being conservative, this technique offers other advantages, such as simplicity of execution and low cost [8].

Another conservative treatment is low viscosity resin infiltration, which is used as an alternative for the treatment of incipient caries. As a side effect, resin infiltration has been shown to camouflage carious lesions in enamel [9]. Positive aesthetic results were found with

resin infiltration into white spot caries around brackets after orthodontic treatment [10,11], and fluorosis stains. This masking occurs because the resin has a refractive index similar to the enamel/apatite (resin - 1.52; enamel - 1.62-1.65), therefore the light scattering is reduced and enamel color differences decrease [12].

Few studies have assessed the combination of enamel microabrasion with resin infiltration. Therefore, the aim of this clinical report is to describe the treatment of a patient with localized tooth stains treated with the enamel microabrasion technique using resin infiltration as a complementary treatment to aesthetic improvement.

## DESCRIPTION OF CASE

A 30-year-old female sought dental care due to unaesthetic appearance of her maxillary anterior teeth. At the initial clinical examination and anamnesis, excessive brownish spots were observed in all teeth and in the upper front elements (Figure 1). The periodontal health of the patient was satisfactory, and a radiographic examination revealed no abnormalities of the supporting tissues.

After the diagnosis was explained to the patient, the possibilities of treatment and the prognosis for this case were presented. The pattern of the staining with an intact substrate suggested that an enamel microabrasion technique using low-viscosity resin infiltration procedures might be appropriate.

After careful cleaning with an oil-free prophylactic paste (Villevie, Dentalville, Joinville, Brazil), the mucosal area was isolated with Vaseline, in order to prevent possible injuries from the acid agent at those tissues. Following periodontal cleaning, the operative field, including the maxillary canine and incisors, was isolated with an extra heavy rubber dental dam (Hygenic, Coltène/Whaledent GmbH, Langenau, Germany) (Figure 2).

Following teeth isolation, an abrasive paste constituted by 6.6% hydrochloric acid and silicon carbide (Opalustre, Ultradent Products, South Jordan, UT, USA) was applied on the surface of enamel using a hand applicator. Ten applications were made, each for ten s and with intermittent washing between applications. A decrease in the appearance of the browning was observed immediately after the end of the procedure, still with absolute isolation (Figure 3). After application of the microabrasive agent, the teeth were subjected to a polishing felt and polishing slurry and then a desensitizer based on sodium fluoride and potassium nitrate was applied (Sensis 2% Villevie, Dentalville Joinville, Brazil) for a period of 10 min.

After a week, a careful prophylaxis with oil-free paste was performed and the operative field was partially isolated with a lip retractor, cotton roll, and a gum shield, as well as eye protection for the patient (Figure 4). The resin-infiltration technique was performed according to the manufacturer's instructions on the upper teeth. The surface layer of enamel was eroded by the application of 15% hydrochloric acid gel (ICON-Etch; DMG, Hamburg, Germany) for 120 s (Figure 5). Afterward, the etching gel was thoroughly washed away for 30 s using a water spray, and the teeth were dried. Next, the enamel surfaces were desiccated using ethanol (99%; ICON-Dry; DMG, Hamburg, Germany) for 30 s, followed by air-drying (Figure 6). Then, low-viscosity resin (ICON-Infiltrant; DMG, Hamburg, Germany) was applied to the enamel surfaces of the eroded teeth and was allowed to penetrate for 3 min (Figure 7). Excess material was removed from the surface before light curing. After the infiltration of the low-viscosity resin, it was light-cured for 40 s with an intensity of 1400 mW/cm$^2$ (Radii LED Curing Light, SDI, Australia). The application of infiltrating resin in the same tooth was repeated once for 1 min, followed by light curing for 40 s.

Finally, the roughened enamel surface was polished with high-luster polishing paste, using goat-hair brushes and cotton buffs (Renfert GmbH, Hilzingen, Germany). The patient presented no sensitivity during or after the use of the stain remover and low-viscosity resin application. Four months after the procedures, a good final appearance was observed (Figure 8), and the patient expressed satisfaction with the final appearance of her teeth.

**Figure 1 -** Clinical aspect of the patient presenting white- brownish spots on all teeth.

**Figure 2 -** Microabrasion technique application in brownish spots.

**Figure 3 -** Immediate clinical aspect after microabrasion technique.

**Figure 4 -** Immediate aspect of mouth isolated with lip retractor, cotton roll, and gingival protection.

**Figure 5 -** Initial etching gel aspect (15% hydrochloric acid gel, ICON-Etch).

**Figure 6 -** Drying of enamel with highly concentrated alcohol (ICON-Infiltrant).

**Figure 7 -** Application of the ICON resin infiltration and photoactivation for 40 s.

**Figure 8 -** Immediate clinical aspect after resin infiltration.

## DISCUSSION

Few studies in literature [13] have associated microabrasion and resin infiltration techniques. Most studies performed techniques combining microabrasion and tooth bleaching. In this study, the resin infiltration technique improved the aesthetics of teeth for which microabrasion alone was not successful.

Microabrasion is a widely accepted technique, which has been demonstrated to be effective in removing intrinsic stains from enamel [3]. Moreover, it is considered a conservative and safe aesthetic treatment [3]. The aesthetic satisfaction demonstrated by the patient whose case was reported in this study is in line with the findings from other cases described in the literature [14]. Hydrochloric acid, in concentrations similar to those used in this study, is widely accepted in cosmetic dentistry to remove surface discolorations by microabrasion of [15-17] enamel. However, contact with the soft tissues of more than 30 s can cause ulcerations. Therefore, in clinical use, a rubber dam should be applied to avoid contact with the gel gum hydrochloric acid.

Some intrinsic staining with its origins in dentin during odontogenesis are not amenable

to this form of surface treatment [18]; therefore the involvement of other treatment methods, such as resin infiltration was needed.

Resin infiltration was first described in 1976 by Robinson et al., using a resorcinol-formaldehyde resin. However, this resin was toxic [19,20]. Afterward, similar techniques were developed. Resin infiltration aims to create a barrier inside the caries lesion to replace the lost mineral [21], and, moreover, to mask the discolored areas [22]. This commercial resin contains monomers, such as triethylene glycol dimethacrylate, with hydrophilic characteristics, low viscosity, and a high penetration coefficient, which facilitates penetration into the pores of the enamel [23]. However, this process requires the application of a substance, such as hydrochloric acid to facilitate the infiltration of the resin into the enamel.

Due to the use of hydrochloric acid in the microabrasion technique, parts of the surface enamel layer must be removed that may have increased the porosity of the surface. This may have favored the penetration of resin infiltration. One study showed that the application of 15% hydrochloric acid gel for 2 min was more effective when compared with 5% HCl gel and 37% phosphoric acid to expose the surface enamel layers in permanent teeth [24]. The association between a larger amount hydrochloric acid gel and resin infiltration resulted in deeper penetration depths in enamel, improving aesthetics. The deep penetration of the resin infiltration led to the plugging of porosities within the enamel, which might be the factor that improved the color due to the similar light refraction index as shown in the present study.

## CONCLUSION

This case report demonstrated that the microabrasion technique and resin infiltration technique are conservative approaches that improve the aesthetic appearance of white and brownish spots from mild to moderate fluorosis, masking them in a short time interval. Furthermore, this combination of techniques showed aesthetically adequate results.

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Date submitted: 2016 Jul 15

Accept submission: 2016 Nov 28