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Clinical Technique/Case Report

Esthetic Management of Incisors with Diffuse and Demarcated Opacities: 24 Month Follow-up Case Report

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Clinical Relevance

A minimally invasive esthetic treatment can provide longevity and color stability.

SUMMARY

This clinical case report describes a minimally invasive approach to mask diffuse and demarcated opacities in permanent anterior teeth in an eight-year-old child who was upset with the appearance of her incisors. Clinical examination showed diffuse opacities in teeth 7, 8, 9, and 10, diagnosed as dental fluorosis associated with yellow demarcated opacity in tooth 9 related to molar-incisor hypomineralization. The treatment was based on conservative dentistry using the low-viscosity resin infiltration technique and resin composite restoration in an attempt to mask the lesions. The follow-up time was 24 months.

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INTRODUCTION

Developmental defects of enamel in anterior teeth might have negative impact on patient self-esteem and consequently quality of life.[1,2] Developmental defects of enamel can affect all the teeth as a whole or can be localized in a specific group of teeth, as in molar incisor hypomineralization (MIH).[3,4] MIH is characterized by the presence of demarcated opacities in at least one first permanent molar, generally associated with incisors also affected.[5] Fluorosis presents diffuse opacities with a chalky white appearance or, in severe cases, with staining and pitting.[6] A demarcated opacity in a single permanent tooth can be attributed to trauma to its predeces-

sor.[3,7] All these conditions come from abnormality in the enamel mineralization phase, modifying the chemical composition and optical characteristics of the enamel.[7]

The patient's expectations and the severity of the enamel opacities will guide the clinician's treatment choice. Alternatives to achieve esthetic improvement of demarcated and diffuse opacities range from minimally invasive strategies, such as dental bleaching[8,9] and microabrasion,[9-11] to more invasive techniques, such as composite resin restorations or porcelain veneers.[12,13] Microabrasion is indicated for fluorotic opacities; however, care should be taken to avoid excessive removal of enamel during the clinical procedure.[13] Among the minimally invasive methods, bleaching with hydrogen peroxide or carbamide peroxide has been used successfully.[14] Composite resins and porcelain veneers have been used to provide good esthetic results but invariably cause greater loss of tooth structure due to tooth preparation.[12,13]

More recently, the use of an infiltrant resin has been recommended as a minimally invasive approach to masking opacities in the enamel. The infiltrant agent was initially proposed for the treatment of white spot lesions caused by dental caries, but successful experiments have been reported for masking opacities related to fluorosis and opacities caused by trauma.[15-18] The technique of infiltrating the opacity with low-viscosity resin is based on the fact that the resin has a refractive index similar to that of sound enamel. Thus, when the resin penetrates and fills the porosities of the carious lesions, the refractive index returns to values very close to those of the sound enamel, masking the opacity.[18]

This clinical case report describes a minimally invasive approach to mask diffuse and demarcated opacities in permanent anterior teeth using a resin infiltrant (Icon, DMG, Hamburg, Germany) and composite resin restoration.

CLINICAL CASE REPORT

An eight-year-old female patient with no systemic disease attended the Pediatric Dentistry Clinic of Rio de Janeiro State University, Rio de Janeiro, Brazil. She was upset with the whitish appearance of her maxillary permanent incisors. Clinical examination showed diffuse opacities in teeth 7, 8, 9, and 10, which was diagnosed as moderate fluorosis (score 5) based on the Thylstrup and Fejerskov Index for Dental Fluorosis.[19] A yellow demarcated opacity in tooth 9 was diagnosed as MIH, according to the European Academy of Pediatric Dentistry[4] because the first permanent molars were also affected (Figure 1).

Figure 1. *Baseline: diffuse opacities in the upper central and lateral incisors. Yellow demarcated opacity in tooth 9.*

The treatment decision was based on minimally invasive dentistry, using the infiltration technique with low-viscosity resin (Icon) and composite resin (TPH, Dentsply, São Paulo, Brazil) in an attempt to mask the discolorations. The parent signed an informed consent form authorizing the treatment and the use of images.

The teeth were cleaned and isolated with a rubber dam (Figure 2). The infiltration technique followed was per the manufacturer's instructions. The enamel was etched using 15% HCl gel (Icon etch, DMG) for 2 minutes (Figure 3) followed by rinsing for 30 seconds, drying with compressed air (Figure 4) and dehydration with 100% ethanol (Icon dry, DMG) for 30 seconds. During ethanol application the visual aspect of the enamel was checked and the opacities had not disappeared. Thus, the etching step was repeated. After the second acid etching, the diffuse opacities were masked, but the MIH yellow opacity in tooth 9 was still visible. Then, approximately 0.2 mm of the enamel was removed with a diamond bur and the acid gel (Icon etch) was reapplied only in the area of the demarcated opacity (Figures 5 and 6). When ethanol was applied, it was possible to see that the demarcated opacity was also camouflaged (Figure 7). The infiltration resin (Icon Infiltrant, DMG) was carefully applied onto the etched area for 3 minutes without rubbing (Figure 8); slightly dried with compressed air; and, after removing the excess with gauze, light-cured for 40 seconds (Altlux, Ribeirão Preto, São Paulo, Brazil) (Figure 9). Composite resin, color A2, (TPH) was used to restore the enamel removed by the bur. The tooth surfaces were polished with composite resin polishing discs (Sof-Lex, 3M ESPE, St Paul, MN, USA). The clinical

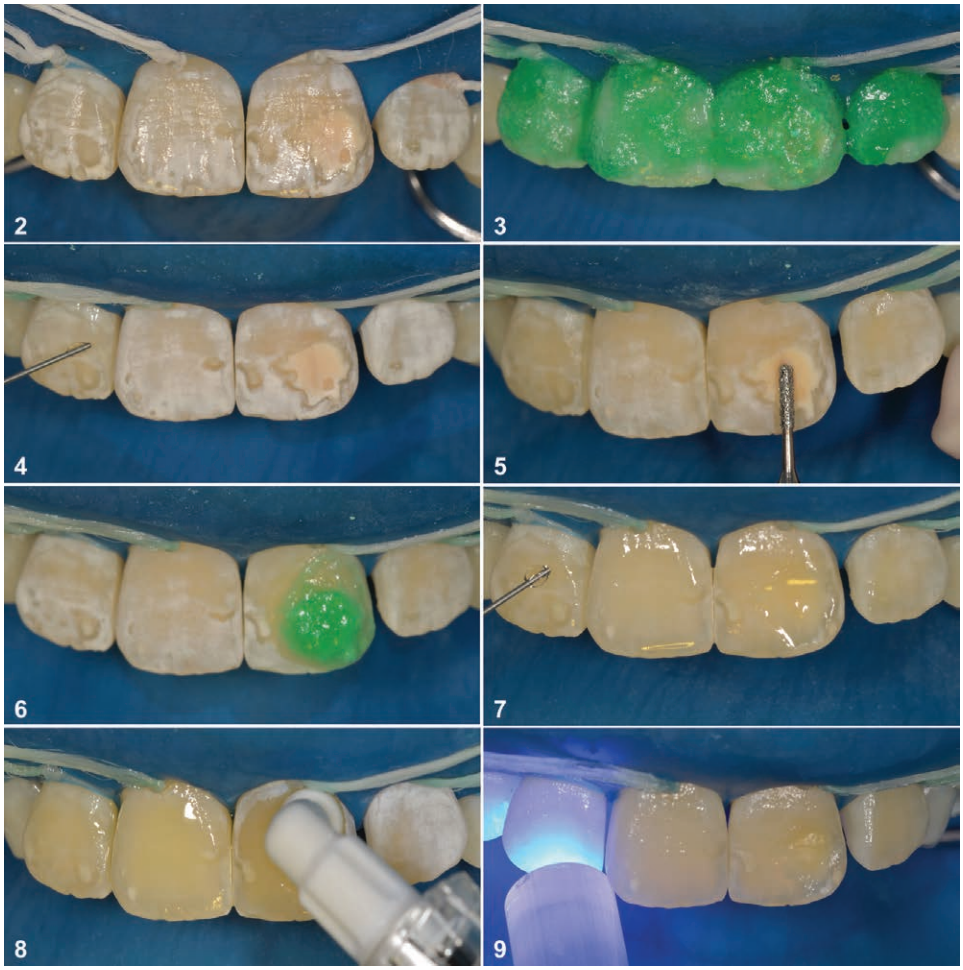

Figure 2. *Rubber dam with ligatures.*

Figure 3. *15% hydrochloric acid application (2 min).*

Figure 4. *Aspect after hydrochloric acid application. Ready for ethanol application.*

Figure 5. *After ethanol application, the diffuse white areas disappeared. The demarcated opacity did not change the aspect and a thin layer of enamel was removed (diamond bur-tooth 9).*

Figure 6. *15% hydrochloric acid application in the demarcated opacity – tooth 9 for 2 min.*

Figure 7. *Ethanol application to preview the masking effect.*

Figure 8. *Resin infiltration in teeth 7, 8, 9, and 10.*

Figure 9. *Light-cure for 40s.*

aspect immediately after infiltration and rubber dam removal and at the 12-month and 24-month follow-up are shown in Figures 10, 11, 12, and 13 respectively.

DISCUSSION

Resin infiltration is an approach that can be safely and effectively performed in a single session with optimal results.[15-17,20] The diffuse opacities were completely masked by the infiltrant. Compared with microabrasion, the resin infiltration technique removes considerably less enamel as the acid application is not combined with mechanical abrasion. The microabrasion technique with abrasive gel composed of a mixture of hydrochloric acid or phosphoric acid and pumice or silica carbide particles is widely used as a minimal intervention,[21,22] although it invariably results in considerable enamel reduction. The enamel loss after microabrasion ranges from around 100 μm to more than 250 μm depending on the pressure, time of application, and concentration of the acid.[21,23-26] As mild to moderate fluorosis presents a porous subsurface zone of 80 to 100 μm in depth,[5] microabrasion abrades the whole affected enamel. Hence, the esthetic appearance is improved because the fluorotic enamel is removed. Etching with 15% HCl for 120 seconds, according to the resin infiltration technique, removes between 30 and 40 μm of surface layer, thus enabling the resin to penetrate into the deeper affected enamel.[27] The masking effect occurs due to the resin infiltrating the porous subsurface. That is why the application of ethanol is used as a prognostic parameter of the final result. If the wetting effect of the ethanol masks the opacities partially or completely, it means that the infiltrant will penetrate and mask the opacities. For a thicker surface zone additional etching may be necessary, as in the present case.

Home bleaching has also been recommended as an esthetic treatment for fluorosis. The modality that involves the use of a vacuum-formed custom-fitted tray filled with carbamide peroxide (10%-20%) or hydrogen peroxide (1%-10%) and has been validated by several studies.[14,28,29] For pediatric patients, the

Figure 10. *Immediate aspect after resin infiltration and composite resin – teeth 7, 8, 9 and 10.*

Figure 11. *Immediate aspect after rubber dam removal.*

Figure 12. *6-month follow-up.*

Figure 13. *24-month follow-up.*

American Association of Pediatric Dentistry recommends caution in the use of bleaching techniques.[30] Taking into account that in young patients dental pulp is wider than in adult patients and that the diffusion of hydrogen peroxide at high concentrations into dental tissues is extensive, the risk of adverse effects such as sensitivity might be high. Additionally, in contrast to bleaching therapy, which can reduce the microhardness of demineralized enamel surfaces,[31] the infiltrant resin can strengthen the enamel structure mechanically.[32] Therefore, for the current patient, bleaching was not considered.

In contrast to the fluorotic opacities, the demarcated opacity localized in the left incisor did not show any improvement even after a second acid etching. It was decided to use a bur to remove the superficial layer of the opacity and repeat the acid etching. In this case, treatment combining resin infiltration with composite can be considered a minimally invasive procedure because a very thin layer of enamel was removed that was restricted to the area of the demarcated opacity. Microabrasion was not used because of concerns about the risk of postoperative sensitivity considering the amount of enamel that would need to be removed and the patient's young age. However, in a previous case report, a nine-year-old patient had a demarcated opacity that was treated with microabrasion repeated in three consecutive appointments followed by resin infiltration; the patient had no complaints about sensitivity.[33]

The combination of resin infiltration and composite was effective in improving esthetics with minimal loss of tooth structure. Once the demarcated opacity was masked by the infiltrant, the restoration could be done with a single-color composite in a simple and practical procedure. No strategies combining opaque liner and different colors of composite were necessary to obtain the masking effect. Additionally, as bonding on a surface previously treated with Icon is possible,[34] no primer or adhesive was used before inserting the composite resin. The esthetic result showed color stability at the 24-month follow-up.

MIH is relatively common worldwide with an average prevalence of 11.24%,[35] which means pediatric dentists and clinicians will probably have patients with esthetic issues related to this condition and should be aware of possible treatment options. Considering the importance of the smile during adolescence and implications for self-esteem and social well-being to a child, clinicians should consider a conservative and effective approach. In the current case, diffuse and demarcated opacities were masked by the combination of infiltrant with composite in a single session, and a satisfactory outcome was achieved.

CONCLUSIONS

The esthetic treatment based on resin infiltration and composite achieved excellent results with color stability at the 24-month follow-up. Diffuse and demarcated opacities were masked in a single session that improved the patient's self-esteem.

Acknowledgement

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Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies of the ethical committee from Universidade do Estado do Rio de Janeiro. The approval code issued for this study is 07753213.0.0000.5259.

Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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