Responsible Esthetic Improvement of a Smile Utilizing Minimal Intervention, No-Preparation Procedures: A Case Report

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Abstract

Tooth discoloration, particularly when it affects the maxillary anterior teeth, is a widespread esthetic concern for patients. The most common cause of intrinsic tooth discoloration is dental fluorosis. Microabrasion is a technique used to correct surface enamel irregularities and remove intrinsic stains through the application of hydrochloric acid combined with pumice in a paste. The success of microabrasion depends upon the extent and severity of the discoloration and occasionally a slightly yellowish appearance will result; this can be improved by bleaching, with long-lasting results. This article provides a clinical report on the use of microabrasion combined with nightguard bleaching to improve the esthetics of teeth affected by fluorosis.

Key Words: bleaching, esthetics, minimally invasive dentistry, minimal and no-preparation restorations

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Introduction

Tooth discoloration is a concern for many dental patients, particularly when it affects the maxillary anterior teeth.¹ The most common cause of intrinsic tooth discoloration is dental fluorosis (DF),¹ which is enamel hypomineralization due to longterm ingestion of high levels of fluoride during tooth mineralization.² DF results in white opaque areas or discolorations ranging from yellow to dark brown, with porosities on the enamel surface.³ The Tooth Surface Index of Fluorosis (TSIF), developed by Horowitz and colleagues,⁴ is widely used to classify the severity of DF. Utilizing this scale, the examiner determines the extent of affected enamel by estimating the amount of DF as a fraction of the total visible enamel surface.

Microabrasion, introduced by Croll and Cavanaugh in 1986,⁵ is a technique used to correct surface enamel irregularities and remove intrinsic enamel stains through the application of hydrochloric acid combined with pumice in a paste.⁶ When microabrasion is performed correctly and conservatively, the amount of enamel lost is clinically insignificant.⁷ The success of microabrasion depends upon the extent and severity of the discoloration; occasionally, a slightly yellowish appearance will result from the yellow dentin shade showing through the translucent enamel.⁸ Final esthetics can be improved by dental bleaching, with long-lasting results.⁷ The following clinical report discusses the use of microabrasion combined with nightguard bleaching with 10% carbamide peroxide to improve the appearance of teeth affected by fluorosis.

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Clinical Report

Patient History and Evaluation

A 23-year-old female presented to the General Practice Residency Clinic at the Dental College of Georgia at Augusta University wishing to improve the appearance of her stained teeth. The clinical examination revealed the presence of white and brown staining on the facial surfaces of the maxillary anterior teeth (Figs 1-4). The patient's medical history was noncontributory. She reported no previous orthodontic treatment, grew up drinking municipally sourced tap water, and was never given any supplemental fluoride. All anterior teeth were intact and exhibited a retroclined position. Because the anterior teeth were intact a minimally invasive treatment was the only option considered. As the enamel defects appeared to be less than 0.2 mm in depth, with no exposed dentin present or sensitivity reported, a no-preparation protocol was indicated to preserve the integrity of tooth structure. A combined microabrasion and bleaching treatment was presented to, discussed with, and accepted by the patient.

Treatment

After rubber dam isolation was completed, floss ligatures were placed around each of the teeth to displace the rubber dam apically and to have better access to tooth structure (Fig 5). Per manufacturer instructions, a slurry of 6.6% hydrochloric acid with silicon carbide microparticles (Opalustre, Ultradent Products; South Jordan, UT) was applied approximately 1 mm thick to an approximately 3 x 3 mm area of the facial surface from maxillary canine to canine (Fig 6). A bristle polishing cup (OpalCups, Ultradent) in a slow-speed handpiece was used with gentle yet firm pressure for approximately 20 seconds per tooth (Fig 7). The teeth were rinsed (Fig 8), dried, and visually inspected to determine whether additional applications were needed.

This process was repeated four times until adequate surface stain was removed. During the final application, a polishing cup without bristles was used (Fig 9) to help smooth any remaining irregularities (Fig 10). After rubber dam removal, a 5% topical sodium fluoride varnish (Vanish, 3M ESPE; St. Paul, MN) was applied for 2 minutes (Fig 11). A follow-up visit was scheduled for 24 hours posttreatment (Fig 12). Nonscalloped, no-reservoir bleaching trays were fabricated for the patient by using well-trimmed casts placed in an interlocking design on the vacuum-forming machine (Fig 13) with only one sheet of bleaching tray material (Fig 14). These trays were delivered to the patient during the appointment and she was instructed to start a regimen of nightguard bleaching with 10% carbamide peroxide (Opalescence, Ultradent) for 15 days. The patient returned for evaluation throughout the bleaching process and final photographs were taken 21 days after completion (Fig 15) and 3 months after completion (Figs 16-18).

Cowan/Coleman/Pruett/Babb/Romero





Figure 5: Rubber dam isolation and floss ligatures for tissue protection.



Figure 6: Hydrochloric acid slurry covered an approximately 3 x 3 mm area of the facial surface.



Figure 7: A bristle polishing cup was used with gentle yet firm pressure.



Figure 8: Rinsing after first application to inspect teeth to determine whether additional applications were needed.



Figure 9: A polishing cup without bristles was used to help smooth any irregularities.



Figure 10: Aspect of teeth after final application.



Figure 11: Application of 5% topical sodium fluoride varnish.



Figure 12: Smile view at the 24-hour follow-up appointment.



Figure 13: Orientation of well-trimmed casts on vacuum-forming machine to fabricate bleaching trays from one sheet of bleaching tray material.



Figure 14: Bleaching trays after vacuum-forming.

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The texture of the enamel on the central incisors illustrates how conservative a treatment microabrasion actually is when properly performed. 99



Figure 15: Smile view 21 days posttreatment.







Figures 16-18: The patient's smile 3 months posttreatment. The texture of the central incisors illustrates the conservative nature of the treatment.

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Discussion

The etiology of the enamel hypomineralization in this case could not be conclusively determined; therefore, it was deemed idiopathic and a "fluorosis-type" stain.⁹ The patient's initial presentation was considered a 4 on the TSIF scale. Because the white spots appeared to be superficial, it was decided to proceed with microabrasion. As the patient had initially presented with marginal gingival inflammation, she was given oral hygiene instructions prior to treatment.

Microabrasion

The first step of microabrasion is proper isolation of the teeth to be treated. When making holes in the rubber dam, the authors recommend that the holes be 5 mm apart so that the material is less likely to tear interseptally. The thickness of rubber dam material also is more favorable for proper floss ligatures, which is paramount in sealing the gingival tissues from the hydrochloric acid.

The best-known commercially available microabrasion products are Opalustre and PREMA (Premier Dental; Plymouth Meeting, PA). Of the two, Opalustre has been shown to produce faster results.¹⁰ In the authors' experience with microabrasion, adequate coverage of the tooth surface with the slurry paste is crucial. If the slurry is isolated to too concentrated an area on the tooth, that area will appear too shiny in comparison to the rest of the tooth. The clinician in this case used a drop of material that was 3 mm in diameter and 1 mm in thickness to cover the entire tooth, using the rubber prophy cup. This process was repeated three times, after which the patient started to experience sensitivity. However, one more treatment was deemed necessary to remove the white spots and brown stain. The final application involved the use of a prophy cup without bristles to smooth the surface of the tooth. It also was observed that the patient was less sensitive when this cup was used. A topical fluoride varnish was applied immediately after treatment to help with the sensitivity.

Bleaching

At the end of the treatment with microabrasion, some small white spots remained. The patient waited for 48 hours after microabrasion to commence bleaching so that the teeth could fully rehydrate. The patient did at-home nightguard bleaching for 15 days with potassium nitrate toothpaste (Sensodyne, GlaxoSmithKline; Brentford, UK) and reported no sensitivity. The appearance of the white spots and the small brown spot on the left central incisor was greatly improved, with a final TSIF score of 0. The texture of the enamel on the central incisors, as shown in **Figure 17**, illustrates how conservative a treatment microabrasion actually is when properly performed.

Summary

This clinical report described a case in which microabrasion combined with nightguard bleaching was utilized to improve the esthetics of teeth affected by fluorosis. It was a conservative and affordable way to improve the appearance of the patient's stained teeth and she was very pleased with the outcome of the combination therapy.

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