Indications and limits of the microabrasion technique

BENBACHIR-HASSANI, Nacer, ARDU, Stefano, KREJCI, Ivo

Abstract

This clinical report illustrates with clinical cases the indications and limits of microabrasion in patients with discolored anterior teeth. The proposed techniques are based on the elimination of the dysplastic external enamel layer through microabrasion, completed by home bleaching and the use of modern adhesive restorative techniques, if necessary. In specific cases, the proposed technique may eliminate dysplastic enamel lesions without being invasive. The use of minimally invasive techniques based on microabrasion allows for treatment of slight enamel defects. In more severe cases, megabrasion combined with a minimally invasive adhesive resin composite restoration may present a valuable alternative to microabrasion.

Reference


PMID : 18197319

Available at:
http://archive-ouverte.unige.ch/unige:84743

Disclaimer: layout of this document may differ from the published version.
Over the past decades, the demand for esthetic dental treatments has increased considerably. Because this is a general trend, specialists and general dentists alike are challenged to provide esthetic solutions for their patients. Esthetic dentistry seeks to improve the appearance of patients' smiles through an approach that conserves tooth substance. For example, tooth discoloration can be treated in many cases by vital bleaching, which is completely noninvasive. However, in some cases, a minimally invasive technique, such as microabrasion, is required.

Microabrasion treatment is based on the principles described by Croll. It is a safe, efficient, atraumatic method of removing superficial enamel defects. The technique involves the application of a paste containing hydrochloric acid and pumice to the affected tooth surfaces to uniformly remove up to 0.2 mm of enamel surface using a combination of chemical erosion and mechanical abrasion. In the past few years, microabrasion has often been used with vital bleaching to reduce the contrast between white spot lesions and the surrounding tooth surface to uniform tooth color. Microabrasion is also recommended for the treatment of fluorosis, postorthodontic demineralization, localized hypoplasia, and idiopathic hypoplasia where discoloration is limited to the outer enamel layer. Microabrasion is not as likely to succeed in deep lesions caused by amelogenesis imperfecta. When the malformation is too deep, a restorative approach using a resin composite might become necessary, a technique sometimes called megabrasion.

Indications and limits of the microabrasion technique

Nacer Benbachir, DMD1/Stefano Ardu, DMD2/Ivo Krejci, Prof DMD3

This clinical report illustrates with clinical cases the indications and limits of microabrasion in patients with discolored anterior teeth. The proposed techniques are based on the elimination of the dysplastic external enamel layer through microabrasion, completed by home bleaching and the use of modern adhesive restorative techniques, if necessary. In specific cases, the proposed technique may eliminate dysplastic enamel lesions without being invasive. The use of minimally invasive techniques based on microabrasion allows for treatment of slight enamel defects. In more severe cases, megabrasion combined with a minimally invasive adhesive resin composite restoration may present a valuable alternative to microabrasion. (Quintessence Int 2007;38:811–815)

Key words: enamel dysplasia, home bleaching, megabrasion, microabrasion, minimally invasive treatment, white spot lesion

1Lecturer, Division of Cariology and Endodontology, Dental School, University of Geneva, Geneva, Switzerland.
2Lecturer, Division of Cariology and Endodontology, Dental School, University of Geneva, Geneva, Switzerland.
3Professor and Chairman, Division of Cariology and Endodontology, Dental School, University of Geneva, Geneva, Switzerland.

Reprint requests: Dr Nacer Benbachir, Ecole de Médecine Dentaire, Université de Genève, Rue Barthélémy-Menn 19, CH-1205 Genève, Switzerland. E-mail: nacer.benbachir@medecine.unige.ch
Fig 1a  Facial view of white spot lesions.
Fig 1b  Rubber dam application.
Fig 1c  Microabrasion procedure.

Fig 1d  Application of a highly concentrated fluoride gel for remineralization.
Fig 1e  Facial view 3 months after microabrasion and home bleaching.

Fig 2a  Facial view of fluorosis white spot lesions.
Fig 2b  Facial view after microabrasion, with persistent white spot lesions in the proximal and cervical areas.
Fig 2c  The outer layer of the proximal and cervical enamel is removed with a fine diamond bur (15 µm).

Fig 2d  Facial view after removal of enamel defects in the entire buccal area.
Fig 2e  Facial view 2 months after microabrasion and home bleaching.
Proper patient selection is imperative in choosing the correct treatment option and determining the pretreatment prognosis. The purpose of this clinical report is to illustrate with some clinical cases the different indications and limitations of microabrasion on discolored maxillary anterior teeth.

CLINICAL PROCEDURES

Case 1: Enamel hypoplasia

The proposed technique is based on a combination of microabrasion and vital bleaching.

Once the white spot lesion was diagnosed (Fig 1a), but before treatment had begun, meticulous oral hygiene instruction was given to the patient to ensure correct toothbrushing and flossing.

As for all microabrasion procedures, the eyes of the patient, clinician, and dental assistant were shielded with protective glasses. Scaling and polishing were first performed. Rubber dam was then applied (Fig 1b) for chemo-mechanical reactivation of the superficial enamel substrate. Microabrasion was then performed with an abrasive water-soluble paste containing 6.6% hydrochloric acid and silicon carbide microparticles (Opalustre, Ultradent). A small amount of paste was applied to the affected tooth surfaces (Fig 1c), and a special rubber cup (OralCups, Ultradent), attached to a gear-reduction contra-angle, was used to abrade the tooth surface with slight pressure for 60 to 120 seconds. Whenever necessary, a small drop of the product can be added and the abrasion repeated. Several applications may be required. The effect must be optically evaluated after water rinse after each application.

To enhance enamel remineralization, a highly concentrated (12,500 ppm) basic fluoride gel (Binaca Natrium Fluor Gelée, Reckitt & Colman) was then applied to the treated enamel surface (Fig 1d), left undisturbed for 5 minutes, and finally removed by aspiration, but not water sprayed.

After subsequent home bleaching (Nitewhite 10%, Discus Dental) for 10 days, the teeth recovered a uniform and natural appearance (Fig 1e).

Case 2: Fluorosis

When fluorosis was diagnosed (Fig 2a), scaling and polishing were performed, followed by microabrasion with an abrasive paste (Opalustre). After several applications, the white spot lesions disappeared from the buccal surface but not from the proximal and cervical areas (Fig 2b). The additional use of a fine diamond bur (15 µm) to remove the outer layer of the proximal enamel (Fig 2c) was necessary to achieve a natural, spotless enamel (Fig 2d). After subsequent home bleaching (Nitewhite 10%) for 10 days, the teeth recovered a uniform and natural appearance (Fig 2e).

Case 3: Molar-incisor hypomineralization

After molar-incisor hypomineralization (Figs 3a to 3c) was diagnosed, scaling and polishing were performed, followed by evaluation of the lesion depth. In this case, the lesion was too deep to recover an esthetic appearance with microabrasion alone. The lesion was therefore carefully removed invasively with a diamond-coated, 80-µm bur in a red contra-angle handpiece under water-spray coolant (Fig 3d). A bevel was introduced around the preparation using a fine diamond bur to enhance adhesion and esthetics (Fig 3e).

After acid etching with phosphoric acid gel for 60 seconds followed by bonding application, resin composite was stratified using the biomimetic direct composite technique (Fig 3f). After light curing for 20 seconds with a powerful light-emitting diode (LED) light-curing unit, the resin composite surface was characterized using diamond burs (Fig 3g) to provide a natural enamel look. The restoration was then polished with Sof-Lex disks (3M Espe) (Fig 3h). The final esthetic control was performed 2 weeks after restoration, after complete rehydration of the tooth, and the resin composite was found to be well integrated (Fig 3i).
DISCUSSION

As shown by histologic studies, microabrasion removes the dysplastic superficial enamel layer. The microabraded surface reflects and scatters light in such a way that mild imperfections in the underlying enamel layer are masked. Mild surface abrasion of the enamel prisms with simultaneous acid erosion compacts mineralized tissue within the organic part of enamel, thus re-creating the outer, prism-free region. Croll has named this phenomenon the “abrasion effect.” Hydration by saliva improves optical properties of this altered enamel surface; the optical properties are further enhanced by the application of topical fluoride.

Microabrasion masks and removes stained tooth structure and improves tooth coloration. The surface layer formed during treatment is a highly polished, densely compacted mineralized structure. These advantages may be useful in a number of clinical situations, such as for slight enamel hypoplasia or fluorosis, as illustrated by cases 1 and 2. Case 3 is characterized by enamel opacities, asymmetrically affecting incisors and molars. In 2001, Weerheijm et al named this...
phenomenon molar-incisor hypomineralization.\textsuperscript{11} Despite many efforts to find the causes of molar-incisor hypomineralization, no clear etiology has been established.\textsuperscript{12} It can be prevented in posterior teeth by sealing or protecting the occlusal surface of molars with a layer of resin composite or glass ionomer. Esthetic demands may be fulfilled by removing the white spot lesions on incisors using the microabrasion technique in slight cases. However, megabrasion may become necessary if the lesion depth exceeds 0.2 to 0.3 mm. The megabrasion technique enables elimination of deeper white opaque stains in enamel and leads to an acceptable esthetic result in these cases without an unnecessary sacrifice of sound hard dental tissue.

CONCLUSIONS

The use of the proposed minimally invasive techniques based on microabrasion allows for treatment of slight enamel defects that have a negative impact on the esthetic appearance of anterior teeth. This kind of approach, which may be completed by bleaching, conserves maximum tooth substance and earns excellent acceptance by patients. In more severe cases, megabrasion combined with a minimally invasive adhesive resin composite restoration may present a valuable alternative to microabrasion.

REFERENCES