

Understanding and Performing Enamel Micro-Abrasion: A Case Report

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ABSTRACT

Aesthetic dentistry has been drawing particular attention for many years, due to patients' growing interest in the aesthetic appearance of their smile. The importance of appearance and self-esteem has led to an increase in patients' aesthetic demands. Enamel micro-abrasion is a technique that has been proposed for decades. It is indicated for the removal of structural or pigmentation anomalies confined to the enamel surface- more specifically, in the presence of superficial stains or mild enamel hypoplasia, mild fluorosis, mild forms of MIH (Incisal/Molar Hypo-mineralization) or postorthodontic demineralization. This is a physical and chemical treatment that removes the most superficial part of the tooth enamel hosting the dyschromia. This technique provides a satisfactory aesthetic result in cases of mild to moderate fluorosis. The aim of this work is to illustrate, through a case study, the different clinical stages of micro-abrasion, highlighting the indications and precautions to be taken.

Keywords: Dental Fluorosis, Microabrasion, Esthetics, Dental Enamel.

INTRODUCTION

The color of a natural tooth depends on its constituent tissues. Any mechanical, chemical or biological alteration of one of these tissues inevitably leads to a change in tooth color. Today, several types of treatment have been introduced into our daily practice to restore the aesthetic appearance of the smile. These techniques ensure effective results in a minimum of time and at a low cost. When it comes to superficial enamel defects, microabrasion is preferable, as it is considered a conservative aesthetic treatment [1,2].

This procedure was described by Croll et al in 1986 [3] and has met

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with great clinical success. The main indication for enamel microabrasion is the presence of intrinsic dyschromia or altered enamel structure, such as enamel hypoplasia or fluorosis. This technique removes the surface layer of enamel and any stains trapped therein. This is achieved using a gel containing an acid and an abrasive compound. This technique is the first step in treating dyschromia caused by fluorosis. It is the only technique that can treat these discolorations without significantly affecting tooth structure. In fact, this technique respects the principle of tissue economy by being the less invasive technique for dental fluorosis treatments such as direct or indirect restorations. The aim of this work is to illustrate, through clinical cases, the different clinical stages of micro-abrasion, emphasizing the indications and precautions to be observed [4-6].

CASE REPORT

A 16-year-old patient consulted the dental medicine department of sahloul hospital, Tunisia, for aesthetic discomfort due to the presence of stains on the vestibular surfaces of both maxillary central incisors. A preliminary prophylactic cleaning was performed and clinical examination revealed yellow to light brown stains on the incisal third.

Dental mapping (Figure 1) and transillumination (Figure 2) are two necessary clinical parameters for making the diagnosis and proposing a therapeutic approach adapted to the clinical situation.

Tooth mapping of the central incisors showed yellow to light-brown stains located in the incisal third. Transillumination showed stains with sharp contours on both maxillary central incisors, indicating that these stains are superficial.



Figure 1. Tooth mapping.



Figure 2. Transillumination.

The treatment consisted of a microinvasive treatment using micro-abrasion, while at the same time motivating the patient to practise good oral hygiene. At the start of the session, the operating field was set up and the light-curing dam was placed on the vestibular surface of the two maxillary central incisors, particularly in the area without dyschromia (Figure 3).

Next, a micro-abrasive paste was applied to the vestibular surface of both maxillary central incisors (Figure 4) and activated by a specific cup mounted on a low-pressure contra-angle handpiece (300 rpm) at a rate of 10 seconds/tooth (Figure 5) The enamel is chemically removed by an acid (hydrochloric acid). This erosive action was supplemented by an abrasive action, provided by abrasive particles, generally alumina or silicon oxide, incorporated into the acid.

This cycle was repeated 4 times per session. Each cycle was followed by a rinse with water, then drying and aesthetic evaluation. At the end of the microabrasion session, a fluoride paste polish was applied to ensure remineralization of the tooth surface. Two micro-abrasion sessions with a

10-day spacing were sufficient for this clinical case (Figure 6,7). The result was satisfying for the patient, who benefited from 12-month follow-ups, the aesthetic results proved to be stable at the end of this period.

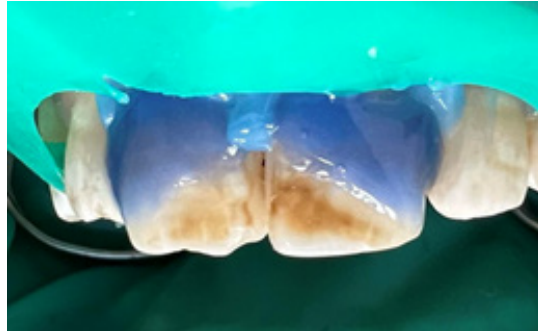


Figure 3. Fitting the rubber dam and protecting the rest of the vestibular surface with the light-curing dam.



Figure 4. Application of opalustre to the vestibular surface only on dyschromia.



Figure 5. Activation of the product for 10 seconds, then a thorough rinse with water.



Figure 6. Result at the end of the first microabrasion session.



Figure 7. Result at the end of the second microabrasion session.

DISCUSSION

Enamel micro-abrasion may be indicated for any enamel discoloration that is thought to be superficial but anchored in the tissue and not deposited on the surface (Pini et al., 2015) [7]. Dental fluorosis is the most common indication [8].

This pathology results from chronic fluoride intoxication and appears clinically as white, opaque lines, entirely chalky white surface or as dark yellowish or brownish dyschromias. The severity of discoloration increases with age and fluoride dose.

The enamel stain or defect is removed by combining the erosive and abrasive effects of a mixture containing a low-concentration acid and an abrasive agent. This mixture is applied mechanically using a special cup mounted on a low-rotation contra-angle handpiece. This procedure should be the first option for managing these intrinsic dyschromias, and can achieve a satisfactory aesthetic result in cases of mild to moderate fluorosis [8]. In the case of yellowish or brownish discoloration, microabrasion of the enamel can improve the aesthetic appearance of the teeth, but it must be combined with other whitening techniques to secure the result [9]. Enamel microabrasion may also be indicated for

localized enamel hypoplasia, whatever the etiology. White spots can also be treated with microabrasion, provided of course that the risk of caries is kept under control.

Stains associated with IMH (Incisal Molar Hypomineralization) cannot be treated by microabrasion, as they originate at the amelo-dentinal junction and extend to the periphery. The microabrasion technique does not enable aesthetic improvement of this type of dyschromia, since it only removes the most superficial part of the tooth enamel. In fact, the success of the treatment depends on the depth of the dyschromia in the enamel. It can be estimated that dyschromia anchored less than 200 μ m into the enamel can be removed by microabrasion (De Macedo et al., 2008) [7,10].

Some tricks can be used to estimate the depth of dyschromia. A black-and-white photograph of a tooth reveals variations in brightness and translucency within the tooth. The deeper an area is stained within the enamel thickness, the lighter it will absorb and the opaquer it will appear (Terry et al., 2013) [11].

Transillumination can also be used to assess the depth of dyschromia, using an LED or halogen curing light placed on the lingual side of the tooth. The lighter the stain absorbs,

the darker it appears with sharp contours and the more superficial it is (Sundfeld et al., 2014) [5].

In order to eliminate superficial enamel discoloration, particularly the one due to fluorosis, the erosive action is supplemented by a mechanical abrasive action, provided by abrasive particles, generally alumina or silicon oxide, incorporated into the acid. The use of this procedure results in a loss of enamel thickness evaluated by *in vitro* studies at between 25 and 200µm, depending on various criteria such as the type of acid or the application pressure [5,12].

Croll currently offers a pre-mixed, syringe-packed paste (Opalustre Bisico). This paste consists of 18% hydrochloric acid, mixed with a micronized silicon oxide abrasive. Préma® from Premier Dental Products contains 10% hydrochloric acid and silicon carbide particles with particle sizes ranging from 30 to 60µm. Whiteness RM® from FGM contains 6% hydrochloric acid and silicon carbide particles of unspecified particle size. A paste can also be prepared on request. It consists of a mixture of 35% phosphoric acid gel and micronized pumice powder. This mixture gives good results [13].

Application occurs by rotation, at 500 rpm, using a dedicated cup supplied in the kit. Time, number and pressure factors influence enamel loss. Indeed, if two or three factors are increased simultaneously, enamel loss is potentiated. To avoid splashing, we recommend that conventional rotating instruments such as brushes or felt-tip pens should not be used for microabrasion, even at slow speeds [14]. In our case, a 1 mm-thick layer of micro-abrasive paste (Opalustre®) was applied to the relevant tooth surfaces and rubbed in using a special silicone cup (OpalCup), with a relatively rigid brush at its center, in order to rub the enamel surfaces with gentle pressure for 5 to 10 seconds per tooth. The paste is then removed by rinsing with a spray after each cycle, while aspirating. This procedure should be repeated 5 times for mild lesions and 10 times for moderate and severe lesions in the same session [15].

At the end of each micro-abrasion session, the treated teeth are thoroughly rinsed with water and fluoridated with a 1% sodium fluoride gel for 4 minutes. The purpose of this fluoridation is to reduce the risk of postoperative sensitivity and protect the teeth against possible external demineralization.

Several authors recommend a combination of micro-abrasion and external brightening. In fact, loss of enamel

thickness can reveal underlying dentine, giving teeth a yellowish appearance after micro-abrasion. Micro-abrasion can be used to reduce saturation and harmonize color, especially in cases of fluorosis where teeth have a chalky, cloudy appearance that can be reduced by micro-abrasion. Several authors recommend a combination of micro-abrasion and external bleaching, as the loss of enamel thickness can cause the underlying dentin to show through, resulting in a yellowish appearance of the teeth after micro-abrasion. Micro-abrasion can be used to reduce saturation and harmonize color, especially in cases of fluorosis where teeth have a chalky, cloudy appearance that can be reduced by micro-abrasion. External bleaching optimizes aesthetics by reducing the contrast between healthy and stained enamel [16]. Today's aesthetic dentistry is only willing to concede enamel loss on a micrometer scale. This is why, after microabrasion and its losses estimated at less than 200µm, the development of composite resins has brought us infiltration with its losses of 30 to 40µm. When tissue loss is required to improve aesthetics, microabrasion is no longer the first choice. Nevertheless, it remains a preferred solution, since it does not require the addition of any material, thus avoiding the ageing process and all that this implies in terms of color stability and bacterial penetration at the interface [17,18].

CONCLUSION

Dental fluorosis is defined as a qualitative anomaly of the enamel, clinically presenting as opacities in the enamel that can affect several groups of teeth symmetrically. Depending on the stage, different treatment options are considered, among which enamel microabrasion is favored for its ability to effectively eliminate superficial dyschromias. This technique combines chemical and mechanical processes, involving the application of a mixture of acid and abrasive agent to the teeth concerned. It is the non-invasive treatment of choice for mild to moderate fluorosis, and offers a satisfactory aesthetic result. The patient's psychological profile is an important factor in avoiding setbacks in this field. The aesthetic request must first and foremost come from the patient. It is not advisable to start an aesthetic treatment on a patient who has not expressed a demand for it.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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