OPEN ACCESS

Saudi Journal of Oral and Dental Research

Abbreviated Key Title: Saudi J Oral Dent Res
ISSN 2518-1300 (Print) |ISSN 2518-1297 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Case Report

Minimally Invasive Approach for Aesthetic Management of Enamel Fluorotic Stains: The Microabrasion Technique as a Solution

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DOI: 10.36348/sjodr.2021.v06i09.003 | **Received:** 03.06.2021 | **Accepted:** 07.07.2021 | **Published:** 15.09.2021

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Abstract

Dental fluorosis is a common disorder characterized by hypomineralisation of the tooth surface and affect the aesthetic appearance of the teeth. (2) It is caused by excessive and chronic consumption of fluoride during odontogenesis. (1) The affected teeth are characterized by the presence of stains with different colors (white or brown) associated or not to loss of substance (1). This aesthetic damage has a significant impact on the quality of patient's life. (1, 2, 3)**.** To manage this aesthetic problem, superficial irregularities and certain intrinsic stains could be solved by Enamel micro-abrasion procedure. This conservative technique could be followed by in-office or at-home bleaching. (1, 2, 3) Hence, the objectives of this article are:

- To discuss the indications and limitations of enamel microabrasion.
- To present three case reports treated by enamel microabrasion.

Keywords: Enamel microabrasion, dental fluorosis, clinical diagnosis, remineralization, minimally invasive treatment, stain removal.

INTRODUCTION

Dental fluorosis is a disorder of tooth formation characterized by hypomineralisation, discolored and unpleasant appearance of the teeth [1, 2]. In fact, dental fluorosis is caused by an excessive and chronic ingestion of florid during amelogenesis [1].

Fluoridated water in some areas, toothpaste and supplements florid in milk and salt are the most common sources of excessive ingested florid [6].

Referring to the World Health Organization (WHO) recommendations, dental fluorosis could occur if florid concentration ingested is more than 1.5 and 4 mg /l [6, 11].

Recent studies showed that socioeconomic status play an important role in the severity and level of exposure to dental fluorosis [5]

Depending on the severity of dental fluorosis, enamel is characterized by the presence of tiny white striations in the wild form and may become mottled, discolored and/or pitted in the severe shape [4].

Referring to literature, dental fluorosis may be managed by many techniques such as resin composite, laminate veneers or crowns. However, all these techniques are not generally recommended for young and adult patients [3, 4, 12].

Accumulating evidence revealed that the microabrasion procedure is efficient, effective and

secure to eliminate the discolored stain limited to the outer enamel layer [3].

This procedure is considered as a safe, atraumatic and conservative method that offers efficient and permanent results [1, 2, 3, 12].

Herein, the aim of this article is to show the effectiveness of micro-abrasion technique to remove dental fluorosis stains and to establish the smile aesthetics.

CLINICAL CASES

Case report N°1

A 29-year-old patient consulted with a chief complaint about the appearance of his front teeth. Anamnesis revealed that the patient lived the majority of his life in a region with optimal florid concentration.

No systemic disorder was recorded. Medical and family history was not relevant. Clinical examination showed an insufficient oral hygiene, opaque white stains over the mild third of maxillary central and lateral incisors and brown stains were noted over the mild third of central incisors.

The diagnosis was a mild fluorosis staining determined by using Dean's fluorosis index (Figure 1). First, a dental scaling was achieved. Then, the microabrasion technique with Opalustre™ (Ultradent) had been chosen for aesthetic improvement of the teeth with stains.

The first step was to isolate upper anterior teeth with the rubber dam. Then, we applied the Opalustre™ (Ultradent) micro-abrasion paste over labial surfaces of the six anterior teeth. (Figure 2).

Tow applications were achieved, in every one the stained enamel was micro braided with an OpalCup™ (Ultradent) attached to a gear contra-angle turned at slow speed for 15-20 seconds. Then, the surface was rinsed off and carefully examined (Figure 3).

The enamel surface was polished and a topical florid gel was applied to minimize the sensitivity to cold and hot stimulus on teeth. Finally, the rubber dam was removed (Figure 4).

Follow-up examination was released after 1 month. The aesthetic result was maintained and the patient showed satisfaction (Figure 5).

Fig-1: Initial view of the patient's anterior upper teeth

Fig-2: The affected teeth were isolated with a rubber dam to avoid contact between microabrasion paste and the soft tissues of the oral cavity

Fig-3: The microabrasion paste was applied on the enamel surface of the upper teeth. The paste was scrubbed with a rubber cup for 15-20 seconds.

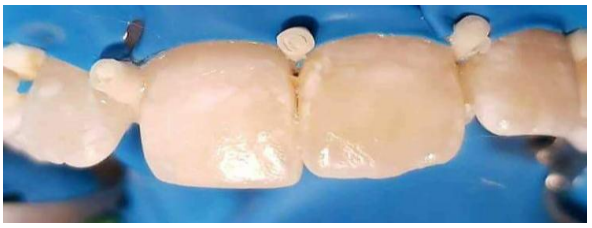

Fig-4: Post-operative view after 2 visits

Fig-5: Post-operative view after 1 month follow-up

Case report N°2

A 25- year old patient looked for cosmetic treatment for his teeth that presented brown stains. Diagnosis: Mild fluorosis staining referring to Dean's Fluorosis Index. Treatment proposed: Enamel Microabrasion technique with Opalustre™ (Ultradent).

Fig-6: Initial image of the patient with brown stains of fluorosis affecting especially the upper anterior teeth

Fig-7: Enamel appearance after two applications of Opalustre™.

After the microabrasion method, the surface was polished and a desensitizing fluoride paste was applied for 5 minutes. The patient was greatly satisfied.

Case report N°3

A 20 year-old female patient consulted with a complaint about the appearance of her teeth that present brown stains and an irregular enamel surface.

Diagnosis: moderate fluorosis staining referring to Dean's Fluorosis Index. The treatment plan presented to the patient included enamel Microabrasion by opalustre™ (Ultradent) followed by resin composite restoration.

Fig-8: Preoperative view

Fig-9: The microabrasion paste was applied on the enamel surface of the upper anterior teeth. Then, it was scrubbed on the stained enamel with a rubber cup for 15-20 seconds. After that, the enamel surface was rinsed off and air-dried for examination

Fig-10: A desensitizing fluoride paste was applied for 5 minutes

Fig-11: Postoperative view after the microabrasion procedure and resin composite restoration

DISCUSSION

Dental fluorosis is a hypomineralisation of enamel surface with intensity ranges from barely noticeable striations to brown, dark stains with discrete or confluent pitting on the surface [2].

Many indexes and classifications have been proposed to measure the dental fluorosis. In our treated three clinical cases, we used Dean's index [6, 12].

In clinical practice, the diagnosis of dental fluorosis should be determined carefully. In order to avoid missing diagnosis, the clinician must establish the differential diagnosis for:

1. Molar incisor hypomineralisation (MIH)
2. Varieties of amelogenesis imperfecta
3. Dentinogenesis imperfecta
4. Tetracycline stains
5. White spots of carious lesions.

Microabrasion treatment is generally recommended for correction of surface irregularities that may be attained after the removal of orthodontic brakets or induced by imperfect enamel formation. This procedure is also indicated for fluorosis and idiopathic hypoplasia when discoloration is limited in the surface [13, 10].

Enamel microabrasion should be indicated as the first option in case of mild and moderate fluorosis. The result is highly satisfactory, effective and safe [10, 3, 1].

Microabrasion should not be indicated in case of dental sensitivity, gingival recession, tooth crack, dentinogenesis imperfecta and tetracycline discoloration [13, 3].

In addition, enamel microabrasion can be delayed for patients who have deficient lip sealing which make demineralization more apparent [10, 3, 12].

In 1970, mechanical application with a low rotation micro motor using a mixture of hydrochloric acid hydrogen peroxide and ether was indicated. Then, Murrin *et al*. in 1982 proposed the combination of 36 % hydrochloric acid to pumice.

Concerning the acid concentration and its dangerous use in the mouth, Croll revealed that the microabrasion system should contain a lower acid concentration mixed to pumice in a water soluble mixture and applied with a low rotation micro motor [10].

Recently, many safe and efficient microabrasion products were commercially available such as Prema compound (Premier dental product, USA), Opalustre™ (Ultradent) and Whitness RM (FGM). The already mentioned products contain (10; 6; 6, 6%) respectively of hydrochloric acid mixed to Silica carbide with different granulation and dispersed in a water soluble gel [1, 10, 12].

For Opalustre™ product, the dentist should apply a little quantity of the paste on stains and surface irregularities and use a rubber cup with a 10:1 gear reduction angle for 5 to 20 seconds [12].

It is also recommended to rinse the enamel surface after each application and to apply for 4 minutes a gel containing 2% of neutral sodium floride in order to decrease sensitivity of the treated teeth [12].

In fact, Fragoso *et al*. in 2011, after evaluating different procedures on bovine enamel, they concluded that microabrasion followed by polishing the surface by diamond paste or application of floride offers a better surface smoothness and increase the hardness, the remineralisation process of the dental enamel [3, 14].

To make the microabrasion safer and more efficient, Nahsan *et al*. in 2011 suggested the use of 37% of phosphoric acid with pumice. Referring to literature, both compound (HCL with pumice, phosphoric acid with pumice) show effectiveness and durable results in removing fluorosis stains. However, products based on HCl take the lower treatment duration [3, 15].

The microabrasion treatment had insignificant loss of enamel, in fact referring to Celik *et al*. 2013, the microabrasive technique removes only the outer enamel layer [12].

Depending on the number of applications the enamel loss varies from 25 to 200 ym after 5 to 10 applications. For that, the microabrasion is considered as a safe and conservative technique [3, 1].

Referring to literature, the enamel loss with microabrasion technique depends on the pressure used, acid concentration and the time of application [10, 1].

Abrasive and erosive effect of microabrasion depend on several parameters such as time of application, the force applied and revolutions per minutes, concentration, pH of acid used and finally pumices granulations [10, 5, 9].

Microabrasion technique increases the roughness of enamel. However, it reduces the enamel microhardness [14, 10]. Referring to literature, these effects could be inverted by polishing the surface and the exposure to saliva [10, 14].

During the microabrasion procedure, erosive acid and abrasive particles have an effect on the enamel surface called “Abrosion effect” (abrasive and erosive effect) giving the enamel special histological and optical characteristics [1, 10, 3, 9].

Concerning the histological particularities, the erosive action of the acid leads to the disorganization of prisms. During its reorganization, there is a production of highly compacted prism free region in the surface reinforced with particles from microabrasion material such as silica on polishing pastes (fluorides) [1, 10].

Concerning optical properties, treated enamel becomes smoother without irregularities with shiny and lustrous surfaces [1, 10, 3].

The microbraded surface reflects and refracts light differently in a rough way that the remaining subsurface stains could be masked [1, 10, 3]

CONCLUSION

The clinical findings in our case reports substantiate the use of minimally invasive technique involving microabrasion in case of mild dental fluorosis because it is efficient and effective for improving the esthetic appearance and garantees a permanent result.

Accumulating evidence and the results of our clinical cases support the use of enamel microabrasion as a first approach to manage mild dental fluorosis for young patients and who are searching for a minimally invasive treatment.

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