

Minimally Invasive Microabrasion Technique for Conservative Management of Dental Fluorosis Stains: A Case Report

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ABSTRACT

Dental fluorosis is a condition caused by a high fluoride intake during the tooth developmental stage. It causes chalky white or brownish-yellow surface stains, significantly affecting the patient's aesthetics. Management of dental fluorosis includes dental bleaching, microabrasion, macroabrasion, and veneers. The current case report highlights a conservative, minimally invasive treatment approach using the microabrasion technique for mild-to-moderate dental fluorosis. Enamel microabrasion involves the application of hydrochloric acid and pumice slurry. It effectively removes superficial stained enamel layers while preserving the tooth structure. Microabrasion conservatively manages the yellow-brown superficial stains. However, the microabrasion may require multiple applications to achieve the desired results.

Key Words: Microabrasion, Stains, Fluorosis, Aesthetic, Conservative treatment.

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INTRODUCTION

Dental fluorosis is a condition caused by excessive fluoride intake during tooth formation. The free fluoride ions reduce calcium ion concentrations in the enamel matrix, which affects the normal mineralisation process and interferes with proteases that degrade matrix proteins during maturation. This leads to porous, hypomineralised enamel eruption. Fluorosis manifests as white, opaque spots or discolouration, ranging from yellow to brown, and may involve porosities on the enamel surface. When fluorosis affects the front teeth, it presents a cosmetic issue that can significantly impact an individual's self-esteem. As a result, management of dental fluorosis through conservative aesthetic treatments not only improves the appearance of the smile but also enhances the confidence of affected patients.¹

Treatment protocols for the management of dental fluorosis vary based on the severity of the stains. It can include conservative options such as microabrasion, bleaching, and other invasive approaches such as composite restorations, veneers, or full crowns.

For mild-to-moderate fluorosis, enamel microabrasion is typically the first-line treatment choice for improving the appearance of stains with no reported postoperative pulpal complications.² Enamel microabrasion involves the removal of the porous subsurface layer of enamel, along with any trapped stains, through the application of a gel containing hydrochloric acid (HCl).³ This case report demonstrates the treatment of moderate stains of dental fluorosis using microabrasion.

CASE REPORT

A 27-year female patient presented to the operative dentistry department with a concern about brown stains on her teeth. She complained that her teeth had brownish-yellow stains which affected her aesthetics and smile. She also added that she had these stains since childhood, and all her siblings also had the same issue with different severities. She did not have any other complaints of pain or sensitivity.

On clinical examination, the patient had a normal smile line and brownish-yellow stains on maxillary central incisors, cervical area of lateral incisors, and the tip of canines. She also had multiple white spots on her anterior and posterior teeth, but her chief concern was dark stains on her anterior teeth (Figure 1). The radiographic examination showed that all teeth had a normal periodontal ligament space and maintained lamina dura. A cold test was performed to check the vitality of the teeth, and the teeth gave a normal response on sensibility testing.

The presence of brownish-yellow and chalky white stains on anterior and posterior teeth indicated the diagnosis of fluorosis with the tooth fluorosis index 4. So, the treatment strategy for the patient comprising a minimally invasive approach of microabra-

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sion was suggested with 6.6% HCl slurry. The clinical procedure before microabrasion included polishing teeth with abrasive paste and a polishing brush. After rinsing with water, rubber dam isolation was done by placing rubber dam clamps on premolars and securing them with dental floss in the dental sulcus of teeth.

The Opalustre gel of approximately 1 mm thick layer was applied on the anterior surfaces of all isolated teeth. The surface was microabraded with the OpalCupse prophy cups (Ultradent Products Inc.) connected to a contra-angle using slight pressure for 10 seconds (Figure 2 A,B).

The slurry was removed, and the surface was rinsed after each application and the procedure was repeated six times. After achieving the desired results, the surface was rinsed and dried for the application of fluoride varnish (Enamelast™). Postoperative photographs were taken, and postoperative instructions were given to patients (Figure 3).



Figure 1: Preoperative photograph of patient showing brownish-yellow stains on the anterior surface of teeth.

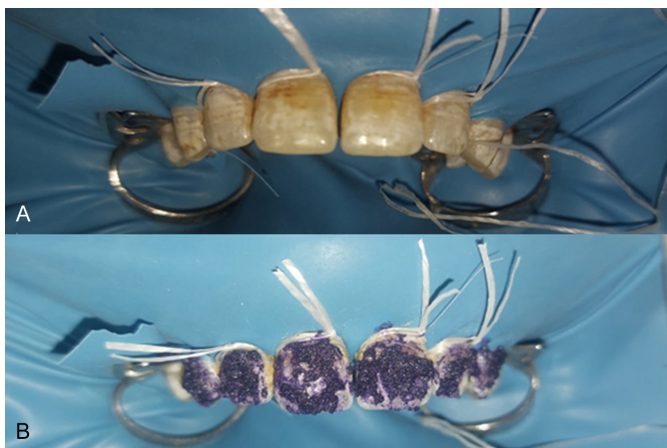


Figure 2 (A,B): Application of rubber dam and opalustre gel.



Figure 3: Postoperative photograph of the patient after microabrasion.

DISCUSSION

Dental fluorosis can be classified based on the surface involved and staining intensity. For mild fluorosis with Thylstrup and Fejerskov Index (TFI) scores of 1-2, bleaching may be a suitable option, while moderate fluorosis with TFI scores of 4-5 might benefit from microabrasion, which involves the acidic removal of affected enamel. In cases with TFI scores of five and above, microabrasion can be combined with composite restorations or porcelain laminates. For severe fluorosis with TFI scores of 8-9, crowning the teeth may be the preferred approach, as discolouration can be challenging to treat with minimally invasive methods. In this case, the diagnosis and treatment followed this established protocol.⁴

Microabrasion is one of the conservative and minimally invasive treatment approaches for managing mild-to-moderated surface brownish-yellow stains. Enamel microabrasion involves the combined use of erosion and abrasion techniques to remove the outer layer of enamel, typically eliminating between 50 and 200 µm of enamel. HCl (18%) is the most commonly used acid for microabrasion, typically combined with a granular substance to form a slurry. This microabrasion technique creates a prism-free outer enamel surface, enriched with minerals, and less prone to the rapid formation of acquired pellicle and colonisation by *Streptococcus mutans* on the smooth surface. During microabrasion, calcium and phosphate are compacted into the interprismatic spaces while the enamel surface is abraded. As a result, the enamel appears brighter and more reflective.⁵ In this case, the microabrasion technique was employed for the moderate dental fluorosis stains because it was the least invasive technique and preserved the enamel surface. One study found that applying an 18% HCl and pumice mixture for 10 successive five-second applications led to an initial enamel removal of 12 µm. After 50 five-second applications, the removal ranged from approximately 36 µm to 100 µm of enamel.⁶ This demonstrates that the degree of enamel abrasion can vary depending on the number of applications and the duration of each session. The Opalustre gel used in the case has 6.6% HCl, which allows the safe application and minimum abrasive effect on the tooth surface.

In conclusion, microabrasion is an effective, conservative, and cost-effective approach for mild-to-moderate dental stains. It preserves the tooth's natural structure and provides satisfactory results to the patients.

PATIENT'S CONSENT:

Informed consent was obtained from the patient to publish the data concerning this case.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

NS: Conception of the study design, drafting of the case report, and data collection.

SAK: Supervision and critical analysis of the manuscript.

Both authors approved the final version of the manuscript to be published.

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