

Original Article

Combining Microabrasion and Remineralization for Effective Enamel Stain Treatment

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ABSTRACT

Dental fluorosis is a leading cause of unsightly smiles due to the discoloration of the teeth, especially affecting incisors and cuspids. These stains, ranging from mild to moderate fluorosis as well as tobacco stains, can create an unappealing appearance. A minimally invasive technique known as enamel microabrasion has been proposed as a solution that effectively improves aesthetics while minimizing enamel loss. However, the abrasive nature of this procedure may cause post-operative sensitivity. To address this problem, the use of remineralizing agents applied topically after microabrasion has shown promise in reducing these effects. This case report highlights the treatment of fluorosis and tobacco stains in two male patients aged 28 and 33 years, using microabrasion followed by remineralization. The results demonstrate the effectiveness of combining these techniques for optimal aesthetic results. The clinical relevance lies in offering a minimally invasive, non-restorative approach that ensures excellent long-term esthetic results.

Keywords: Combination technique, Macro-reduction, Remineralization, Microabrasion.

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Introduction

An unattractive smile can significantly affect the psychological well-being of young individuals, often leading to reduced self-confidence and esteem [1]. Several factors can contribute to tooth discoloration or pitting, including conditions such as amelogenesis imperfecta, enamel hypoplasia, and dental fluorosis, as well as external influences like tobacco, tea, coffee, and red wine, alongside various intrinsic causes [2]. Dental fluorosis is characterized by white, matte patches on the enamel, often appearing opaque, streaky, or blotchy. These discolored areas typically become stained, creating an undesirable appearance. This

presents a challenge for dental professionals aiming to meet the aesthetic needs of patients. In cases of mild to moderate fluorosis or extrinsic stains, such as those caused by tobacco, enamel microabrasion is an effective and favored treatment approach that delivers satisfying cosmetic results. This minimally invasive technique involves minimal enamel reduction, causing little patient discomfort while leaving behind a smooth and lustrous surface that provides long-term benefits. Furthermore, microabrasion reduces the necessity for more invasive restorative treatments, which is particularly advantageous in treating younger patients [3]. Microabrasion works by removing a thin layer of enamel using a specialized abrasive material, preserving the integrity of the enamel surface. First

introduced in 1916 by Dr. D. Kane, hydrochloric acid (HCl) was used to improve the appearance of teeth affected by fluorosis [4]. Since then, research has explored the use of various concentrations of HCl (ranging from 6.6% to 18%) and phosphoric acid (ranging from 30% to 40%) in combination with abrasives, further enhancing the technique's effectiveness [5]. Enamel microabrasion has proven to be a successful, esthetic, and conservative treatment for addressing superficial enamel defects or stains [6]. Additionally, post-treatment sensitivity is alleviated by the use of remineralizing agents, such as Remin Pro®, which hydroxyapatite, contains fluoride, and xylitol to support enamel remineralization and strengthen the tooth surface [7, 8].

This case report highlights the treatment of fluorosis and tobacco stains in two male patients aged 28 and 33 years, using microabrasion followed by remineralization.

Case Study

Case 1

A 33-year-old male patient visited the Department of Conservative Dentistry and Endodontics at Inderprastha Dental College and Hospital in Sahibabad with the primary concern of staining on his upper and lower anterior teeth. The patient reported having noticed this discoloration over the past 5-6 years, with a history of tobacco use spanning 9-10 years. There were no relevant systemic health issues or family history noted. Upon clinical evaluation, generalized brown staining was observed. Vitality tests, including the electric pulp testing and cold test, were conducted on the upper and lower anterior teeth, all of which responded normally. After discussing various treatment options, the patient opted for a conservative method. The treatment plan was thoroughly explained to the patient, and consent was obtained. The approach involved enamel microabrasion followed by the application of Remin Pro, a remineralizing agent.

The treatment began with pre-operative photographs after an oral cleaning. Rubber dam isolation was applied to the upper arch, followed by the placement of a gingival shield that was light-cured. The patient was provided with protective eyewear. Opalustre (Ultradent products) was selected for microabrasion to improve aesthetics with minimal enamel removal. A 1mm layer of Opalustre was applied to the labial surfaces of the six upper anterior teeth (central incisors, lateral incisors, and canines), and the surface was carefully abraded using small rubber cups and a contra-angle handpiece. After 60 seconds per tooth, the treated area was rinsed and observed, with the process repeated

with a second layer of Opalustre. This procedure was also applied to the lower anterior teeth. After the microabrasion, Remin Pro cream (Voco) was applied to the treated teeth for 4 minutes, and the patient was instructed to continue home applications three times a day for 2 weeks.

Case 2

A 28-year-old male patient visited Inderprastha Dental College and Hospital, Sahibabad, with a complaint of staining on his upper and lower anterior teeth. The patient mentioned that the discoloration had been present for the past 10-12 years. No systemic health concerns were reported, but the patient lived in an area with high fluoride levels. Due to the unattractive appearance of his teeth, he was self-conscious about talking or smiling. Based on Dean's fluorosis index, he was diagnosed with moderate fluorosis. The armamentarium used in this study is presented in **Figure 1**.

For this case, the steps followed in Case 1 were repeated, with the addition of enamel macro-reduction (**Figure 2**), which involved trimming the enamel surface with a fine diamond bur before applying the Opalustre (Ultradent products).

The pre and post-treatment images for Case 2 are shown in **Figure 3**.

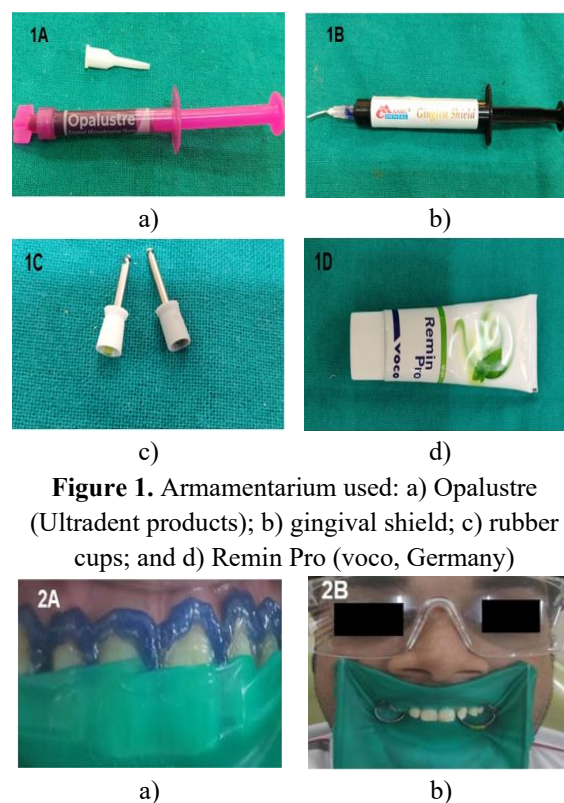


Figure 1. Armamentarium used: a) Opalustre (Ultradent products); b) gingival shield; c) rubber cups; and d) Remin Pro (voco, Germany)

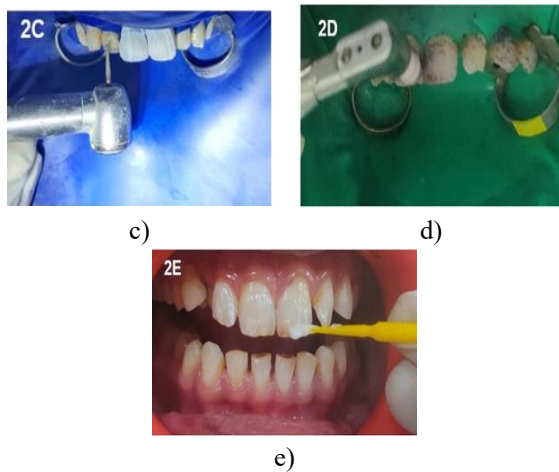


Figure 2. a) application of gingival shield; b) rubber dam application; c) enamel macro reduction; d) application of Opalustre; and e) application of Remin Pro



Figure 3. a) case 1 pre-operative; b) case 1 post-operative; c) case 2 pre-operative; and d) case 2 post-operative

Results and Discussion

Aesthetic concerns can have a profound psychological impact on individuals of all ages, particularly young adults, affecting their confidence, social interactions, and emotional well-being. Enamel microabrasion has gained prominence as a conservative and non-invasive approach for addressing superficial enamel defects, particularly those associated with demineralization and decalcification [9, 10]. This technique involves the removal of only a minimal amount of stained enamel, thereby reducing the likelihood of post-procedural discomfort or sensitivity. Additionally, the procedure is often completed in a single session, making it a convenient option for patients. The immediate and long-lasting aesthetic improvement is attributed to alterations in the enamel surface following microabrasion, which refracts light that masks discoloration rather than merely covering it [11].

According to Sundfeld *et al.* [12], the application of micro-abrasive agents such as Opalustre, combined with 30%-40% phosphoric acid, results in an enamel reduction of approximately 25 to 200 μm , an amount considered clinically acceptable. The process of mechanical acid erosion and abrasion simultaneously leads to the deposition of mineralized tissue within the enamel's organic matrix, which increases surface roughness while minimizing microstructural alterations [13, 14]. However, the effects can be naturally reversed with saliva exposure, which aids in the restoration of enamel integrity [14-16].

In the present clinical case, microabrasion effectively restored the natural appearance of the teeth. Following the procedure, a remineralizing agent, Remin Pro, was applied to enhance the results. The application of this agent played a crucial role in reducing post-procedural sensitivity and stabilizing the enamel's mineral balance by reinforcing its crystalline structure. Remin Pro®, manufactured by Voco, Cuxhaven, Germany, contains fluoride, hydroxyapatite, and xylitol, which promote the neutralization of acids and aid in the restoration of demineralized and eroded enamel surfaces. The combined action of fluoride and hydroxyapatite significantly contributes to the remineralization and strengthening of the enamel substructure [8].

The effectiveness of enamel microabrasion depends on various factors, including the severity of the stains, the number of applications, and the condition of the patient's enamel. Since the procedure is minimally invasive and preserves the natural tooth structure, it is suitable for patients of all ages [17]. However, individuals with incomplete lip closure may not be ideal candidates for this treatment, as continuous enamel dehydration could compromise the outcome [13]. Additionally, research suggests that combining enamel microabrasion with bleaching can further enhance aesthetic outcomes, making it an effective approach for managing discolored teeth [18].

Conclusion

Enamel microabrasion is an effective technique for enhancing a patient's self-confidence by improving dental aesthetics and achieving a uniform tooth color. This method is particularly reliable for addressing superficial enamel stains and defects, as it is a safe, conservative, and non-traumatic procedure that preserves the integrity of the teeth. Given its minimally invasive nature, enamel microabrasion serves as the preferred treatment option for individuals seeking aesthetic improvements without extensive restorative intervention. Additionally, remineralization therapy following microabrasion plays a crucial role in

optimizing treatment outcomes by minimizing post-procedural sensitivity and reinforcing enamel structure, making it a highly beneficial approach for managing various types of enamel discoloration.

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