

**A minimally invasive approach for aesthetic and smile enhancement using enamel microabrasion technique: Reports of two cases****Akash Kumar Baranwal**

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**ABSTRACT:**

Among the young patients with their anterior teeth involvement, aesthetic is usually a major factor that may produce a challenge to the dentist. Discoloured teeth may often affect the general population and dental fluorosis can be a major problem in areas of endemic fluorosis such as in India. The fluorosis resulting in discoloration of teeth may have various treatment options like bleaching, veneering (composite or ceramic), or artificial crowns and microabrasion.

Among these, the microabrasion is a conservative, aesthetic treatment used for the selective removal of localized areas of intrinsically stained superficial enamel, usually caused by fluorosis and/or enamel hypoplasia (white spots). The purpose of this paper is to illustrate the two case reports of fluorosis treated with microabrasion technique applied over inactive brown spots present on maxillary anterior teeth helping further in patient's aesthetic and smile enhancement.

**Keywords:** Microabrasion, fluorosis, aesthetic, bleaching, conservative.

**INTRODUCTION:**

Dental fluorosis may be result of chronic endogenous intake of fluorides in amounts that exceed the optimal daily dose of 1 ppm<sup>1, 2</sup>. Depending on the amount of fluoride intake, the tooth may show different degrees of changes in its enamel.

The enamel affected by fluorosis may generally show an altered structure resulting in more susceptibility towards fracture and wear.<sup>3</sup> Clinically, their shades may alter from white to brownish.<sup>4</sup> Histologically, it is consisting of hypomineralized sub-surface areas limited to few micrometers from the external mineralized surface and it can have increased level of porosity.<sup>5</sup>

The ultrastructural studies about the affected structure have reported the appearance of highly uniform, flattened, hexagonal crystals in the outer regions and irregular crystals in

the inner regions, more closely resembling those explained for normal enamel.<sup>6, 7</sup>

The modes of treatment for such cases may range from invasive ceramic veneer bonding restorations to abrasive chemical treatments, depending on the degree or extent of the enamel stains.<sup>8</sup> Bleaching, micro-abrasion and composite resin restorations are widely used as minimally invasive approaches since they are cheaper and less time-consuming treatments.<sup>9</sup>

Enamel microabrasion being a conservative technique, modifies the superficial enamel to improve discolorations as it is limited to outer enamel layer only. According to an in-vitro study by Sundfeld, et al. (2007)<sup>10</sup>, enamel microabrasion technique results around 25-200 µm loss of enamel depending on the number of applications and acids concentration.

The enamel microabrasion technique, consists a mixture of 18% hydrochloric acid and

pumice<sup>11</sup> or 6.6% and 10% hydrochloric acid<sup>12</sup> with silica carbide particles, or even 37% phosphoric acid.<sup>13</sup> Commercially available microabrasion kit Opalustre (Ultradent Products, Inc) (**Figure 1- Opalustre Kit**) is a chemical and mechanical abrasion slurry containing 6.6% HCl and silicon carbide microparticles in water-soluble paste.



Figure 1: Opalustre Kit

Therefore, the aim of current article is to describe and discuss the treatment of two case reports of mild to moderate dental fluorosis treated with microabrasion technique using Opalustre applied over inactive brown spots present on maxillary anterior teeth.

## CASE HISTORY

### Case report 1:

A 21-year-old female patient reported in Dept. of Conservative Dentistry & Endodontics in Dr. R. Ahmed Dental College & Hospital Kolkata, with chief complaint of discoloured upper front teeth. There was no significant associated sign & symptoms and the non-contributory past medical history.

On clinical examination, maxillary incisors & canines presented with intrinsic brown stains on the facial surfaces. According to Dean's fluorosis index, it was categorized as mild to moderately severe grade of fluorosis.

Rubber dam with interproximal wedjets was applied for isolation of teeth and to protect soft tissues from strong acid (**Figure 2 – Affected teeth after rubber dam isolation**). During the microabrasion treatment, the patient's, clinician's and assistant's eyes were protected with protective glasses.



Figure 2: Affected teeth after rubber dam isolation

Initially, slight trimming with the fine diamond bur was done on the affected area (**Figure 3 – slight trimming of tooth surface with fine diamond bur**) in order to reduce the time needed for the microabrasion as well as the amount of microabrasive material used. This procedure is generally referred as "Microreduction".



Figure 3: slight trimming of tooth surface with fine diamond bur

Now, 1-2 mm thick layer of Microabrasion paste Opalustre (6.6% HCl & Silicon carbide microparticles) was applied on the affected teeth (**Figure 4 – Opalustre material applied over tooth**). A rubber cuff was attached to contra angled handpiece & tooth surface was microabraded with slight pressure for 60-120 seconds. Whenever necessary small drop of water can be added.



Figure 4: Opalustre material applied over tooth

Several applications may be necessary depending upon severity of the fluorosis. After three applications of Opalustre, done in a single session, it is possible to visualize the

removal of stains and the esthetic improvement on the wet surface without need for aesthetic reconstruction. Abundant rinsing must be done after each application for an optical evaluation, before proceeding to the next application.

After polishing the region with felt disc and paste at slow speed, a neutral 2% sodium fluoride gel was applied for one minute in order to enhance remineralisation. The patient was instructed not to rinse for one hour. Pre-operative photograph & post-operative photograph has been shown in **Figure 5 (Pre-operative photograph case one)** and **Figure 6 (Post-operative photograph case one)** respectively.



Figure 5: Pre-operative photograph case one



Figure 6: Post-operative photograph case one

### **Case report 2:**

A 24-year-old female patient reported in Dept. of Conservative Dentistry & Endodontics in Dr. R. Ahmed Dental College & Hospital Kolkata, with chief complaint of discoloured upper front teeth.

On clinical examination, maxillary incisors presented with intrinsic brown stains on the facial surfaces along with some white flecks. According to Dean's fluorosis index, it was categorized as mild grade of fluorosis. The microabrasion technique was also planned for this case. After isolation with rubber dam and interproximal wedgets, the same protocols were followed as in case one. The removal of stains in this case, required two applications of

Opalustre over the surface in order to achieve a satisfactory aesthetic result. Pre-operative photograph & post-operative photographs has been shown in **Figure 7 (Pre-operative photograph case two)** and **Figure 8 (Post-operative photograph case two)** respectively.



Figure 7: Pre-operative photograph case two



Figure 8: Post-operative photograph case two

### **RESULTS**

For above cases, the microabrasion treatment followed by subsequent remineralisation gave good and satisfactory results. This treatment was done in a single session for each patient separately which required several applications (three for case one and two applications for case two) for removal of intrinsic stains and it resulted in immediate aesthetic improvement. These results included an aesthetic recovery of affected teeth, enamel remineralisation, and complete disappearance of inactive brown spots present on maxillary anterior teeth.

At the maintenance appointments, after one and three months, it was observed that the shiny aspect and the surface smoothness were maintained and that there was absence of pain and sensitivity on teeth that had been treated with microabrasion.

### **DISCUSSION**

Dental fluorosis is resulted due to excessive occurrence of fluorine in the drinking water at

certain places or is the result of overdoses of fluorine within an endogenous fluorine prophylaxis. Such intrinsic discolouration may only involve the enamel or dentin, or both.

Various clinical procedures have been proposed to improve the aesthetic aspect of the affected teeth, which include: dental bleaching, enamel micro-abrasion, restorative correction by using tooth colored bonded adhesive materials (porcelain veneers, direct resin-based composite repair, or, in some cases, a combination of procedures).<sup>14</sup> Use of invasive procedures like prosthetic approach with veneers or crowns may result in an excessive sacrifice of tooth structure which on other hand may further promote the destruction of the tooth at an early age.

The indications of microabrasion usually include cases of fluorosis, post-orthodontic demineralization, localized hypoplasia due to infection or trauma, and idiopathic hypoplasia where the discoloration is limited to the outer enamel layer. Post-management, the analysis of the effectiveness of microabrasion should be delayed for approximately one month, as the teeth appearances will continue to improve in this duration.<sup>15</sup>

In the case reported, two or three applications of Opalustre, done in one session, were necessary in order to remove the inactive brown pigmentation present on the maxillary anterior teeth. After using the proper technique protocol, the tooth colouration was improved and a shiny surface was appeared because during the procedure, the demineralised layer was completely removed.<sup>16</sup>

The rotary procedure allows the material to simultaneously abrade and erode the enamel surface, so removes the stain. During microabrasion, it is supposed for enamel surface layer to be restructured resulting in an amorphous prismless layer that clinically appears as smooth and lustrous. This amorphous layer contained compacted mineralized structure within organic tissue<sup>17</sup>. The light reflected off or refracted through this layer, is in different manner than it would on normal surface. This effect has been called the

‘enamel glaze’ or ‘abrasion effect’.<sup>17, 18</sup> After evaluating various techniques, Fragoso, et al. (2011)<sup>19</sup>, concluded that microabrasion followed by polishing with diamond paste or fluoride prophylactic paste result in increased hardness and better smoothness of the enamel surface.

It has been proved that microabrasion technique using acidic/abrasive materials gives immediate and permanent aesthetic outcomes with insignificant enamel destruction<sup>20, 21</sup>. Also, various studies have checked for the effects of micro-abrasion on the remaining enamel surface<sup>22, 23</sup>. The potential erosive and abrasive effects depend on several parameters, including the type, concentration and pH of the acid used, the abrasive medium, time of instrumentation, application mode, force applied, and revolutions per minute<sup>24</sup>. At the counterpart, this technique may increase the roughness of the enamel surface, regardless of whether 18% or 35% phosphoric acid or 6.6% hydrochloric acid with abrasive was used. Similarly, enamel microabrasion can also be related to reduced enamel microhardness<sup>19, 22</sup>. However, both effects are generally reversed by the polishing procedure or saliva exposure.<sup>22, 23</sup>

## **CONCLUSION**

The proposed microabrasion provides a minimally invasive technique to treat the teeth with enamel fluorosis and allows recovery of natural tooth appearance. This kind of approach has the advantage of being safe, extremely conservative and very well accepted by the patients since the technique causes reduced wear of tooth surface, minimum discomfort to the patient and finally, the enhancement of the patient's smile and aesthetic.

Furthermore, no special precaution or maintenance is required; thus it may be considered as an interesting alternative to other interventions which are more invasive.

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