

# Management of stained fluorotic teeth

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## Introduction

Dental fluorosis is a condition that affects the enamel, caused by overexposure to fluoride during tooth formation. Recommended intake of fluoride for primary prevention of caries is reported to be 0.05-0.07mgF/Kg/day (Warren, Levy and Kanellis, 2001). When the concentration is more than 1.5-4mg/L, as the World Health Organization (WHO) recommends, dental fluorosis occurs. Hypermineralised and hypomineralised areas appear in the enamel that is being formed, resulting in whitish opaque discolourations ranging from yellow to brown with or without porosities in the enamel surface (Pendrys and Stamm, 1990; Celik, Yildiz and Yazkan, 2013).

Fluorosis staining of anterior teeth constitutes an aesthetic problem among affected people. In addition, it has been found to have a psychological impact and adverse impact on academic performance. Thus, conservative aesthetic management of dental fluorosis not only improves smiles but also greatly enhances the self-esteem of the affected individuals.

Contemporary aesthetic procedures allow these teeth to be restored to give them the appearance of healthy teeth in the most minimalistic invasive manner.

This case report aims to highlight a three-treatment combination for aesthetic correction of severe fluorotic teeth. It also discusses the advantages, drawbacks of various treatment choices and apprise the clinician of the appropriate aesthetic conservative management protocol for dental fluorosis with diverse clinical appearance.

## Case study

A 43-year-old female patient attended the practice concerned with the aesthetics of her teeth. She had a complaint of chipping, which had been repaired by different dentists.

The patient reported that the teeth had been discoloured for many years. She was unable to recollect when they first started to discolour, but reported that the discolouration had increased over time.

The patient reported no pain or discomfort and she was not aware that she had severe fluorosis. We used Thylstrup-Fejerskov (TF) index for scoring fluorosis.

Intraoral examination revealed brownish discolouration of enamel with all maxillary and mandibular incisors, canines and premolars.

The pattern of discolouration was bilateral and symmetrical. The surfaces of some of these teeth were pitted.

Discolouration was more prominent on maxillary teeth compared to mandibular

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Figure 1: Initial situation. According to the TF index score, the maxillary and mandibular teeth were classed as 'severe'

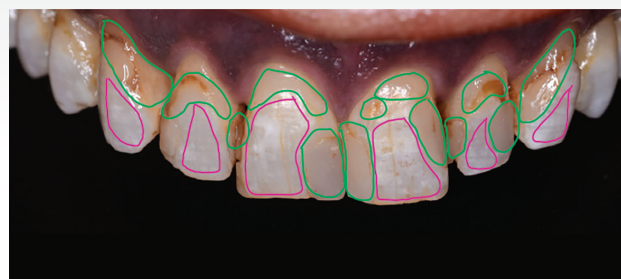


Figure 2: Mapping (pink = Icon; green = Venus Pearl)

teeth (Figure 1).

Pulp sensibility testing of the discoloured teeth was carried out using cold test and electric pulp testing, which indicated normal pulp with all these teeth.

The medical history was non-contributory.

### Treatment planning process

In the past, enamel microabrasion and vital bleaching were the preferred treatment for mildly or moderately fluorosed teeth without enamel defects, (Price et al, 2003; Limeback, Vieira and Lawrence, 2006). While fluorosed teeth with enamel defects or severe fluorosis were traditionally restored with laminate veneers or crowns (Habbu et al, 2011; Al-Jazairy, 2001).

However, the more recent trend is toward minimal intervention dentistry. Since restorative intervention is often the starting point of a long series of re-restorations, commonly leading to crowns and implants, irrespective of how well the first restoration was prepared, minimally invasive techniques (enamel microabrasion and vital bleaching) may be the first option, even though the more traditional restorative techniques result in a satisfactory aesthetic appearance for many patients.

Several treatment strategies are proposed for dental fluorosis, depending on the severity and extent of the disease.

The most frequently reported are microabrasion and/or macroabrasion, dental bleaching, composite restorations, veneers, and prosthetic crowns.

Resin infiltration has also shown promising results. This approach meets the concept of minimally invasive restorative dentistry and allows us to reach satisfying results avoiding unnecessary tissue removal.

### Procedure

In this case, complexities and challenges presented throughout treatment.

The patient was not aware of her fluorosis. However, thorough discussion of her social history helped me to diagnose her condition (Tahir and Rasheed, 2013).

The patient was a heavy smoker and consumed a lot of fizzy drinks. These factors would negatively impact the outcome of the treatment. It was important that the patient understood this, so we shared photographic/comparative results, which helped gain her compliance and achieve positive change.

For this case, since the restorative intervention is a starting point of long series of re-restoration, we opted for minimal invasive procedures and the patient was warned about the possible compromised results.

We began treatment with a five-week course of home-



Figures 3A, 3B and 3C: Shade taking Venus Pearl and Diamond composite



Figure 4A: White opaque areas, brown discoloration with surface porosities on enamel



Figure 4B: Two-week home-based bleaching with 10% carbamide peroxide for six to eight hours at night



Figure 4C: Microabrasion with Opalustre 6.6% HCL



Figure 4D: Three-week home-based bleaching with 10% carbamide peroxide for six to eight hours at night



Figure 4E: Icon smooth surface and composite restorations



Figure 4F: Occlusion adjusted (especially UL3) and finishing

based tooth whitening with 10% carbamide peroxide and a cycle of microabrasion (Figures 4b and 4d). In the future, I will opt for a longer bleaching regime for better results.

A fine grit diamond bur helped in removing darker stains and smoothing of enamel loss. After two weeks microabrasion with 6.6% hydrochloric acid (Opalustre), we saw a lightening of the brown stains (Figure 4c).

We performed the microabrasion according to the manufacturer's instructions.

Rubber dam was applied, and gingival margins sealed with Oraseal Caulking material. The slurry was applied in 1-3mm thickness on the upper front teeth for 60 seconds using rubber prophyl cups (Opalcups). The teeth were rinsed with water.

A study by Ahmed and Murbay (2016) found that 120 seconds of microabrasive treatment reduces approximately 10% (200µm) of the enamel thickness.

It helps to remove discoloured enamel and change

enamel optical characteristics, turning it into a lustrous, shiny and glass-like surface, which may reflect and refract light.

Composite shade matching also presented a challenge, as the patient had different values and chroma of teeth. Moreover, the patient's enamel has less translucency.

I used Venus Pearl composite A1 shade in interproximal, buccal and incisal areas and A2 shade in cervical areas, since it was the nearest match and has good aesthetic quality (Figure 3).

All old, stained composite fillings were removed. Resin infiltration (Icon) and change of old composite was performed according to manufacturer instructions.

Bonding to composite after resin infiltration does not require an additional adhesive step. If, after the infiltrant final light-curing, there is no contamination of the operator field, composite increments may be directly applied onto the infiltrated surfaces. The depth of resin infiltration is about 60µm (Davila et al, 1975) (Figures 5a to 5c).



Figures 5A, 5B and 5C: Old composite filling removed Icon infiltration



Figure 6: Polishing

Occlusion was managed through silicone putty, as the anterior guidance was likely to change in the treatment process. In cases non-responsive to resin infiltration, this treatment shows a very good example of resin infiltration and composite resin option for the cases of enamel defects and severe fluorosis. This opens the possibilities that aim for a highly aesthetic outcome with a minimally invasive approach.

## Treatment stages

### Pre-treatment

Figure 4a shows the pre-treatment presentation with white opaque areas, and brown discolouration with surface porosities on the enamel.

### Home-based bleaching

Two-week home-based bleaching with 10% carbamide peroxide (Boutique) was carried out for six to eight hours at night. Notice the minimal changes in brown discolouration (Figure 4b).

### Microabrasion

We then performed one cycle of microabrasion with Opalustre (6.6% hydrochloric acid). This resulted in a non-homogenous colour, and thinner enamel (Figure 4c).

### Home-based bleaching

Vital home-based bleaching with 10% carbamide peroxide (Pola Night) was undertaken for six to eight hours a night for three weeks to remove brown discolouration, and lighten adjacent enamel to change perception of white opaque areas. This created a homogenous colour of teeth surface (Figure 4d).

### Icon smooth surface and composite restorations

One week after Icon and composite restorations (Figure 4e), the occlusion was adjusted (especially UL3) and finished (Figure 4f).

## Icon resin infiltration

The old composite filling was removed with a coarse diamond bur. An LED UV torch was used to distinguish between old composite and tooth surface. Next, the following steps using Icon infiltration were undertaken:

- Etch for two minutes, rub with a microbrush and rinse for 30 seconds. Dentine is protected with application of glycerine (Figure 5a)
- Icon-Dry. Let it sit for 30 seconds and thereby carry out visual inspection, dry with oil- and water-free air. If white patch disappears, do not repeat etch cycle. However, if white patch is visible then repeat etch cycle. The etch cycle can be repeated three times. The preview showed an even chromaticity (Figure 5b)
- Apply Icon-Infiltrant. Let it sit for three minutes, maintain wet lesion surface with occasional twist of syringe. Disperse with air, and floss. Light-cure for 40 seconds. Replace applicator tip. Apply Icon-Infiltrant, let it sit for one minute. Remove excess and floss. Light-cure for 40 seconds and polish. According to studies, Icon can penetrate to depth of 60 micrometre (Skucha-Nowak, 2015)
- Polish with Compoglaze (Figure 6).

## Reflection

Figures 7a to 7f demonstrate the various treatment stages of this case.

Overall, the patient was pleasantly surprised with the outcome (Figure 7f), reporting that the treatment has helped her to gain social confidence. As the treating clinician, I am also satisfied with the result.

Although the patient accepted the least invasive approach to manage her upper arch for UR4 to UL4, she declined treatment for the lower arch.

Also, at the follow-up appointment, after Icon and composite fillings, the patient felt high points on UR3 and UL3. While achieving her comfort, the anatomy of her canines was compromised.

In relation to the patient's oral health benefits, the least invasive approach to manage UR4 to UL4 enabled retention of her natural teeth structure.

The pits and fracture lines have been covered and strengthened through removal of the fluorosed surface via microabrasion and application of Icon and composite.

Also, during the microabrasion and whitening stages of treatment, the patient stopped smoking and vaping completely.



Figure 7A: Pre-treatment



Figure 7B: Two-week whitening



Figure 7C: One cycle of microabrasion



Figure 7D: Three-week whitening



Figure 7E: Resin infiltration and composite resin



Figure 7F: After one-week

As a result of this treatment, the patient is now more likely to remain motivated for maintaining her oral hygiene, reducing early onset of staining and caries.

Aesthetically, the impact of fluorosis has been overcome through the process of bleaching, microabrasion and Icon.

Furthermore, fracture lines, pits and caries have been covered using Icon and matching composites. This process has provided a homogeneous colour to her teeth. There is an evenness of the enamel edges of UR4 to UL4, thereby improving the patient's smile line.

To maintain the outcome achieved, the patient needs to keep good oral hygiene. She will have to attend regular appointments with the dentist and dental hygienist and will also need an annual appointment to manage risk/impact of composite staining and chipping.

In addition, the patient was encouraged to significantly reduce or cease consuming fizzy drinks as well as remaining committed to the smoking and vape cessation.

For this case, there is a good prognosis of five to seven years (Bårdsen, 1999), provided oral health instruction is followed, along with routine dental appointments as stated above.

The restorations completed for this patient can lead to a variety of complications, including:

- General fracturing or fracture through grinding
- Cervical abrasion
- Staining of composite.

Nonetheless, poor diet, excessive fizzy drink consumption, poor oral hygiene (including poor toothbrushing) and grinding are likely to act as modes of failure for her

restorations. Therefore, this treatment requires continuous maintenance from both the dentist as well as the patient.

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