When faced with increasing aesthetic requirements, patients need options for the most effective therapies. Today, fluorosis stains constitute a frequent reason for aesthetic dentistry consultation. These stains, which are white or brown in the most severe cases, may originate from a physical problem. This article will use two clinical cases to illustrate the treatment of white fluorosis stains, using a conservative technique that combines tooth whitening with caries-infiltration.

Options for therapy
An attractive smile can be extremely important for a person's social relations. There are many resources available in dentistry for correcting an aesthetic defect that is caused by a stain: construction of a crown, veneers or a direct composite filling. However, these procedures are considered to be invasive, because they require more or less extensive preparation of the tooth, which involves a significant alteration to the tooth's structure. These treatments are not directed towards the preservation of tissue, which is the basis of current dental practice.

When young patients present with this type of defect, the predictability and lifespan of traditional dental restorations must be taken into consideration. It seems obvious that the first course of treatment should be the most conservative.

The selected treatment in the two clinical cases presented, according to gradient therapy, was an external outpatient whitening procedure using caries-infiltration.
10 per cent carbamide peroxide for three weeks, followed by one session of caries-infiltration. This caries-infiltration technique, which was initially developed for the treatment of early carious lesions in the enamel, has the secondary effect of masking white stains because it modifies the optical properties of the tooth. In fact, hypomineralisation due to fluorosis has a refraction index that is different from that of healthy enamel. The lesion does not absorb any wavelength and therefore appears to be white in colour. The infiltration of a very low-viscosity resin, with a refraction index that is close to that of healthy enamel, into the porosities of the body of the lesion, produces a translucent enamel once again. Maximum tissue preservation is achieved with this treatment. The only product currently on the market for treatment by caries-infiltration is Icon, by DMG.

Clinical case one
A young woman attended (Fig 1) complaining of the presence of “white stains”. A prophylactic dose of fluoride appears to have been exceeded over a number of years, since no record of her prior fluoride treatment was available. Clinical exam did not reveal any dental caries and the diagnosis of fluorosis was confirmed. According to the Hattab classification, we were looking at a class II fluorosis, corresponding to symmetrical opaque stains.

External outpatient whitening was carried out using thermoformed trays and 10 per cent carbamide peroxide gel. Treatment consisting of night-time use of the trays lasted 21 days with a weekly inspection in the Dentist’s chair. Whitening, by increasing the overall brightness of the teeth, acts as masking of small white defects in the enamel. The results of the whitening process (Fig 2) was satisfactory, but not sufficient. In fact, the opaque fluorosis stains were not sufficiently attenuated by whitening the rest of the tooth. Therefore, a caries-infiltration session was scheduled for one month after the whitening treatment had been completed.

The erosion-infiltration session began with prophylactic polishing using an interdental brush and prophylactic paste (Fig 3), in order to eliminate any biofilm and therefore salivary proteins. A rubber dam was applied. This step was essential for protecting the surrounding tissues, while the hydrochloric acid was being applied, and in order to keep everything away from any moisture during the resin infiltration process.

The next step consisted of accessing the hypomineralised fluorosis lesions (Fig 4). This requires the elimination of the hypermineralised enamel on the surfaces of the body of the lesion, produces a translucent enamel once again. The Icon-etch was then aspirated and rinsed.

Dehydration process is carried out.

A second erosion procedure is carried out.

Surface are given a protective polish.

The erosion-infiltration session began with prophylactic polishing using an interdental brush and prophylactic paste (Fig 3), in order to eliminate any biofilm and therefore salivary proteins. A rubber dam was applied. This step was essential for protecting the surrounding tissues, while the hydrochloric acid was being applied, and in order to keep everything away from any moisture during the resin infiltration process.

The next step consisted of accessing the hypomineralised fluorosis lesions (Fig 4). This requires the elimination of the hypermineralised enamel on the surfaces of the lesions. Therefore, the erosion was treated using a gel of 15 per cent hydrochloric acid (Icon-Etch DMG) for 120 seconds. The acid was applied using the applicator tip provided. In order to avoid uneven erosion, which could be caused, for example, by bubbles forming in the gel, the surface was mechanically agitated using a microbrush.

The Icon-etch was then aspirated and rinsed.
rinsed for 30 seconds using a water spray (Fig 5) and the surface dried using water-free air. Once the enamel had been eroded, the water that was contained in the microporosities of the fluorosis lesions had to be eliminated (Fig 6) before the resin infiltration was carried out. Effectively, the infiltrating resin (Icon-Infiltrant) is a mixture based on hydrophobic methacrylate resin (TEGDMA). For this reason, the lesions must be desiccated beforehand. This dehydration was accomplished through the application of a solution of 99 per cent ethanol (Icon-Dry), for 30 seconds, on the surface of the lesions using a flat-ended needle. Because the whiteness of the lesions did not exhibit any significant decrease when this procedure was performed, it meant that the demineralised lesions were not fully accessible.

Therefore a second erosion procedure was performed for 120 seconds (Fig 7). This time, after rinsing, drying and a new application of the ethanol solution, the lesions appeared to be much less bright and had nearly disappeared (Fig 8). Therefore, this time, they were accessible for the resin infiltration. Drying with air was then carried out to evaporate the ethanol. After this drying was completed, the lesions appeared to be more pronounced (bright opaque white), which can be explained by the refractive index of air.

At this point, infiltration was performed (Fig 9). The application of TEGDMA-based resin (Icon-Infiltrant) with a refractive index of 1.52, which is close to that of enamel (1.62), was done using the sponge applicator tip. This resin, which has a very low viscosity and water-resistance, uses capillary action to infiltrate the porosities of the lesions for three minutes. Since the resin can be photopolymerised, this should be done away from light. The application of acid provides significant surface tension, which also facilitates the infiltration. The resin penetrates more deeply into the enamel than conventional adhesives do. Solvents were evaporated using the air blower and any excess was eliminated using dental floss on the vestibular surface.

Continued »
A polymerisation step was performed for 40 seconds before a second, similar infiltration step was carried out. This minimises the surface porosity.

To finish the session, the rubber dam was removed and the surfaces were very carefully polished to prevent any future external discolouration (Fig 10). Any excess was eliminated using dental floss and, if necessary, fine abrasive strips. All vestibular surfaces were polished using silicone tips. The microgeography was then copied before final polishing, using silicon carbon brushes (Enamel Plus; Shiny 4 (Micerium)), diamond pastes associated with a goat’s-hair brush (Enamel Plus; Shiny A and B (Micerium)) and aluminium oxide paste (Enamel Plus; Shiny C (Micerium)) associated with a felt disk.

Considerable improvement in the aesthetic appearance of this patient’s teeth was achieved immediately (Fig 11). An examination was carried out every six months to assess the aging of the resin over time. This minimally invasive treatment made a significant improvement in the patient’s smile, which caused a considerable change in her personal and social relationships.

**Clinical case two**

Initial examinations revealed that the patient was concealing the white fluorosis stains with her lower lip when she smiled (Fig 12).

- Fig 13. Initial condition: vestibular view showing very slight porosity of the central incisors.
- Fig 14. Results after 21 days of external outpatient whitening.
- Fig 15. Erosion procedure, after the operating field had been prepared. A palatal fixed orthodontic retainer made placing the rubber dam extremely complex.
- Fig 16. Drying step, before the second erosion.
- Fig 17. Resin infiltration procedure.
- Fig 18. Results one year post-treatment.

**Conclusion**

The combination of an outpatient whitening treatment with a caries-infiltration treatment represents a therapy that is very appealing in cases of clinical fluorosis. In fact, the fluorosis lesions, which appear as opaque white stains on the vestibular surfaces, may be masked simply by the infiltration of microporosities, which are responsible for the appearance of the lesions.

Therefore, this superficial fluorosis does not need the in-depth infiltration that was recently described by Attal et al. The combination of whitening and caries-infiltration shows a satisfactory result in these two patients.

This therapy preserves the structures of the tooth and does not cause any pain to the patient.

They are also quick and simple for the practitioner to carry out. Therefore, for all these reasons, this treatment should be considered as an alternative to micro-invasive treatments for concealing the white stains of fluorosis.

However, long-term studies are necessary to follow the progress of this therapy over time.

---

For further information contact DMG Dental Products (UK) Ltd on 01656 789400, fax 01656 360100, email info@dmg-dental.co.uk or visit www.dmg-dental.com