Treating white discolouration on upper front teeth: a case report

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Initial Consultation

A 27-year-old female presented requesting an improvement to her smile with reference to the white discolouration to her upper front teeth (Figures 1-2). She had an unremarkable medical history.

On extraoral examination there was:

- No apparent decay
- Temporomandibular joint non-clicking
- No pain on loading or palpitation.

Oral examination showed:

- Good general dental health
- Moderate fluorosis affecting the upper incisors
- The fluorosis was markedly worse on the upper centrals, where there was a marked white opacity
- Molar-incisal hypoplasia was ruled out due to absence of lesions on the first permanent molars (Denis, 2013).

Treatment options discussed

Enamel is the most highly mineralised tissue in the body, 96% hydroxyapatite and 4% organic fluids. In white lesions part of the mineral phase is replaced by organic fluids, however, the surface layer is constantly being re-mineralised by the saliva. This means that, histologically, white spots are characterised by hypo-mineralised subsurface enamel with a relatively intact surface layer.

As the structure of the white lesions is less mineralised and less organised than healthy enamel this causes a change in the lesions' optical properties (refractive index). Light entering the lesions is reflected back to the eye much brighter than light entering healthy enamel, giving the lesions a bright white appearance. Historically, treating white lesions in a minimally invasive way has been particularly difficult, with some practitioners advocating the extended use of minimal intervention paste, with varying success rates.

Often, if the lesions were to be covered completely, patients underwent aggressive restorative treatment plans. Recent advancements in dental technology now allows the masking of the white spots by modifying the optical properties of the white lesions through resin infiltration. Resin infiltration is a technique where the overlying mineralised layer is removed with hydrochloric acid, allowing a low viscosity resin with a similar refractive index to natural enamel to be infiltrated into the more porous and hypomineralised white lesions (Paris and Meyer-Lueckel, 2009). As the resin has a refractive index close to that of healthy enamel, once infiltrated it allows the lesions to

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Figures 1: Initial presentation.

Figures 2: Close-up view of central incisors.

mimic the translucent properties of healthy enamel more effectively, restoring natural translucence.

It was discussed with the patient that it would be best to first approach her teeth with a minimally invasive treatment plan using a combination of home tooth whitening and, if necessary, resin infiltration. If she was not satisfied with the results then other treatment could be explored; such as resin or ceramic veneers.

The patient was advised that, before resin of superficial enamel removed infiltration, she should carry out a course of home tooth whitening. This would reduce the contrast between the white lesions and her natural tooth colour. In some cases, this is enough to achieve the aesthetic demands of the patient without resorting to further treatment with resin infiltration, as the reduction in contrast between the white lesions and natural tooth colour can make the white lesions less noticeable.

The patient was satisfied with her current tooth colour, so it was decided to go ahead with the resin infiltration treatment without home tooth whitening.

It was explained to the patient that resin infiltration would still be possible, however, the results with resin infiltration alone would not be as predictable due to the relatively dark shade of her natural teeth. It was discussed that if she wished for the best possible resolution it may be necessary to remove a thin layer of superficial enamel with a bur, in order for the resin to be able to reach the full depth of the white lesions. This would result in shallow labial defects following infiltration, which would need to be restored with thin layers of composite resin. The patient was happy with this proposed approach.

Protocol

As Icon treatment requires working with a strong acid it is important to isolate the soft tissue from the area you will be working on. Isolation was achieved from upper first molar to upper first molar with a heavy gauge non latex dental dam (Unodent) with wedgits distal to the canines as this negates the need for local anaesthetic (Figure 3).

The areas to be treated were coated with Icon Etch, which is a 15% hydrochloric acid gel, for two minutes before being washed off to leave the typical post acid etch frosted appearance (Figures 4-5).

Following rinsing and drying, the lesions were then 'previewed' using the Icon-Dry ethanol solution provided (Figure 6).

Icon-Dry has a refractive index significantly nearer to that of healthy enamel than air. Because of this, after it has been applied and allowed to penetrate the lesions for 30-40 seconds and whilst it is still wet, it enables you to preview the effect of resin infiltration on the white spot lesions. This preview allows the operator to see if the lesions have been sufficiently penetrated to thoroughly mask the white lesions. If the lesions are still visible during the application of the Icon-Dry further etch cycles are needed, if the lesions disappear it is safe to proceed to infiltration.

Initially, the process of etch, rinse and application of Icon-Dry was carried out three times with no resolution of the white lesions on the centrals (Figure 6). This was discussed with the patient and permission was granted to remove a thin layer of superficial enamel in order to access the white lesions to depth. A red band rugby ball bur was used to remove approx. 0.2-0.3mm of superficial enamel (Figure 7).

Figure 3: Teeth isolated with dental dam.

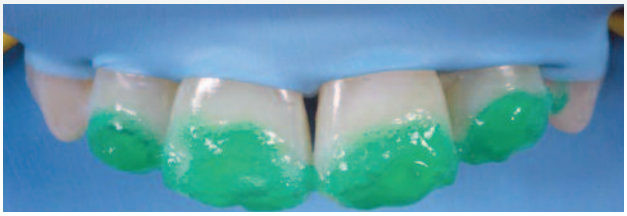

Figure 4: Icon Etch applied for two minutes.

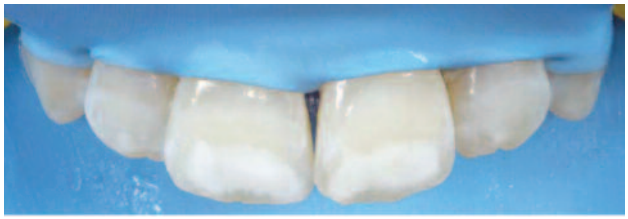

Figure 5: Post acid etch frosted appearance.

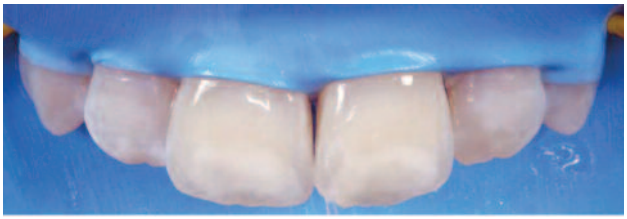

Figure 6: 'Preview' using Icon-Dry ethanol solution.

Figure 7: Approx. 0.2-0.3mm of superficial enamel removed.

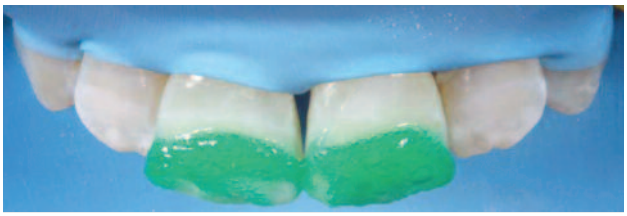

Figure 8: Further application of Icon Etch.

The process of etch, rinse and application of Icon-Dry was repeated two more times (Figure 8), until the majority of the white lesions were no longer visible following preview with the Icon-Dry ethanol solution (Figure 9).

Once satisfied with the preview stage, the teeth were dried to a frosty post-etch appearance with a further application of the Icon-Dry ethanol solution being allowed to evaporate over 60 seconds (Figure 10). The operating light was then switched off to prevent premature curing of the Icon resin and the hydrophobic Icon resin was then applied to the teeth. The resin was then left to infiltrate for three minutes and excess resin was then removed from the labial surface using a cotton wool roll. Pre cure, contacts were then flossed to prevent the teeth being bonded together. Each lesion was then light-cured for 40 seconds. This resin application process was then repeated one more time.

Immediately post cure, the Icon treatment leaves the teeth slightly rough due to excess resin being present on the surface of the teeth (Figure 11). The defect caused by the removal of superficial enamel is also still present.

According to the literature it is possible to bond to freshly cured Icon resin without further conditioning, as it exhibits its own oxygen inhibition layer (Wiegand et al, 2011). In the author's experience there is sometimes a problem with delamination around the margins of any composite resin added, which causes a problem during polishing and finishing. The literature suggests that the bond can be further strengthened though the addition of a bonding resin prior to composite addition.

A thin layer of FL bottle 2 (Kerr) was painted over the defects and cured before the addition of a thin layer of achromatic composite (3M Espe, Filtek Supreme XTE White enamel), which was cured for 40 seconds before being cured again for a further 40 seconds under a glycerine barrier. This final cure under the glycerine barrier serves to remove the sticky oxygen inhibition layer that can clog finishing and polishing instruments making them less effective (Park and Lee, 2011) (Figures 12-13).

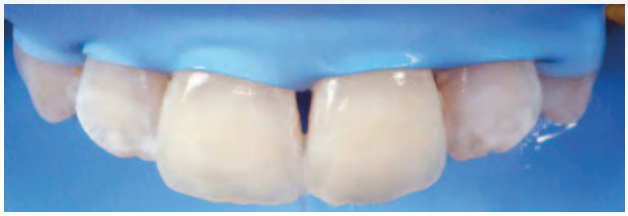

Figure 9: Final Icon-Dry 'preview'.

Figure 10: Teeth are allowed to dry.

The teeth were polished with the Astropol system (Ivoclar Vivadent) until the surface of the composite resin was smooth and any excess Icon resin had been removed. This excess resin requires removal to prevent staining.

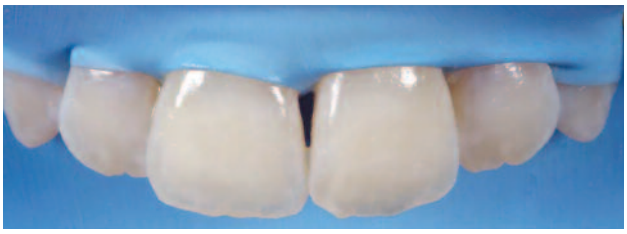

Figure 11: Icon resin applied and cured.

Results

The patient was reviewed one month later and final review photos were taken (Figures 14-15). The patient was thrilled with the huge improvement that the treatment had made to her smile. This was particularly significant as she had previously been told that nothing could be done and had reluctantly accepted that she may need veneers at some stage. She was so happy that she was able to get the result she wanted in such a conservative and biologically respectful way.

References

Denis M, Atlan A, Venat E, Tirlet G, Attal JP (2013) White defects on enamel: Diagnosis and anatomopathology:Two essential factors for proper treatment (part 1). Int Orthod 11 (2): 139-65

Park H, Lee I (2011) Effect of glycerin on the surface hardness of composites

Paris S, Meyer-Lueckel H (2009) Masking of labial enamel white spot lesions by resin infiltration-a clinical report. Quintessence international volume 40, number 9

Wiegand A, Stawarczyk B, Kolakovic M, Hammerle CH, Attin T, Schmidlin PR (2011) Adhesive performance of a caries infiltrant on sound and demineralised enamel. Journal of Dentistry 39: 117-121.

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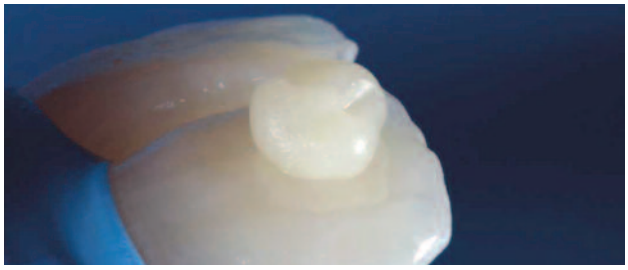

Figure 12: Addition of a layer of composite.

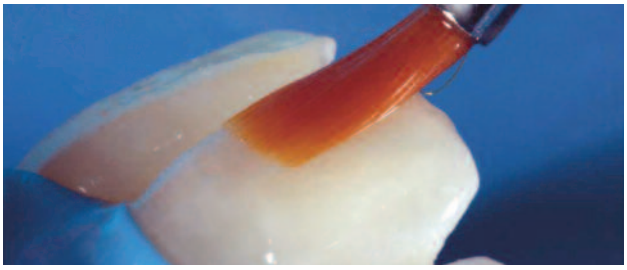

Figure 13: Applying the glycerine barrier.

Figure 14: Review at one month.

Figure 15: Review at one month, full-mouth view.