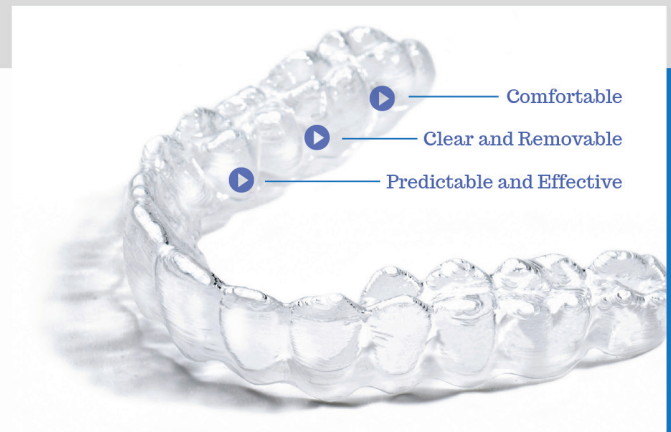


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Minimally invasive treatment of white spot lesions

Victoria Sampson¹

White spot lesions on teeth are defined as enamel surface and/or subsurface demineralisation without cavitation.

Unfortunately, dentistry has seen a rise – not only in the prevalence but also the severity of these defects, with the US Oral Health Surveys recording a marked jump from 1.2% to 30.4% between 1986 and 2012 (Neurath, 2019). White spot lesions can be caused by numerous reasons, thus affecting prognosis and the treatment options available to remove them.

In response to the rise in white spot lesions, the dental industry has been pushed to adapt and create less invasive alternatives for removal of these white spots. When once the only alternative to white spots was drilling the defects away, we now understand the science and causes better, allowing us to create minimally invasive, preventive alternatives.

White spot defects have numerous causes that can affect the enamel substructure, and the treatment options available must reflect this. It is vital that the cause, size and depth of the white spots are ascertained before providing treatment options to a patient, as treatment results will vary depending on the enamel substructure available. The main causes of white spot lesions are outlined in Table 1.

Main complaint

Both patients presented with white spot lesions on their anterior teeth. The lesions had been present from the eruption of the permanent teeth. Both patients were mainly concerned with the appearance of the white spots, requesting for the spots to be removed.

Presenting symptoms

Following examination, neither lesion was carious. There were no signs of trauma or periapical infection and both teeth tested positive with Endo-Frost.

Cause	Presentation
Fluorosis	Symmetrical, white lines, snow capping, snow flaking on enamel
Trauma	Asymmetrical punctiform lesion on incisal third of tooth
Demineralisation	Faint white lesions around orthodontic brackets
Molar incisal hypomineralisation	Hypomineralised permanent first molars +/- incisors. Yellowing, mottling, post eruptive breakdown of molars
White spot lesion (natural)	Isolated white spots with diameter less than 0.5mm in incisors. Naturally occurring.

Table 1: Main causes of white spot lesions

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Figures 1a and 1b: Patient A (left) and patient B (right). Note the punctiform shape of the lesion and its location on the incisal third of the lateral incisor and central incisor respectively

Medical history

Both patients were fit and well with no known allergies. Neither patient had experienced illness or complications perinatally or postnatally, with their births being unremarkable. Their mothers had also experienced no difficulties during pregnancy and had not had antibiotics.

Previous dental history

The patients maintained excellent oral hygiene, brushing twice a day with fluoridated toothpaste.

Clinical diagnosis

Both lesions were indicative of traumatic hypomineralisation. Although many clinical diagnoses are possible, the

punctiform lesions were asymmetrical, appearing only on one tooth on the incisal coronal third. Furthermore, neither patient had poor oral hygiene or a history of fixed braces, confirming that the hypomineralisation had not been caused by accumulation of plaque.

Treatment options discussed

Several treatment options were discussed for removal of the white spot on the labial surfaces of the teeth in question (Greenwall, 2013):

1. Tooth whitening (16% carbamide peroxide, two-four weeks)
2. Application of amorphous calcium phosphate (Abreu, 2011)



Figures 2a and 2b: Patient A (left) and patient B (right) displaying their white spot lesions on the upper right lateral incisor and upper right central incisor respectively before any treatment



Figures 3a and 3b: Patient A (left) and patient B (right) after two weeks of whitening with 16% carbamide peroxide. Note the exacerbation of the white spot lesions

3. Microabrasion using 6.6% Opalustre (Greenwall, 2006)
4. Resin infiltration (Icon, DMG)
5. Composite bonding
6. Direct resin veneer
7. Indirect veneer
8. Crown.

The advantages, disadvantages, prognosis and cost of each treatment option available were covered. As both lesions were small, relatively shallow white lesions, it was recommended to treat the lesions as atraumatically and non-invasively as possible. Both patients decided to start with whitening and have Icon Resin Infiltration treatment if whitening was not successful in full removal of the white spot. Both patients were aware of the risk of the white lesion being exacerbated with whitening (Walsh, 2004).

Treatment carried out

- 1) Both patients underwent two weeks of nightly at-home whitening with 16% carbamide peroxide delivered via a custom-fitting mouth tray
- 2) After the whitening, three weeks was allowed to wait for remineralisation and rehydration of the teeth (Tittley, 1993). At this point, both lesions had been exacerbated by the whitening as expected
- 3) Icon resin infiltration was performed on the white lesions in question with the following technique:
 - Isolation with Optragate isolation retractor and cotton wool rolls
 - Surface of lesion was cleaned with pumice
 - 15% hydrochloric acid was applied directly onto the lesion and left for two minutes
 - Water rinse

- Ethanol was applied with a syringe directly onto the white lesion
- TEGMA resin (Icon resin) was applied on the white lesion and left for three minutes
- Light cure for 40 seconds
- Further Icon resin was applied to the tooth for another minute and cured for another 40 seconds
- The process was repeated until the white spot was removed. For patient A, the cycle was repeated 12 times until the white spot was removed. For patient B, the spot was removed within six cycles
- Polishing with Sof-Lex disc to remove any surface roughness (Neurath, 2019).

Review of treatment and comments

White lesions present with an intact layer of enamel followed by a subsurface porous area, called 'the body of the lesion'.

The pore volume of these areas of demineralisation increases, thus altering the refractive index of these lesions compared to adjacent sound tooth structure.

The more porous the lesion is, the more water and air lies within it, altering the refractive index (RI) compared to sound enamel (Cazzolla, 2018). The alteration in refractive indices between the porous enamel (RI=1.1.33) and the non-affected enamel (RI= 1.65) (Denis, 2013) produces the optical illusion of a white spot lesion.

During the procedure of Icon resin infiltration, hydrochloric acid is first applied to the lesion to promote erosion of the surface layer and allow penetration of resin infiltration into the lesion body (Torres, 2010).

The ethanol drying agent (Icon-Dry) is then applied to allow for complete drying of the lesion. The agent creates a dry field that encourages resin to be drawn into the lesion

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Figures 4a and 4b: Patient A (left) and patient B (right) after whitening and Icon resin infiltration

through capillary action. The resin infiltrant then is in an optimal position to occlude the microporosities, preventing any further demineralisation and altering the refractive index to become more similar to that of unaffected enamel (RI of resin = 1.475).

In both cases, Icon resin infiltration was effective and successful at treating the white spot lesions. Both patients were extremely satisfied with the physical outcome of the procedure and the painless and non-invasive nature of the treatment.

Summary

Icon resin infiltration is an effective treatment option for patients exhibiting traumatic hypomineralisation in certain cases. As the depth and morphology of the lesion cannot be distinguished clinically, treatment with resin infiltration should be done with caution and the patient warned of unsuccessful or incomplete resolution (Denis, 2013).

Nevertheless, in both cases mentioned, the white spots were removed atraumatically with Icon resin infiltration, proving that the procedure should be attempted before moving on to more invasive treatment options such as direct or indirect restorations. At six-month follow up, the resolution of the lesion remained stable.

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