Minimally invasive treatment of white spot lesions

IN THIS CASE, VICTORIA SAMPSON USES RESIN INFILTRATION AS A NON-INVASIVE TREATMENT ALTERNATIVE FOR TRAUMATIC HYPOMINERALISED WHITE SPOT LESIONS

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.

### 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

<table>
<thead>
<tr>
<th>Cause</th>
<th>Presentation</th>
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<tbody>
<tr>
<td>Fluorosis</td>
<td>Symmetrical, white lines, snow capping, snow flaking on enamel</td>
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<tr>
<td>Trauma</td>
<td>Asymmetrical punctiform lesion on incisal third of tooth</td>
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<tr>
<td>Demineralisation</td>
<td>Faint white lesions around orthodontic brackets</td>
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<tr>
<td>Molar incisal hypomineralisation</td>
<td>Hypomineralised permanent first molars +/- incisors. Yellowing, mottingling, post eruptive breakdown of molars</td>
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<tr>
<td>White spot lesion (natural)</td>
<td>Isolated white spots with diameter less than 0.5mm in incisors. Naturally occurring.</td>
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</tbody>
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**TABLE 1:** Main causes of white spot lesions

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Dr Victoria Sampson BDS MFDS RCS Ed obtained her bachelor in Dental Surgery from Barts and the London, where she was also chosen to represent the UK in a four-month training program at the renowned Karolinska Institute in Sweden in 2017. She then completed her foundation training in West Hampstead, ranking in the top 100 newly qualified dentists in the country. Victoria has published numerous papers both in the UK and internationally, and won the national undergraduate prize for the British Society of Dental Maxillofacial Radiology, the Association of British Academic Oral and Maxillofacial Surgeons and most recently the best Young Dentist Award by the British Endodontic Society.
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)
3. Microabrasion using 6.6% Opalustre (Greenwall, 2006)
4. Resin infiltration (Icon, DMG)
5. Composite bonding
6. Direct resin veneer
7. Indirect veneer

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 asatraumatically 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 (Titley, 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=1.1-1.33) 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 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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REFERENCES

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

FIGURES 4A AND 4B: Patient A (left) and patient B (right) after whitening and Icon resin infiltration