



## Case Report: Combined Treatment with Home Bleaching and Resin Infiltration in Treating Two Non-Cavited Carious Lesions

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### Abstract

Enamel defects are often qualitative in nature and appear as white spots on the tooth surface. Increasingly, patients are asking for these imperfections to be treated and it is now possible to intervene with minimally invasive methods to restore the aesthetics of these dental elements. In this case report, we report the case of a 19-year-old patient suffering from White Spot Lesion (WSL) and treated with home bleaching followed by resin infiltration of the lesions. The treatment satisfied the patient and the clinicians.

**Keywords:** Case Report; White Spot; Resin Infiltration; Icon; Dental Bleaching; Aesthetic; Minimally Invasive Dentistry

### Introduction

The appearance of white spots on teeth can be the result of pre or post-eruptive damage.

Fluorosis, trauma and molar-incisor-hypomineralization (MIH) are among the pre-eruptive injuries.

White lesions of carious origin, commonly called White Spot Lesions (WSL), are post-eruptive.

All these conditions have in common the reduction of the min-

eral component of the enamel which, by altering its chemical composition, alters its optical characteristics, creating chalky white areas on the tooth [1].

White spot lesions (WSL) are the first signs of demineralisation under intact enamel, which may or may not lead to the development of tooth decay. WSLs occur when pathogenic bacteria have breached the enamel layer and the organic acids produced by the bacteria have filtered out a certain amount of calcium and phosphate ions that may or may not be replaced naturally by the remineralisation process [2,3].

When these lesions occur on the front teeth, the aesthetics of the smile is compromised and more and more patients are requesting surgery to improve the aesthetics of the teeth involved.

Current knowledge makes it possible to intervene with minimally invasive methods such as the application of remineralising agents [4,5], microabrasion [5], tooth whitening [6] and resin infiltration [5,7].

### Case Report

This case report describes a case of WSL treated with a minimally invasive approach, opting for a combination of home bleaching and resin infiltration.

### Materials and Methods

#### Timeline

Figure 1 shows the timeline of the interventions. The timing of each intervention was agreed upon

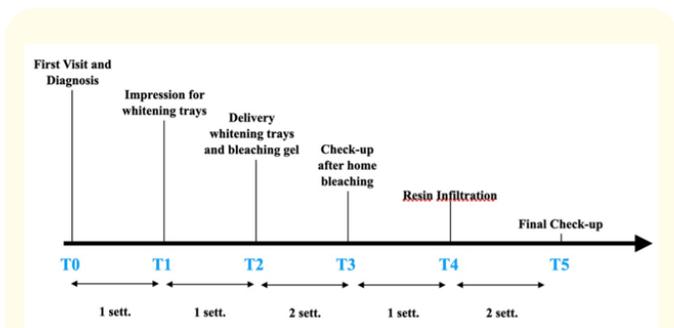


Figure 1: Timeline of interventions.

#### Patient information

The female patient is 19 years old, Italian. The patient has no systemic diseases and has excellent home oral hygiene.

She was referred to us to treat the aesthetic problem, non-invasively, on the two upper central incisors (11 - 21).

#### Objective examination

Upon clinical examination, there were two carious lesions on 1.1 and 2.1. The lesions were white, non-cavitated and not painful (Figure 2a). The patient presented an A3 tooth colour (Vita scale).

#### Diagnostic evaluation

The lesions were clinically examined for diagnosis. There were no obstacles to the diagnostic process. In agreement with the patient, it was decided to treat the WSLs first by home bleaching and then by resin infiltration of the lesions. The patient has never undergone bleaching treatments or treatments on non-cavitated carious lesions with infiltrating resins.

The prognosis is unpredictable for both bleaching and resin infiltration, but as these are two minimally invasive clinical procedures, there were no doubts about the execution.

The patient is shown and asked to sign an informed consent form.

#### Interventions

After the initial examination and diagnosis, steps were planned as shown in the timeline.

During the first session, initial photographic documentation was carried out (Figure 2 and 3) with a d7200 SLR, sb200 side flash and Nikon 105 macro lens, with the following settings: ISO 100, t 1/120 and f 32. Subsequently, alginate impressions were taken for the fabrication of thermo-moulded templates for home bleaching.



Figure 2: Initial frontal (2a) and lateral (2b) photographic analysis.



Figure 3: Detail of WSL on 11 and 21.

The impressions were cast with type IV plaster. Using a hand-held thermoforming machine, customised templates were made with 1 mm thick soft thermoplastic disc reservoirs (Figure 4).



Figure 4: Masks for home bleaching.

After one week, the masks were tried on and given to the patient together with the bleaching kit (Opalescence® PF 16%), with instructions to place the gel inside the reservoirs and wear the masks for 6 hours a day for a fortnight after routine and thorough oral hygiene procedures. Dietary advice was given and the use of substances with a high acid pH (vinegar and pickles, tomato sauce, coca-cola and energy drinks) and foods containing dyes or dark pigmentation (coffee and black or green tea, red wine, blueberries and red fruits, artichokes and raw green vegetables) was prohibited.

During the third session, 15 days after the second, the colour was assessed after bleaching (A2 Vita scale). (Figure 5a and 5b).

In the fourth session, 7 days after the third, resin infiltration was carried out using Icon.



Figure 5: Post home whitening photos.

After the rubber dam had been placed over the entire upper frontal dental group (Figure 6), the surfaces to be treated were cleaned using a nylon brush mounted on a micromotor and fluoride-free prophylaxis paste (Nupro; Dentsply).



Figure 6: Rubber dam positioning.

In this case, we decided not to carry out any pre-treatment of the elements with micro-abrasion.

After the elements had dried, 47% hydrochloric acid (Icon etch, DMG) was applied (Figure 7). The product was left to act for 2 min-

utes and activated by moving the tip smooth surface. The etchant was sucked off and rinsed with water for 30 seconds.



**Figure 7:** Icon Etch application (Hydrochloric acid (HCl) etching gel).

After drying the tooth with dry, oil-free air, the result was simulated by applying 99% ethanol (Icon Dry, DMG) for 30 seconds.

The etched enamel will lose its chalky white appearance on contact with ethanol. In this particular case, etching with HCl had to be repeated 5 times before a satisfactory simulation was obtained.

At this point we proceeded with the application of the infiltrating resin (Icon Infiltrant, DMG) for three minutes, always activating the material with circular movements using the special tip. After removing the excess material, we light-cured for 40 seconds on all sides and repeated the infiltration for another minute.

Once the rubber dam had been removed, polishing was carried out using abrasive discs (Sof-Lex; 3M) and yellow and white rubbers (Figure 8).



**Figure 8:** Result after resin infiltration.

Two weeks after the infiltration with Icon, a final check and photo collection of the case was carried out (Figure 9 and 10).

The patient reports that she has had no side effects either following debridement or after resin infiltration. The treated elements appear shiny, homogeneous in colour and with optimal light refraction.



**Figure 9:** Final frontal (9a) and lateral (9b) photographic analysis.



Figure 10: Detail of 11 and 21 post-treatment.

### Discussion

This case report shows the excellent results achieved by the combined use of home bleaching and resin infiltration in treating WSL.

More and more often, patients are coming to us complaining of imperfections in the frontal areas due to the presence of white spots. It is therefore essential to correctly approach the diagnosis of these lesions to be able to make the best use of all known techniques to offer the patient the least invasive treatment.

In the case shown, the patient’s young age and high compliance made us opt for a combination of highly aesthetic and the least invasive treatment possible.

Home whitening performed as a first step was aimed at reducing the contrast between the white spots and other unaffected areas of the tooth, minimising the colour difference and improving the aesthetic perception of colour [8,9].

Subsequently, as the lesions were not deep, it was decided to proceed with infiltration without micro-abrasion of the lesions. The infiltrants are light-curing resins with low viscosity and a high penetration coefficient. Through capillary forces, this material penetrates and fills the porous spaces of hypoplastic enamel. Healthy enamel has a refractive index (RI) of 1.62.

The microporosities of carious enamel lesions are filled with an aqueous medium (RI 1.33) or with air (RI 1.0) (Table 1) [10].

Type of Enamel	Refractive Index (RI)
White Spot Lesion Enamel	1 - 1.33
Normal Enamel	1.62 - 1.65
Resin-Infiltrated Enamel	1.45 - 1.48

Table 1: The refractive indices of porous enamel, normal enamel and resin-infiltrated enamel.

The difference in refractive indices between the enamel crystals and the medium within the porosity causes a scattering of light that results in the opaque white appearance of these lesions [11].

The microporosities of the infiltrated lesions are filled with resin (RI 1.46) which, unlike the aqueous medium, is not able to evaporate. Therefore, the difference in refractive indices between porosity and enamel is negligible and the lesions appear similar to the surrounding healthy enamel [8].

A review of the literature has shown that all currently known minimally invasive techniques are more or less effective in masking WSL, the limitation of all these treatments being a correct differential diagnosis of the lesions and therefore estimating the depth of damage [10].

We believe that further technological and methodological studies will be able to help clinicians in refining the diagnosis of these lesions.

### Conclusion

It is becoming increasingly common for us to see patients who complain of imperfections in their front teeth.

Home bleaching is now recognised in literature as the least invasive and quickest solution for changing tooth colour.

In treating WSL, resin infiltration offers the great advantage of total preservation of the tooth tissue, as well as being a fast, painless and patient-friendly treatment.

This case report shows the excellent results of combining these two techniques on a 19-year-old female patient with WSL on elements 11 and 21.

### Author Contributions

“Conceptualization, G. Solinas and G. Stellino.; methodology, G. Solinas and M. Lattari; investigation, G. Solinas and G. Stellino; writing-original draft preparation, G. Solinas and M. Lattari.; writing-review and editing, A. Amodeo, A.B. Gianni and G. Stellino; visualization, A. Amodeo, A.B. Gianni and G. Stellino; supervision, A. Amodeo, A.B. Gianni and G. Stellino; project administration, G. Solinas. Amodeo and G. Stellino.; All authors have read and agreed to the published version of the manuscript”.

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### Informed Consent Statement

Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patient to publish this paper.

### Conflicts of Interest

The authors declare no conflict of interest.

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