

## CASE REPORT



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## Evaluation of the therapeutic performance of ICON infiltration resin in the treatment of White Spot Lesions in esthetic dental areas. Clinical Report.

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### Abstract

White spot lesions, pathologically characterized by enamel demineralization, present a significant challenge in dentistry. Notably, intervention at the white spot stage is crucial to impede further lesion progression. Recent advances studies have demonstrated the effectiveness of flowable resin infiltration as a minimally invasive alternative to traditional treatment modalities. This technique allows for the concurrent treatment of multiple lesions in a single appointment, circumventing the necessity for local anesthesia or extensive cavity preparation. Clinically, this method has shown consistent stability, evidenced by maintained enamel integrity, enhanced rigidity, and preservation of adjacent healthy dental tissues. Additionally, the aesthetic outcomes of this approach are noteworthy, with a gradual diminution of lesion visibility over time. The present case report elucidates the long-term clinical outcomes and the efficaciousness of the Icon kit in the targeted management of specific white spot lesion pathologies.

**Keywords:** infiltration, resin, white spot, demineralization, remineralization, ICON.

### Introduction

White spot lesions (WSLs) refer to the demineralization of the enamel surface and subsurface, characterized by the absence of cavities. These symptoms serve as the initial clinical observations of the course of dental caries, with the potential for reversal. The observed lesions exhibit a distinct visual characteristic, with a white chalky, and opaque look. WSLs may manifest in patients as a consequence of undergoing fixed orthodontic treatment, hence impeding oral health and elevating the susceptibility to enamel demineralization [1].

The distinctive characteristic of these lesions can be attributed to an optical phenomenon. This phenomenon arises from the demineralization process, which leads to an expansion in the pores dimension which alters the refractive index of the enamel due to the presence of both water and air. Contributory risk elements, such as inadequate dental hygiene, disrupted saliva secretion, and the existence or lack of fluoride in certain regions, might contribute to oral health issues [2].

The therapeutic strategy varies depending on the specific types of lesions. In the first phase, the use of preventative therapies proves to be advantageous. Numerous strategies have been suggested for addressing non-cavitated carious lesions. These include the remineralization of the enamel through the infiltration of topical fluoride using fluoride mouth-wash or varnishes containing tri-calcium phosphate, or the use of casein phosphopeptide-amorphous calcium phosphate pastes combined with fluor [3]. Additionally, pastes containing hydroxyapatite, fluorine, and xylitol have been suggested. Lastly, microabrasion using 18% hydrochloric acid has also been proposed as a management strategy.

Nevertheless, it is important to acknowledge that these treatment approaches include certain limits. One such limitation is the inability to provide instant results. Additionally, these treatments necessitate patient compliance in order to be effective. Furthermore, it is worth noting that external sources of stain may become integrated into lesions during the process of remineralization

[4,5]. Moreover, it should be noted that remineralization primarily takes place on the surface level, leaving the body lesions porous. This characteristic accounts for the inconsistent outcomes and enduring presence of white discoloration.

The aim of our study was to assess the effectiveness of treating WSLs with infiltrating resin (Icon, DMG, Hamburg, Germany) and to present the clinical and the aesthetic outcomes in cases of frontal teeth with multiple WSLs [6,7].

### Case presentation

A 28-year-old male patient was referred to our dental clinic on 13 July 2023 with concerns about the appearance of white spots on his central incisors. He reported noticing the lesions several months before, with no associated pain or discomfort. The patient's medical history was unremarkable, and he reported good oral hygiene practices with no history of orthodontic treatment.

Clinical findings: upon intraoral examination, white spot lesions were noted on the labial surfaces of both upper central incisors. The lesions were well-demarcated, chalky in appearance, and located primarily in the middle third of the crown. There was no evidence of cavitation, and the surrounding enamel appeared to be intact. The radiographic examination did not reveal any subsurface demineralization or pathology. Based on the clinical presentation, a diagnosis of non-cavitated white spot lesions possibly due to

enamel demineralization was made being considered mild dental fluorosis lesions.

Given the limited presence of lesions, a minimally invasive treatment strategy utilizing infiltrating resin Icon (DMG, Hamburg, Germany) was deemed preferable. Specifically, the DMG Icon vestibular resin was applied due to the localization of WSLs.

For treating the case we decided to use Icon which is a dental treatment product used for caries infiltration and enamel lesions, such as WSLs that are common after orthodontic treatment. It is a minimally invasive treatment option that helps to stop the progression of early enamel lesions and improve the appearance of white spots on teeth.

Icon is produced by DMG and includes a resin infiltrate that penetrates into the porous lesion body of white spots, filling in the voids and creating a barrier that prevents further demineralization.

The treatment is non-invasive, meaning that it does not require drilling or removal of healthy tooth structure, making it an attractive option for patients and clinicians alike. Additionally, the esthetic outcome of Icon treatment is often very favorable, with significant improvement in the appearance of WSLs.

The Icon resin kit includes three syringes (Figure 1):

- Icon-Etch, which contains hydrochloric acid, pyrogenic silicon acid, and a surfactant;
- Icon Dry, which contains 99% ethanol;
- Icon infiltrate, a methacrylate-based resin used for infiltration.



Figure 1. DMG Icon Kit

### 1. Pre-treatment evaluation

Prior to the treatment, we conducted a detailed clinical examination to assess the size, location, and depth of the lesion ensuring that the lesion is non-cavitated and confined to the

enamel and we requested intraoral radiographs to confirm that the lesion is limited to the enamel and to rule out any dentin involvement (Figure 2, Figure 3).



Figure 2. Preoperative image showing WSLs on the upper right and left central incisors



Figure 3. OPT (Orthopantomogram) X-ray showing the intact dental structures on both dental arches

## 2. Operative field and isolation

Following the oral prophylaxis, we cleaned the tooth surface with an abrasive paste with a micro brush, and after that, we washed it with water to remove any plaque or debris. We applied a rubber dam to isolate the affected tooth and to protect the soft tissues and adjacent teeth (Fig.4). The following step was the application of etch on the surface and

preparation of the lesion by applying 15% hydrochloric acid gel for 60 seconds to erode the surface layer of enamel and open up the porosities. This step was followed by rinsing thoroughly with water for at least 30 seconds to remove the etching gel. Next, we gently air-dried the area to ensure that the lesion was fully dried.



Figure 4. Placement of the rubber dam on the upper incisors

## 3. Icon infiltration

We applied Icon-Dry (ethanol) to the lesion for 30 seconds to help in the desiccation of the lesion and to enhance the penetration of the resin followed by the Icon infiltrate resin to the lesion, ensuring full coverage.

We allowed it to penetrate for 3 minutes, and then we used the curing light to polymerize the resin for 40 seconds. A second layer of Icon infiltrate resin we applied and allowed to penetrate for 1 minute, followed by light curing for 40 seconds (Figure 5, Figure 6).



Figure 5. Application of Icon-Etch and the application of Icon-Dry.

## 4. Finishing

We remove any excess resin from the surface and margins with dental instruments or

dental floss, and polished the treated area with fine-grit polishing discs or rubber cups to achieve a smooth, lustrous finish (Figure 7).



Figure 6. Light curing for 40 seconds the resin layer



Figure 7. Removing any excess resin from the surface using dental floss

#### 5. Post-treatment evaluation

The purpose of this step is to evaluate the aesthetic outcome (Figure 8), to ensure that the white spot lesion has been masked and the

shade match is satisfactory, and to provide the patient with post-treatment instructions, emphasizing the importance of good oral hygiene.



Figure 8. Postoperative image

#### 6. Follow-Up

We scheduled follow-up visits to monitor the treated area, ensuring stability of the treatment and assessing for any potential recurrence of the lesion.

#### 7. Documentation

We documented the entire procedure, including the materials used, steps performed, and the outcome, in the patient's dental records.

### Discussions

WSLs are included in the list of potential diagnoses alongside non-carious WSLs. Non-carious WSLs can be further classified as fluorosis, developmental enamel hypomineralization, hypomineralization due to physical trauma, and enamel hypoplasia. These conditions may have genetic causes, or they may be linked to rare general syndromes [8].

The management of WSLs necessitates a multidisciplinary approach. The primary focus should be on preventing demineralization and biofilm formation, as well as utilizing various techniques for remineralizing lesions [9]. These

approaches include thinning, micro-abrasion, erosion-infiltration, adhesive composite resin restorations, and the application of bonded facets.

The Icon infiltration approach is user-friendly; the manufacturer provides clear instructions for treatment procedures and precise guidelines for the timing of component usage within the kit. According to the manufacturer's guidelines, it is advised to adhere to the recommended time limit for acid etching to prevent any potential damage to the enamel surface, such as cavity lesions [10]. In a study conducted by Zotti F et al., the authors investigated the effects of infiltrations with Vestibular Icon.

The study involved a significant number of etching cycles, and in certain instances, no adverse effects were observed. Therefore, further investigation is warranted in this context; empirical evidence suggests a correlation between etching cycles and lesion size [11]. This observation indicates that resolving larger lesions may require a greater number of etching cycles.

The procedure is characterized by its minimally invasive nature as it does not necessitate the mechanical removal of dental tissues, obviates the need for local anaesthesia, and boasts a relatively quick completion time [12, 13].

Consequently, it is well-tolerated by younger children. However, according to findings by Mattos-Silveira et al., acceptance of this conservative treatment in children might be influenced by factors such as discomfort associated with the procedure and the extended duration of clinical appointments. Additionally, clinical practice encounters constraints that can complicate therapy, particularly with paediatric patients [14]. These constraints include the need for strict isolation measures and aesthetics to mitigate certain sensations experienced by children.

The optic properties of the enamel may differ due to etiopathology and might be dependent on the refractive indices (RI) amid the enamel crystals and the substance within

the porosity causing light to disperse and creating visible opacities. The aesthetic outcome of the Icon technique relies on the interaction of light reflection with the enamel, and therefore the external visual perception after the resin infiltration. When most micro-porosities are saturated with resin infiltrate, the difference in RI between the white spots and the healthy enamel is minimized; hypomineralized enamel structure is defined by a RI between 1.00 and 1.33, but after resin infiltration, it needs an RI of approximately 1.52. This negligible discrepancy in relation to the refractive index of sound enamel, which is 1.63, goes unnoticed by the naked eye [15].

Brescia et al. reported a major improvement in colour uniformity in treated lesions in cases of mild to medium fluorosis and in some situations of slight hypomineralization in a study involving resin infiltration [16]. Managing these lesions presents challenges predominantly due to the anatomical positioning of the enamel defect. Nevertheless, the effectiveness of treatment is contingent upon the density of the mineralized outer layer in averting enamel discolorations. The demineralization often penetrates deeply into the enamel, potentially being confined to the inner regions of the enamel or spanning its full breadth, resulting in a lesion that is relatively impervious [17, 18].

The patient did not report any notable adverse responses subsequent to infiltration. The teeth did not exhibit sensitivity, and no abnormal or distressing observations were made. Several studies have examined the occurrence of tooth sensitivity following treatment, specifically focusing on the sequence of whitening procedures before infiltration.

The utilization of Vestibular Icon material has been observed in several dental conditions, including demineralization, fluorosis, traumatic demineralisations, demineralization following orthodontic treatment with fixed appliances, and hypomineralization.

## Conclusions

The patient reported satisfaction with the aesthetic outcome, as the white spots were significantly reduced and the color match with the surrounding enamel was excellent. Follow-up visits at 1 month and 6 months post-treatment showed stable results with no recurrence of the lesions.

This case highlights the efficacy of Icon infiltration resin in the management of white spot lesions on central incisors, providing a conservative and aesthetic solution for patients. Further studies of resin infiltrations with long-term recalls and follow-up are needed to establish the durability and effectiveness of this treatment modality.

**Conflict of interest:** None to declare.

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