



Resin Infiltration Technique – A Microinvasive Treatment Approach for White Spot Lesions

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Case Study

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ABSTRACT

White spot lesions (WSL) are defined as surface and subsurface demineralization of enamel without the formation of a cavity. These lesions have always been an aesthetic concern for patients. There are different treatment options for these lesions. Recently a new micro-invasive technique has been introduced for the treatment of WSL, by infiltrating the lesions with a low-viscosity resin. This technique is simple, painless, and improves aesthetics. This case report explains the ultra-conservative method of treating white spots using resin material ICON. This technique relies on the infiltration concept and helps treat white spot lesions on proximal regions and smooth surfaces.

Keywords: Icon; minimum intervention dentistry; resin infiltration; subsurface caries lesion.

1. INTRODUCTION

“Dental caries is one of the most common diseases of the hard tissues of teeth. Usually, the first sign of dental caries is a white spot on the enamel surface without the formation of a cavity. These lesions are referred to as white spots and are defined as surface and subsurface demineralization of enamel. They are more

porous than the surrounding enamel and appear more opaque due to the differences in the refraction of light compared to the sound enamel” [1,2,3].

“Etiological factors include plaque accumulation around orthodontic brackets, poor oral hygiene, fluorosis, developmental defects, molar incisor hypo-mineralization, and traumatic hypo-

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mineralization” [1]. These lesions may present aesthetic problems as well as the progression of demineralization [4,5].

Remineralization can stop the progression of white spot lesions. Remineralizing agents like Casein Phosphopeptide, Amorphous Calcium Phosphate (CPP-ACP), and Fluorides have been used to treat these lesions, but their action is limited to the surface of the lesion, and they usually take more time [6,7,8]. Micro abrasion is a commonly used approach for white spot lesions. Due to the duration, intensity, and number of applications this approach, however, may result in an aggressive reduction of enamel [6,9,10].

“Conventionally, restorations with tooth reduction have been used for the treatment of white spot lesions. However, most patients seeking treatment for white spots are children, adolescents, or young adults and these invasive procedures usually result in excessive sacrifice of tooth material, which accelerate the destruction of the tooth at an earlier age” [6,11].



Fig. 1. Preoperative view showing white spot lesions on maxillary right central incisor, mandibular right lateral incisor, and left central incisor

Recently a new concept of resin infiltration was developed, which helps in arresting the incipient lesions by penetrating the low-viscosity resin into the enamel and by obstructing the pathways for acid diffusion in the enamel. This technique also strengthens the enamel structure mechanically, thereby preventing the breakdown of the enamel surface [6,12,13].

The treatment of white spots using resin material—Icon®— (DMG America Company, Englewood, NJ) is explained in this case report. This method is based on the infiltration of resins into white spots and can be used for proximal as well as smooth surface lesions.

2. CASE PRESENTATION

An 8-year-old female patient was referred from the Department of Paediatric Dentistry to the

Department of Conservative Dentistry and Endodontics D A Pandu Memorial RV Dental College. The patient had white spot lesions on her right maxillary central incisor and mandibular right lateral incisor and left central incisor. The various treatment options were discussed with the patient's mother and the most conservative approach, the resin infiltration technique, was chosen.

Informed consent was obtained and oral prophylaxis was performed, followed by polishing using a rubber cup and prophylaxis paste. Isolation was achieved using a rubber dam (Dental Dam, Coltene, USA) and a gingival barrier (name the brand) was placed to ensure gingiva protection as the mandibular isolation is using split dam technique (Fig. 2).

Etching was done by applying Icon-Etch HCl 15% on the white spot lesion for 2 minutes followed by rinsing with water for 30 seconds to remove the acid and drying with oil- and water-free air (Fig. 3a). Icon dry (99% ethanol) was applied to the lesion for 30 seconds which desiccated the lesion by removing water from the pores (Fig. 3b). Icon Etch and Icon dry were reapplied as the white spot lesions were still visible. After reapplication, the whitish opaque lesion greatly improved. Icon resin was then applied for three minutes to the lesion (Fig. 4a). The excess resin was removed using an applicator tip followed by interdental flossing.

It was then light cured for 40 seconds. (Ivoclar blue phase N MC). The applicator tip was replaced and the Icon infiltrant was reapplied and left for 1 minute. Excess was removed and flossed followed by light curing for 40 seconds and polished using rubber cups and polishing paste.

The results were satisfactory as seen in the post-operative photographs (Fig. 4b). There was no incidence of gingival or soft tissue irritation and post-operative sensitivity.

3. DISCUSSION

White spots develop as a result of subsurface enamel demineralization under the superficial hypermineralized enamel surface. When the tooth is dry, these lesions become more evident due to the differences in the refractive indices of enamel, water, and air. The sound enamel has a refractive index of 1.62 and when it is demineralized, it becomes more porous.

Desiccated teeth become more opaque in comparison to sound enamel because the water in these porosities is replaced by air (refractive index of 1.0) [14,15].

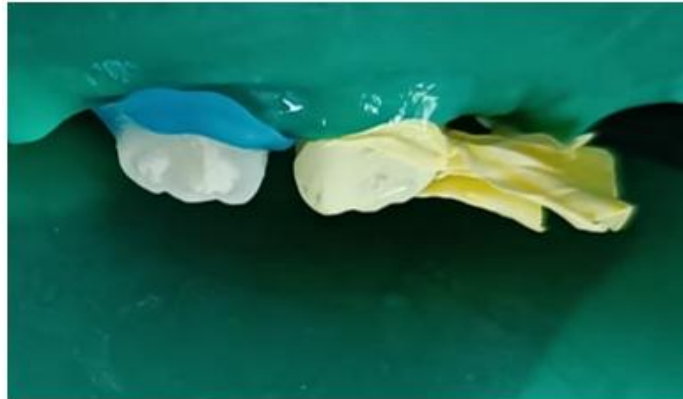


Fig. 2. Isolation using rubber dam and gingival barrier



3a(1)



3a(2)

Fig. 3a(1-2). Etching using icon etch HCl 15%



Fig. 3b. Application of Icon dry



Fig. 4a. Application of resin infiltrant



Fig. 4b. Postoperative view showing significant reduction in white spots

“The difference between the refractive indices of the infiltrated lesion and enamel becomes minimal when these micro-porosities are filled

with resin infiltrant, however, and the lesions resemble the surrounding sound enamel” [6]. Infiltration with resin helps mask the spot, even

within the deeper regions of the lesion. Compared to remineralizing agents, the resin infiltration procedure instantly reduces the white spots. This method is less invasive than micro abrasion, macro abrasion, or restorations, making it a more conservative option. By preventing the diffusion of acid into the enamel, this approach helps to arrest incipient lesions rather than removing them and it helps to mechanically reinforce enamel as well [12,16].

The superficial hypermineralized enamel is eroded by etching, exposing the body of the lesion. The etchant helps the resin to penetrate the body of the lesion by removing the superficial hyper-mineralized enamel. Meyer-Lueckel et al. reported that in comparison to micro abrasion which removes up to 360 µm of demineralized enamel, etching with 15% HCl removes approximately 40 µm of the hyper-mineralized surface layer, allowing the resin to penetrate the lesion [17,18] 99% ethanol removes the water from the lesion's porosities, allowing the infiltrant to enter the pores under the influence of capillary forces [19].

According to Paris S et al., ICON infiltrant can quickly penetrate the enamel because of its low viscosity, high surface tension, and low contact angle [20]. Triethylene-glycol-dimethacrylate-resin has demonstrated deeper penetration when compared to the other infiltrants. Due to the potential for material shrinkage following the initial application, which could result in the formation of spaces, the resin is applied twice as it occludes these spaces [16]. The resin infiltration approach is very useful for managing the aesthetics of mild white spot lesions that have developed after orthodontic treatment.

4. CONCLUSION

The initial enamel white spot lesions can be masked with resin infiltration, which also prevents the lesions from progressing into deeper areas. By inhibiting the demineralization process and sealing the enamel's micropores, further caries can be prevented while simultaneously increasing the enamel's resistance. But the long-term colour stability of this technique should be continuously evaluated with more clinical studies.

CONSENT

As per international standard or university standard, parental(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per the international standard or university standard, written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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