

Microinvasive Management of White Spot Carious Lesions Using Resin Infiltration Technique - A Case Report

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Abstract

White tooth discoloration could be due to multiple reasons such as dental fluorosis, early caries (white spot lesions), and developmental defects. White spot lesions are enamel sub surface demineralization without cavitation. They are reversible and chalky white in appearance, commonly seen after orthodontic treatment. Conventionally, various products have been used such as fluorides, casein phosphoprotein-amorphous calcium phosphate. DMG icon is one such product based on caries infiltration. This case report presents a clinical case where white spot carious lesion is treated using microinvasive technique of resin infiltration by DMG-ICON infiltration resin.

Keywords: White spot lesions, Resin infiltration, Non-invasive treatment.

INTRODUCTION

In the management of dental caries, a dramatic change has evolved in recent years from the traditional restorative treatment approach to a more preventive approach, namely non-invasion or minimal invasion. Enamel carious lesions are caused by mineral loss in the body of the lesion, which results in greater visual enamel opacity because of alteration of the refractive index of the affected area. Similarly, white marks on anterior teeth can be unsightly and patients often want treatment of the same. White patches, sub surface lesion, white line/stripes, faint white lines, and white speckled lesions can also be due to the presence of tissue porosity.

Noninvasive treatment of enamel carious lesions, which includes remineralization of the lesion with fluoride and casein phosphopeptide-amorphous calcium phosphate, or the use of therapeutic sealants for occlusal lesions has been given great attention in the recent years.

“Resin infiltration” is a technique in which diffusion barrier is created within the lesion without establishing any material on the enamel surface. Therefore, during the management of smooth surface and proximal non-cavitated caries lesions resin infiltration can be of great use as in these porosities of enamel lesion are infiltrated with a low viscosity resin. Thus, resin infiltration can delay the time for restoration placement.

ICON, DMG is an innovative product for the micro-invasive treatment of dental lesions in proximal regions and on smooth surfaces. Initially, it was developed as a treatment for incipient interproximal caries and anterior white spot lesions. Clinical experience with this technique, however, revealed that it is also effective in masking enamel discoloration of non-carious origin. The procedure consists of etching the tooth with a 15% hydrochloric acid, drying with an ethanol solution, and applying a TEGDMA-based resin infiltrant.

CASE REPORT

A 22-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with the complaint of white spots in the upper anterior teeth. Clinical examination revealed white spots present on 14,13,12,11,21,22,23,24 involving tooth from cervical third to incisal third with brownish discoloration on 11,21 (Fig 1).

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Received: Nov. 19, 2021; **Accepted:** Dec. 23, 2021; **Published:** Jan. 10, 2022

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How to cite this article: Chauhan V, Sharma A, Srivastava V, Mishra P, Narang A, Singh SK. Microinvasive Management of White Spot Carious Lesions Using Resin Infiltration Technique - A Case Report. J Res Adv Dent 2022;13(2):9-12.

Access this article online

Website:
www.jrad.co.in

DOI:
<https://doi.org/10.53064/jrad.2022.13.2.123>

DMG Icon (Fig 2) was used in this case to remove white spots. Teeth were isolated by placing rubber dam from 14 to 24. Microabrasion was done prior to the treatment with the help of pumice slurry.

Treatment involves three major steps - (1) Icon etch (2) Icon dry and (3) Icon infiltrate followed by light curing for 40 s. After tooth were isolated and microabrasion was done Icon etch (Fig 3) was applied onto the lesion site by turning the syringe shaft carefully for 2 min. Excess material was removed with cotton. It was then rinsed with water and dried. After that Icon dry (Fig 4) was applied for 30 s and visual inspection was done to see if discoloration diminished or not. If discoloration did not reduced then Icon etch and Icon dry steps were repeated until desired results were obtained. In this case, steps were repeated four times. After that Icon infiltrate (Fig 5) was applied on all the teeth and was allowed to penetrate for 3 min followed by light curing for 40 s (Fig 6). Rubber dam was removed and surface was finished using polishing cups (Fig 7).

Postoperative instructions were given to avoid food that could possibly stain the teeth and toothpaste for sensitivity was prescribed in case any sensitivity persists.

DISCUSSION

Enamel carious lesions are characterized by mineral loss in the body of the lesion, resulting in greater visual enamel opacity due to alteration of the refractive index of the affected area.^[1,2] Remineralization of the lesion with fluoride and casein phosphopeptide-amorphous calcium phosphate or the use of therapeutic sealants for occlusal lesions have been in use for years. However, as these approaches require great compliance from the patient, they do not get successful very often. Non-cavitated enamel caries has been treated with sealants too as an attempt to reduce caries progression. The pores within the body of enamel caries provide diffusion pathways for acids and dissolved minerals.^[3]

Experiments conducted by Robinson *et al.*^[4] suggested an alternative approach for superficial sealing of these pores and arrest carious lesions by the infiltration of these pores with resorcinol-formaldehyde resins. This concept was been then commercially developed and modified in Germany for the management of smooth surface and proximal non-cavitated caries lesions where the porosities of enamel lesion are infiltrated with a low viscosity resin, a technique known as “resin infiltration.” This technique is based on the principle of creating a diffusion barrier within the lesion and not on the lesion surface.^[5,6-11]

Resin infiltration, introduced by Munoz *et al.*^[7] is one of the promising approaches for arresting lesion progression in case of enamel caries. White spot lesion can be masked efficiently by caries infiltration. However, the impermeable surface layer of natural enamel hampers resin penetration. Therefore, a preparation phase is required wherein the tooth surface is cleaned and prepared with 15% hydrochloric acid



Figure 1: Pre-operative clinical picture



Figure 2: DMG icon



Figure 3: Icon etch application (2 min and then washed and dried)



Figure 4: Icon dry application (30 s) (Steps from figure 6 to 7 are repeated until desired results are obtained)

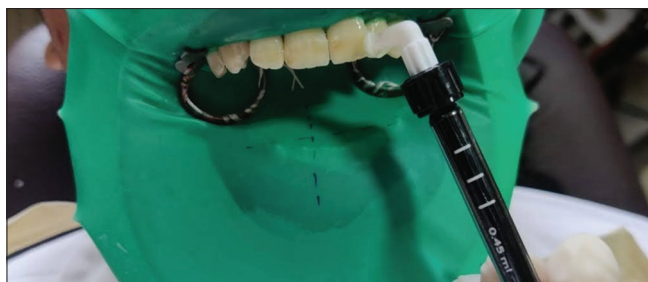


Figure 5: Icon infiltrate application (3 min for better penetration)

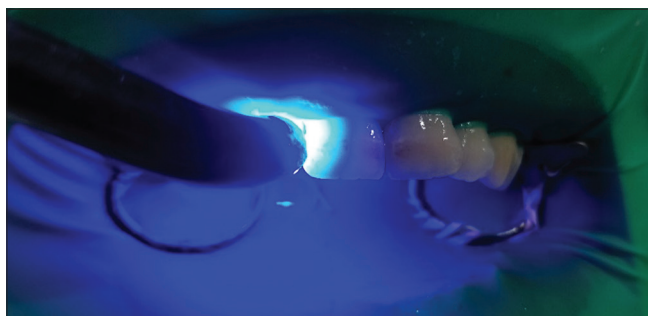


Figure 6: Light cure for 40 s



Figure 7: Post-operative picture

(icon etch) for 2 minutes. 15% HCL gives a penetration depth of 58 μm , which is more than double that of phosphoric acid (25 μm), enabling penetration into the deepest part of the lesion, preventing further attacks.^[8] This technique also involves slowly replacing water within the demineralized collagen matrix with increasing concentrations of 99% ethanol (Icon Dry), allowing it to penetrate the collagen matrix.

The pores within the hypomineralized lesion get occluded by the low viscosity resin infiltrant, (icon resin-tetraethylene glycol dimethacrylate) as a result blocking the diffusion pathways for acids and dissolved minerals, thus sealing these pathways. It is marketed under the name Icon® (DMG America Company, Englewood, NJ) and is described as a micro-invasive technology that fills, reinforces, and stabilizes demineralized enamel without sacrificing the healthy tooth structure.^[9,10]

The microporosities of enamel caries lesions are filled with either a watery medium (RI 1.33) or air (RI 1.0). The difference in the refractive indices between the enamel crystals and

medium inside the porosities causes light scattering that results in a whitish opaque appearance of these lesions, especially when they are desiccated.^[11,12]

Hence, this technique can also be used to camouflage aesthetically disfiguring white spot lesions on buccal surfaces.^[13] This is due to the fact that the refractive index of resin infiltrant (1.42) is optimized and adapted to the Refractive Index of sound enamel (1.62) which causes changes in light scattering within the lesions.

According to Robinson *et al.* about 60 $\pm$ 10% of the lesion's pore volume gets occupied by resin.^[4] Although ICON has provided an excellent treatment option for white spot carious lesions it still has few drawbacks

1. Does not produce satisfactory results in cavitated lesions
2. Greater the depth of lesion, lower the success rate
3. Maintaining absolute isolation is mandatory or else treatment may fail.

Hence, there is an evident need for more clinical studies demonstrating long-term aesthetic results of resin infiltration therapy.

CONCLUSION

Resin infiltration has been an outstanding innovation in the field of dentistry that has helped us to prevent caries progression at an early stage. It gives excellent esthetics by masking the white spots and also being micro invasive at the same time. Hence, DMG-ICON resin infiltrates can be considered a promising solution for smooth surface/non-cavitated enamel lesions.

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