

# Icon : A Revolutionary Treatment of White Spot lesions

Dr. Niladri Maiti  
Senior Lecturer

Prof. (Dr.) Utpal Kumar Das  
Professor & HOD

Department of Conservative Dentistry & Endodontics  
Guru Nanak Institute of Dental Science & Research, Kolkata, India

Address for Correspondence  
Dr. Niladri Maiti  
46-A, Harish Chatterjee Street  
Kolkata-700026  
dr.niladrimaiti@gmail.com

## Abstract

The purpose of this article is to assess the new innovative use of the resin infiltration technique for the minimal invasive aesthetic treatment of white spots and how this may be used for the eradication of white lesion, flecks and patches that are not due to caries. It is based on the infiltration of an initial enamel caries lesion with low-viscosity light-curing resins called infiltrants. The surface layer is eroded and desiccated, followed by resin infiltrant application. The resin penetrates into the lesion microporosities driven by capillary force and is hardened by light curing. Infiltrated lesions lose their whitish appearance and look similar to sound enamel. Additionally, the treatment prevents lesion progression. This technique might be an alternative to microabrasion and restorative treatment in treating of white spot lesions of esthetically relevant teeth. Thus, the resin infiltration techniques have opened up a new range of options for minimal invasive treatment of white spots.

**Keywords:** Capillary force, infiltrant, infiltration, resin, white spot

A new caries treatment technique that bridges the gap between remineralization and restoration could do away with that age-old dilemma: Is it better to wait and watch or drill and fill?

## Introduction

White marks and white lesions on anterior teeth can be unsightly (Fig. 1) Patients often seek treatment to have these marks eradicated. The first line of treatment of white spot is remineralisation. There are creams, pastes and topical remineralisation treatments such as fluoride therapy, case in phosphopeptide amorphous calcium phosphate pastes, Novamin (calcium sodium phosphosilicate), invasive approaches such as micro-abrasion, conventional bonding and various types of veneers.<sup>1</sup>

A new technique using resin infiltration has been introduced.<sup>2</sup>

A new minimally invasive technique for treating white spot lesions is by caries infiltration, a product of "DMG," (U.S.A) called "Icon." (Fig. 2)

This icon prevents further progression of

initial enamel caries lesions and occludes the microporosities within the lesion by infiltration with low-viscosity light-curing resins that can rapidly penetrate into the porous enamel. The resin completely fills the pores within the tooth, replacing the lost tooth structure and stopping caries progression.<sup>3,4</sup>

After conditioning of lesions using 15% hydrochloric acid gel (Icon etch), desiccating the tooth with ethanol is performed, which allows easy penetration of resin into the porous tooth.<sup>5</sup> The resin penetrates into the lesion by capillary forces and creates a diffusion barrier inside the lesion and not on the lesion surface.<sup>5,6</sup> (Fig. 3)

The advantage of resin infiltration is that enamel lesions lose their whitish appearance when their microporosities are filled with the resin and look similar to sound enamel.

## Indications

1. Small white lesions inherent on the tooth
2. Smooth surface white decalcification on the tooth such as after stasis of plaque after orthodontic treatment
3. Larger white marks and bands on the tooth
4. Lesions due to molar incisor hypoplasia (MIH)
5. Hypoplasia stains due to traumatic injuries
6. Mild to moderate fluorosis
7. Large single bands due to fluorosis.

"The secret to Icon and to infiltration is the resin, which has an extremely high penetration coefficient," Flavin said. "The best bonding agents on the market today infiltrate 10 to 12 microns into the tooth structure. Icon infiltrates 600 microns, and it can fully infiltrate a lesion in only two to three minutes."

## The Resin Infiltration Technique

The resin infiltration technique was introduced as a method of reducing the size of carious lesions in the enamel.<sup>7</sup> The resin was meant to infiltrate into the hypomineralised enamel and arrest the developing caries.<sup>8</sup> Whilst this technique can be used for interproximal and smooth surface caries [9] a new use has been suggested, that of eradicating surface white spots and marks on the buccal and labial surface of anterior teeth.

The use of resin infiltration interproxi-

mally was the only way of sealing the interproximal surface, thus improving the inhibition of caries progression. This resin infiltration can delay the time for restoration placement and thus closes the gap between non-invasive and invasive treatment options.<sup>8</sup>

When starting to use the resin infiltration treatment, it is easier to begin treating a smaller white lesion as smaller white marks are easier to remove than the larger patches. The medium-to-large size patches may require two treatments if the lesion is very deep then it is advisable to sandblast the white area prior to applying the hydrochloric acid as an etch to the tooth. The sandblasting helps to open up the enamel tubules so that better penetration of the hydrochloric acid can be achieved.

The technique consists of these components-

1. The preparation phase the surface of the teeth is cleaned and prepared with 15% hydrochloric acid (**Icon etch**). (Fig. 4) for 2 minutes and stirring the gel from time to time during application with a microbrush. The etching procedure removes superficial discolorations and the higher mineralized surface layer, which might hamper resin penetration. (Fig. 5)
2. The lesion is desiccated by applying ethanol (**Icon-Dry**) (Fig. 4) for 30 s followed by air drying. This step will change the refractive index of the surface of the enamel and will assist in assessing whether the resin will make a difference in erasing the white lesion completely or whether further sand blasting and hydrochloric acid etching will be necessary.
3. **Icon resin** composed of tetraethylene glycol dimethacrylate (Fig. 6) is applied on the lesion surface using a microbrush and allowed to penetrate for 5 min.<sup>10,11</sup> The excess is removed using a cotton roll and light cured.

The application of infiltrant should be repeated once to minimize enamel porosity. Finally, the rough surface is polished using disks and silicone polishers to avoid rediscoloration by food stains.<sup>10</sup>

## Discussion

In a study undertaken by Munoz et al , 2013<sup>2</sup> where suitable cases were infiltrated

Maiti, et al. : Icon : A Revolutionary Treatment of White Spot lesions

with resin, they found that the most successful cases were the ones with fluorosis stains. These cases showed visibly perceptible differences. The hypoplasia areas were not completely eradicated. The researchers reported that the patients recovered their self-esteem as a result of the treatment and thus this was considered as a success.

The effect of the hydrochloric acid on the enamel was evaluated in a study by Paris et al, 2010.<sup>7</sup> These researchers evaluated the etching effect of the hydrochloric acid vs phosphoric acid on deciduous teeth. They evaluated 36 pairs of primary molars enamel lesions and etched for two minutes both the phosphoric acid and hydrochloric acid they examined the results under confocal microscopy. They reported that there was a difference between the two acid on the surface of the teeth and that the hydrochloric acid caused higher erosion on the enamel thus allowing deeper penetration of the resin infiltrant. The erosion depth of the hydrochloric acid was twice the depth of the phosphoric acid. The phosphoric acid at etching time of two minutes can not erode the surface of the enamel. It seems that the resin infiltration technique can reduce the long term restorative needs and costs thus complementing the concept of minimal intervention dentistry.<sup>12</sup>

Dr. Paris and his colleagues address various aspects of the infiltration technique, such as evaluating different etching gels for pretreatment purposes; comparing the penetration coefficients of a proprietary resin formulation to commercially available adhesives and validating the ability of fluorescence confocal microscopy to analyze

the infiltration of caries lesions with low-viscosity resins.

More recently, two additional studies involving resin infiltration- "Progression of resin-infiltrated natural caries lesions in vitro" and "Modern detection, assessment, and treatment of initial approximal lesions."

In the first study, they applied the infiltration process to extracted teeth, etching the teeth with 15% hydrochloric acid gel for 120 seconds and then infiltrating with one of four experimental infiltrants -- bisphenol A glycidyl methacrylate (BisGMA) 25%, triethylene glycol dimethacrylate (TEGDMA) 75%; BisGMA 20%, TEGDMA 60%, ethanol 20%; TEGDMA 100%; and TEGDMA 80%, ethanol 20% -- for five minutes. Specimens of the teeth were then exposed to a demineralizing solution (pH 4.95) for 200 days. After imaging with micro-radiography, they found that the lesions treated with the latter three infiltrants all showed lower progression rates in a demineralizing environment in vitro than lesions that were not treated with infiltrants.

The second study, sponsored by DMG, compared resin infiltration to flossing and sealing of approximal lesions around the enamel-dentin junction as part of an ongoing three-year, split-mouth study on approximal-posterior surfaces and preventive procedures. The study concluded that "the infiltration technique has been described as a clinically feasible method for treating approximal enamel-dentin junction lesions."

It is shown that the resin arrests the progression of white spot by occlusion of the micro-porosities that provide diffusion pathways for acids and dissolve minerals; it also blocks the further introduction of any

nutrients into the porous system.

Secondly, the white opaque appearance of the lesion can be masked by using resin infiltration. The principle of masking enamel lesion by resin infiltration is based on changes in light scattering within the lesion, which was proved by the study conducted by the authors Kidd and Fejerskaro who stated that the enamel has a refractive index of 1.62. In the subsurface lesion, the pores are filled with a watery medium with a refractive index of 1.33. The difference in refractive index between the water and the enamel affects light scattering and makes the lesion look opaque. The microporosities of the enamel caries lesion are filled with either a watery medium (R.I. of 1.33) or air (R.I. of 1.0). The microporosities of infiltrated lesions are filled with resin (R.I. of 1.46), which, in contrast to the watery medium, cannot evaporate. Therefore, the difference in refractive indices between the porosities and enamel is negligible and lesions appear similar to the surrounding sound enamel.<sup>13</sup>

**Conclusion**

Cosmetics and esthetics are current trends of dental industry, as more and more patients are demanding for minimally invasive cosmetic enhancement without anesthesia, drilling and less-expensive restorations. This technique may be considered as a microinvasive treatment of smooth-surface white spot lesions and also one that allows for the recovery of natural tooth appearance. Thus, Icon Resin is a new microinvasive technology that will fill, reinforce, stop the caries progression and mask the enamel white spot lesions.

**References**

References are available on request at editor@healtalkht.com

