

Chameleon Effect of A Micro-Invasive Approach for the Esthetic Improvement of Fluorosis and Hypoplastic Stains: Case Reports

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ABSTRACT

Introduction: White opacities have always been a major concern of esthetics for patients and can have varying etiology such as dental fluorosis, early caries (white spot lesions), developmental defects etc. Resin infiltration is a novel microinvasive approach to treat smooth-surface white spot lesions has recently been developed.

Case report: Two cases of white lesions (fluorosed and hypoplastic) were treated with resin infiltration technique. ICON smooth surface kit (DMG, Hamburg, Germany) was the material used according to manufacturer's guidelines. This technique masked the lesions completely and improved esthetics significantly.

Conclusion: The resin infiltration technique is a promising microinvasive approach to preserve (demineralized) enamel, arrest lesion progression and esthetically mask white spot lesions.

Keywords: White spot lesions, fluorosis, hypoplastic, case report, chameleon effect.

INTRODUCTION

In dentistry, the concept of aesthetics is extremely subjective and is related to beauty, harmony and the needs of the patient. The interactions between new restorative materials and techniques allow the reproduction of dental structures, restoring form and function in such a way that restorative procedures become imperceptible.¹ Certain tooth colors, hypocalcifications, surface imperfections, and other perceived flaws are subjective measurements with important esthetic considerations.² White tooth discoloration can result from a number of factors and are usually a concern of esthetics for patients. In general, white discolorations of enamel might be due to dental fluorosis, opacities due to early caries called as white spot lesions (WSL's) and other opacities like developmental defects.³

Dental fluorosis is a form of enamel hypomineralization due to the effect of excessive fluoride on ameloblasts during enamel formation resulting in surface and subsurface porosities and subsequent optical and physical changes. The main consequence of dental fluorosis is compromised esthetics. In its mildest form, enamel fluorosis appears as loss of translucency at the tip of the summit of the cusps of premolars, molars, or incisal border of the anterior teeth.

Enamel hypoplasia is another cause of white spot lesions which occurs due to perinatal problems, premature birth, low birth weight, chronic infections, and febrile episodes in infancy, and trauma to permanent teeth or infection of their deciduous predecessors. A classic feature of enamel hypoplasia is that the defects are very well demarcated and affect few teeth, unlike those in fluorosis which tend to have diffuse boundaries and affect many teeth.

Some of the commonly used techniques to improve the

appearance of tooth stains are enamel bleaching, microabrasion, placement of veneers, or artificial crowns. The choice among these treatments depends on the severity of the disease.² Resin infiltration is an alternative therapeutic approach to esthetically mask white spots and arrest progression of enamel lesions. This treatment uses low viscosity light curing resins to occlude the microporosities within the lesion body by infiltration. A positive effect of resin infiltration is that the enamel lesions lose their whitish opaque appearance and become more translucent due to change in refractive index and look similar to sound enamel ultimately improving the esthetics.⁴

With the aim of improving the esthetic appearance, these case reports describe the minimally invasive infiltrant resin technique for camouflaging the white spot lesions formed due to fluorosis and enamel hypoplasia. Ethical approval was sought from Institutional Review Board, and informed written consent was obtained from the patients.

CASE REPORTS

Case 1

A 22 year old female patient reported to the department of Conservative Dentistry and Endodontics, with a chief complaint of whitish discoloration of all the teeth which affected her appearance and smile. The patient gave a history of early childhood living in a high fluoridated area. On clinical examination, the lesions were white, opaque, diffuse and affected all the teeth and the diagnosis was made as mild fluorosis. The enamel infiltration technique with resin infiltrant (Icon, DMG, Hamburg, Germany) was selected for the treatment (Figure-1). Considering her smile line, the labial surfaces of maxillary right second premolar to left second premolar (#15 to #25) were planned to be treated.

The conventional rubber dam was applied to protect soft tissues and to achieve clean, dry working conditions. After the teeth were cleaned using prophylaxis paste, the enamel on the buccal surface was eroded by the application of 15% hydrochloric acid gel (Icon-etch) for 120 seconds (Figure-2A). For homogeneous etching, the etching gel was stirred from time to time using the smooth surface-tips provided in the product kit. Subsequently, the etching gel was thoroughly washed away for 30 seconds

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using water spray. To completely remove the water retained within the microporosities of the lesion body, lesions were desiccated twice by the application of ethanol for 30 seconds (Icon-dry) and subsequent air-drying (Figure-2B). The whitish appearance of enamel lesions became more pronounced after air-drying.

A resin infiltrant (Icon-infiltrant) was applied on the lesion surface using smooth surface-tips and allowed to penetrate for 3 minutes (Figure-2C). Because the aim of infiltration is to create a diffusion barrier inside the lesion and not on top of the lesion surface, resin surplus on the tooth surface was wiped away using a cotton roll before light polymerization for 40 seconds (Figure-2D). After light curing, reapplication of infiltrant for 1 minute and light polymerization (40 seconds) was carried out to minimize enamel porosity, according to manufacturer's recommendations. Finally, the roughened enamel surface was polished using disks and silicone polishers to avoid rediscoloration by food stains. An improvement in the esthetic appearance was achieved and the fluorosis stains were well blended (Figure-3).

Case 2

A 21 year old male patient reported with a chief complaint of white lesion on the left upper front tooth and gave a history of its presence since childhood. On clinical examination, the lesion was observed to be well demarcated, present on the incisal third of #21 and was diagnosed as Enamel Hypoplasia. Resin infiltration technique was used to treat the lesion with the same protocol followed in the previous case. A remarkable improvement in esthetic appearance was observed following the treatment procedure.

DISCUSSION

The White Spot Lesion (WSL) has been defined as "subsurface enamel porosity from carious demineralization" that presents itself as "a milky white opacity when located on smooth surfaces".⁵ WSL is a broad term that includes developmental enamel lesions (fluorosis, enamel hypoplasia, etc.), and localized areas of demineralization due to incipient caries. The etiology of dental fluorosis seems to be well known. Excessive consumption of fluoride during critical ages disturbs enamel mineralization, inhibits enamel apatite crystal growth, and interferes with the degradation of enamel matrix proteins, which results in a whitish brown defect of enamel structure, depending on the severity of the dental fluorosis.⁶ Enamel hypoplasia is an incomplete or defective formation in the organic matrix of the enamel. The irregularities present in a hypoplasia provide favorable conditions for the retention of plaque and the early development of caries lesions, which progress and reach deep into the enamel and the dentin.¹

Correct diagnosis based on its etiology, depth of lesion, and prognosis of technique are crucial factors in the treatment planning and in the success of the case. Several techniques have been devised to treat esthetically objectionable fluorosis and discoloration/hypoplasia such as direct/indirect veneers, bleaching, micro and macroabrasion and full crowns. Usually, enamel microabrasion is the chosen technique which removes superficial parts of the lesion by abrasion with a slurry of hydrochloric acid and pumice. Unfortunately, with this technique, substantial amounts of enamel often have to be eroded to improve appearance. The inherent danger of using a

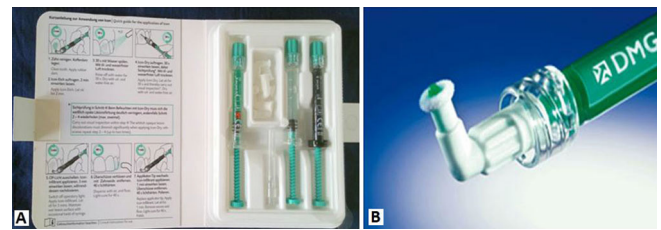


Figure-1: A) ICON DMG Smooth surface kit B) Smooth surface applicator tip

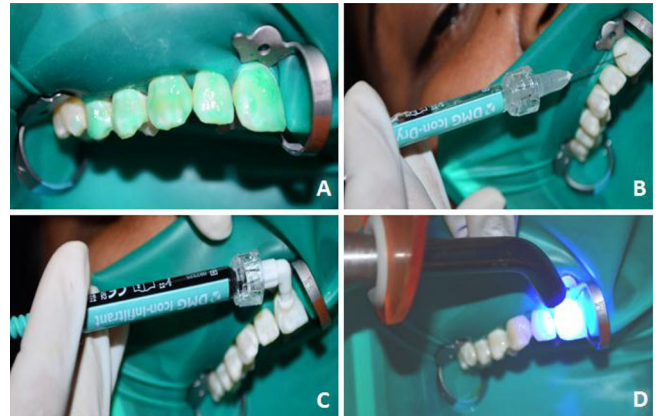


Figure-2: A) Icon Etch (2 mins) B) Icon Dry (30 sec) C) Icon Infiltrant (3 mins) D) Light cure (40sec)

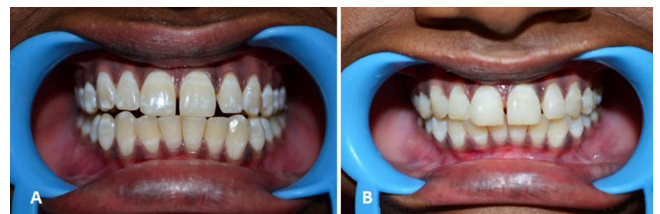


Figure-3: Case 1: A) Preoperative (mild dental fluorosis) B) Postoperative (note improved esthetics)

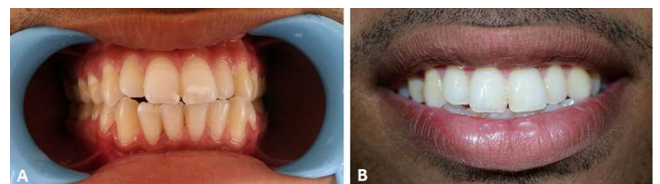


Figure-4: Case 2: A) Preoperative (enamel hypoplasia in #21) B) Postoperative (note remarkable improvement in esthetics)

strong acid intraorally, and the inconvenience and time required for application have led to the search for a safer, quicker, easier method.²

Resin infiltration is a novel treatment option for white spot lesions and might bridge the gap between non-operative and operative modalities. It is a microinvasive technology that fills, reinforces and stabilizes demineralized enamel, without drilling or sacrificing healthy tooth structure. It has also been shown to inhibit caries progression in lesions that are too advanced for fluoride therapy.

This technique uses infiltrants that are light curable resins optimized for rapid penetration into the porosities of the lesion body. These materials have a very low viscosity, low contact angles to the enamel and high surface tension which allow complete penetration of the resin infiltrant into the lesion body.

Acid etching with 15% hydrochloric acid gel removes the partially mineralized intact surface layer that could hamper the resin from penetrating into the lesion. Acid-etching by hydrochloric acid when applied for 120 seconds has been demonstrated to be superior to 37% phosphoric acid gel in removing the surface layer of natural enamel lesions.⁷

Sound enamel has a refractive index (RI) of 1.62. The microporosities of enamel caries lesions are filled with either a watery medium (RI 1.33) or air (RI 1.0). The principle of masking enamel lesions by resin infiltration is based on the difference in refractive indices between the enamel crystals and medium inside the porosities which causes light scattering. This results in a whitish opaque appearance of these lesions, especially when they are desiccated. The infiltrants have a refractive index of 1.46 which is close to that of sound enamel. Therefore, after application, the difference in refractive indices between the infiltrated porosities and sound enamel is negligible and lesions appear similar to the surrounding sound enamel, also called "The Chameleon Effect".⁴

In the present cases, the resin infiltration technique was considered the treatment option because no mechanical enamel removal is required for blending. Only 30 to 40 µm of enamel was eroded by etching with this technique.⁸

Resin infiltration offers some advantages compared with the remineralizing (fluoridation) approach. First, the appearance even of deep lesions can be improved because the resin infiltrant is capable of penetrating deep into the lesion. Second, the esthetic improvement is achieved instantly. Resin infiltration is much less invasive compared to enamel microabrasion or conventional restorative techniques, and only negligible amount of tooth structure is sacrificed by etching and polishing. Similar to remineralizing approaches and enamel microabrasion, the esthetic outcome of caries infiltration cannot be precisely predicted. But even if not all whitish parts of a lesion disappear completely, resin infiltration usually leads to a considerable improvement of the appearance. Thus, resin infiltration is a relatively fast treatment option for masking demineralized enamel lesions.

The drawbacks of this technique are that premature curing of resin under ambient light, it is more technique sensitive, case selection needs to be proper and some studies have shown poor colour stability of the infiltrant.⁹

CONCLUSION

Although the results of these cases are encouraging, further evaluation of this technique for different types of lesions and longevity of the treatment in a larger sample size of patients is required.

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