



ESTHETIC MANAGEMENT OF DEVELOPMENTAL ENAMEL DEFECT WITH RESIN INFILTRATION TECHNIQUE

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ABSTRACT

Developmental defects cause color changes in enamel, compromising the esthetic appearance of the tooth and therefore affecting the child's quality of life. The resin infiltration technique has shown a positive esthetic effect in the treatment of developmental enamel defects with different etiologies and is regarded as micro invasive procedure since only a small amount of enamel is removed in this procedure. The present paper reports the effectiveness of the resin infiltration technique (Icon, DMG) in the management of localised enamel hypomineralisation of permanent teeth after trauma to the primary predecessor.

KEYWORDS : Developmental defects of enamel; Enamel hypomineralisation; Icon; Resin infiltration.

INTRODUCTION

Developmental enamel defects (DED), which can be classified as demarcated opacity, diffuse opacity, and hypoplasia clinically, are caused by changes in hard tissue matrices and their mineralization that happen during odontogenesis.¹ When the maturation stage of enamel formation is disrupted, enamel hypomineralisation occurs, and it manifests as diffuse or clearly defined opacities. Enamel hypoplasia, which manifests as widespread grooving, pitting, or even a complete absence of enamel, results from the defective formation of the enamel matrix.² The developmental enamel defects is caused by a number of factors, including local, systemic, genetic, environmental, or multifactorial in nature. Trauma to the primary teeth is one of the most common causes of localised enamel defects in permanent teeth.³ The traumatic hypomineralised lesion is a consequence of a periodontal disturbance involving the primary tooth, affected by luxation injuries during the mineralization phase of the permanent tooth, which reduced the mineral phase and changed the chemical makeup of enamel and, as a result, its optical characteristics.⁴ Additionally, the germ of a permanent successor can be harmed by the periapical infection of a deciduous tooth.⁵

Several techniques have been proposed to improve the appearance of white opaque spots, such as micro abrasion, bleaching, composite restoration, or veneers. However, they are potentially more invasive. Thus, it becomes a practical choice for the treatment of early dental caries on the anterior teeth. Resin infiltration is a microinvasive procedure and in addition, the resin infiltration has a high penetration coefficient into the intracrystalline spaces of the porous lesion, rehardening the tissue that is demineralizing and preventing it from progressing further.^{6,7,8}

This clinical case demonstrates the resin infiltration technique for masking developmental enamel lesions presenting as white opaque spots and achieving immediate esthetic results.

CASE REPORT

A 12-year-old female patient was brought to the Department of Pedodontics and Preventive Dentistry at Inderprastha Dental College and Hospital, Sahibabad, by her parents, with the chief complaint of white opaque spots on the upper front teeth region since the eruption of teeth. The mother gave a history of trauma to the primary tooth when the patient was 2 years old.

The child had no significant past medical history. No other family members had a history of having white opaque spots. On intra-oral examination, both the upper central incisors had clearly defined white opacities. (Figure 1)

Figure 1: A clinical view of a 12-year-old patient with white opaque spots in the maxillary central incisors.



The white opaque spot was reported as an esthetic concern by the parents. The procedure to be performed was explained to the child and parent, and written informed consent was obtained for the same.

After discussing all the treatment options with the parent, a decision was made to perform the resin infiltration technique with Icon (DMG-Hamburg, Germany). To prevent contamination and soft tissue irritation and to achieve the highest level of isolation necessary, the treatment was carried out under a rubber dam, as it is a sensitive technique procedure. Each step of the procedure involves various stages and is summarised in (Table-1) along with the composition of the product as per the manufacturing guidelines. The step-by-step procedure was done in this case. (Figures 2: A-F).

Table 1: Composition and Procedure for Icon® Resin Filtration

| Material | Icon® Resin Infiltration |
|--------------|--|
| Manufacturer | DMG-Hamburg, Germany) |
| Composition | 1. Icon-Etch with 15% HCl 2. Icon-Dry with 99% ethanol 3. Icon-Infiltrant (methacrylate-based resin matrix, initiators, additives) |
| Procedure | 1. Clean the affected tooth 2. Apply Icon-Etch. Periodically massage for 2 minutes 3. Rinse with water for 30s. Air dry 4. Apply Icon-Dry. Let set for 30s. Air dry 5. Apply Icon-Infiltrant. Allow to set for 3 minutes or 6 minutes in case of deeper and larger defects 6. Light-cure for 40s 7. Apply Icon-Infiltrant. Let set for 1 minute 8. Light cure for 40s |

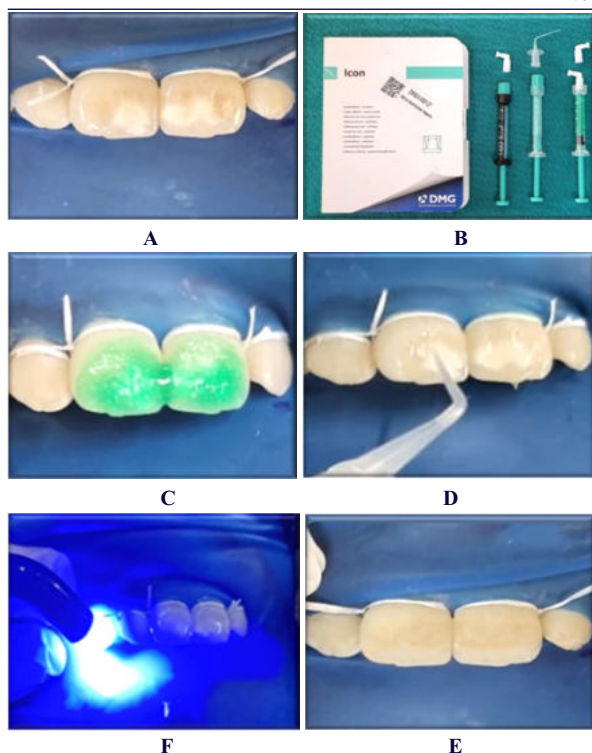


Figure 2: A- Preoperative front view, B- ICON kit, C- Application of 15% HCL (icon-etch), D- Dehydration with 99% ethanol, E- Application of low viscosity resin infiltrant (Icon infiltrate) and Light cure polymerization of resin infiltrant, F- Immediate postoperative view. (As the desired color change was not achieved, therefore steps 2-4 were performed twice as per the manufacturing guidelines)

DISCUSSION

The ICON resin infiltration procedure is a single visit procedure that provides mechanical stabilisation of demineralized enamel and is described as a micro-invasive technology that fills, and reinforces the enamel without sacrificing the healthy tooth structure.⁸ The white opaque appearance of enamel is due to the presence of air (R.I 1.0) or water (R.I 1.33) within the lesion body with a refractive index contrasting the sound enamel (R.I 1.62). Light scattering occurs when different refractive indices interact, causing the color of enamel to change, especially when it is dehydrated.⁹ The microporosities of infiltrated lesions are filled with resin (RI 1.46) that, unlike water, cannot evaporate. As a result, the refractive index difference between porosities and enamel is less, and lesions seem identical to the sound enamel.¹⁰

The principle of resin infiltration is to saturate the porous enamel with resin through capillary action, occluding the microporosities to halt the progression of the lesion.¹¹ Robinson et al. reported that resin occupied approximately 60% of the pore volume of the lesion.¹² To achieve this goal, a solution of 15% hydrochloric acid (HCL) should be applied for 90-120 seconds. HCL removes the less-porous surface layer of enamel, allowing resin to infiltrate the internal enamel porosities, resulting in a penetration depth of 58 μ m, which is more than twice that of phosphoric acid (25 μ m), allowing penetration into the deepest part of the lesion.¹³ According to Kielbassa et al resin infiltrates into subsurface lesions, producing resin-infiltrated sections of the lesion.¹⁴ 99% ethanol (Icon Dry) is applied for 30 seconds followed by air drying to dehydrate the surface and maintain a completely dry field. Doing so will encourage hydrophobic monomers to penetrate demineralized wet enamel or dentine and increase the effectiveness of hydrophobic infiltrate (TEGDMA), resulting in a layer of resin infiltration that is clearly defined. Visual inspection is important as ethanol permeates the collagen matrix without causing the interfibrillar gaps to further contract, replacing the water within the demineralized collagen matrix.^{15,16} Borges A et al. reported a clinical trial that rewetting the etched lesion with ethanol could predict the color shift that would occur once the lesion was infiltrated.¹⁷ Icon resin, composed of tetraethylene glycol Di methacrylate, is applied on the lesion surface using a microbrush and allowed to penetrate for three minutes. Repeated application for another one minute is performed to

prevent the shrinkage of the material after the first application.¹⁸ This technique over time has shown controversial results with varying degrees of success.^{19,20} Although, in this case, the resin infiltration stability was evaluated as satisfactory.

CONCLUSION

Resin infiltration has shown its efficacy in masking the opacity caused by enamel hypomineralisation. It significantly enhances the esthetics of white opaque spots. There has been no report of postoperative sensitivity, pulpal irritation, or gingivitis/periodontitis. Complete masking was accomplished with excellent patient acceptability.

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