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Case Report

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Efficacy of icon infiltration resin on anterior teeth discoloration- A case report

Abstract

Tooth discoloration with pronounced white color lesions within the enamel are often insufficiently masked by bleaching techniques or resin infiltration procedure alone. This frequently leads to select more invasive prosthetic restoration in order to mask the tooth color such as veneer and crowns. This article describes a minimally invasive treatment options to manage anterior tooth discoloration with suspected developmental origin. A combination of resin infiltration procedure and composite restoration was used to attain a natural tooth color. By joining the two minimally and noninvasive techniques, patient's aesthetic expectations were met and preservation of hard tooth structure was managed. The benefits of this technique are ease of adaptation and repair in future.

Keywords: tooth discoloration, restoration, technique, enamel, lesion, treatment

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Introduction

Dentist nowadays lives in minimal invasive dentistry era. The aim of the concept is to preserve tooth structure by preventing disease formation and intercepting its progress, but also remove and replace with as little tissue loss as possible.[1] Tooth discoloration is defined as any change in tooth color, hue or translucency due to multiple reasons[2] that alters its physical appearance from its natural state. The etiology of tooth discoloration can vary from extrinsic and intrinsic factors such as foods, drinks, smoking, poor oral hygiene, diseases that affects enamel, medications, genetics, trauma to the teeth and normal aging process.[3]

Today esthetics plays a vital role in our modern society. Through social media outlets a greater awareness has been spread on the ideal beauty, accordingly creating a consciousness of imperfection amongst the world. Tooth discoloration is a frequent finding across general populations, where it is considered an esthetically displeasing finding that causes psychological trauma affecting the individual self-esteem.[4,5] Tooth discoloration was found to be more affecting in 31 to 40 years old individual.[6] The prevalence of white spot lesions ranges from 23% to 95%.[7,8]

There are different treatment modalities to manage tooth discoloration ranging from least invasive to most invasive such as bleaching,[9] enamel micro abrasion,[10] resin infiltration,[11] ceramic porcelain.[12] These treatment modalities could be used individually or in combination depending on the severity of tooth discoloration.

This study describes the use of micro-infiltration, using Icon infiltration resin (Icon, DMG, Hamburg, Germany) in treating developmental tooth discoloration in anterior teeth.[13] This method was first introduced to manage initial non cavitated carious lesions, to promote tooth preservation.[14] This technique is minimally invasive, painless and allows managing the discoloration in a single session.

Icon infiltration resin material (Icon, DMG, Hamburg, Germany) consist of a low viscosity, fluid methacrylate resin mainly triethylene glycol dimethacrylate (TEGDMA) with high penetration coefficient, high surface tension, and low contact angle with enamel that facilitates penetration of lesion body of carious enamel.[15] The main action of the resin is to infiltrate into the enamel to fill, reinforce and stabilize enamel demineralization without the need to remove tooth structure.[16]

The histopathology of enamel caries occurs as acid dissolves inter crystalline spaces within enamel.[17] Since the outer most surface of enamel is more resistant to dissolution due to the presence of fluorapatite, and formation of a more porous subsurface form.[18] The main action of the resin infiltration to arrest caries is to occlude the porosity formed during the caries process and prevent a pathway for acid to further dissolves the tooth structure.[19] Hence, a solution of 15% hydrochloric acid is applied for 90-120 seconds to remove the surface layer of the lesion it has shown to remove 45 microns of the surface lesion.[20] The next step is to resin infiltrate the lesion were the literature showed that the TEGDMA resin infiltrate in Icon system to penetrate deeper than others.[21] When applied for three minutes, the Icon TEGDMA resin infiltrate was shown to penetrate 414 microns into the non cavitated lesions.[22]

The visual changes in enamel that arises from enamel caries is due to the presence of air in the subsurface porosities. The opaque appearance of the white spot lesion occurs due to light scattered within the body of the lesion. Light scattering is caused when light interacts with two substances with different refractive indices. The refractive index of enamel (1.62-1.65) which is different than that to air (1.00). While a lesion with resin infiltrate has a refractive index of 1.52 that is able to mask the lesion.[23]

Clinical protocol for treatment of anterior tooth discoloration using Icon infiltration resin (Icon, DMG, Hamburg, Germany)

The Icon infiltration resin kit comes with Icon etch (15% hydrochloric acid gel), Icon dry (Ethanol alcohol) and Icon infiltrate (TEGDMA) (Figure 1).

Figure 1 Icon infiltration resin kit.

A 31 years old patient presented to the clinic with esthetic concerns of white discoloration on his maxillary central and lateral incisors (Figure 2). Based on the clinical examination and due to the location and the pattern of the lesions, they were determined to be non-carious discoloration caused either by fluorosis or an idiopathic demineralization of developmental origin. Based on the lesion depth it was decided that resin infiltration Icon system and resin composite combination is suitable to treat the lesion. Furthermore, the patient was advised that the chance of complete or partial masking of the lesion was estimated in the literature as 25% and 35% respectively.[24]

Figure 2 Pre-operative frontal view.

Rubber dam isolation was placed on the patient as demonstrated in Figure 3. The purpose of the use of isolation is critical due to possibility of saliva contamination of the resin infiltration process decreases its effectiveness[22] and exposure of the hydrochloric acid to soft tissue may causes temporary bleaching and chemical burn injury.[25] Then with high speed with diamond round bur 0.5mm of the while lesion was removed for better penetration of the resin infiltrate and due to the depth of the lesion. The Icon etch (15% hydrochloric acid) was applied for two-minutes with a gentle scrubbing motion (Figure 4). Afterwards tooth was rinsed with water for at least 30 seconds and then Icon-dry which is composed of ethanol solvent was placed on the tooth and allowed to set for at least 30 seconds (Figure 5). At this point the tooth is observed to determine if an acceptable color changes has occurred and if not then another cycle of Icon etch (15% hydrochloric acid) for two minutes is applied with genital scrubbing motion. Then the lesion is dried and re viewed. In our case we needed a total of 3 cycle of Icon etch (15% hydrochloric acid), dry and rewetting with Icon-dry to achieve the desired tooth color. Later on, the lesions were washed with water for 30 seconds and dry for 30 seconds and Icon-infiltrate was applied on the tooth for three minutes with constant genital rubbing motion as shown in Figure 6, air dried, interproximal contacts were flossed and light cured for 40 seconds as shown in Figure 7. Then composite resin was applied to restore the shape of the teeth. Hence, esthetic masking effect of the treatment was evident immediately upon competition of the treatment in a single visit as shown in Figure 8–10.

Figure 3 Rubber dam isolation.

Figure 4 Icon etch for 2 minutes.

Figure 5 Icon dry for 30 sec.

Figure 6 Icon resin infiltrate for 3 minutes.

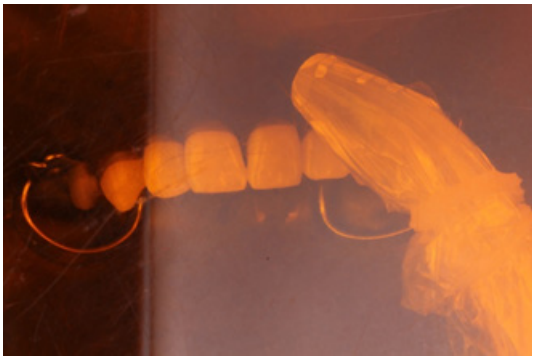

Figure 7 Light cure for 40 seconds.

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Figure 8 Final desired colors after light cure.

Figure 9 Composite restoration.

Figure 10 Post-operative frontal views.

Conclusion

Tooth discoloration of different etiological factors can cause functional and esthetic concerns that must be managed properly to meet patient's expectation. Treatment planning and management should emphasize proper sequencing, starting with the most conservative treatment option. Furthermore, the patient should also be part of the decision-making process. In our case we decided to manage the tooth discoloration minimally via the use of Icon resin infiltrate system. With multiple etching steps using 15% hydrochloric acid, drying and re wetting using dry icon ethanol was used to reach the desired tooth color then seal it with the resin infiltrate. The scientific evidence illustrated a white spot lesions can be treated minimally with the use of Icon infiltrate system.[26,27] Moreover, it has been reported the masking effect of resin infiltration has remained unchanged at follow up time up to 12 months for non-carious lesions[28] and 24 to 45 months for carious lesions.[29] By joining the two minimally and noninvasive techniques, patient's aesthetic expectations were met and preservation of hard tooth structure was managed. The benefits of this technique were ease of adaptation and repair in future. Hence the patient was delighted with the improved aesthetics and appreciated the relatively low financial cost of the treatment.

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None

Conflicts of interest

The author declares no conflicts of interest.

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