ORIGINAL RESEARCH PAPER
Volume-6 | Issue-12 | December-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 93.98
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

RESIN INFILTRATION OF WHITE SPOT LESION: A REVOLUTIONARY APPROACH FOR ENHANCEMENT OF ESTHETICS – CASE SERIES.

Dental Science

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ABSTRACT

Dental caries is one of the most prevalent chronic diseases in the India, predominantly affecting children. Despite the decline seen in the past several decades, caries remains a major public health challenge, as the caries prevalence rate in children and young adults remains high, affecting over 60- 65% of individuals entering adulthood. The early enamel lesions are mainly characterized by loss of mineral beneath an intact surface layer, and such lesions appear as white spots because of the increased porosity within the body of the lesion. The new concept called resin infiltration (ICON®) was developed to address the retention issues and enhanced decay prevention on the smooth surfaces. This case report describes a technique used to treat smooth surface white spot lesions microinvasively. It is based on the infiltration of an initial enamel caries lesion with low-viscosity light-curing resins called infiltrants.

KEYWORDS

Resin infiltration, White spot lesions, ICON.

Introduction

The days of GV Black's "extension for prevention" have long passed us by, and the watchword now is "Enamel is sacred". Of course this has only become a possibility due to the development of modern techniques and materials. The concept of minimally invasive dentistry, is to conserve healthy tooth structure. It focuses on prevention, remineralization, and minimal dentist intervention. In addition, in minimally invasive dentistry, dentists use long lasting dental materials that conserves the maximum tooth structure so the need for future repairs is reduced.

Dental caries is a transmissible bacterial disease process caused by acids from bacterial metabolism diffusing into enamel and dentine and dissolving the mineral. Dental caries process is a dynamic dietomicrobial disease that involves multiple cycles of demineraliz ation and remineralization before its consequences are expressed clinically[1].

The early carious lesion is an opaque white spot, Which in active lesions appears chalky, and if mineral loss continues, frank cavitation may result. An accumulation of bacterial plaque and a supply of fermentable sugars are the prerequisites for decalcification to occur. Unfortunately, fixed orthodontic appliances hinder tooth cleaning, and favour plaque and food retention. The incidence of incipient enamel caries or WSL adjacent to orthodontic appliances has been reported by various sources to range from 15 % to 85 %[2]. Other than early caries lesions, dental fluorosis and other form of developmental enamel anomaly also results in discoloration and is associated with genetic defects and environmental insults such as metabolic conditions and exposure to drugs, chemicals, radiation, and trauma. These defects are associated with hypoplasia, hypomineralization, or hypomaturation[3]. These may present initially as white spot lesions that then progress to brown spots due to the inherent porosity that makes them more susceptible to stain.

Treatment of white spot lesion

Various treatment modalities exist for white spot lesions such as Remineralization , Microabrasion, Bleaching, argon lasers, Conventional bonding, veneers and a novel approach called resin infiltration[4]. The infiltration technique has several advantages over the other techniques. First, deeper lesions can be improved by the infiltration techniques which aren't amenable to remineralization, and the esthetic improvement can be seen instantly. Secondly, the infiltration is much less invasive compared to restoring the tooth[5].

A new minimally invasive technique for treating white spot lesions is by caries infiltration, a product of "DMG," called "Icon." 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. After conditioning of lesions using 15% hydrochloric acid gel, desiccating the tooth with ethanol is performed, this allows easy penetration of resin into the porous tooth. The resin penetrates into the lesion by capillary forces and creates a diffusion barrier inside the lesion and not on the lesion surface. 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[6].

Case report:

A 24-year-old female patient named Ms.Zubaida reported to the Department of Conservative Dentistry and Endodontics, KVG Dental college and Hospital, Sullia, Karnataka presented with the chief complaint of whitish opaque areas in upper front tooth region since 2 yrs. On examination there were a carious white spot lesions in relation to cervical 3rd of Maxillary anterior teeth (figure1) and another male patient named Mr. Krishna chetan aged 28 yrs presented with a chief complaint of white spot in upper front teeth region since 4 years, patient has also given a history of orthodontic treatment. On examination well defined carious white spot is seen at the junction of incisal and middle 3rd of 21(figure 2).

The clinical procedure was followed step by step as given below,

1. Oral prophylaxis was carried out before starting procedure.
2. Isolation: Cheek was retracted using cheek retractor, gingival barrier () was used in order to protect gingival from acid insult and in the second case rubber dam for isolation.
3. After achieving an isolated dry field, the surface of white spot was etched with ICON etch(15% Hydrochloric acid) with a special applicator for a period of 2-5 minutes. Teeth were rinsed with water and dried.
4. ICON dry (ethanol) was applied directly on to the lesion. Ethanol further facilitates drying of the lesions. A chalky white appearance was observed.
5. ICON dry (TEGMA resin) is applied directly onto the dried white area this is left in place for 2-5 minutes. Excess resin is removed from the tooth surface. The tooth is light cured for 40 seconds.
6. 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 re-discoloration by food stains.
7. Preoperative and post-operative Photographs were evaluated.

Significant esthetic improvement was observed after resin infiltration (Figure 1(g) & Figure 2 (f).)


Fig 1 (a)


Fig 1(b)

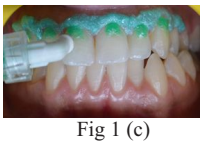
Fig 1 (c)


Fig 1 (d)


Fig 1 (e)


Fig 1 (f)


Fig 1(g)

Figure1 : (a) Preoperative picture showing incipient caries in the cervical 3rd of maxillary anterior teeth. (b) Application of gingival barrier (c)Application of Icon Etch for 2 min. (d)Application of Icon Dry for 30 s. (e) Application of Icon resin and allowing penetration for 5 min. (f) Light curing the resin. (g) Postoperative picture.

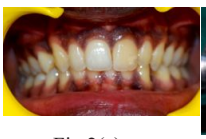
Fig 2(a)


Fig 2(b)


Fig2 (c)

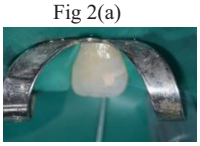
Fig2 (d)

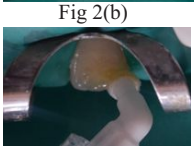
Fig2 (e)


Fig 2(f)

Figure2: (a) Preoperative picture showing white spot lesion spot at the junction of incisal and middle 3rd of facial surface of 21. (b) Isolation of teeth using rubberdam (c) Application of Icon Etch for 2 min. (d)Application of Icon Dry for 30 s. (e) Application of Icon resin and allowing penetration for 5 min. (f) Postoperative picture.

Discussion:

Early carious lesions, sometimes called white spot lesions (WSLs) may form, compromising the health of the teeth and the esthetic result of the treatment. Every orthodontic patient hopes to have a beautiful smile the day the braces are removed. Even if the teeth are perfectly aligned and the occlusion is ideal, the patient may be disappointed with the results if there are white spot lesions on his or her teeth. Most methods of treating white spot lesions depend on patient compliance and work slowly over time, if at all.

The difference in refractive indices between the enamel crystals and medium inside the porosities affects the light scattering and gives these lesions a whitish appearance, especially when desiccated. Sound enamel has a refractive index of 1.62. Refractive index of porous enamel of WSLs when filled with water is 1.33 and with air is 1. When these micropores of WSLs were infiltrated by resin(refractive index: 1.52), the difference in RIs between porosities and enamel was decreased to a negligible level, and the WSLs regained translucency, appearing similar to that of the surrounding sound enamel[6].

A caries infiltrant resin, Icon, offers a unique approach to treating white spot lesions that does not depend on patient compliance and can be completed in one office visit to restore the natural appearance of the teeth. Icon penetrates the white spot lesion and seals it in order to prevent the lesion from progressing to cavitation. Previous invitro studies have shown that Icon is able to mask the white spot lesions. [7,8].

The main aim of resin infiltration concept is to arrest the incipient enamel caries lesions instead of removing the lesion and obstruct the diffusion pathways for acids and dissolved minerals in the enamel[9]. Enamel structure can also strengthen mechanically by resin matrix[10]. An infiltrant resin shows very low viscosity, high surface tension, and low contact angle with the enamel which are needed for an resin infiltrant to penetrate into the layer of lesion body of enamel caries.

The hyper mineralized surface layer prevent the penetration of the resin into the lesion body by obstructing the pathway, however. Therefore, the purpose of a conditioning procedure is complete erosion of the surface layer and exposure of the lesion body[11]. Removal of the surface layer might also weaken the lesion structure, but Meyer-Lueckel et al.[12] reported that 15% HCl is most suitable for removing approximately 40 µm of the hypermineralized surface layer. Moreover, in this study, no cavitation occurred after etching, even when the surface layer had been eroded completely. subsequent resin infiltration should ensure restrengthening of the lesion structure. In contrast, microabrasion, which has been commonly used in white spots, removes up to 360 µm of enamel[13].

The motive of ethanol (ICON dry) is to remove the water that is stored inside the microporosity of the lesion body and allow the resin to penetrate into the lesion body driven by capillary forces[14]. A resin layer on lesion surface is not required if the lesion body is infiltrated homogeneously with the resin. So, the overlaying resin is wiped away prior to light curing resin. The reason for applying the resin twice is because of the shrinkage of materials after the first application results in the generation of space that can then be filled by a second application[15].

Limitations of resin infiltration: The resin infiltration technique may not always fade the white spot lesion entirely. This may improve over time. Kim et al (2011) classified his results in his study into three different groups: completely masked, partially masked and unchanged. They concluded that the masking effect was dramatic in some cases but not in others. There is still further research to be undertaken to know the long term effect of resin infiltration treatment on white spot lesion.

Conclusion: Resin infiltraton is a recent technique which brings out esthetic enhancement of white spot lesions. It is a microinvasive technique done in a single visit with no drilling and anesthesia while preserving healthy tooth structure. Further longterm clinical studies are required to know the stability in esthetic improvement.

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