



ORIGINAL RESEARCH PAPER

Dental Science

RESIN INFILTRATION- A NOVEL APPROACH FOR THE MANAGEMENT OF WHITE SPOT LESIONS

KEY WORDS: Resin infiltrant, white spot lesion, non-invasive procedures.

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ABSTRACT

The earliest evidence of demineralization on the enamel surface of a crown is known as a white spot lesion. The conventional treatment for these include noninvasive measures involving fluoridation, dietary control, and oral hygiene instruction, as well as invasive restorative methods, The following article illustrates the use of a novel approach to treat the noncavitated white spot lesions with low-viscosity light curing resins called resin infiltrants.

INTRODUCTION

Dental caries is one of the most common human diseases that affect a vast majority of individuals as a result of cyclic demineralization and remineralization of enamel due to altered pH levels.^[1]

The earliest evidence of demineralization on the smooth enamel surface of a crown is a "white spot lesion." These classical areas of white spot lesions lose their translucency because of the extensive subsurface porosity caused by demineralization and should be distinguished from developmental white spot hypocalcifications of enamel.^[2] These early lesions are amenable to remineralization or arrest but if the demineralization process is not stopped, the intact enamel surface eventually collapses and cavitates.^[3] The conventional treatment of these white spot lesions includes topical fluoride application, improving the oral hygiene, and use of remineralizing agents like ACP-CPP.

If these lesions persist for a long time, they represent a severe esthetic problem and are frequently called as enamel scars.^[4] The treatment of these white spot lesions should aim upon both the prevention of caries progression and simultaneously on improving esthetics, by diminishing the opacity.^[5]

Infiltration Concept is a relatively new method which improves the retention and prevents caries on smooth surfaces, but not for pit and fissure surfaces ^[6]. Resin infiltration is a micro-invasive method that fills the incipient lesion pores via capillary action ^[7], which blocks further diffusion of the bacteria by creating barriers and stops lesion development, restoring the tooth without anaesthesia and drilling to preserve the natural anatomy of the tooth form ^[8].

CONCEPT OF WHITE SPOT LESION

Sound enamel has a refractive index (RI) of 1.62 while demineralized WSLs have many pores filled with water (RI = 1.33) or air (RI = 1.00). The difference in RIs between the enamel crystals and medium inside the porosities affects the light scattering and gives these lesions a whitish appearance, especially when desiccated. When the micropores of WSLs were infiltrated by resin (RI = 1.46), which has a similar RI as enamel and cannot evaporate, the difference in RIs between porosities and enamel was decreased to a negligible level, and the WSLs regains its translucency, appearing similar to

that of the surrounding sound enamel.^[9]

THE TECHNIQUE OF RESIN INFILTRATION

Caries infiltration or resin infiltration technology is a micro-invasive technology that reinforces, fills and stabilizes demineralized enamel without drilling on sacrificing the healthy tooth structure; the micro invasive infiltration can be used to treat the proximal and smooth surface carious lesion up to the one third of dentin. It prevents the progression of lesion and life expectancy of a tooth will be increased. It provides an alternative to microabrasion and other restorative treatments for white spot lesions which are cariogenic. Once infiltrated by the resin, white spot lesion takes on the appearance of the surrounding healthy enamel. It is a novel technology that seems to bridge the gap between minimally invasion and noninvasive treatment of initial dental caries, postponing as long as possible the need for a restoration. Charite Berlin and the University of Kiel developed the concept of caries infiltration for the first time, as a micro invasive approach for the management of proximal and smooth surface non-cavitated caries lesions (Kugel, 2009; CRG, 2012)

Procedure

Step:1- For the purpose of infiltration, initially rubber dam is placed on the tooth to provide a dry working field and to ensure the best treatment results. Then, prophylaxis is performed on the teeth to be treated (Fig1)

Step:2- Application of Etchant-. 5% hydrochloric acid for 2 min- The etchant gel is stirred with a micro-brush to achieve a homogenous etching pattern. (Fig2)

Step:3-The left out etchant is rinsed away with water for at least 30 seconds

Step:4- Application of Ethanol for drying- If after rinsing and drying, the etched enamel did not have a chalky white appearance, the process of application of etchant and drying agent is repeated. (Fig 3)

Step 5 : Application of resin infiltrant-, the low-viscosity infiltrant is applied and is left to for 3 minutes for its penetration (Fig 4)

Step:6-Light curing the infiltrant for 40 seconds- Clinically, changes in opacity is remarkably evident and immediate improvement in the esthetics is observed .Improvement in esthetics is found consistent even in the wet environment (Fig 5&6)^[10]



Pre- treatment (FIG1)



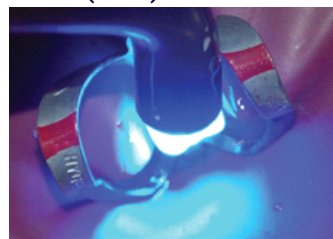
Application of etchant (FIG 2)



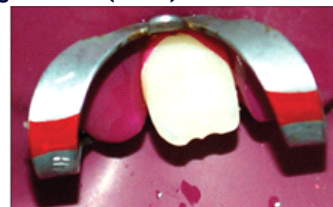
Application of drying agent (FIG 3)



Application of resin (FIG 4)



Light curing the resin (FIG 5)



Post treatment (FIG 6)^[10]

Advantages of the infiltration

- This technique is highly accepted by patients.
- Improved aesthetic outcome as a masking resin on

demineralized labial surfaces.

- No risk of postoperative sensitivity and pulpal inflammation.
- It shows reduced risk of gingivitis and periodontitis. The progression of lesion is retarded.
- Minimum risk of secondary caries.
- Obturation of porous deeply demineralized areas.
- Delay of restorative intervention for longer periods.
- Mechanical stabilization of demineralized enamel.
- Prevention of sound hard substance.
- Permanent occlusion of superficial micro pores and cavities.^[11]

DISCUSSION

Superficial sealing of caries lesion is introduced as a safe method for controlling caries progression in non-cavitated enamel caries. The infiltration concept was developed as a micro-invasive technique. The material concept is based on infiltration into the porosity of the tooth structure and stopping further progression of the lesions.^[12] The goal of clinical management of tooth discoloration is to produce an acceptable cosmetic result as conservatively as possible. The most conservative and effective of these methods includes microabrasion. But microabrasion also results in loss enamel surface.^[13]

When compared with enamel microabrasion or conventional restorative techniques, resin infiltration is much less invasive, and only negligible tooth substance must be sacrificed by etching and polishing. With this technique, only 30 to 40 μm are eroded in contrast with enamel microabrasion with enamel removal of around 360 μm when applied in 5-second intervals and repeated 20 times^[14].

It has been reported that active lesions show only thin and porous surface layers that are easier to infiltrate than inactive lesions. If more inactive lesions are supposed to be infiltrated, the application of ethanol can be used to confirm the complete erosion of the surface layer. The color of desiccated lesions should change during ethanol penetration. If color does not change, ethanol will not reach the lesion body because of surface layer remnants. The depth of hypoplastic lesions, thicker surface layer, and infiltration behaviour are similar to those of an inactive lesion, which could probably justify the result of partial blending of the hypoplasia stain.^[15] Also, treating early caries lesions with a combination of resin-infiltrated and fluoride varnish showed promising results compared to fluoride varnish only^[16].

In RI technique, the infiltrant must be applied twice to decrease polymerization shrinkage and for the micro pore structure to be occluded.^[17] Resin infiltration would be the future of treating early caries lesions, since it's easily used non-invasive and painless technique.^[18]

CONCLUSION

The early detection of caries and minimal invasive techniques would help a lot in preserving the tooth structure and avoid unnecessary trauma to the dental tissues. In this sense, resin infiltration technique bring about esthetic solution as well as minimal tooth reduction. This technique can be used in combination with other enamel remineralizing agents like fluoride gels, fluoride varnishes, non-sugar containing chewing gums etc. for better results. Hence this micro-invasive procedure seems to be a promising solution providing immediate esthetic improvement of white spot lesions.

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