ORIGINAL RESEARCH

Comparison of Microleakage of Glass Ionomer Sealant in Etched and Non Etched Fissure Enamel with Resin Based Sealant- An In Vitro Study

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ABSTRACT

AIM: The purpose of the study was Comparison of microleakage of glass ionomer sealant in etched and non etched fissure enamel with resin based sealant. **METHOD**: After cleaning and pumice prophylaxis, 0ne hundred and fifty non carious premolar teeth extracted for the orthodontic purpose were equally divided into three groups. In group, I glass ionomer sealant (GC Fuji VII) was applied after acid etching. In group II glass ionomer sealant (GC Fuji VII) was applied without acid etching where as in group III, resin sealant (Clinpro) was used after acid etching. After thermocycling, staining and sectioning microleakage scores were recorded and compared. **Result**: When the group I and group III were compared, the group I leaked more as compared to group III. But the difference was statistically non significant ($p>0.05$). When the group I was compared with group II, group II leaked more as compared to group I and the statistical significant difference were found between them ($p<.01$).Similarly group II showed more microleakage than group III. **Conclusion**: Acid etching of enamel prior to application of glass ionomer sealant reduces its microleakage this is beneficial in newly erupted molars where moisture isolation is difficult to maintain, and application of resin sealant is technique sensitive.

KEYWORDS: Glass Ionomer, Sealant, Microleakage, Etched, Nonetched.

INTRODUCTION

Tooth surface with pits and fisures are prone to dental caries because of their unique anatomy.[1] This high susceptibility provides the rationale for protection of these areas. Resin and glass ionomer based material have been tried as a pit and fissure sealant.[2] The long term efficacy of resin based sealants in preventing dental occlusal caries is well documented.[3] But they are technique and moisture sensitive. Now days glass ionomer cement are being advocated as a pit and fissures, sealant because of their sustained fluoride release, biologic kindness, moisture friendly nature and potential to bond chemically to dentin and enamel.[2,3] Despite the lack of clinical detection of glass ionomer material in fissures replica studies have shown that the material was present within the depth of pits and fissures ,giving long term caries protection.[4] Any amount of pellicle remaining interposed between the sealant and the tooth will compromise its adhesion. The marginal seal of the sealant is one of the most important factor for its clinical success.

MATERIALS AND METHODS

One hundred and fifty non carious premolar teeth extracted for the orthodontic purpose were used in this study. After cleaning pumice prophylaxis, teeth were randomly divided into three equal groups. In the group I, glass ionomer sealant (GC Fuji VII) was applied after acid etching. In group II glass ionomer sealant (GC Fuji VII) was applied without acid etching where as in group III, resin sealant (Clinpro) was used after acid etching.

Teeth were thermocycled and after application of sticky wax at apex, nail polish was applied on the teeth except around the sealant. Then teeth were immersed in 5% methylene blue for 4 hours. After thoroughly washing the samples, roots of the teeth were cut at the cervical margin. The crowns were sectioned in bucco-lingual direction with the diamond disc. Measurements of maximum linear dye penetration along the enamel sealant interface were made to quantify the relative microleakage under a stereomicroscope.The following scores were used to assess the microleakage.

- Score 0: No dye penetration. (Figure1)
- Score1:Dye penetration into the occlusal third of the enamel sealant interface. (Figure 2)
- Score 2:Dye penetration into the middle third of the enamel sealant interface. (Figure 3)
- Score 3: Dye penetration into apical third of the

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enamel sealant interface. (Picture 4)

Data collected was subjected to statistical analysis (Pearson chi square test).

Fig 1: Photograph showing microleakage score 0

Fig 2: Photograph showing microleakage score 1

Fig 3: Photograph showing microleakage score 2

Fig 4: Photograph showing microleakage score 3

RESULTS

The mean dye penetration value for the group I, group II and group III are 1.00 ± 0.808, 1.92 ± 1.192, 0.76 ± 0.916 respectively (Table1). The difference in measurements clearly indicates that group II leaked significantly more as compared to group I and group III.

Group	No. of samples	Microleakage Score				Mean ± SD
		0	1	2	3	
I	50	13 (26%)	27 (54%)	7 (14%)	3 (6%)	1.00± .808
II	50	10 (20%)	7 (14%)	10 (20%)	23 (46%)	1.92± 1.92
III	50	25 (50%)	15 (30%)	7 (14%)	3 (6%)	0.76± .916

*SD Standard Deviation

Table 1: showing Pattern of microleakage (mean score)

When the group I and group III were compared, the group I leaked more as compared to group III. But the difference was statistically non significant ($p>0.05$). When group I was compared with group II, group II leaked more as compared to group I and the statistical significant difference were found between them ($p<.01$). Similarly when group II was compared with group III, group II leaked more as compared to group III and the statistical significant difference were found between them ($p<.01$)(Table2).

Comparison	χ^2 Value	df	p value	Significance
Group I vs II	28.070	3	<0.01	S
Group I vs III	7.218	3	>0.05	NS
Group II vs III	25.252	3	<0.01	S

*SD Standard Deviation

Table 2: showing Pattern of microleakage (mean score)

DISCUSSION

The rationale of using the sealant is to penetrate and seal off caries–prone pits and fissures from oral environment. As a result, the cariogenic microorganism present in these fissures looses their viability.[5] The primary factor influencing the efficacy and life expectancy of a sealant is favorable marginal adaptability to enamel in order to form a seal and minimize microleakage.[5,6,7]

Resin and glass ionomer based material have been tried as a pit and fissure sealant.[2] Resin-based sealants are technique sensitive,and if the proper application technique is not followed correctly,they can be detrimental to the long term health of the tooth.This is especially true for newly erupted molars in which complete isolation is difficult to achieve.[3] The well documented properties of GIC's–adherence to untreated enamel and dentin under moist conditions, bio-compatibility with tooth tissue and potential fluoride release are the main reasons for their wide spread use in pediatric dentistry. Glass ionomer has been proven to have a caries preventing effect due to their gradual release of fluoride which enhances remineralization and inhibits demineralization of dental tissues.[2,8] Glass

ionomer restoration have also been reported to cause the reduction in the level of streptococcus mutans found on the surface of restoration and in the neighbour plaque.[9,10] Since glass ionomer is hydrophilic, it has the tendency to absorb the dye into the material, and this could give a false positive results. Hence in this study dye leakage into the material was not taken into consideration, but dye penetration along the sealant and enamel interface was taken into consideration. From each crown, only one section was selected for scoring.

Resin sealant (Clinpro, group III) showed less microleakage as compared to glass ionomer sealant (GC Fuji VII, group II) which was applied without the acid etching of fissure enamel. Better results shown by resin based sealant could be due to it micromechanical retention property.[5] Extensive microleakage in Group II may be due to inadequate removal of acquired pellicle by pumice prophylaxis and brittle nature of glass ionomer material.[11,12] This finding is in accordance with the study of Ovrebo RC et al. (1990)[13], Herle GP et al. (2004)[4], Mahadevan G and Tandon S (2007)[5]. When the Group I and Group III were compared, group I leaked more as compared to group III. But the diffreence were statistically non significant ($p>0.05$). Etching of fissure enamel prior to application of glass ionomer sealant (Fuji VII) showed comparable results with resin based sealant. The probable reasons could be that acid etching detaches the pellicle, reduces the contact angle thereby increasing the wettability of the enamel surface.[9,14] GC Fuji VII used in this study has a low viscosity, so it has a greater potential to penetrate into fissures and microspaces created by the etching of enamel rods. The phosphoric acid used etches the enamel, increasing the surface area for glass ionomer sealant to bond with. When group I was compared with group II, group II leaked more as compared to group I and statistically significant difference was found between them. Acid etching prior to the application of glass ionomer sealant (Group I) significantly improves its bonding ability to enamel in comparison where no etching of fissure enamel is under taken (Group II).[9,15] This, in turn, reduces the microleakage at the sealant enamel interface.

CONCLUSION

Glass ionomer sealant with acid etching can be used as a sealant of choice in areas where complete moisture isolation is difficult to achieve; this is beneficial in newly erupted molars where moisture isolation is difficult to maintain and application of resin sealant is technique sensitive.

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