Comparative Evaluation of Three Different Pit and Fissure Sealants

Ifzah[1], Saranya Kumar[2]

ABSTRACT

Introduction: Dental caries is an infectious mulifactorial disease which can affect any tooth in the oral cavity. As such it is important to protect them from becoming carious. Resin sealant methods developed by Bowen in 1962 still continue to form the basis of presently available sealants. An important factor for sealant success is its marginal integrity and retention. Hence this study was undertaken to assess the retention and marginal discoloration of conventional pit and fissure sealants, Glass ionomer sealant type VII and Helioseal-F. Study aimed to assess the retention and marginal discoloration of conventional pit and fissure sealants, glass ionomer sealant type VII and helioseal -F.

Material and methods: This study was conducted in a private dental clinic in Bangalore from 2015 to 2016. Thirty children aged 6 to 8 years were selected. The children were divided into 3 groups of 10 children each. First group, ortho Phosphoric acid etchant gel was applied with a disposable nylon applicator tip on to the pit and fissures. Conventional light-cured resin-based pit-and-fissure sealant (Clinpro™ Sealant (3M ESPE) was cured with the light curing unit for 20 seconds. Second group (Group II): Fuji VII cement was mixed according to manufacturer's instructions and applied to the occlusal surface using a plastic-filling instrument and a disposable nylon brush to spread it into the pits and fissures. Third Group (Group III): Etching was done with 37% phosphoric acid for 20 seconds. Using the syringe needle tip, Helioseal F sealant was flowed into the fissures for 20 seconds. First follow up examination was done at 3 months recall by using visual and tactile examination. The sealants were examined for their integrity, retention and marginal discoloration. The data was obtained at 3 months and 6 months intervals. The teeth were visually inspected for caries.

Results: At 3-month evaluation 89.7% of retention was seen for conventional resin sealant, 72.7% retention for Helioseal F and 65.3% for Glass ionomer sealant. At 6month follow up 73.3% retention was seen for conventional resin sealant, 52.4% retention for Helioseal F and 34.9% for Glass ionomer sealant. There was no significant difference in terms of marginal discoloration between conventional resin sealant and helioseal F. However glass ionomer sealant showed a significant marginal discoloration as compared to helioseal F. No significant differe-nce was seen in the development of caries between the three groups.

Conclusion: Conventional sealants are better sealants with respect to retention.

Keywords: Different Pit, Fissure Sealants

INTRODUCTION

Dental caries is an infectious mulifactorial disease which can affect any tooth in the oral cavity. Deep pits and fissures in molars favor food retention, thus providing a favorable environment for the oral microorganisms to thrive and convert the carbohydrates to acids, leading to demineralization of the enamel.[1] Lack of post-eruptive maturation and contact with the antagonist favor the development of dental caries. As such it is important to protect them from becoming carious.[2] Resin sealant methods developed by Bowen in 1962 still continue to form the basis of presently available sealants.[3] An important factor for sealant success is its marginal integrity and retention. Hence this study was undertaken to assess the retention and marginal discoloration of conventional pit and fissure sealants, Glass ionomer sealant type VII and Helioseal-F.

MATERIAL AND METHODS

This study was conducted in a private dental clinic in Bangalore from 2015 to 2016. Prior to conduct of study consent was taken from the parents. Thirty children aged 6 to 8 years were selected based on the following inclusion criteria:

1. Fully erupted first permanent molars with sound occlusal surface and deep pits and fissures.
2. All four permanent molars were caries–free.
3. No history of previous sealants or restorations in molars.
4. Cooperative patient.
5. Dentition status allows rubber dam placement.

Exclusion criteria

1. Patients with rampant caries.
2. Patients with well-coalesced, self-cleansing pits and fissures.
3. No previous caries experience.
4. Medically compromised patients, mentally and physically challenged patients.
5. Highly uncooperative patient.

The selected children were divided into 3 groups of 10 each. Prior to sealant placement, thorough oral prophylaxis was performed and all the first molars were subsequently polished with pumice using rubber cup. Then, the teeth to be sealed were separated with rubber dam. First group (Group I): The occlusal surface was thoroughly cleaned with water in order

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	3 Month				6 month			
Retention criteria	**CS (n)**	**GI (n)**	**HS- F (n)**	**P value**	**CS (n)**	**GI (n)**	**HS-F (n)**	**P value**
0	95	81	87	0.003	89	78	84	0.286
1	20	26	23	0.0068	18	29	25	0.003
2	5	13	10	0.006	7	16	13	0.005

Table-1: Comparison of retention rates of conventional resin sealants, glass ionomer sealant and Helioseal F

to remove any remnants. 37% Ortho Phosphoric acid etchant gel was applied with a disposable nylon applicator tip on to the pit and fissures. The etchant was allowed to remain on the teeth for up to 20 seconds followed by proper rinsing with an air-water syringe for 30 seconds. The etched surface was thoroughly dried till a 'frosty white' appearance was seen, followed by the application of conventional pit and fissure sealant on the tooth surfaces. Conventional light-cured resin-based pit-and-fissure sealant (Clinpro™ Sealant (3M ESPE) was cured with the light curing unit for 20 seconds as per manufacturer's instructions. A probe was used to check for any air bubble or void which was then removed prior to the curing to ensure that the sealant flows into all the pits and fissures. Using articulated paper the sealant was then tested for high points. Patient was then scheduled for follow up visit at 3 and 6 months interval. Second group (Group II): The occlusal surfaces of first Permanent molars were conditioned with GC dentine conditioner using a micro brush for 20 seconds followed by rinsing using water spray. The surfaces were then air-dried for 5 to 10 seconds. Fuji VII cement was mixed according to manufacturer's instructions and applied to the occlusal surface using a plastic-filling instrument and a disposable nylon brush to spread it into the pits and fissures. It was light cured for 30 seconds and protected by applying varnish. Third Group (Group III): Etching was done with 37% phosphoric acid for 20 seconds. The teeth were then rinsed thoroughly with water and then washed and dried to obtain a chalky-white enamel surface. Manufacturer's instructions were followed for recommended etch and rinse times. Using the syringe needle tip, Helioseal F sealant was flowed into the fissures for 20 seconds. The sealant was then light cured for 30 seconds. A minimum amount of sealant was added, which was sufficient to adequately cover the pit and fissure network. Before curing, any air bubbles or vacuums were extracted.) Any air bubbles or voids were removed before curing. The whole procedure was carried out under insulation of the cotton roll and the suction end. Using articulated paper the restoration was tested for high points. First follow up examination was done at 3 months recall by using visual and tactile examination. The sealants were examined for their integrity, retention and any discrepancy if present was noted down. Similar recall protocol was followed after another 6 months. The data was obtained at 3 months and 6 months intervals. The teeth were visually inspected for caries. The results were tabulated for retention and marginal integrity using the the Z-test for proportion using SPSS software 19 using Windows. Importance of all statistical tests was decided at a p-value of <0.05. Criteria for evaluation: (Horowtiz, Heifetz and Poulsen)[4] Score 0: Complete retention Score 1: Partial retention Score 2: No retention

RESULTS

At 3-month evaluation 89.7% of retention was seen for conventional resin sealant, 72.7% retention for Helioseal F and 65.3% for Glass ionomer sealant. At 6 month follow up 73.3% retention was seen for conventional resin sealant, 52.4% retention for Helioseal F and 34.9% for Glass ionomer sealant. There was no significant difference in terms of marginal discoloration between conventional resin sealant and helioseal F. However glass ionomer sealant showed a significant marginal discoloration as compared to helioseal F. No significant difference was seen in the development of caries between the three groups.(Table 1)

DISCUSSION

Clinpro is an unfilled sealant. Unfilled sealants have a lower viscosity, which results in a greater penetration in small spaces and a stronger bonding in the deep layers of the enamel.[5] Helioseal-F is shaded white and contains an inorganic filler of 40 percent, including a fluorosilicate glass that releases fluoride ions slowly over time. For double defense, helioseal-F blends mechanical block plus fluoride depot action. Cliniically, after polymerization, Helioseal-F forms a smooth surface that is easy to clean and doesn't allow bacteria to settle. Certain benefits include lack of air bubbles, ease of use and simple post-polymerisation finishing. When set, Fuji VII has a pink shade, which is in contrast to the tooth structure, allowing sealant retention inspection. The absence of any resin component in the sealant for Glass Ionomer hastens the setting reaction. Another major advantage of using Glass ionomer VII over Glass ionomer materials is the sealant's fluoride escape, considered the highest among all Glass ionomers. Resin sealants are extremely sensitive to moisture as compared to Glass ionomers as they are Bis-GMA-based materials that are primarily hydrophobic in nature.[7] However the main disadvantage of glass ionomer sealants is its inadequate retention. This may be due to inadequate adhesion of the cement to the enamel surface. The low wear resistance of glass ionomer materials to occlusal forces may contribute to faster cement disintegration, thinning the sealant, and eventually fracturing it off the enamel surface.[8,9] In this study high retention rate was seen for conventional resin sealant. This could be attributed to its ease of use, strong performance, limitless work time. The Glass ionomer sealant was considered to be a good alternative to sealant resin. In addition to the fluoride releasing property, they demonstrate low technique sensitivity and strong

adhesion.The Glass ionomer also serves as a reservoir from which the fluoride added is slowly released into the oral cavity to prevent demineralization of the enamel and increase remineralization. An early indicator of its lack of marginal integrity with neighboring tooth structure is the superficial discoloration of a restauration. When there is a slight failure, a reconstruction discolors at its margins, which produces a rough and uneven surface. This can cause microleakage, which can lead to secondary caries formation. Microleakage is the passage of bacteria, fluids, molecules, and ions between the cavity wall and the restorative material. The sealant capacity to prevent microleakage in fissures is an important factor to evaluating the clinical success of such materials since microleakage can also affect the process of decay under the sealant.[11,12,13] There was no statistically significant difference across the three classes. However at 6th month of follow up a significant marginal discoloration was seen in glass ionomer sealants. Glass ionomer sealants have an anticariogenic effect due to fluoride release. However due to lack of toughness, early water sensitivity, low abrasion resistance and different retention rates. Glass ionomer sealants are used primarily when resin content can not be used, for example due to poor compliance with the patient)[14,15]

Ninawe et al. performed a 1-year clinical evaluation of the efficacy of Helioseal-F sealant compared to Glass ionomer Fuji VII sealant and it was found that Helioseal-F was better sealant in terms of preservation, anatomic form and surface texture)[6]

CONCLUSION

Conventional sealants are better sealants with respect to retention.

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