

Role of Sealants in the Prevention of Pit and Fissure Caries in Permanent Molars

ASRAR AHMED¹, ASAD ULLAH², NADEEM TARIQUE³, FAIZ RASUL⁴, MUHAMMAD SAFDAR BAIG⁵, MARIA⁶

ABSTRACT

Aim: To assess the efficacy of resin based fissure sealant and the Glass Ionomer Cement (GIC) in the pit and fissures of newly erupted mandibular and maxillary permanent molars.

Method: The clinical trial study was performed at de'Montmorency College of Dentistry, Lahore/Punjab Dental Hospital, Lahore from 1st January 2018 to 30th June 2018. Total number of 72 patients were examined and selected according to the inclusion criteria to be treated with fissure sealants. 31 patients received the resin based fissure sealants and 42 patients got glass ionomer as fissure sealant. All the patients had the age between 6-7 years. Restoration success was scored according to the Ryge's criteria. The data analyzed under the chi square statistic tool in order to test the hypothesis.

Results: The Chi square statistic value obtained with degree of freedom 1 (df) is 0.0762. The result is not significant at $p < 0.05$. So the null hypothesis is not rejected.

Conclusion: There is no significant difference in restoration success between the resin based fissure sealant and the glass ionomer sealer applied in molars of the younger patients.

Key words: Pits, Fissures, Resin based material, Glass ionomer cement, Polymerization, Acid etching

INTRODUCTION

Health is wealth. It is an old English saying that points the importance of being healthy. According to WHO, health is defined as "a state of complete physical, mental and social well being and not merely the absence of disease or infirmity". There are numerous people in the world who are suffering from different types of diseases. These diseases need special attention and protocols for the proper cure. Dental diseases are considered as having high prevalence in the society. One of them being most common is the caries or the tooth decay¹. The period when there is more inclination towards caries is the developmental or the maturation stage. At this stage, generally, the younger patient is unaware of the oral hygiene status and the dentition may go south due to lack of oral hygiene awareness. Sometimes this tooth decay is fast and furious due to certain diets taken regularly that may hit a nerve. The sealing or closing of the crevices or the defects that are the retentive areas for the food lodgments is a key factor in reducing the progression of caries in the future. The occlusal morphology of permanent molar is another important determining factor since pit and fissures are potential areas where decay can easily develop due to structural defect.² It is now widely accepted the sealing effect is of much importance when caries is considered. It is known that the sealant should be applied between 1 to 1.5 years of post eruption of a tooth. The early placement is necessary for reducing the further decay of tooth³.

Resin based sealer has gained much popularity because It has an excellent sealing capacity. Due to this quality, the invasion of the microorganisms into the deeper parts of pits and fissures is blocked. On the other hand, the invention of the glass ionomer cement has also changed the conventional retention measures with having bonding capability to the enamel and the releasing the fluoride over a prolonged period^{4,5}. This releasing of fluoride ions is long lasting. Thus, not only it strengthens the tooth but also it prevents the occurrence of secondary caries and resistance against the acidic attacks.^{6,7} The retention means of the glass ionomer cement are the chemical as well as mechanical. While the resin based sealer has the micro mechanical type of retention. The retention of the earlier mentioned is weaker as compared to the other yet it bears a good potential in work against caries progression. This is due to the release of fluoride ions in a significant depth in the enamel. Currently a light polymerized type resin modified glass ionomer has also been evolved and has thus eliminated some of its retention demerits^{8,9}.

MATERIALS AND METHODS

The clinical trial study was conducted at de'Montmorency College of Dentistry, Lahore/Punjab Dental Hospital, Lahore from 1st January 2018 to 30th June 2018. A total number of 72 patients were selected randomly. 40 patients were males and 32 were females. The patients had the age between 6-7 years. There were no developmental defects in the teeth like hypo mineralization or any congenital tooth anomalies. All the patients had a good oral hygiene and were having the awareness about the tooth cleansing. Teeth with poor prognosis and having periodontal diseases were excluded. The maxillary and mandibular molar teeth were selected to be restored. These teeth had the pit and fissures that were naturally present and were prone to caries due having the retentive areas for the food lodgments. These defects were to be restored in order to prevent the caries in the future. In one group resin based fissure sealant was used. In other group glass ionomer

¹Associate Professor of Oral Biology, de'Montmorency College of Dentistry Lahore,

²General Dental Practitioner, Al-Imran Shifa Khana, Mochi Gate Walled City Lahore

³Associate Professor of Operative Dentistry, Dental Section, Faisalabad Medical University, Faisalabad,

⁴Assistant Professor of Community & Preventive Dentistry, de'Montmorency College of Dentistry Lahore,

⁵Associate Professor of Oral and Dental Surgery, Quaid-e-Azam Medical College Bahawalpur,

⁶HO, Rawal Institute of Health Sciences, Islamabad

Correspondence to Dr. Asrar Ahmad
Email: drahmedasrar72@hotmail.com

cement was used in the pits and fissures. For resin based sealer, whole of the occlusal surface was cleaned making it free of any debris. Isolation was performed by the cotton rolls and saliva ejectors. Acid etching was done by the 35% orthophosphoric acid applied to 45 seconds. Then it was washed and unfilled resin was made flow into the fissures of molar teeth by the fine needle of the cartridge loaded by the material. While application of the material, it was teased by a dental probe ensuring deeper penetration of the material. It was then polymerized for 20 seconds by the halogen light, visible blue type, the specific wavelength of which was 400-450nm according to the equipment manufacturer. For glass ionomer restoration, in the occlusal surface, conditioning was done by the 30% citric acid. It was then washed out. The material was mixed and applied according to manufacturer's instructions. The success ratio of the restorative material and occurrence of secondary caries involvement was calculated by the Ryge criteria at six months interval.¹⁰ Chi square test was applied in order to find the difference between the two materials. Furthermore, secondary caries was also assessed according to above mentioned criteria.

RESULTS

The Chi square statistics obtained with degree of freedom 1 (df) is 0.0762. The p- value is 0.782528. The result is not significant at $p < 0.05$. We find out that the value in the chi square chart is 3.841. Our statistical value 0.0762 is less than 3.841 (Tables 1-4).

Table 1: Marginal integrity

Restorative methods	Success	Failure	Total
Unfilled resin based fissure sealant	23	7	30
GIC	31	11	42
Total	54	18	72

Table 2: Calculation table with expected values and chi square statistic for each category

Restorative Material	Successful	Failure
Unfilled resin based fissure sealant	22.5 (0.01)	7.5 (0.03)
GIC	31.5 (0.01)	10.5 (0.02)

Table 3: Appropriate tabulation showing maxillary and maxillary molars outcome

Restorative Material	Successful (Alpha)	Failure (Bravo/Charlie)
Fissure sealant	15man/08max	3man-B/4max-C
GIC	20man/11max	7man-B/4max-C
Total	35man/19max	10man/8max

Table 4: Secondary caries

Restorative Material	Criteria (Alpha)	Criteria (Bravo)
Fissure sealant	19	4
GIC	22	9
Total	41	13

DISCUSSION

Pits and fissures are the natural developmental defects that are present in the teeth. Any pointed depression is called a pit. The fissure is a linear depression or crevice resulting from the incomplete union of the two sloping surfaces. Had

the two surfaces met it would have resulted in groove. So in dentition, there are certain developmental disorders that may lead to the pits and fissures formation. These pits and fissures are of much importance when we talk about the dental caries. These are the stagnation points for the food and the microorganisms. In the deep parts of these crevices along food debris, the bacteria cause the breakdown of orally taken carbohydrates and lead to acid production. This acid production further disintegrates the tooth structure by dissolving the enamel and thus responsible for caries progression. If these developmental defects are restored at earliest, it may minimize the chances of further tooth decay and deterioration. Thus, it might be a step ahead improving the oral hygiene¹¹.

There is jury's out on the success of both resin based sealer and GIC sealer. The school based fissure sealant program also contributes much in increasing the oral hygiene. The rationale is the earlier sealing of the developmental defects of the teeth. This study explores the success rates of the two materials i.e. unfilled resin based material and the glass ionomer cement while being used as fissure sealant. Glass ionomer based fissure have a good bond strength, penetration and remineralization capacity while evaluating different sealants¹². There is good evidence that indicates an equal caries control by the high viscosity glass ionomer cement and the resin based fissure sealants used in permanent molars after a period of four years¹³. The unfilled resin base material has more flowing potential and can be employed successfully. Reddy et al¹⁴ established that unfilled resin based fissure sealant has almost equal retention efficacy as compared to the filled one. Despite some of the brands available in the market, there might be a minor difference in terms of retention.

Haznedaroğlu et al¹⁵ identified glass ionomer sealant with releasing fluorides are more effective in caries control. There is also a significant level of fluoride in the saliva that may be helpful in reducing the caries. High viscosity glass ionomer ART sealants can be used successfully along with the resin based sealants.¹⁶ A total number of 72 molar teeth (45 mandibular and 27 maxillary) were selected having the developmental pits and fissures on the occlusal surfaces. Thirty teeth were restored by the unfilled resin fissure sealant while 42 teeth were restored by the GIC (Table 1). Out of 30 cases, 23 cases were rated as successful while 31 cases out of 42 cases were declared as successful. The remaining 07 and 11 cases fell in the Bravo and Charlie category of Ryge criteria in the resin based fissure sealant and GIC groups respectively. Highlighting the successful cases in resin based fissure sealants, 15 were mandibular molars and the 08 were maxillary molars. In case of GIC group 20 cases were mandibular molars and 11 cases were maxillary molars. Overall 35 mandibular molars and 19 maxillary molars were declared as successful. The unsuccessful group in resin based fissure sealant had 3 mandibular molars in B category and 4 maxillary molars in C category. The unfilled resin material is applied directly after etching by the needle tip of the cartridge and flowed into the depth of the fissure. It is then polymerized by light. However the application of the adhesive has also been proved to be effective increasing the longevity of the restoration. Even the

application of adhesive is helpful in increasing the retention of the sealant¹⁷.

The GIC group had 7 mandibular molars in B category and 4 maxillary molars in C category. There is overall 75% success ratio and 25% failure ratio in terms of marginal integrity. The mandibular teeth showed 77.77% success while 22.22% were observed as having failure. The maxillary teeth had 70.37% successful molars and 29.62% having failure (Table 3). Coming to the secondary caries evaluation, 76% were in A category and 24% achieved B category (Table 4). In the resin based fissure sealants group 82.60% were categorized as Alpha and 17.39% as Bravo. On the other hand, the GIC group 70.90% were Alpha and 29% declared as Bravo category. Current researchers keep abreast of all the newly developed materials and their benefits. Our findings coincide with the work of Walsh T that states that the appropriate application of the resin based fissure sealants remarkably reduce the prevalence of caries¹⁸ Ulusoy et al¹⁹ demonstrated that the dental caries was not observed in the 24 months study using the resin based fissure sealant and the glass ionomer cement (Fuji VII). So the glass ionomer cement can also be used along the resin coating material exhibiting excellent outcome.

CONCLUSION

The occurrence of occlusal pits and fissures are a usual features of permanent molars and these structural defects are not avoidable since they are an integral part of tooth morphology. There is striking evidence of reducing the prevalence of caries by earlier sealing of the pits and fissures. Whether we use the resin based fissure sealant or the glass ionomer cement, the success outcome of both the materials is drop in the bucket, an equal outcome in terms of caries prevention. Moreover, there is also significant secondary caries reduction by either of the two materials. The resin based fissure sealant has an edge over the glass ionomer cement in terms of preventing secondary caries.

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