



**ORIGINAL ARTICLE**

**A Clinical Comparison on Success of Sealant and Preventive Resin Restoration on Caries Prevention**

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**Abstract**

The purpose of this study is to compare the clinical success between preventive resin restoration, and pit and fissure sealant in terms of retention and caries prevention on first permanent molar. Data were collected from the patients' case records in Pediatric Dentistry clinic. Records of children who had done their sealants and preventive resin in their first permanent molar were reviewed. 61 patients had preventive resin restoration and 56 pit and fissure sealant done in permanent first molar 2 years ago were included and called for clinical review. Participants were between 6-10 years. Visual and tactile assessment was done to detect the integrity of preventive resin restoration and pit and fissure sealants under 4 categories whether the sealant or PRR is total lost, partial lost, completely present, carious. Data was analyzed using descriptive statistics. At the end of 2 years, sealants showed 64.3 % total retention, 21.4% partial retention and 10.7% complete loss when compared to PRR which showed 62.2% total retention, 14% partial retention and 4.9% complete loss. Preventive resin restoration have more tendency to have caries, while teeth with pit and fissure sealants does not (18% vs. 3.6%). As a conclusion, pit and fissure sealants have marginally higher retention compared to preventive resin restoration on permanent molars. Pit and fissure sealant is better in terms of caries prevention compared to preventive resin restoration.

**Keywords:** Pit and fissure sealants; preventive resin restoration; first permanent molar; caries prevention.

**Introduction**

Individual tooth surfaces have vastly different susceptibilities to caries, with the pit and fissure (occlusal) surfaces the most susceptible, and the smooth (labial and lingual) surfaces the least susceptible. Various reasons for the differing caries susceptibilities have been proposed, such as different tooth surface morphology or different post-eruptive enamel maturation of the surfaces. The caries susceptibility of a tooth surface also varies over time. It was found that susceptibility to caries is low during the first post-eruptive year, but rises rapidly to the maximum rate approximately two to three years post-eruption. Information on surface-specific

dental caries patterns is a useful source of reference for dental administrators in deciding which preventive strategies to use (Demirci et al., 2010).

Dental sealants can be a preventive measure used effectively as part of a comprehensive approach to caries prevention on an individual basis or as a public health measure for at risk populations against pit and fissure decay (Beauchamp et al., 2008). The majority of previous clinical studies involving fissure sealants have evaluated the effectiveness of a single sealant application to reduce the incidence of caries in relation to that found on similar untreated control teeth in the same mouth (Buonocore, 1971). Long-term results have indicated uniformly that there is a loss of material with time that can vary according to the material used (Mertz-Fairhurst et al., 1984), the technique of application (Hinding & Buonocore, 1974), and the characteristics of the patient population (Eden, 1976).

Types of pit and fissure sealant materials that are available are resin - based sealant and glass ionomer cement. Available resin-based sealant materials can be polymerized by auto-polymerization, photo-polymerization using visible light or a combination of the two processes (Beauchamp et al., 2008). With the proven results of etched resin techniques, there has been renewed interest in conservative cavity design with a view to the preservation of healthy tooth material. Among the newer techniques showing long-term success are preventive resin restorations. Minimal exploratory openings in enamel are filled with pit and fissure sealants, whereas isolated carious lesions are removed without any extension into the surrounding healthy tooth. The cavity is obturated with filled resin and the unaffected pits and fissures are protected with pit and fissure sealant. (McConnachie, 1992).

Preventive resin restoration is a secondary prevention which halts the progress of the disease at its incipient stage and prevents complication. When caries is present, small composite restorations referred to as preventive resin restorations offer a more conservative preparation than the large amalgam preparation, which requires healthier tooth structure to be removed. Pits and fissures are minimally prepared to remove demineralized enamel and dentin, and then restored with resin-based composite (White & Eakle, 2000).

When placed with care and then routinely maintained, sealants and PRR represent an exceptional preventive service. Nonetheless, many dentists express frustration or a distrust for the long-term benefit of this treatment. Hence, this study was conducted to compare the clinical success between preventive resin restoration, and pit and fissure sealant in terms of retention and caries prevention.

## **Materials and Methods**

Data were collected from the patients' case records in Paediatric Dentistry clinic where children below 14 years were treated. Study was conducted in paediatric dental clinic during the period of 2013-2015. Ethical clearance was obtained before the start of the study. A total of 575 case records were scrutinized, of which 120 records were selected for the study. Records of children who had done their sealants and preventive resin in their first permanent molar two years ago were included. Any children whose records with missing important information such as isolation techniques, material used were excluded. From the 120 records, 61 had preventive resin restoration and 56 pit and fissure sealant done in permanent first molar. 3M ESPE clinpro sealant and 3M ESPE Z350 XT Filtek flow-able restorative materials were used. After informed consent, these selected patients were called for clinical review and underwent dental examination by dental operator.

Visual and tactile assessment was done to detect the integrity of preventive resin restoration and Sealants, as well as cavitation's. The retention was evaluated by visual inspection by a single operator. Teeth were examined with a front surface dental mirror and a straight dental explorer No. 6. Use of an explorer or a probe to confirm cavitation (catch) especially in pits and fissure, was one of the most common procedures to detect dental caries and researchers used these instruments widely in early protocol (Fontana et al., 2010). Information regarding the preventive resin restoration and pit and fissure sealant on the previously restored molars were evaluated under four categories whether the sealant or PRR

is total lost, partial lost, completely present, carious. Data collected were analysed using descriptive statistics.

## Results

The total number of samples included 116 (Table 1). The samples were distributed between ages of 6 to 10 years with predominantly females. Data were analysed using descriptive statistics. Clinical examination after two year showed, teeth with pit and fissure sealants have higher retention rate than those with preventive resin restoration (64.2 % vs. 62.2%) (Table 2). However, the differences are not significant. Sealant have higher percentage of partial loss compared to that of preventive resin restoration (21.4% vs. 14%). Sealant have higher percentage of total lost compared to that of preventive resin restoration (10.7% vs. 4.9%). Whereas teeth prepared with preventive resin restoration have more tendency to have caries, while teeth with pit and fissure sealants does not (18% vs. 3.6%). Table 3 and Table 4 shows the comparison of sealants and preventive resin restoration among both genders. The retention rate among genders very not significant. Males shown to have high carious rate compared to females both in sealants and PRR.

**Table 1.** Distribution of participants

Characteristics of Participants		Total, n (%)
<b>Age</b>	6 to 7 years	55 (47%)
	8 to 10 years	62 (53%)
<b>Gender</b>	Male	48 (41%)
	Female	69 (59%)

**Table 2.** Clinical status of the restored first permanent molar after 2 years

Category	Clinical condition of the restored first permanent molar				
	Present	Partial lost	Total lost	Carious	Total
<b>Pit and fissure sealant</b>	36 (64.3 %)	12 (21.4%)	6 (10.7%)	2 (3.6%)	56 (100%)
<b>Preventive resin restoration</b>	38 (62.3%)	9 (14.75%)	3 (4.9%)	11 (18%)	61 (100%)

**Table 3.** Comparison of sealant status among gender

Pit and fissure sealant	Clinical condition of the restored first permanent molar				
	Present	Partial lost	Total lost	Carious	Total
<b>Male</b>	21 (64 %)	7 (21%)	3 (9%)	2 (6%)	33 (100%)
<b>Female</b>	15 (65%)	5 (22%)	3 (13%)	0	23 (100%)

**Table 4.** Comparison of preventive resin restoration status among gender

Preventive resin restoration	Clinical condition of the restored first permanent molar				
	Present	Partial lost	Total lost	Carious	Total
<b>Male</b>	10 (67 %)	2 (13%)	0	3 (20%)	15 (100%)
<b>Female</b>	28 (61%)	7 (15%)	3 (7%)	8 (17.4%)	46 (100%)

## Discussion

The sealant restoration is indicated primarily on the occlusal surfaces of permanent molars and premolars and may also be indicated for primary molars. They are most appropriate when the prepared cavity in a pit or fissure is small and discrete. Larger cavities would be more appropriately restored with amalgam or a posterior composite whilst smaller cavities may be restored with sealant alone (Hassall & Mellor, 2001). Preventive resin restoration was first suggested by Simonsen, whereby, the susceptible fissures were opened up with a small tapered fissure bur prior to restoring the cavity with diluted composite. The advantages of sealing include: Lower cost in comparison to that of restorations, and a nine fold decrease in the occurrence of caries in comparison to unsealed teeth (Fernandes et al., 2012).

This clinical study examined the retention of sealants after a 2 year period. In this study, sealants showed 64.3 % total retention, 21.4% partial retention and 10.7% complete loss when compared to PRR which showed 62.2% total retention, 14% partial retention and 4.9% complete loss. Based on our study comparing the efficacy between pit and fissure sealant and preventive resin restoration, results indicate that pit and fissure sealant has a marginally higher percentage of success in retention compared to preventive resin restoration after a period of 2 year. The rates were higher when compared to results of Subramaniam et al. (2008) reported 14.6% complete retention, 39.3% partial retention and 46% complete loss for a resin sealant in terms of complete retention and complete loss. Similarly Clinical study on evaluation of sealants and preventive resin restorations in a group of environmentally homogeneous children with one year follow up, showed teeth prepared (PRR) and restored with flow-able composite resins had significantly lower retention rates (27% vs. 63%) than did teeth with non-prepared sealants. Teeth prepared (type B PRRs) were also significantly more likely to have caries on follow-up examination (50% vs. 11%) than were teeth with non-prepared sealants or type A PRRs. These results suggest that preventive resin type B restorations restored with flow-able composites are not helpful in terms of retention or caries reduction (Lekic et al., 2006).

Pit and fissure sealant have higher percentage of partial loss compared to that of preventive resin restoration. Anson et al. (1982) listed that loss of pit and fissure sealants from the tooth surface is due to poor placement technique (inadequate moisture control, not sealing all pits and fissures, inadequate etching, rinsing and drying, insufficient curing time), material wear and finally failure due to a combination of these factors. Clinical evidence suggests that sealant loss (retention failure) occurs in two phases: firstly, an initial loss due to faulty technique (such as moisture contamination), followed by a second loss associated with material wear under the forces of occlusion. (Manton & Messer, 1995).

Regarding tooth eruption newly erupted teeth have a lower chance of success as compared to fully erupted teeth (Feigal, 1998). In accordance to a study done by Barja-Fidalgo et al any incomplete eruption of these teeth may have led to salivary contamination during pit and fissure sealant application, thereby decreasing mechanical bonding and substantially compromising pit and fissure sealant retention (Ulusu et al., 2012). Most of the sealants available in the market are resin based. However, placement of a resin is very technique-sensitive and is influenced by several factors, such as patient cooperation, operator variability,

and contamination of the operating field (Karlzén-Reuterving & van Dijken, 1995). A major drawback of sealing fissures with resins is that the clinical procedure is extremely sensitive to moisture, which makes it difficult to etch partially erupted molars (Subramaniam et al., 2008).

In this study, the occurrence of carious teeth in preventive resin restoration is higher 18% vs. 3.5 than those in pit and fissure sealant on follow up examination. The benefit of dental sealants for pits and fissures is based on retention and integrity over time. However, since the retention is not permanent, this physical effect could be enhanced by the local release of fluoride from the sealant material (Lobo et al., 2005). Although high percentages of lost sealant have been observed, this loss does not seem to have a direct relationship with caries development (Antonson et al., 2002), even when the sealant appears partially lost clinically, it may act as a source of fluoride. However the result obtained was not in accordance with that reported by Mertz-Fairhurst et al. (1998). He reported that there was no carious lesion progression below intact preventive resin restorations even after 9 years. Our study shows, higher carious rate is seen in boys than girls for both pit and fissure sealant and preventive resin restoration. This could be due to the fact that boys start to brush their teeth at a later period compared to girls ( Al-Malik & Rehbini, 2006), Girls tend to brush their teeth more often than boys do (Suominen-Taipale et al., 2004), boys consider tooth brushing to be unimportant. (Poutanen et al., 2006). Besides, boys and girls also have different dietary lifestyle. Girls reported to have a higher intake of light meals and fruits and a lower intake of milk than boys (Vågstrand et al., 2007). It was noteworthy that the main limitation of this study is the technique of tooth brushing practiced varies from patient to patient. Besides that, diet, dental health status and socio-economy are not taken into consideration.

## Conclusion

Sealants and PRR have proved to be efficient treatment fulfilling in modern operative dentistry. Fissure sealants have marginally higher retention compared to preventive resin restoration on permanent molars. Pit and fissure sealant is better in terms of caries prevention compared to preventive resin restoration Available evidence supports that the placement of sealants over non-cavitated carious lesions arrests the disease process and is cost effective in forms of individual and community. This suggests that sealants can continue to prevent caries even when they appear clinically to be partially or completely lost compared to preventive resin restoration. Meanwhile, a vigilant recall should be followed-up in the PRR due to the risk of failure for flow-able materials and also to check any carious formation.

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