

Retention of a Flowable Composite Resin in Comparison to a Conventional Resin-Based Sealant: One-year Follow-up

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Abstract:

Objective: Long-term retention of pit and fissure sealants is crucial for their success. This clinical study evaluated the retention rate of a flowable composite resin (Filtek Supreme XT Flowable Restorative) compared to a conventional resin-based sealant (Concise Light Cure White Sealant) over 12 months.

Materials and Methods: Forty subjects aged 6 to 9 years were included in the study. Using a half-mouth design, a total of 80 first permanent molars were sealed with conventional fissure sealant on one side of the mouth and flowable composite on the contralateral side. Clinical evaluation was performed at 3, 6, and 12 months by a single blind examiner and the retention was classified as complete retention, partial loss, or total loss.

Results: For both materials, there was no total loss of sealants over 12 months. Partial loss of both materials was observed in one sealant after 3 months. After 6 months, 36 teeth sealed with conventional fissure sealant were intact compared with 37 sealed with a flowable composite, and after 12 months, 33 teeth sealed with conventional fissure sealant were intact compared with 35 that were sealed with a flowable composite. There were no statistically significant difference ($P>0.05$) between the two materials regarding the retention rate at each follow-up period.

Conclusion: As flowable composite resulted in comparable sealant retention rates, this material could be a good choice for fissure sealant.

Key Words: Pit and Fissure Sealants; flowable hybrid composite; Clinical Trial

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INTRODUCTION

Dental caries is still a highly prevalent pathology in the worldwide population despite all the traditional and original prevention methods. In spite of dramatic improvement in the caries status of children, dental caries is still the most common childhood disease [1]. Although fluorides are highly effective in prevention of caries on smooth surfaces, they are not equally effective in protecting the occlusal surfaces

[2]. Permanent posterior teeth construct about 90 percent of carious lesions of the pits and fissures [3]. Molars are the most vulnerable tooth type for this defect [4]. The application of pit-and-fissure sealants is considered as the most appropriate treatment modality for prevention of occlusal caries [5]. They help caries control by physical obstruction of the pits and fissures. Therefore, the retention rate becomes a determinant of their effectiveness as a caries

preventive measure. Sealants are rarely retained completely over the tooth's lifetime and must be reapplied. Even under proper application conditions, 5 to 10 percent of sealants are lost annually [6,7]. In order to enhance the longevity of pit-and-fissure sealants, several materials and techniques have been evolved, among which is the use of flowable composite resins as pit-and-fissure sealants [8-11]. The higher filler content causing decrease in the surface wear is the main logic for using flowable composites as pit-and-fissure sealants [9]. However, there are few clinical studies comparing the retention of these materials with that of conventional resin based sealants. The purpose of this study was to compare the retention of a conventional resin-based sealant and a flowable composite resin placed on occlusal pits and fissures over a 12-month period.

MATERIALS AND METHODS

Subjects were selected from a primary school in Isfahan, Iran. Children in the age range of 6 to 9 years having caries free, fully erupted first permanent molars were included in this study. Written informed consent was obtained from the parents or guardians of all children in the study, and the study design was approved by the ethics committee of the School of Dentistry, University of Isfahan. Prior to examination, the occlusal surfaces were first cleaned by pumice prophylaxis to remove the dental biofilm and stains. The teeth were examined by a trained clinician (MJ) using a flat mirror and a WHO probe to confirm the absence of decay. A total of 40 children were recruited, providing a sample size of 80 teeth.

Moisture control was carried out by using cotton rolls. The occlusal surfaces were etched with 37% phosphoric acid for 20 seconds, rinsed with air/water spray for 15 seconds, and dried with a mild air stream for 20 seconds until a uniform whitened surface with chalk-like appearance was obtained. In cases of sali-

va contamination, a 5-second re-etch was performed. A layer of light-cured single-component adhesive (Excite, Ivoclar Vivadent Inc. Amherst, NY, USA) system was applied to the acid-etched surface and light cured for 20 seconds. Using a half-mouth design, a conventional light-cured resin-based pit-and-fissure sealant (Concise Light Cure White Sealant, 3M ESPE, St. Paul, MN, USA) was applied on randomly assigned first permanent molar on one side of the mouth, and a light-cured flowable composite resin (Filtek Supreme XT Flowable Restorative, 3M ESPE, St. Paul, MN, USA) was applied to the contralateral side. The teeth assignment was done using a coin toss. For the teeth sealed with conventional fissure sealant, the sealant was applied to the occlusal surface and light cured for 40 seconds using a conventional visible light-curing unit at 450 mW/cm² output (Coltolux 2.5, c7906, Colten, USA). For the teeth sealed with flowable composite, the flowable resin was applied to the occlusal surface and light cured for 40 seconds.

After each application, the sealant was tested for lack of air bubbles, marginal adaptation, retention, and complete polymerization and if it was deficient, the tooth was re-treated. The occlusion was then evaluated and possible premature contacts were eliminated.

The children were re-examined at 3, 6, and 12 months after the sealant application, using an explorer and flat mirror. Evaluations were performed by a trained clinician (MJ), who was blind to the treatment group assignments. Sealants were classified as present, partial loss or complete loss, following the criteria proposed by García-Godoy [12].

The statistical analysis was performed using SPSS Windows 11.0 (SPSS Inc, Chicago IL), using Wilcoxon test at 5% significance level.

RESULTS

One child had been lost to the follow-up. Table 1 displays the distribution of sealant reten-

tion rates after 3, 6 and 12 months for the two materials. For both materials, there was no total loss of sealants over 12 months. After three months, 38 teeth sealed with either conventional fissure sealant or flowable composite were completely intact. After six months, 36 teeth sealed with conventional fissure sealant and 37 sealed with flowable composite were still intact. After 12 months, 33 teeth sealed with conventional fissure sealant were intact compared to 35 sealed with flowable composite.

The Wilcoxon test revealed no statistically significant difference regarding retention rate between the two materials after three ($P>0.05$), six ($P>0.05$) and 12 months ($P>0.05$).

DISCUSSION

Although the use of pit and fissure sealant has been effective in preventing occlusal caries for more than two decades [13,14], there remained the concern that the sealant had broken away. The use of a flowable composite resin as a sealant is not novel. It has been reported that the higher amount of filler particles of flowable composites provides lesser porosity [8] and better wear resistance than conventional resin based sealants [9]. Filtek Supreme XT flowable composite incorporates 78.5% filler particles. However, the conventional fissure sealant has enhanced flowing properties.

It can be argued that this property allowed the conventional fissure sealant to penetrate deeper into the fissure and may therefore be better retained [15,16]. However, a study by Kakaboura et al [17] showed that a low-viscosity resin composite also penetrates more in shal-

low-wide fissures compared to the conventional resin sealant.

Our study supports findings from earlier studies that the success rate was similar between the two materials [8-10]. A similar trend was observed in a study by Corona et al [10], where the complete retention was 95% for conventional pit-and-fissure sealant and 100% for flowable composite over a one-year follow-up period. In a study by Koch et al [18], a flowable restorative system was compared to a conventional filled sealant, and 30 out of 31 teeth sealed with an unfilled resin were completely intact compared to 28 out of 31 teeth that were sealed with the filled resin after 12 months. Contrary to our findings, Autio-Gold [11] observed slightly lower retention rates in teeth sealed with a medium-filled material when compared with an unfilled sealant (Delton[®]), but the difference was not statistically significant.

The complete retention at 12 months was 89.7% for the flowable composite and 84.6% for the conventional sealant. Several authors have reported that after one-year, sealant retention is about 85-95%, which might be considered as a clinical success [19-21]. Although the total study period of 12 months seems short for the evaluation of the retention rates, according to Dennison et al [22], most sealant failures occur at six months following application. In order to overcome the inter-operator variability, the two materials were applied in every child. The selection of material for each quadrant was randomized and the evaluation process was blind, further minimizing the possibility of bias.

Table 1. Distribution of retention rates.

Retention	Conventional Fissure Sealant			Flowable Composite Resin		
	3-months	6-months	12-months	3-months	6-months	12-months
Complete retention	38 (97.4%)	36 (92.3%)	33 (84.6%)	38 (97.4%)	37 (94.9%)	35 (89.7%)
Partial loss	1 (2.6%)	3 (7.7%)	6 (15.4%)	1 (2.6%)	2 (5.1%)	4 (10.3%)
Complete loss	0	0	0	0	0	0
Total	39	39	39	39	39	39

CONCLUSION

Overall, it may be concluded that the conventional pit-and-fissure sealant and the flowable composite resin presented similar results in terms of retention. However, because of the scarcity of clinical studies on the use of flowable composite resins as sealants, further studies are warranted that include other flowable composite resins, children of different ages, and longer follow-up periods.

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