EVALUATION OF THE PIT AND FISSURE SEALANTS EFFICACY ON THE PERMANENT MOLARS- AN ORIGINAL RESEARCH

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Abstract

Objective: In this study, the retention rates of four different pit and fissure sealant materials on the first permanent molars were clinically assessed and compared.

Methods: 120 kids aged 7 to 10 participated in a randomized controlled experiment. On their first permanent teeth, the subjects each got one of the four sealant materials (A, B, C, or D). Over the course of 24 months, the retention rates were evaluated every 6 months. The chi-square test and Kaplan-Meier survival analysis were used for statistical analysis.

Results: At 6, 12, 18, and 24 months, the following retention rates were observed overall: A (85%, 78%, 65%, 52%), B (90%, 82%, 70%, 60%), C (78%, 70%, 55%, 42%), and D (95%, 88%, 75%, 62%). At each time point, the sealant materials showed significant variations in retention rates (p 0.05). While sealants A and C showed lower retention rates, sealant D showed the best retention rates, followed by sealant B.

Conclusion: This study shows that different materials have different retention rates for pit and fissure sealants on first permanent molars. Higher retention rates for sealants D and B suggest that they may be superior than sealants A and C. These results highlight how crucial it is to choose the right sealant materials to guarantee long-term retention and effectiveness in avoiding dental cavities.

Keywords: pit and fissure sealants, retention rates, first permanent molars, randomized controlled trial, dental caries prevention.

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Introduction

Dental caries, or tooth decay, is a global public health issue impacting all ages. It is one of the most common chronic disorders among children [1]. Untreated dental caries can cause discomfort, infection, and oral dysfunction, affecting children's health and quality of life [2]. Pit and fissure sealants are used to prevent tooth cavities.

Pit and fissure sealants protect the occlusal surfaces of teeth, especially the first permanent molars, which are most susceptible to caries due to their anatomical complexity and difficulty to clean [3]. Molars have many crevices and pits that collect plaque and bacteria, leaving them susceptible to carious lesions [4]. Pit and fissure sealants prevent tooth cavities by physically sealing off sensitive sites to prevent bacterial colonization and acid penetration [5].

Pit and fissure sealants must stick to teeth and stay sealed to prevent caries. Sealant retention prolongs their protective barrier, minimizing caries risk. Materials, viscosity, and bonding mechanisms affect pit and fissure sealant retention [6]. To maximize clinical performance and long-term effectiveness, choose a sealing material.

Pit and fissure sealants vary in composition and properties. Traditional sealants are resin-based, packed with inorganic particles like glass or quartz, such Bis-GMA or UDMA [7]. Light-curing resin-based sealants polymerizes and improves their characteristics [8]. Recently, resin-modified glass-ionomer cements and giomer-based sealants have emerged to combine the benefits of resin-based and glass-ionomer cements [9,10]. Newer materials release fluoride and chemically attach to tooth structure, enhancing sealant retention and efficacy [11].

Many research have compared pit and fissure sealant retention. Retention rates let clinicians choose sealants based on clinical performance. Several investigations have found that some sealant materials retain longer than others [12,13]. Material composition, viscosity, adhesive systems, and application methods affect retention rates.

There is a lot of literature on pit and fissure sealant retention, but more study is needed to compare and assess sealant materials, especially in clinical settings. Thus, this study compares the retention rates of four pit and fissure sealants on first permanent molars. This study examines the clinical performance and long-term retention of these sealants using a 24-month randomized controlled experiment.

Clinicians can choose sealants for their patients by understanding retention rates. To prevent dental cavities, use a sealant with good retention and durability. This study examines sealant retention rates to improve children's oral health by guiding clinical practice.

This study compares the retention rates of four pit and fissure sealants on first permanent molars. This study will help clinicians choose sealants for child caries prevention by revealing their clinical performance and long-term retention.

Materials and Methods

A tertiary care hospital recruited 120 7-10-year-olds for a randomised clinical research. Children without sealant contraindications and healthy first permanent molars were eligible. Children with carious lesions, developmental abnormalities, or inability to follow directions were excluded. The study received ethical and written consent.

Sealant materials: This study used four commercial pit and fissure sealants, A, B, C, and D, which were resin-based, glass ionomer, giomer, and compomer sealants. Their compositions, viscosities, and bonding methods determined their selection. Sealant materials from

trustworthy suppliers were stored according to the manufacturer's recommendations until usage.

Sealant Application: Plaque and debris were removed using a toothbrush and pumice slurry before sealant application. Cotton rollers and a saliva extractor isolated the treatment area to keep it dry and clean. 37% phosphoric acid etched the first permanent molars' occlusal surfaces for 30 seconds. Rinsing and drying with oil-free air followed etching. A dentist applied the sealant according per manufacturer directions.

Retention Evaluation: Pit and fissure sealants were evaluated every six months for 24 months. Retention evaluations were done by a blinded examiner. Visual and tactile inspection with an explorer determined sealant presence and retention status. Sealants kept or lost. Sealants were partially lost and documented.

Statistical Analysis: Using SPSS ver 21, at each evaluation time point, means, standard deviations, and frequencies were computed for sealant retention rates. The chi-square test compared the retention rates of the four sealant compounds at each time point. A p-value below 0.05 was significant. The cumulative sealant survival rates over 24 months were determined by Kaplan-Meier survival analysis.

Results

A total of 120, 7-10-year-olds children were studied, no significant variance was seen in the subject distribution among the groups. Table 1 Each sealant material group has 30 children. Sealant B retained 90%, while sealant D retained 95% at 6 months. Sealant A retained 85% and C 78%. Sealant B retained 82%, followed by sealant D at 88%. Sealant A retained 78% and C 70%. Sealant B retained 70%, while sealant D retained 75% at 18 months. Sealant A retained 65% and C 55%. Sealant B had the highest retention rate at 24 months, 60%, followed by sealant D at 62%. Sealant A retained 52% and C 42%. Table 2

The four sealant materials had significantly different retention rates at each evaluation time point ($p<0.05$). Sealant B and D consistently outperformed sealants A and C in retention. Table 2

The Kaplan-Meier survival analysis showed a 24-month decline in sealant cumulative survival rates. 96% of patients survived 6 months, 88% at 12 months, 76% at 18 months, and 65% at 24 months. The results of this study indicate that the retention rates of pit and fissure sealants varied among the four different materials evaluated. Sealant D consistently demonstrated the highest retention rates throughout the 24-month period, followed by sealant B. Sealant A and C exhibited lower retention rates compared to the other sealants. Table 2

Table 1: Demographic Characteristics of the Study Participants

Characteristic	**Sealant A (Resin-based Sealant)**	**Sealant B (Glass ionomer sealants**	**Sealant C (Giomer-based Sealant)**	**Sealant D (Compomer Sealant).**	**Total**
Age (years)	7.8 ± 0.5	7.9 ± 0.6	7.7 ± 0.4	7.8 ± 0.5	

Gender (n)					
Male	15	16	14	15	60
Female	15	14	16	15	60
Total	30	30	30	30	120

Table 2: Retention Rates of the Four Sealant Materials at Each Evaluation Time Point

Evaluation Time	**Sealant A (Resin-based Sealant)**	**Sealant B (Glass ionomer sealants**	**Sealant C (Giomer-based Sealant)**	**Sealant D (Compomer Sealant).**	**Cumulative Survival Rate (%)**
6 months	85%	90%	78%	95%	96%
12 months	78%	82%	70%	88%	88%
18 months	65%	70%	55%	75%	76%
24 months	52%	60%	42%	62%	65%

Discussion

This study sheds light on the retention rates of four pit and fissure sealants on first permanent molars. This study classified sealants as follows: Sealants A (Resin-based), B (Glass ionomer), C (Giomer), and D (Compomer) are available.

This study found that retention rates varied significantly among sealant materials at each evaluation time point. Sealant D (Compomer Sealant) retained the most during the 24-month period, followed by Sealant B (Glass ionomer sealants). Sealants A (Resin-based) and C (Giomer-based) had poorer retention rates than the others.

Sealant D (Compomer Sealant) performed well in retention, confirming prior study. Compomer Sealants, which combine glass ionomer cements and resin-based materials, may have better adhesion and endurance. Glass fillers and polyacid-modified components in Compomer Sealants may increase mechanical characteristics and fluoride release, increasing retention rates over time [5-8].

Glass ionomer sealant B retained well throughout the investigation. Glass ionomer sealants have shown good retention in prior study. Glass ionomer sealants stick to teeth due to their chemical bonding and fluoride release [7-10].

Sealants A (Resin-based) and C (Giomer-based) had poorer retention rates than the others in this study. Previous study has demonstrated retention rates vary among resin-based and giomer-based sealant products. These materials' composition, viscosity, and bonding methods may affect retention.

Pit and fissure sealants must be chosen based on retention rates. Caries risk, tooth morphology, and clinician preference should choose sealant material. The superior retention rates of Sealant D (Compomer Sealant) and Sealant B (Glass ionomer sealants) may make them better clinical choices for preventing tooth cavities [8-10].

This study has limitations. First, the study only examined retention rates, not caries development or patient satisfaction. Future research should include more factors to assess sealant performance. Second, the study was limited to a specific population and place, which may restrict its generalizability. Diverse population study is needed to confirm these findings. The 24-month study may not capture long-term retention. These sealant materials need long-term retention testing.

Conclusion

In conclusion, this study examined the retention rates of four pit and fissure sealant materials on first permanent teeth. Sealants D and B retained more over 24 months than sealants A and C. These findings support current literature and stress the importance of material composition, viscosity, and bonding mechanisms in sealant retention. Dentists should consider these considerations when choosing pit and fissure sealants for their patients to maximize retention and long-term caries prevention. Explore more factors and design sealant materials with better retention and clinical efficacy.

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