

Six-year clinical evaluation of fissure sealants placed after mechanical preparation: a matched pair study

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Abstract

The occlusal fissures of 61 matched pairs of first permanent molars in children aged 6–9 years were sealed. The experimental tooth of each pair was prepared mechanically by running a #1 round bur in the fissure area. After 6 years, 34 pairs were available for examination. Of 19 pairs of mandibular molars sealed, 4 molars of the control and 2 of the experimental groups sustained partial or total loss of sealant. Of 15 pairs of maxillary molars sealed, 2 molars in the experimental group lost their sealants, whereas 8 molars in the control group sustained partial or total sealant loss. It was concluded that mechanical preparation resulted in a significantly higher retention rate of sealants placed on maxillary molar teeth.

Reports^{1,2} have demonstrated a decline in the retention rates of fissure sealants with increasing time. A previous report has shown an increased retention rate following mechanical preparation of the fissure of maxillary teeth; this study had a follow-up period of 3 years.³ The purpose of the present report is to present 6-year data for retention of fissure sealants applied in a matched pair experimental design where the experimental molars were sealed following mechanical preparation of the fissures.

Methods and Materials

Forty-seven children residing in a nonfluoridated area (<0.3 ppm) with paired caries-free, contralateral first permanent molars were selected from 200 first and second graders (mean age 7 years) attending a school dental clinic in a Jerusalem suburb. By the end of the sixth year, 23 children (49%) were available for re-examination. All clinical procedures and follow-up examinations were carried out in the school dental clinic. The children were examined by the authors and a consensus diagnosis was reached in every case. Criteria and rationale of this study methodology have been reported previously.³ The treat-

ment procedure was explained to the parents and oral consent obtained before treatment.

The experimental tooth was chosen randomly by a toss of a coin. This group was treated by mechanically preparing the fissure using a #1 round steel bur at low speed, in order to remove plaque and organic debris from the fissure, and to remove surface enamel. The surface then was cleaned with a slurry of pumice, etched for 1 min, and sealed with Delton^a according to the manufacturer's instructions, using cotton rolls for isolation. After polymerization, the marginal adaptation and retention of the sealants were checked by trying to pry the sealant off with an explorer.

When re-examined, the teeth were rinsed, air-dried, and examined with an explorer to detect the degree of sealant retention (recorded as total retention, partial loss, or total loss). Sealant failure was defined when the material was partially or totally lost, or when an amalgam restoration was replacing the sealant; success was defined when the sealant was retained fully and covered all available fissures. At the time of the examination the examiners did not know which was the control and which was the experimental tooth. From the original 61 pairs of molars treated, 34 were available for examination after 6 years; of these 34 pairs, 19 were in the mandible and 15 in the maxilla. None of the children included in this study were treated in a private practice during the period of this clinical trial; this fact decreased the probability of resealing by another dentist. The McNemar binomial test was used for the statistical analysis.⁴

Results

The results of sealant retention after 6 years are presented in Table 1. In the experimental group, 88%

^a Johnson & Johnson Products Co: East Windsor, NJ.

Table 1. Sealant Retention in First Permanent Molars After 6 Years

	Maxillary		Mandibular		Total	
	No.	Total Retention	No.	Total Retention	No.	Total Retention
Exp.	15	13 (86.67%)	19	17 (89.47%)	34	30 (88.24%)
Contr.	15	7 (46.67%)	19	15 (78.95%)	34	32 (64.70%)

of the sealants were totally retained, as compared to 65% in the control group. This difference was highly significant ($P < 0.02$).

As seen in the table, total retention rate for the mandibular molars in the experimental group was 89%, compared to 79% in the control group. This difference was not statistically significant ($P < 0.33$). For the maxillary teeth the difference in success rate was highly significant, 87% for the experimental group compared to 47% for the control group ($P < 0.016$). No differences were found in sealant retention between mesial and distal sites of maxillary molars.

Of a total of 16 molars classified as failures, 8 molars had mesioocclusal amalgam restorations, 3 in the experimental group, and 5 in the control group. These restorations were due to mesial caries. The state of the occlusal sealants was not examined when the restorations were placed. Of the remaining 8 failures, 5 had occlusal caries, and 3 sustained sealant loss without detectable caries. All molars with occlusal caries were in the control group. Only 1 of these cases of sealant loss was in the experimental group and was without occlusal caries.

Discussion

In spite of recent improvements in materials and techniques, long-term retention rates for fissure sealants are far from ideal, 1 study reporting 64% retention after 7 years¹ and another study reporting 58% retention after 6 years.²

The present investigation, using matched pairs, has demonstrated the beneficial effect of mechanical preparation on the rate of sealant retention. Retention rate for the mechanically prepared teeth was 88% compared to 65% for the control group after 6 years.

Since the technique of sealant application utilized in this study was similar to that used in both previous studies and in the control group in the present

study, the only possible explanation for the significantly higher retention rate obtained must be the mechanical preparation of the fissures prior to etching.

The findings are strengthened by the fact that first permanent molars were treated soon after eruption; this group of teeth is considered to have the lowest retention rate.⁵ A previous study⁶ has shown that retention rates in mandibular molars are almost twice that of those in the maxilla. The retention rate for sealants in the control group of this study was 46.7% in the maxillary teeth compared to 78.9% in the mandibular teeth. In the experimental group (mechanical preparation) this difference disappeared. Thus, the impact of the mechanical preparation was greater in the maxillary molars; this finding has been reported previously.³

One possible explanation for a better retention rate following mechanical preparation in the maxillary molars is that this procedure widens and deepens the fissure, eliminates organic material and plaque, and removes a very thin layer of enamel—possibly resulting in a deeper sealant penetration. This may counteract thinning of the sealant material in the maxillary molars that occurs when the material flows distally, leaving a thin layer of sealant on the mesial aspect of the tooth. Further studies with a larger sample size should be undertaken for corroboration of these high retention rates after 6 years.

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