

The effectiveness of a chemically polymerized sealant in preventing occlusal caries: five-year results

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Abstract

Using the half-mouth technic, a pink-colored, self-curing Bis-GMA sealant was placed on 425 newly erupted sound or sticky first permanent molars in 266 second grade children. The etchant contained 37% orthophosphoric acid. The curing time was 120 seconds. After five years, 331 pairs of molars were available for re-examination. The number of sealants remaining intact was 223 (67.4%), partially lost 34, and completely lost 74. Of the control teeth, 174 (52.5%) became carious or were restored, while 85 (25.6%) of the sealed teeth became carious or were restored—a 51.2% reduction in caries. The pink color enhanced detection, and no complaints were received concerning the sealant's color.

In 1975 a long-term clinical study of an adhesive sealant was initiated in a nonfluoridated suburb of Vancouver, BC, Canada. Using the half-mouth technic, a pink-colored, self-curing Bis-GMA resin^a was placed on 425 newly erupted first permanent molars in 266 second grade children. Following a prophylaxis with an oil-free paste, the procedure followed was wash, dry, etch for 90 seconds, wash, dry, seal. The curing time was 120 seconds and the etchant contained 37% orthophosphoric acid. A rubber dam was not used. Sound and sticky surfaces were included in the study. The aim of the study was to evaluate a self-polymerizing sealant's retentiveness and ability to reduce occlusal caries in recently erupted first permanent molars. The one-, three-, and four-year results previously have been reported.¹⁻³

Methods and Materials

The initial and annual examinations were conducted in school health rooms using portable light, mouth mirrors, and new explorers. One examiner conducted the initial and follow-up examinations. The surfaces were recorded as sound, sticky, carious, or filled. Surfaces which offered minor resistance to explorer removal after moderate pressure, without any visual signs of caries,

^a Test Material, 3M Co., St. Paul, MN.

were deemed sticky. The sealants were recorded as intact, partially lost, or completely lost. Originally, 53 sticky occlusal surfaces were sealed while 58 control teeth were diagnosed as sticky. Previous data was not available to the examiner during the follow-up examinations.

Results

A total of 331 pairs of first permanent molars were available for re-examination five years after the sealants were placed. Of the 331 initially sealed surfaces 223 (67.4%) remained intact, 34 (10.3%) were partially lost, and 74 (22.4%) were completely lost (Table 1). Thirty of the partially lost sealants were on maxillary molars with 22 of the 30 on the distal fossa. The sealants were recorded as lost when they had been replaced with occlusal or mesial-occlusal amalgam restorations. Table 2 presents the figures for caries after five years. The number of control teeth becoming carious or restored was 174 (52.5%) while only 85 (25.6%) of the sealed teeth became carious or were restored (Figure 1), a reduction of 51.2%. Thirty-three sealed and 33 control teeth with two surface restorations were recorded as filled even though the occlusal surfaces could have been sound when the restorations were placed.

Table 1. Retention of sealant in 331 first permanent molars five years after application.

	Intact		Partial Loss		Complete Loss		Total
	N	%	N	%	N	%	
Max	94	61.0	30	19.5	30	19.5	154
Mand	129	74.1	4	2.3	44	25.3	177
Total	223	67.4	34	10.3	74	22.4	331

Discussion

A retention rate of 67.4% after five years compares favorably with the five-year Kalispell⁴ study, which reported a total retention of 50% and partial retention of 16% for molars and premolars. In a five-year study, Doyle⁵ reported a 61% retention in permanent teeth. After four years Going⁶ reported a 28.5% complete retention, and Leake⁷ 21.6%. Charbeneau⁸ used a chemically polymerized sealant on paired first permanent mo-

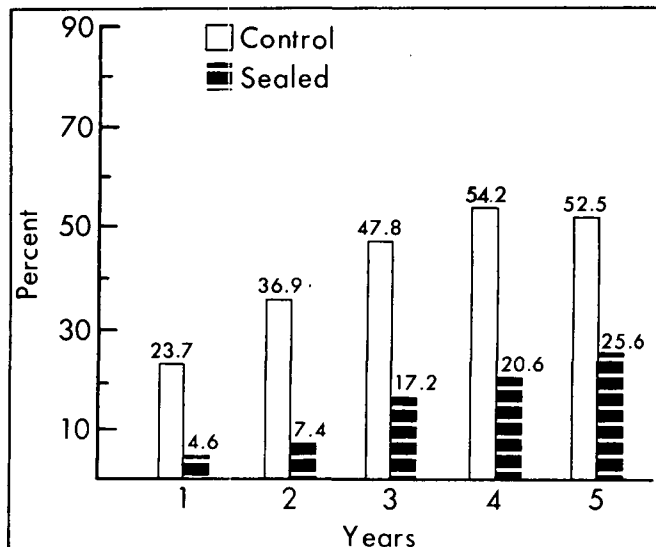


Figure 1. Percent of control and sealed first permanent molars which became carious or were restored.

lars; the four-year retention was 53.8%. Also using paired first permanent molars, the Augusta⁹ study reported complete retention of 72% for Delton[®] and 35% for Nuva-Seal[®] after 4½ years. Due to uncontrolled variables it is difficult to compare the clinical studies. Generally, a retention rate of about 50% after four to five years is reasonable with chemically polymerized sealants being slightly better.

The control molars had 89 more carious or filled occlusal surfaces than the sealed molars, thus the placement of the sealants produced 51.2% reduction in caries after five years. The caries rate for the sealed molars increased from 4.6% after one year to 25.6% after five years (Figure 1). The controls of the same period increased from 23.7% to 52.5%, with a high rate of 54.2% after four years. The decrease from the fourth to the fifth year is probably due to examiner error and subject change. Four children missed the fourth examination but were present at the fifth, and three were present at the fourth examination but missed the fifth. After five years Horowitz⁴ reported an overall reduction of 45%, and Doyle⁵ reported a 28% reduction in sealed first permanent molars. In Augusta the five-year effectiveness for Delton[®] was 60–63%, for Nuva-Seal[®] 13–15%.⁶ The six-year effectiveness⁹ was 52% for Delton[®] and 10% for Nuva-Seal[®].

It is of interest to note that 47.5% of the control molars in the study remained caries-free after five years. This suggests that indiscriminate filling of occlusal surfaces as "preventive" restorations is contraindicated, if almost half of those surfaces remain caries-free after five years. Sealing of these surfaces would appear to be a useful and more conservative preventive measure.

As reported in a previous study,¹⁰ the control surfaces at greatest risk are the sticky occlusals, of which 77.4% became carious or were filled after 30 months.

Among the filled teeth, 33 sealed and 33 control teeth

Table 2. Caries rate after five years in 331 pairs of first permanent molars.

	At Risk		Filled		Caries		Total	
	N	%	N	%	N	%	N	%
Control	331	100	159	48.0	15	4.5	174	52.5
Sealed	331	100	82	24.7	3	0.9	85	25.6

were recorded as filled even though the occlusal surfaces could have been sound when the restorations were placed. If these teeth were subtracted from the total number filled, the reduction in occlusal caries from the sealant would increase from 51.2% to 63.1%, and the control molars remaining caries-free on their occlusal surfaces would increase from 47.5% to 57.5%.

The pink coloring agent does not inhibit the sealant's effectiveness, nor does it produce complaints from the children or their parents. It does enhance detection immediately after application and at subsequent examinations.

Conclusion

Under the conditions of this study, a chemically-polymerizing, colored, Bis-GMA resin was an effective means of controlling occlusal caries in first permanent molars.

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