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The effectiveness of a chemically polymerized sealant: Four-year results

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Abstract

Using the half mouth technique, a pink-colored, self-curing, Bis-GMA sealant was placed on the occlusal surfaces of 425 newly erupted first permanent molars in 266 Grade II children. After four years, 330 pairs of molars were available for reexamination. The number of sealants remaining intact was 226 (68.5%), with 34 partially lost, and 70 completely lost. Of the control teeth, 179 (54.2%) became carious or were restored, and 68 (20.6%) of the sealed teeth became carious or were restored—a 62.01% reduction in caries. The pink color enhanced detection, and no complaints were received concerning the sealants's color.

Introduction

In 1975, a long-term clinical study of an adhesive sealant was initiated in a non-fluoridated suburb of Vancouver, B.C., Canada. Using the half mouth technique, a pink-colored, self-curing, Bis-GMA resin was placed on occlusal surfaces of 425 newly erupted first permanent molars in 266 Grade II children. Following a prophy with an oil-free paste, the procedure followed was wash, dry, etch for 90 seconds, wash, dry, and seal. The curing time was 120 seconds and the etchant contained 37% orthophosphoric acid. The 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-, two-, and three-year results have been previously reported.[1,2]

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Materials and Methods

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 sealants were recorded as intact, partially lost, or completely lost. The surfaces were recorded as sound, sticky, carious, or filled. Surfaces which offered resistance to explorer removal after moderate pressure, without any visual signs of caries, were deemed sticky. Fifty-three sticky occlusals were sealed while 58 control teeth were diagnosed as sticky. Previous data was not available to the examiner during the second, third, or fourth examinations.

Results

A total of 330 pairs of first permanent molars were available for reexamination four years after the sealants were placed. Of the 330 initially sealed surfaces, 226 remained intact, 34 were partially lost and 70 were completely lost (Table 1). Thirty-one of the partially lost sealants were on maxillary molars with 28 of the 31 on the distal fossa. The sealants were recorded as lost when occlusal or mesial-occlusal restorations were present. Table 2 presents the figures for caries after four years. The number of control teeth becoming carious or restored was 179 (54.2%), while only 68 (20.6%) of the sealed teeth became carious or restored (Figure 1). Twenty-eight sealed and 23 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 330 first permanent molars 48 months after application

	Intact		*Partial loss*		*Complete loss*		*Total*
	No.	*%*	*No.*	*%*	*No.*	*%*	
Maxillary	88	60.3	31*	21.2	27	18.5	146
Mandibular	138	75.0	3	1.6	43	23.4	184
Total	226	68.5	34	10.3	70	21.2	330

* 28 of the 31 were distal pits.

Table 2. Caries rate after 48 months in 330 pairs of first permanent molars

	At risk	*Caries*		*Filled*		*Total*	
		No.	*%*	*No.*	*%*	*No.*	*%*
Control	330	30	9.1	149	45.1	179	54.2
Sealed	330	4	1.2	64	19.4	68	20.6

Discussion

A retention of 68.5% in first permanent molars, four years after the placement of a chemically-curing, pink-colored sealant, compares favorably with other studies. Going[3] reported 28.5% complete retention in first molars, however the partial retention was 40.3%. He found the least retentive area to be the distal pit of maxillary molars, similar to the findings of this study. Leake[4] found an overall retention of 21.6% in molars and premolars with a partial loss of 1.9%. In the Kalispell study,[5] after four years the total retention was 50% and partial retention 16% for molars and premolars. When only first permanent molars were considered, the total retention was 0% to 98% depending on site and age at application. Partial loss ranged from 1% to 60%.

When total retention plus partial loss (retention) are compared, differences between studies decrease. This may be due to a difference of opinion as to what constitutes total retention or partial loss of sealants. In this study, the sealants were considered intact (totally retained), if they covered caries potential sites, i.e. deep pits and grooves. Thus an intact sealant could fill the entire fossa, appear as a narrow river through the central fissure, or cover only the central pit when other developmental grooves and pits were not present.

The 330 sealed first permanent molars in this study had 111 less filled or carious occlusal surfaces when compared to unsealed controls. This is a 62.01% reduction in occlusal caries four years after placement of the sealants. After two and three years, the reduction was 80% and 63.9% (Figure 1). A total of 111 molars have been protected from occlusal caries for every 330 sealed, a benefit to effort ratio of 1:3. Cons[6] reported a caries reduction in first permanent molars after three years of 46.8% in maxillary mesial pits and 43.6% in mandibular occlusals. Using a similar U.V. system after four years, Going[3] reported caries effectiveness of 25.0% for maxillary first molars and 38.2% for mandibular first molars. The number of study pairs were 40 and 42 respectively. The Kalispell[5]

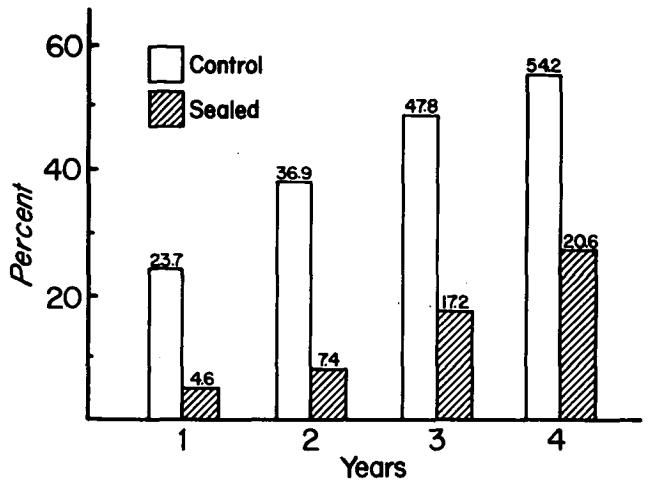

Figure 1. Percent of sealed and control first permanent molars which became carious or were restored.

study had an overall reduction of 45% in posterior permanent teeth, and Leake's[4] study showed a 21.6% reduction. In an uncontrolled study, Doyle[7] reported that 28% of sealed first permanent teeth were restored within five years.

In a review of sealant studies, Powell[8] concluded that pit and fissure sealants have not fulfilled their early expectation, particularly in permanent molars. The results of this study do not support his conclusion. A 62.01% reduction in caries after four years is encouraging, particularly when the subjects were only in Grade II, the location was a simple school clinic, the operator was a third year dental student, and the rubber dam was not used.

Conclusion

Under the terms of this study, a chemically-polymerizing, colored, Bis-GMA resin is an effective means of controlling occlusal caries in first permanent molars. The pink coloring agent does not inhibit the sealant's effectiveness, nor does it produce complaints from the children or their parents. The pink color does enhance detection immediately after application and at subsequent examinations.

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