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A comparative clinical study of autopolymerized and light-polymerized fissure sealants: five-year results

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Abstract

The retention of autopolymerized and light-polymerized Delton® fissure sealants was compared. Sealants were applied to 207 first permanent molars with 304 separate sites in 73 children 6–8 years old (mean age 6.3 years). After five years, there was complete retention in 59% of the autopolymerized and 48% of the light-polymerized sealants. The resulting 11% difference in retention rates was not statistically significant at $P < 0.05$.

Introduction

Sealants are an effective caries-preventive technique in children (National Institute of Health Consensus 1984). The development of the visible light-polymerized fissure sealant expedited the application procedure. With less time required for sealant application, maintenance of a dry field in a young child is easier, and the possibility of salivary contamination is reduced. This technique could result in improved retention. This report presents data on the retention of a visible light-polymerized sealant compared to an autopolymerized sealant after five years.

Materials and Methods

Seventy-three children 6–8 years old (mean age 6.3), residing in Jerusalem, participated in this study. Each child had at least one caries-free first permanent molar. The sealant type for the first tooth, either Delton® (Johnson & Johnson — Dental Products Co., East Windsor, NJ) light-polymerized sealant or Delton autopolymerized sealant was selected by coin toss. When more than one molar was available in the same mouth for sealing, the materials were placed alternately on the remaining teeth. After cleaning with a slurry of pumice, the teeth were isolated with cotton rolls and the sealant was applied according to the manufacturer's instructions, using 37% phosphoric acid-etching solution for 60 sec.

Maxillary molars received separate sealant on the central pit and distolingual fissure sites. A total of 207 teeth were sealed at 304 sites (160 light-polymerized, 144 autopolymerized, Table 1).

Of the 73 children, eight had only one tooth sealed, 23 had two teeth sealed, 15 had three teeth sealed, and the remaining 27 each had four teeth sealed.

Of the 304 sealants placed, 11 sites required minor mechanical preparation by widening slightly the fissure with a small No. 1/2 round bur to ensure that no caries was present. Light-polymerized sealants were cured for 20 sec with the Elipar light unit (Elipar Light Unit—ESPE Co., Oberbay, West Germany). After placement, all sealants were checked by attempting to pry them off with an explorer. In seven of 304 instances, the sealant was dislodged partially or totally and was reapplied after an additional 60 sec acid-etch procedure.

The sealants were evaluated at baseline and after 12, 31, and 46 months, and five years according to total retention, partial, or complete loss. Sealant failure was defined when the material was partially or totally lost or when an amalgam restoration was found replacing the sealant. Success was defined when the sealant was retained and covered all fissures. The presence of caries was recorded. Even though there was a catch at the margin, retention of the sealant was successful. A Chi-square analysis was used at the 95% level to test for statistically significant differences among the groups.

Results

After five years, 171 sealant sites in 116 teeth of 42 children were examined (Table 1). There was complete retention in 59% of the autopolymerized sealants and

Table 1. Distribution of Sample at Baseline and 46 Months

	No. of Children	*Light Polymerized*			*Autopolymerized*			*Total*	
		Mand.	*Max.*	*Sites*	*Mand.*	*Max.*	*Sites*	*Teeth*	*Sites*
Baseline	73	48	58	160	54	47	144	207	304
5 years	42	29	32	90	28	27	81	116	171

48% of the light-polymerized sealants (Table 2), with an overall retention rate of 53%. This difference was not statistically significant (Chi-square = $P > 0.05$). Amalgam restorations were present in 15 sites (19%) of the autopolymerized and in 22 of the light-polymerized sites (24%). Caries was found in four teeth with the autopolymerized and four teeth of the light-polymerized sealants. In all instances, caries was present in surfaces with either partial or total sealant loss.

Discussion

Although the first-year follow up of the clinical trial (Houpt et al. 1986) demonstrated a significantly higher retention rate for the autopolymerized sealant, subsequent follow up after 31 months (Houpt et al. 1987) and the present study did not demonstrate statistically significant differences between the two types of sealants (Table 3). A recent study by Wright et al. (1988) comparing autopolymerized and visible-light-activated sealants, after 18 months follow up, found no significant differences in retention between sealant types. Similar results to Wright's were found in a two-year follow-up study by Sveen and Jensen (1986). Rock and Evans (1983) found, after three years, a significantly better retention rate for the chemically polymerized sealants.

Conclusion

The overall success rate of this study was slightly lower than that found in similar studies (Houpt and Shey 1983; Mertz-Fairhurst et al. 1984). When comparing retention rates of sealants in different studies, the patient's age should be considered, since the procedure is more difficult to perform in 6-year old children soon after first permanent molar eruption. The application of the sealant in young children may, in part, explain the lower retention rates. Of the 37 amalgam restorations found replacing sealants in this study, only five involved proximal surfaces. Caries was not found in sites where sealants were fully retained. Of the 47% failed sealants (partial or total loss, or amalgam restorations), 55% had caries, if we accept that amalgam was placed because of active carious lesions. We concluded from this study that full retention of sealants prevents caries, and that there was no statistically significant difference in retention rates between light- or self-polymerized sealants. Although the expected higher retention rates with light-polymerized sealant did not occur, the convenience in controlling polymerization warrants the use of the light-cured material.

TABLE 2. Findings at Sealant Sites after 5 Years by Type of Material

	*Autopolimerized**		*Light Polymerized**	
	N°	*Per Cent*	*N°*	*Per Cent*
Sites examined	81	100	90	100
Complete retention	48	59	43	48
Partial loss	10	12	11	12
Complete loss	8	10	14	16
Amalgams	15	19	22	24
Caries	4	5	4	4
Catch	5	6	3	3

* Some sites exhibited more than one finding, thus the sum of the findings and percentages is greater than the total.

TABLE 3. Sealant Retention Rates After 12, 31, and 60 Months by Type of Material

	12 Months		*31 Months*		*60 Months*	
	Light	*Auto*	*Light*	*Auto*	*Light*	*Auto*
Sites examined	150	135	114	110	90	81
Complete retention	129(86%)*	127(94%)*	78(68%)	78(71%)	43(48%)	49(59%)

* Difference in retention is statistically significant at the .05 level (Chi-square = 6.238).

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