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The American Academy of Pedodontics Vol. 5 No. 2

SCIENTIFIC articles

The effectiveness of a fissure sealant after six years

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Abstract

The clinical effectiveness of a self-polymerized fissure sealant was studied in 205 children, ages 6-10 years (mean age 7½ years). There were 313 sites sealed and after four and six years, 247 and 115 were available for recall. After four years, sealant retention was 73% and effectiveness in caries reduction was 77%. After six years, 58% of sealants were retained and these were 56% effective in caries reduction.

During the past decade, numerous studies have demonstrated that fissure sealants prevent decay.[1,2] Recently, long-term results of sealant application illustrated the protective effects of sealants.[3] This study was performed to test the retention and effectiveness of an autopolymerized fissure sealant (Delton[a]). Six-year results also will be reported.

Methods and Materials

Two hundred and five subjects with paired caries-free, contralateral first permanent molars and evidence of dental caries in the mouth were selected from 933 children. The subjects were 6-10 years of age, with a mean age of 7½ years, in Grades 1-4 of three parochial schools. They resided in Jersey City which had communal water fluoridation only during the first three years of the study. There was a loss of only 20% of the sample after four years (Figure 1). By the end of the sixth year, two grades graduated to high school and were lost to the study. Two pedodontists examined each child independently and recorded decayed, missing, and filled surfaces, as well as the presence or absence of sealant. A disagreement relative to the condition of a particular tooth was settled by re-examination by both dentists, resulting in a consensus rating.

[a] Delton®: Johnson & Johnson Dental Products, East Windsor, N.J.

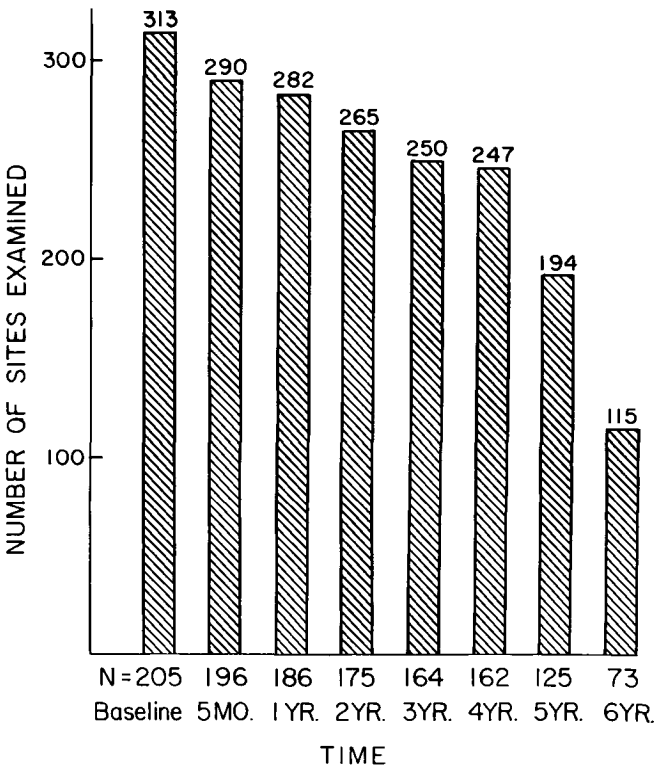

Figure 1. Description of sample. Number of children (shaded bars) and number of sites examined at baseline and at each recall. After four years there was only 20% attrition of the sample.

The initial examination and sealant placement were carried out in a mobile van located near the school building. Under the supervision of the dentist, subjects brushed with a fluoride-containing toothpaste and then rinsed thoroughly. They also were checked by the dentist to ensure that the molars were clean and free of debris. The 205 subjects yielded 313 sites to be sealed (Table 1). Each maxillary tooth had two separate sites; the central and distal pits separated by the oblique ridge.

The experimental tooth was chosen randomly to receive the sealant and was isolated with cotton rolls. No addi-

Table 1. Distribution of treated teeth. Each mandibular molar had a single occlusal sealant placed. Maxillary molars had two separate sealants; one in the central pit area and the other in the distal part separated by the oblique ridge.

	Right	Left	Total Teeth	Total Sites
Maxillary	57	51	108	216
Mandibular	47	50	97	97
Total	104	101	205	313

tional prophylaxis was performed and the tooth was dried briefly and etched for 60 seconds with the conditioning solution supplied by the manufacturer (37% phosphoric acid). A second wash and drying was followed by fissure sealant application according to the manufacturer's instructions. In order to eliminate moisture contamination from the air-water syringe, the water supply was disconnected, and separate air and water syringes were used. When soft tissue covered the distal ridge of partially erupted teeth, a cotton pellet was placed in the sulcus to displace the soft tissue. Care was taken so that excess material did not contact soft tissue prior to polymerization. After the sealant polymerized, the extent of coverage and the margins were checked by both dentists. Immediate postoperative retention of the sealant was checked by trying to pry the sealant off with an explorer. In a few cases a defect was noted, or the sealant was dislodged partially or totally, and it was reapplied after another one-minute etching.

Recall examinations for each child involved independent examination by both operators using a mirror, explorer, and intraoral flashlight. The retention of the sealant and the presence of carious lesions were checked and new examination forms were used at each visit to prevent any examiner bias.

Results

Sealant retention results appear in Figure 2. Sealant loss approximated 7% each year so that after six years almost 60% of the sealed sites still were protected. These are conservative estimates in that a tooth with a mesio-occlusal amalgam was considered a sealant loss. The tooth may have had an intact occlusal sealant with caries confined to the mesial surface.

There was only slightly greater sealant loss from the distal pit compared with the central pit in maxillary teeth. Sealant loss by operator was relatively similar with only slightly greater loss of sealants placed by one operator compared with the other.

Amount of decay or restoration is shown in Figure 3. The percentage of control sites which decayed continued to increase from 23% at one year to 74% after six years, whereas the percentage of experimental sites which decayed increased from 3% at one year to appoximately 25% after six years.

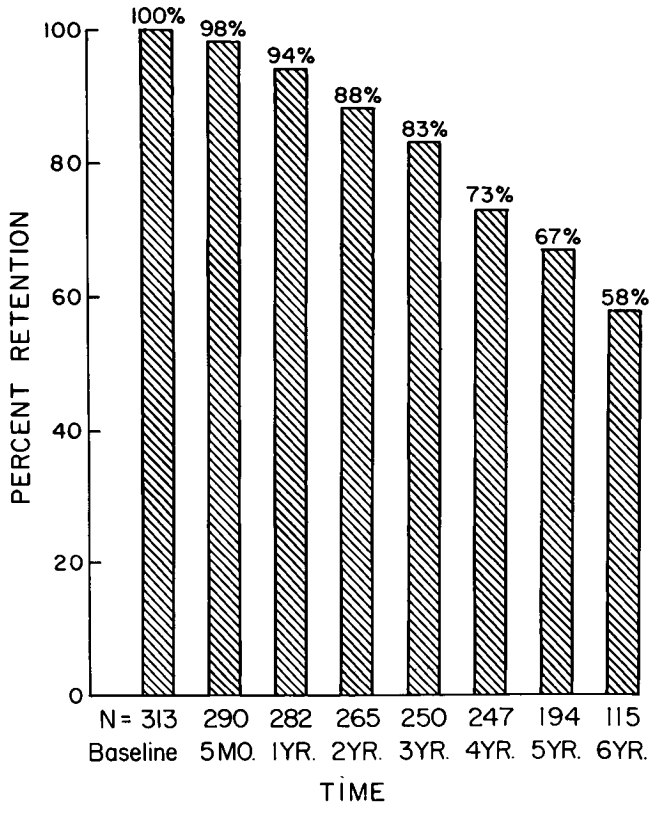

Figure 2. Retention of the sealant — percentage of total number of sites examined (shaded bars) which had the sealant completely retained, i.e., no sealant loss, decay, or restoration.

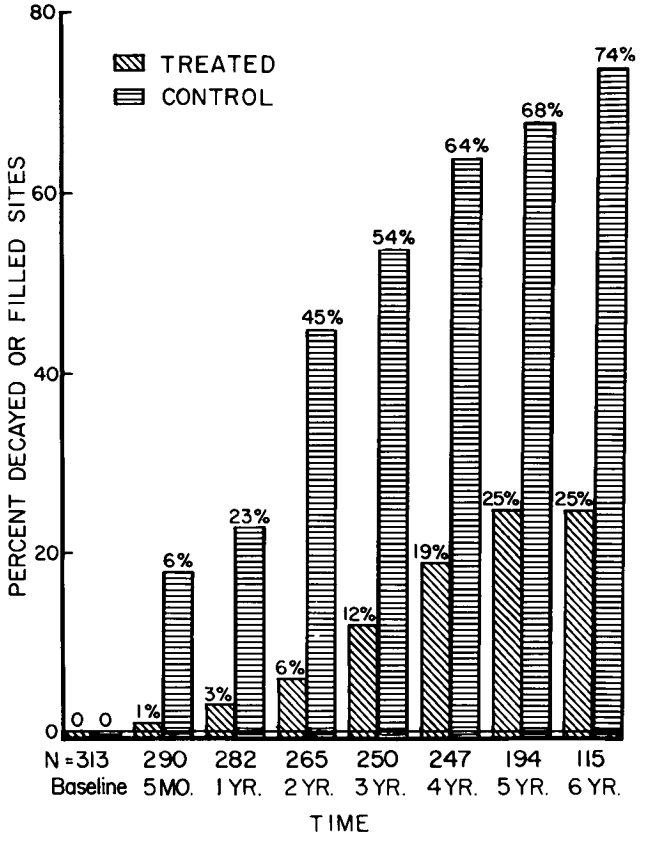

Figure 3. Amount of decay or restoration in treated and control sites. (Numbers of sites appear at the base of the columns.)

The effectiveness in caries reduction appears in Figure 4. The percent effectiveness dropped approximately 8% each year as treated teeth became carious; however, after six years the sealant was still 56% effective in caries reduction.

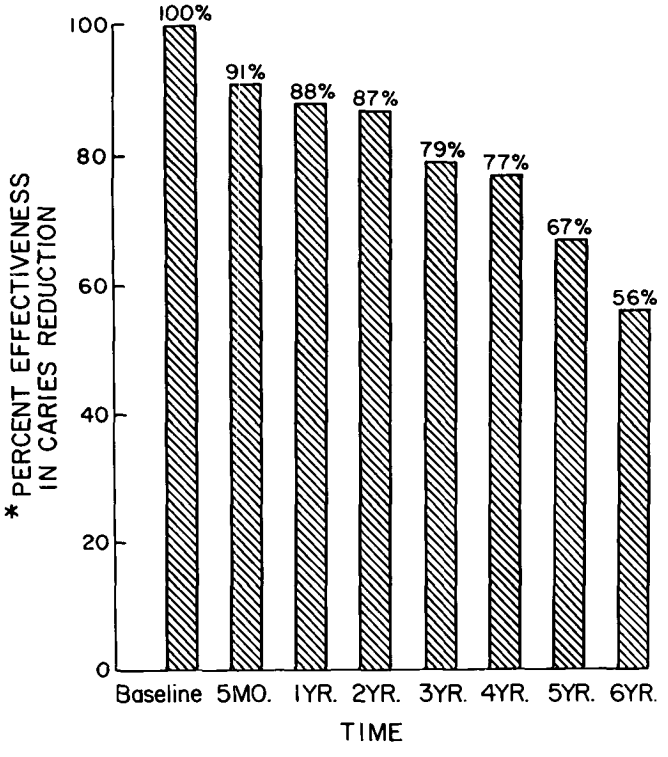

Figure 4. Effectiveness of sealant in caries reduction.

Discussion

This study, one of the longest-running clinical investigations of fissure sealants, demonstrates that Delton® fissure sealant can be retained with great success if a meticulous technique is used. Particular care must be taken to prevent moisture contamination. In most restorative procedures moisture is undesirable; however, the consequence of slight contamination is not nearly as evident as with fissure sealant application where moisture leads to loss of the sealant. In addition, if the sealant touches soft tissue prior to polymerization, tissue fluids will be drawn by capillary action between the enamel and the sealant causing sealant failure; consequently, cotton pellets should be used to displace adjacent soft tissue. Cotton roll isolation is sufficient but there absolutely can be no moisture contamination if the sealant is to be successful.

In this study the experimental teeth were cleaned by toothbrushing with a fluoride-containing toothpaste. Neither a rubber prophylaxis cup nor a bristle brush with pumice were used. The results demonstrate that a clean tooth surface can lead to good results regardless of the method used for plaque removal.

In this study there was little difference in retention between maxillary and mandibular teeth, and between mesial and distal surfaces of maxillary teeth. The excellent rates of retention could be attributed to the test for immediate postoperative retention in which there was an attempt to pry off the sealant following placement. Amalgam or cement does not attain final hardness until many hours after mixing, and operators handle the materials carefully after placement. However, sealants attain their optimal strength almost immediately after polymerization and rather than being handled carefully, they should be tested by attempted removal with an explorer.

Conclusion

This study demonstrated that Delton® fissure sealant has a high degree of retention and a high degree of effectiveness in caries reduction after six years. Testing sealants by trying to pry them off immediately following application may identify those which would have been lost early because of inadequate bonding to enamel.

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