

The combined use of pit and fissure sealants and fluoride mouthrinsing in second and third grade children: one-year clinical results

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Abstract

The combined benefits of pit and fissure sealants and weekly mouthrinsing with a 0.2% NaF solution were assessed. Second and third grade children participating in a school-based fluoride mouthrinsing program since kindergarten had an autopolymerized tinted sealant (Delton®) applied to the occlusal surfaces of all 4 caries-free first permanent molars and to buccal pits and lingual grooves as indicated. Children in the same grades with a caries-free permanent dentition, who also were participating in the mouthrinsing program, served as a comparison group. Of 95 sealant/fluoride mouthrinse-treated children, 87 were available for examination after 1 year. Three children had a total of 3 DF surfaces. Twelve of 81 comparison subjects had 13 DF surfaces. All of the DF surfaces in both groups of children involved the pits and fissures. There were no decayed or filled proximal surfaces. The benefits of sealing and mouthrinsing are additive and the addition of sealants to a mouthrinsing program increases the number of children who continue to be caries free. However, sealing of occlusal surfaces that might not decay increases the cost of sealant application relative to the surfaces saved.

In 1975 a weekly school-based fluoride mouthrinsing program using 0.2% NaF was begun in the elementary schools (grades K-6) of the Three Village Central School District, Long Island, New York (F < 0.1 ppm). After 6 years, participants in the program demonstrated a 55% reduction in caries prevalence compared to children who received baseline examinations in 1975, before the program started.¹ The decline in caries prevalence, however, was not uniform for all tooth surfaces. In sixth grade children who had been rinsing since kindergarten, the highest percent-

age reduction, up to 83%, occurred on the smooth proximal surfaces, while pit and fissure caries of the buccal, lingual, and occlusal surfaces had caries reductions of 40–52%.² Furthermore, 94% of the carious or filled tooth surfaces in sixth grade mouthrinse participants involved the pits and fissures, while only 6% involved smooth surfaces.

Since fluoride mouthrinsing has its greatest relative caries protective benefit on the smooth tooth surfaces and sealants protect exclusively the pits and fissures, a significant additive benefit should be realized by the combined use of the 2 procedures. The concomitant use of different topical fluoride treatments and sealants has been recommended previously,^{3,4} and several studies in which fluorides and sealants were used together have been reported.⁵⁻⁹ Rantala described the use of a self-applied 2% NaF gel (9040 ppm F) and sealants in first to third grade Finnish school children.⁵ Low treated 10- to 13-year-old Malayan school children with an initial topical application of 8% SnF₂ followed by sealant applications.⁶ In the United States, Bagramian et al. conducted a school-based program in an optimally fluoridated community in which biannual topical applications of APF gel and sealants were a component,^{7,8} and Bell et al. conducted a 4-year program on school children in 10 different cities in which sealants were used with APF gels, fluoride mouthrinses, or dietary fluoride supplements in a combination of preventive regimens.⁹ While there is a public health program involving the combined use of a fluoride mouthrinse and sealants, the effect of the combined preventive procedures on caries has not been reported.¹⁰

The purpose of this study was to assess the addi-

tive benefits of sealants applied to caries-free first permanent molars of second and third grade school children who were participating in a school-based fluoride mouthrinsing program since kindergarten. The 1-year caries increment of fluoride mouthrinse participants was compared to that of children who were in the mouthrinsing program and had received sealants. Sealant retention also was assessed as well as the restorative treatment needs of both groups of children. The results presented are the first year findings in a continuing 2-year study.

Methods and Materials

Subjects

The children were participants of a school-based weekly 0.2% NaF mouthrinse program since kindergarten. They were in the mixed dentition stage with permanent incisors and first permanent molars erupted. Only children with all 4 first permanent molars present and no caries or fillings in their permanent teeth were invited to participate. At the beginning of the 1983-84 academic year, children received visual-tactile examinations for caries as part of the mouthrinsing program. The examiner used the criteria for caries established by the ADA Conference on the Clinical Testing of Cariostatic Agents.¹¹ Of 409 second and third graders (7-8 years old) examined, 258 had caries-free permanent teeth with all 4 first permanent molars erupted. Consent to participate in the sealant program was solicited through forms mailed to parents.

One hundred twenty-seven (49.2%) of the children returned positive consent forms. However, some later withdrew, failed to keep their appointments, developed carious lesions, or had dental treatment performed before their teeth were sealed. Ninety-five second and third grade children who had their 4 first permanent molars sealed are the subjects of this study.

One hundred thirty-one caries-free children who were participating in the weekly fluoride mouthrinsing program but did not receive sealants constituted a comparison group with which to assess the relative benefits of the sealant/fluoride mouthrinse combination. Strictly speaking, these children do not represent a true control group since they did not agree to receive sealants, but were examined as part of the fluoride mouthrinsing program. They were identified as being caries free at the baseline examination and were examined after 12 months. The sealant-treated children participated in both examinations, but also received another examination when the sealants were placed. Any child who had developed caries or received a filling on a first permanent molar was disqualified from the study at the pre-sealant examination.

Sealant Application

Sealants were placed 4 months after the baseline caries examinations. The delay was caused principally by the time needed to obtain consent and various school holidays.

Treatment was accomplished by 4 fourth-year dental students at the dental clinic of the School of Dental Medicine, State University of New York at Stony Brook. The students were participating in the pedodontic elective program of the Department of Children's Dentistry. They were experienced in the use of sealants and each had placed an average of 56 sealants before participating in this program.

The autopolymerized tinted Delton[®] Pit and Fissure Sealant^a was used. The students worked in teams of 2 with 1 serving as the operator and the other as the assistant. The first permanent molars were examined by one of the principal investigators (LWR or GSL) to confirm that they were caries free. If caries was detected, a conference was held between both examiners to assure agreement. The sealant then was applied according to the manufacturer's directions. Cotton roll isolation was used throughout. Sealant was applied to the occlusal surfaces of all 380 first permanent molars and to the buccal pits of mandibular first molars and lingual grooves of maxillary first molars when morphologically present and sufficiently erupted to be sealed.

After application, all sealed surfaces were checked by one investigator using a mirror and explorer. If sealant was not covering all pits and fissures or if it was dislodged by the explorer tip, additional sealant was applied using a 10-sec etch procedure and the sealant was reexamined before the patient was dismissed.

Examinations and Analysis

One year after the baseline examinations, the mouthrinse- and mouthrinse/sealant-treated children received visual-tactile examinations for caries by the same examiner. At this examination, the condition of the sealant also was evaluated. Surfaces treated with sealant were recorded as completely covered, partially covered, or uncovered. It also was recorded if treatment was needed — either a restoration or sealant reapplication.

A comparison was made of the 1-year caries increment between the comparison (mouthrinsing) group and the experimental (mouthrinse/sealant) group and of the treatment needs of the 2 groups. An adjustment was made in the caries increment of the mouthrinsing group to compensate for the additional 4-month examination received by the sealant-treated children.

^a Johnson & Johnson Dental Products Co: East Windsor, NY.

Results

Of the original 95 mouthrinse/sealant subjects, 87 children with 348 treated first permanent molars were available for the first annual examination. Fifty-five of the children were initially in the second grade and 32 in the third grade. Eighty-one mouthrinsing children also were examined after 1 year. Fifty-six were initially second graders and 25 were third graders.

Caries Activity

At the first annual examination 84 (96.6%) of the 87 children in the mouthrinse/sealant group remained caries free. Three children in this group had a total of 3 decayed or filled surfaces (Table 1). In the mouthrinse group, 69 children (85.2%) remained caries free. Twelve children exhibited a total of 13 lesions. All of the DF surfaces in both groups of children involved pits and fissures. Of the 16 total DF surfaces, 10 were on the occlusal aspect.

Sealant Status

The status of sealants on the occlusal surfaces is presented in Table 2. Only occlusal surfaces are listed since every child had the occlusal surfaces of all 4 first permanent molars sealed; whereas, buccal pits and lingual grooves were not always sealed if they were morphologically absent or if they were erupted partially, enabling contamination by the crevicular fluid. Two occlusal surfaces had all of their sealant missing and 7 had sealant partially missing.

Treatment Needs

In the mouthrinse/sealant group, 8 occlusal surfaces required resealing. One occlusal surface and 2 lingual surfaces required restorations. In addition, 27 lingual grooves of maxillary first permanent molars and 8 buccal pits on mandibular first permanent molars were indicated for initial sealing or resealing.

For the mouthrinse group, 13 surfaces required restoration — 9 occlusal, 3 buccal, and 1 lingual.

Discussion

The application of sealants to the first permanent molars of second and third grade children enrolled in a school-based fluoride mouthrinsing program essentially eliminated caries activity. Although these

children had maxillary and mandibular permanent incisors at risk to decay, past experience with mouthrinsing participants in this program indicated that, in this age group, all caries and fillings occurred on first permanent molars. Of the 1740 first permanent molar surfaces at risk to decay in the mouthrinse/sealant group, only 3 surfaces became carious.

In the group of children who participated in the mouthrinsing program but did not have sealants placed, 13 surfaces had been filled or had developed caries during the 1-year interval between examinations. All of the DF surfaces in both the treatment and comparison children involved pits and fissures. There was no smooth-surface decay in either group.

The mouthrinse/sealant children required the re-sealing of 8 occlusal surfaces which had become uncovered completely or partially, and the restoration of 1 occlusal surface. In addition, 2 lingual surfaces required restoration. The mouthrinsing group required restoration of 13 surfaces. However, at the 1-year recall visit, sealant-treated children had additional sealant retreatments on buccal and lingual surfaces. This was because of the partial eruption status of some first molars at the initial visit, which made sealant application to buccal pits of mandibular first permanent molars and lingual grooves of maxillary first permanent molars difficult.

The development of so few lesions in the mouthrinse/sealant-treated children is an extremely positive finding, even though the number of subjects was small. It indicates that by combining fluoride therapy (which is especially protective to smooth surfaces) and sealants (which are specific for pits and fissures) dental decay can be eliminated almost entirely in an elementary school population.

These findings, however, must be tempered by the realization that in order to save 10 surfaces from decay (the difference between the caries increment of the 2 groups), 348 first permanent molars were sealed. The small incremental caries difference is due not only to the caries inhibitory effects of fluoride mouthrinsing since kindergarten, (both groups) but also to the design of the study — children who were carries active or had 1 or more fillings at the baseline examination were excluded from the study. Thus, subjects in both groups of this study represented a less caries-susceptible population than their nonparticipating

TABLE 1. Caries Increment of Initially Caries-Free Second and Third Grade Children

Group	Number of Subjects	Number DFS Per Child	Total Number of DF Surfaces	DF Surface Distribution			
				Occ	B	L	Prox
F-mouthrinse/sealant	87	0.03	3	1	0	2	0
F-mouthrinse	81	0.16	13	9	3	1	0

TABLE 2. Occlusal Sealant Status of First Permanent Molars at One-Year Examinations*

Number of Treated First Molars	Completely Covered		Partially Covered		Uncovered	
	Number	%	Number	%	Number	%
348	339	97.4	7	2.0	2	0.6

* Represents sealant evaluation 8 months after application.

peers. Nevertheless, the few additional surfaces saved by combining sealant application with the mouthrinsing program may not be cost efficient.

In 2 different state public health programs, the cost of sealant application when applied by dental auxiliaries was reported to be \$1.20 and \$1.59/tooth.^{10,12} Using these figures, it would have cost approximately \$418 or \$553 to seal all of the teeth. On the other hand, based upon mean national fees for dental services published by the ADA, it would have cost only \$210 to treat the 10 surfaces saved.¹³ Thus, in a population already benefiting from fluoride mouthrinsing, if the number of pit and fissure lesions is low, even though the percentage is high, the additional use of sealants may not be economically practical.

These cost considerations have implications for a public health preventive dentistry program in which the efficiency of the method as well as the benefits must be weighed. They have less relevance for an office practice in which the primary concern should be the long-term benefits for individual patients.

Summary and Conclusions

The caries protection afforded by the application of an autopolymerized sealant to first permanent molars and weekly fluoride mouthrinsing in a school-based program was compared to the caries protection afforded by fluoride mouthrinsing alone. Participants had mouthrinsed since kindergarten and were in the second and third grades when the sealants were applied. Thus, they were in the mixed dentition stage with the first permanent molars being the only permanent teeth for which sealants were indicated.

1. The combination of sealant therapy and fluoride mouthrinsing resulted in almost no decayed or filled permanent tooth surfaces during the first year of the study and it was concluded that the combination of sealants and fluoride mouthrinsing could eliminate dental caries in school-age children almost completely. This preventive combination is highly recommended for individual patients in office practices.
2. Because the total number of lesions experienced by the comparison group was low, the actual number of pit and fissure surfaces estimated saved

by the sealant treatment was small. Many surfaces were sealed that probably would not have decayed. When applying sealants to children already participating in a fluoride mouthrinsing program, teeth should be selected for sealing on an individual basis in order to avoid overtreatment. This has particular relevance in public health programs where cost effectiveness is a major concern.

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Quotable quote: cytomegalovirus

Cytomegalovirus (CMV) infection represents a potential health hazard for dental professionals; the apparently endemic disease, which can be transmitted through saliva and is usually asymptomatic, has been shown to be common among children attending day care centers.

Recent studies conducted in Birmingham, Alabama, reported in the February 1, 1985, *MMWR*, listed the following CMV prevalence data for 5 day care centers in Birmingham: 49, 40, 32, 9, and 13%.

CMV infection, although usually asymptomatic, can cause a form of lymphatic disease resembling mononucleosis in older children and adults. Although CMV can be found in urine, saliva, and other secretions, it is probably transmitted most readily by the latter two. It also can be spread by blood transfusions, breast milk, sexual intercourse, and transplanted organs. CMV infection is of greatest concern when infection occurs *in utero*, and it may account for approximately 0.1% of deaths among newborns. Infection can be acquired from other children or the mother, either *in utero*, at birth, or during the perinatal period.

Because of these findings, dental care professionals are being urged to follow proper clinic sterilization and hygienic procedures carefully to avoid the transmission of infections.

DH & HS, PHS, Centers for Disease Control, Atlanta. November, 1985.