Scientific Article

Performance of sealants applied to first permanent molars in a dental school setting

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Abstract

Purpose: The purpose of this study was to assess the performance of sealants placed by senior dental students as part of a comprehensive dental care program that included periodic patient recall.

Methods: The dental records of 100 patients ranging in age from 6 to 13 years were selected for review to determine the treatments provided for first permanent molars over time. Criteria for inclusion were: 1) at least five documented recall examinations and 2) all four first permanent molars had to have been treated with an occlusal pit and fissure sealant. The data collected included: 1) the age of the patient at the time of initial sealant placement; 2) the subsequent treatment provided to the first permanent molars, including retreatment with sealant or restoration and the date the services were provided; 3) the last date of follow-up examination in the pediatric dental program.

Results: A total of 400 molars were followed for an average of 54 months. Fifty-two percent of all molars received no further treatment after initial placement of sealant. Approximately 35% received retreatment with sealant only. The total number of molars receiving sealant material only was 343 (86%). The total number of teeth that were judged to require restoration was 57 (14%). No relationship was noted between the patient's age at placement of the occlusal sealant and sealant performance.

Conclusion: In a dental school clinic, occlusal sealants were effective at preventing caries in a comprehensive care program that included periodic recall. (Pediatr Dent 20:5 341–344, 1998)

Dental education has a responsibility to prepare dental practitioners who are competent to provide the best, highest quality dental care possible to patients seeking dental care from educational institutions.[1,2] Today, this dual role of education and patient care is increasingly challenging. The profession has expressed concern about the competency and readiness of today's graduates to practice.[3,4] On the other hand, society is concerned about the quality of health care and is increasingly demanding evidence demonstrating the appropriateness and effectiveness of the care provided. By evaluating treatment efficacy, dental education is seeking to demonstrate its effectiveness both in preparing students to practice and in providing care for its patients.[2] Retrospective study of patient dental records may provide a useful method to provide evidence of the effectiveness of our educational and patient care programs.[5]

Students learn to use products and perform dental procedures through classroom and laboratory experiences and ultimately provide services directly for patients. Many of the products and procedures employed in clinical practice and taught to dental students have been evaluated in controlled clinical trials. Clinical trials are generally conducted by experienced clinicians working under the best possible conditions on a select group of patients in order to adequately assess the performance of a material or technique.[1] Pit and fissure occlusal sealants are an example of products, that have undergone such extensive clinical testing and been demonstrated to be effective in preventing occlusal caries.[6–8] However, a controlled clinical trial is very different from a dental student clinic. Dental students, while working with faculty supervision, are inexperienced clinicians who often work without the advantage of dental assistants and treat patients who may not be ideal candidates for the procedure. Therefore, the performance of occlusal sealants, provided by dental students may be different from the results obtained in a controlled clinical trial. This retrospective evaluation of first permanent molars over time is not a controlled clinical trial; rather it is a review of the performance of sealants placed on first permanent molars in a dental school clinic.

The purpose of this review was to assess the performance of sealants placed by senior dental students as part of a comprehensive dental care program that included periodic patient recall.

Methods

Dental students at the Medical College of Georgia treat children in the context of a comprehensive patient care program including periodic recall of completed patients. Comprehensive care is defined as a system of care that addresses the patients' needs through assign-

ment of the patient to a dental student for primary care, with appropriate referral to dental residents or specialists as required. Patients are recalled periodically for preventive and diagnostic services at time intervals determined by the needs of the patient and the availability of an appropriate student provider.

The dental records of 100 patients ranging in age from 6 to 13 years were selected for review from the population of pediatric patients treated by senior dental students. Criteria for patient selection were that the candidate had at least five documented recall examinations and that all four of the first permanent molars had to have been treated with an occlusal pit and fissure sealant.

The sealant material most widely employed was Delton self-cure pit and fissure sealant. Dental assistants were available on occasion to assist the dental students, however, students generally work without them. Senior dental students placed all sealants with faculty supervision of diagnosis and treatment. The criteria employed in the educational program for the placement of sealants is the presence of deep occlusal pits and fissures with no evidence of decay.[9] At the recall exam the decision to reseal or restore a tooth was made by the assigned dental student in conjunction with the supervising faculty member. Occlusal surfaces were restored if evidence of occlusal caries was present. Sealants were replaced if the occlusal surface of the tooth appeared sound but sealant wear or loss was apparent.[9]

The dental records of the patients selected were reviewed to determine the treatments provided for the first permanent molars over time. The data collected included:

1. The age of the patient at the time of initial sealant placement
2. The subsequent treatment provided to the first permanent molars—including retreatment with sealant or restoration and the date the services were provided
3. The last date of follow-up examination in the pediatric dental program.

Results

Dental treatment records of 100 patients, ages 6 to 13 years, were reviewed in order to follow all treatment rendered to previously sealed first permanent molars. The mean age of the patients at initial sealant placement was 92.3 months (range 67 to 135 months). A total of 400 molars were followed for an average of 54 months (range 10 to 134 months). Based upon re-examination by a student and confirmation by a faculty member, 52% (99 maxillary, 108 mandibular) of all molars received no further treatment after initial sealant placement. One hundred and twenty-three molars (61 maxillary, 62 mandibular) were retreated with sealant only once. Thirteen molars (7 maxillary, 6 mandibular) were retreated twice with sealant. The average time interval between reapplication of sealant was 23 months (range 4 to 52 months). The total number of molars receiving treatment with only sealant material was 343 (86%) .

Upon re-examination by a student and faculty member, 10% of the molars (21 maxillary, 20 mandibular) were judged to require occlusal restorations (Table 1). This diagnosis was based on the presence of a clinically detectable occlusal carious lesion. The median time after sealant placement before an amalgam restoration was placed was 25 months for maxillary and 31 months for mandibular molars. Four percent of the molars (12 maxillary, 3 mandibular) received two surface restorations, including occlusolingual, distoocclusal, and mesioocclusal restorations, diagnosed from clinically detectable occlusal and/or lingual caries or radiographic evidence of proximal caries. The median time between sealant placement and placement of the two-surface restoration was 35 months for maxillary molars (range 11 to 69 months) and 51 months for mandibular molars (range 26 to 53 months). Based on radiographic

TABLE 1. TREATMENT TO FIRST PERMANENT MOLARS [*N* (%)]

Arch	*Total teeth*	*Treatment*						
		*Sealed**	*Resealed (x1)*	*Resealed (x2)*	*Sealant†*	*Surfaces restored*		
						1	*2*	*3*
Maxillary	200	99 (50%)	61 (31%)	7 (4%)	167 (84%)	21 (11%)	12 (6%)	0
Mandibular	200	108 (54%)	62 (31%)	6 (3%)	176 (88%)	20 (10%)	3 (2%)	1 (1%)
Total	400	207 (52%)	23 (31%)	13 (3%)	343 (86%)	41 (10%)	15 (4%)	1 (1%)

* Teeth that were sealed one time only.

† Total number of teeth that were treated with sealant only.

TABLE 2. TREATMENT TO FIRST PERMANENT MOLARS BY AGE AND NUMBER OF PATIENTS

	Number of Teeth Treated			
Age (N of patients)	*Sealed*	*Resealed*	*Restored*	*No further treatment*
< 8 (61)	244	88	35	121
> 8 (39)	156	48	22	86

evidence of interproximal caries, one tooth was treated at recall with a mesiocclusodistal restoration 96 months after a sealant had been placed. Complete results are presented in Table 1. There was no statistically significant relationship between the patient's age at placement of the occlusal sealant and the follow-up restorations placed. The complete grouping of patients by number of restorations and age is found in Table 3.

TABLE 3. NUMBER OF RESTORATIONS BY AGE

Number of restorations	*Number of patients*	*Mean age (mo)*
0	65	92.4
1	20	94.5
2	8	94.9
3	7	81.9
4	0	**

Discussion

The results demonstrate that the predoctoral educational program was effective in preparing dental students to apply occlusal sealants. The results also demonstrate that occlusal sealants applied to first permanent molars by dental students as part of a comprehensive care program with periodic patient recall were an effective preventive procedure. This retrospective clinical evaluation of performance demonstrated results similar to those reported by Mertz-Fairhurst et al.[10] in a 7-year clinical trial of occlusal sealants. In the clinical trial, 13% of the molars were judged to be carious/restored 3 years after the initial placement of occlusal sealant compared to 14% of the molars sealed by dental students. In another clinical trial of sealants, Simonsen found 7% of sealed teeth judged to be carious/restored after 5 years.[8]

In this review, 53% of the molars were not resealed or restored compared to 79% of the molars sealed by dental students in a study by Walker et.al.[11] Eighty-six percent of the molars in this study were treated with only sealant material compared to 92% of the teeth in the Walker study.[11] The difference may be that in the Walker study, not all the teeth with sealant received a follow-up examination and those teeth were judged to require no further treatment. In our review, the patient had to have received a minimum of five documented recall exams. Therefore, the need for additional treatment was assessed over a longer period of time.

In the Walker study,[11] children younger than 8 years of age received sealant replacement significantly more frequently than did children 8 or older. Table 2 illustrates that in this review, there was no significant difference in sealant replacement between the age groups, but children younger than 8 years old were judged to require more follow-up restorations. Thirty-four percent of the molars we reviewed received reapplication of sealant material at least once. In the Walker study,[11] 13% of the molars evaluated were judged to require resealing. In another sealant study, the rate of reapplication of sealant material was 44%.[12] Therefore, it appears reapplication of sealant material is often considered desirable by clinicians. The decision to reapply sealant material is likely a result of perceived sealant wear, loss, or breakage, all conditions that must be based on the clinical judgment of the dentist.

There are inherent limitations with retrospective, studies including record-keeping errors.[5] On occasion, sealants may be reapplied at no charge to the patient; therefore it is possible that some sealants may have been replaced or repaired without notation in the patient's record. As a result, it is possible that more of these teeth may have been resealed than the numbers indicate. This would not impact the number of teeth that subsequently were judged to need amalgam restorations. There are several steps incorporated in the pediatric clinic protocol to minimize documentation errors. The student develops a treatment plan as a worksheet. A faculty member reviews the patient and the proposed treatment plan and then the information is transferred to the permanent patient record. The attending faculty member signs the patient record after parental consent has been obtained. Upon completion and clinical evaluation, the steps of the treatment plan are signed and dated by the attending faculty. In addition, the faculty audits all the dental records of each student at least annually. Therefore, despite the inability to clinically verify the findings, useful clinical information regarding the care provided to the patient can be obtained.

This review was not specifically a sealant study with a formal sealant evaluation protocol. All students and supervising faculty were familiar with the criteria for sealant placement; however, it is likely that there was individual variation in the decision to place or replace sealants.

The results demonstrate the need for periodic recall of patients as part of a comprehensive dental care program. Sealed occlusal surfaces may require retreatment with sealant [9, 12] or restoration due to an occlusal or proximal carious lesion. For 34% of the sealed molars in this study, replacement of the sealant at least once was judged to be beneficial. Fourteen percent of the sealed molars were judged to require restorative treatment over an average period of 54 months. The placement of sealants was effective as a one-time-only measure for 52% of the teeth, but in the context of a recall program, with the replacement of sealants as determined by the attending clinical faculty, the effectiveness improved to 86% over the follow-up period. Future studies might try to determine the optimal time for the patient recall examination and identify factors that will enable the practitioner to target the children with the highest degree of caries susceptibility for more frequent examination. The timing of the recall should be based on the needs and risk factors of the individual patient.[13] The results of this evaluation indicate that periodic recall is a necessary component of a comprehensive dental care program. However, further study with a larger patient pool is needed to identify risk factors that can be used to develop optimal time intervals for recall examinations.

In addition to the occlusal sealants, the patients received other preventive measures such as topical fluoride application and oral hygiene instructions. However, this review was not designed to assess the effects of the other preventive procedures in the overall results.

This review suggests that dental education can demonstrate evidence of effectiveness for its educational programs and patient care using data obtained retrospectively from dental records of patients receiving comprehensive dental care in a dental school clinic. The results demonstrated that the dental students received appropriate educational experiences that prepared them to provide sealants for their patients, and that the patients received similar benefits from the sealants as did patients in clinical trials.[5]

Conclusions

1. The performance of sealants placed by dental students indicates that students were educationally prepared to provide occlusal sealants for their patients.
2. In a dental school clinic, occlusal sealants were an effective part of caries prevention in a comprehensive care program that included periodic recall.
3. The performance of sealants placed by dental students was similar to those of sealants applied under controlled experimental conditions.

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