

Retention of sealants placed by dental technicians without assistance

Frank J. Foreman, DDS Bruce A. Matis, DDS

Abstract

The retention rate of sealants placed by dental auxiliaries has not been studied extensively. This study recorded and compiled the retention rate of sealants placed by Air Force dental technicians over a two-year period. The technicians, who were equivalent to dental assistants, were trained to place the sealants without assistance using the Vac-Ejector™ (Whaledent International, New York, NY) system for isolation. Five hundred and ninety-nine sealants on 90 patients were evaluated an average of 13.9 months after sealant placement. The overall complete retention rate was 91.0%, with a partial loss rate of 7.0%, and a complete loss rate of 2.0%. These results suggest that pit and fissure sealants can be placed in this cost-effective manner with a relatively high retention rate.

Introduction

The continuing decline in smooth surface caries has made pit and fissure caries the dominant form of dental caries affecting many American children. Pit and fissure sealants have proven to be effective in preventing occlusal pit and fissure caries (National Institutes of Health [NIH] 1984), and the NIH has recommended a broadening of state dental practice acts to allow dental auxiliaries to place sealants. (The American Dental Association's Council on Dental Materials, Instruments and Equipment made similar recommendations, Council on Dental Materials, Instruments and Equipment 1983). The rationale was that these personnel are better

able to provide this safe, fully reversible, and widely needed procedure on a more cost effective basis than can a dentist (National Institutes of Health 1984).

Sealant retention has proven to be technique-sensitive, and greatly dependent upon the degree of isolation maintained during placement. A new means of isolation during sealant placement was examined by Wood et al. (1989). Using the Vac-Ejector Control System, (Whaledent International, New York, NY) for moisture control, they found no difference in sealant retention when compared to cotton roll isolation.

The purpose of this study was to evaluate the effectiveness of a training protocol for Air Force technicians by determining the retention rates of their sealants.

Materials and Methods

Between November 15, 1985, and August 13, 1988, 20 Air Force dental technicians were trained at Lackland Air Force Base in San Antonio, TX, in the placement of pit and fissure sealants. The technicians had completed the Air Force's basic dental technician's course, including 36 days of training covering dental procedures, nomenclature, and instruments. On-the-job training for proficiency at the tasks required was provided at their first base assignment. This training included the placement of pit and fissure sealants.

During their training, the technicians were instructed to place sealants without assistance using the control system (Fig 1, see next page), which combines dual high-speed evacuation with a mouth prop and a soft rubber shield to retract the tongue.

The technicians were given a manual a week before training that described the rationale and technique of sealant placement. Their instruction included 2 hr of lab and didactic training the day before clinical training, and a full day of placing sealants on six patients of varying ages. They assisted each other in the sealant

This article is a work of the United States Government and may be reprinted without permission. The author(s) are employee(s) of the United States Air Force at Eielson Air Force Base, AK, and Wiesbaden Air Force Base, Germany. Opinions expressed therein, unless otherwise specifically indicated, are those of the author(s). They do not purport to express views of the United States Air Force, or any other Department or Agency of the United States Government.

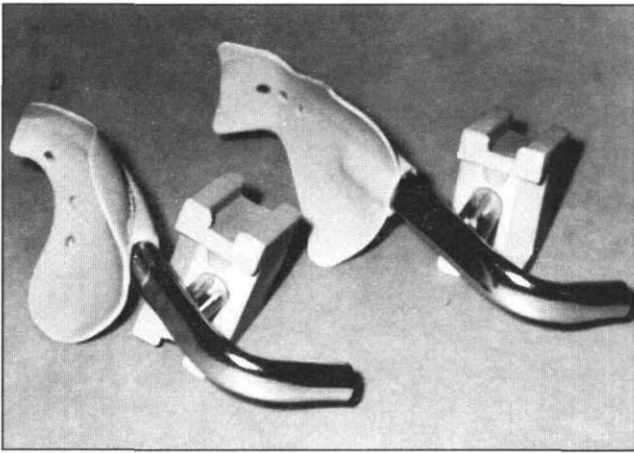


Fig 1a. The Vac-Ejector Moisture Control System consisting of a 'Y' shaped metal connector, which attaches to a high speed suction line and continuously suctions saliva from the mouth prop and the soft rubber shield.

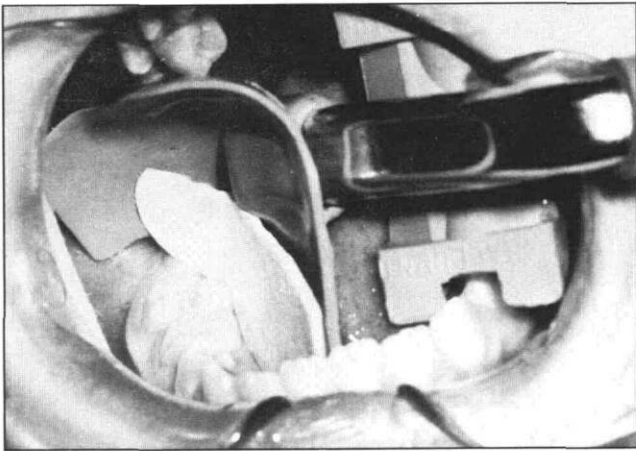


Fig 1b. The Vac-Ejector in the mouth.



Fig 1c. The quadrant isolation obtained with the Vac-Ejector and Dri-Aid placed in the facial vestibule and on the lingual surface of the tooth.

placement in the morning, and placed sealants without assistance in the afternoon, using a gel etchant and light-cured sealant material (Concise[®] Light Cured, 3M Dental Products Division, St. Paul, MN).

The technicians were considered trained to place sealants with limited supervision, but were required to have their first five patients checked by either a dentist or a fully trained technician. Their first 20 patients were examined two to four weeks after sealant placement. After evaluation of 20 recalls, technicians were considered fully trained to place sealants without supervision.

To evaluate the effectiveness of this training program, children reporting for regular annual examinations had sealant retention evaluated as a part of the examination. Four dentists (including the senior author) performed all of the children's examinations using the following criteria:

1. *Complete retention* — All of the sealant appeared intact. One sealant was counted per tooth, even if separate sealants were placed on the same tooth (i.e., the mesial and distal pits of maxillary molars)
2. *Partial loss* — Part of the sealant was missing and part remained. Included in this category were maxillary molars in which the sealant on the mesial pit was found to be present but the sealant on the distal pit was missing
3. *Complete loss* — No sealant was visible.

Results

Eight of the 20 technicians completed all 20 recalls, and were considered fully trained to place sealants independently. They had placed an average of 149.3 sealants on 20 recall patients, and achieved a one-month retention rate of 97.5% (94.3% for molars and 99.8% for premolars).

Over a two-year period, 90 patients treated by the technicians had their sealant retention evaluated during periodic examinations. The mean time of examination after placement was 13.9 months. Five hundred and ninety-nine sealants were provided for these 90 patients, and 545 remained for a complete retention rate of 91.0%. Four hundred and thirty sealants were placed on molars, of which 88.0% were retained completely, 9.4% were lost partially, and 2.5% were lost completely. One hundred and sixty-nine sealants on premolars had a 100% retention rate.

The table (see next page) shows the retention rates by time of examination after placement. Those sealants examined five to nine months after placement had a 92.0% complete retention rate. The 10–14-month group had a 93.0% rate, the 15–20-month group a 91.1% rate, and the 21–26-month group, an 83.7% rate. The com-

plete retention rates at the four time intervals were compared using a single factor analysis of variance. Although the 21–26-month group showed a trend toward a lower retention rate, no significant difference was found between the four groups ($F = 1.96 [3.86], P > 0.13$).

Discussion

This was a retrospective clinical study, and the 90 patients were not recalled together. The rate of sealant retention was recorded as they returned for their periodic examinations; this is why there is a variation in the number of sealants evaluated for each time interval. The majority were evaluated about one year after placement. The slightly higher retention rate noted in the 10–14-month time interval, when compared to the five- to nine-month time interval, is the result of a nonsignificant, statistical variation of independent groups. No statistically significant difference was found between the independent groups of differing time intervals, and so they may be combined into one large group with a complete retention rate of 91.0% and a partial retention rate of 98% after 13.9 months.

In this study, a dental technician (the equivalent of a dental assistant) placed sealants alone. The 91% complete retention rate for a 14-month period in this study is slightly higher than the overall retention rate of 80% that Ripa (1985) found as an average of 29 one-year studies. Visible light curing sealants have been found to have retention rates similar to autopolymerized sealants (Haupt et al. 1987; De Craene et al. 1989). Ripa (1985) found 83% retention as an average in all one- and two-year studies using autopolymerized sealants.

The Saskatchewan Health Dental Plan reported placing more than 11,000 sealants with a complete retention rate of 94.0% after one year, and 90.4% after two years, using expanded-duty dental auxiliaries (Whyte et al. 1987). Wood et al. (1989), in their study of sealant retention using the same moisture control system as in the present study, found no significant difference in

retention between sealants placed by dentists, dental students, and dental hygienists. However, in both of these studies, the auxiliaries were provided with assistants.

In a time of fiscal austerity, federal services are searching for ways to reduce manpower yet maintain high standards in the delivery of dental care. The results of this study suggest that the goal of making sealants more accessible to all children who require them is attainable. Both the NIH and the American Dental Association recommended broadening state dental practice acts to allow sealant placement by dental auxiliaries. Dentists are required to determine which teeth require sealants, but this study shows that this necessary service can be accomplished by "sealant technicians" with background training equivalent to dental assistants, and additional training in sealant placement.

Lieutenant Colonel Foreman was chief of the Pediatric Dentistry Section, Department of General Dentistry, USAF Medical Center, Lackland Air Force Base, TX, and Colonel Matis was special consultant in Preventive Dentistry and Infections Control to the Assistant Surgeon General for Dental Services, USAF School of Aerospace Medicine, Brooks Air Force Base, TX at the time this study was completed. Lieutenant Colonel Foreman is now chief of Pediatric Dentistry, Eielson Air Force Base, AK, and Colonel Matis is now stationed at Wiesbaden Air Force Base, Germany.

- ADA Council on Dental Materials, Instruments, and Equipment: Pit and Fissure Sealants. *J Am Dent Assoc* 107:465, 1983.
- De Craene LGP, Martens LC, Dermaut LR, Surmont PAS: A clinical evaluation of a light-cured fissure sealant (HeliOSEAL). *ASDC J Dent Child* 56:97–102, 1989.
- Haupt M, Fuks A, Shapira J, Chosack A, Eidelman E: Autopolymerized versus light-polymerized fissure sealant. *J Am Dent Assoc* 115:55–56, 1987.
- U.S. National Institutes of Health: Consensus Development Conference Statement on Dental Sealants in the Prevention of Tooth Decay. *J Am Dent Assoc* 108: 233–36, 1984.
- Ripa LW: The current status of pit and fissure sealants: A review. *J Can Dent Assoc* 5:367–80, 1985.
- Whyte RJ, Leake JL, Howley TP: Two-year follow-up of 11,000 dental sealants in first permanent molars in the Saskatchewan Health Dental Plan. *J Public Health Dent* 47:177–81, 1987.
- Wood AJ, Saravia ME, Farrington FH: Cotton roll isolation versus Vac-Ejector isolation. *ASDC J Dent Child* 56:438–41, 1989.

TABLE. Retention rates of sealants placed by dental technicians

Months	Patients	Total placed		Completely retained		Partially lost		Completely lost	
		N	%	N	%	N	%	N	%
5 to 9 (8.1)	17	113	18.9	104	92.0	7	6.2	2	1.8
10 to 14 (11.6)	42	271	45.2	252	93.0	15	5.5	4	1.6
15 to 20 (17.4)	18	123	20.5	112	91.1	8	6.5	3	2.4
21 to 26 (23.5)	13	92	15.4	77	83.7	12	13.0	3	3.3
TOTAL	90	599	100.0	545	91.0	42	7.0	12	2.0