

Comparison of Sealant Failure Rate Among Operators at RSDM Pediatric Dental Clinic

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Abstract

This retrospective study compares the failure rate of sealants placed by dental students to those placed by pediatric dental residents. Records of patients who had sealants placed on their permanent first molars in the Rutgers Pediatric Dental Clinic were followed for 5 years or until occlusal caries developed. Three hundred and fifteen of two thousand and thirty six teeth sealed had an occlusal restoration placed and were classified as sealant failures. No significant differences were observed for failure rate between dental students and pediatric dental residents in the study.

Background/Intro

- About 90% of caries in the permanent dentition involves the pits and fissures of molars.¹
- Placement of sealants protects against 80% of cavities for 2 years, and 50% of cavities for up to 4 years.²
- Children of 6 to 11 years of age without sealants have almost three times more first molar cavities.²

Resin-based sealants are technique sensitive as they will not bond correctly to teeth in the presence of moisture contamination (saliva.) Isolation of the tooth during the sealant process can be challenging, even for experienced clinicians. A limited number of studies have attempted to evaluate the impact of type of operator, with different levels of experience and technique, on the effectiveness of sealants.

Methods

Study participants were patients between the ages of 5 and 13 years who had sealants placed on their permanent first molars in the Rutgers Pediatric Dental Clinic between July 2014 and June 2018. Teeth included in the study were followed for a minimum of 5 years (recall visits) or until occlusal caries developed. Sealant failure was determined by placement of an occlusal restoration.

Failure rates were calculated for each operator type (predoctoral student or pediatric dental resident). Mean time to failure was determined. Survival analysis and Cox regression was used to determine if operator type was a predictor for sealant failure rate. Tooth type (maxillary or mandibular permanent first molar) and age at sealant placement were also examined as predictors for sealant failure rate. SPSS was used for data analysis and the significance level was set at $P < 0.05$ (2-sided).

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Results

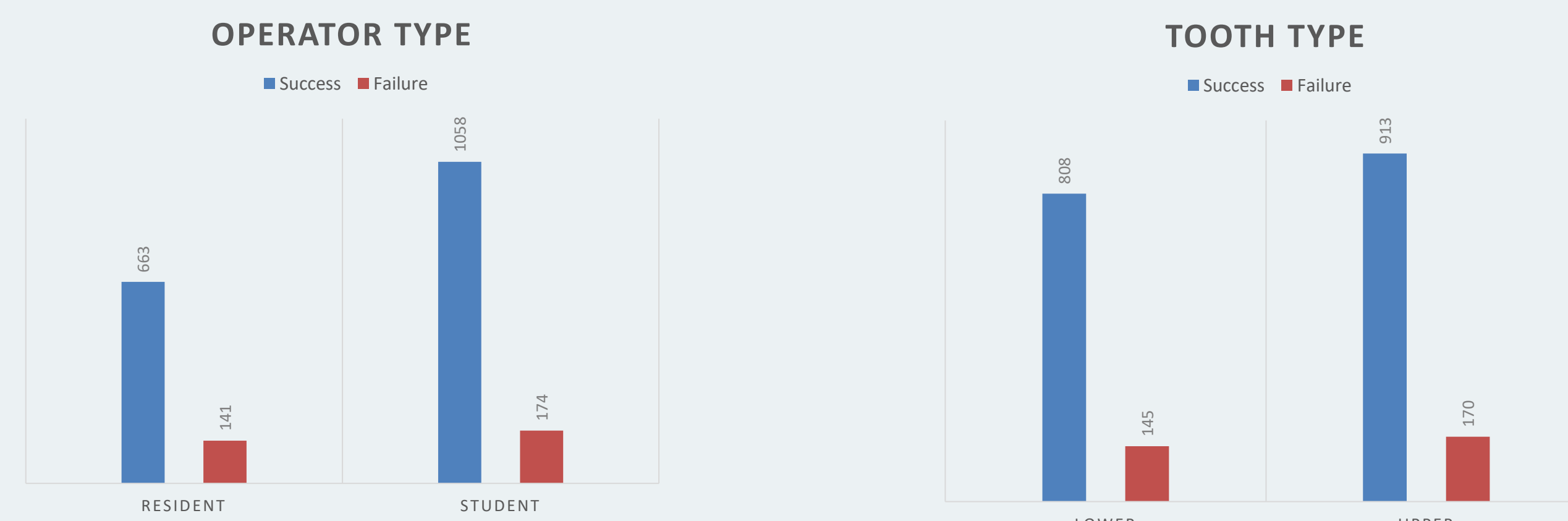
The definition of a successful sealant for the purpose of this study was a tooth that had been sealed and then did not have an occlusal restoration placed within 5 years. Sealant failure was defined as a sealed tooth that had an occlusal restoration placed within 5 years of the sealant. Time to failure was determined by the number of months between sealant placement and restoration completion. A total of 2,036 sealed teeth were included in the analysis.

Table 1. Descriptive statistics

		Overall	Non-failure (n=1721)		Failure (n=315)	
			n	%	n	%
Operator type	Dental student	1232	1058	85.9	174	14.1
	Resident	804	663	82.5	141	17.5
Tooth type	Lower	953	808	84.8	145	15.2
	Upper	1083	913	84.3	170	15.7
Age at sealant placement (years)		mean=8.3 SD=1.8	mean=8.3 SD=1.9		mean=7.9 SD=1.6	

Table 2: Cox Regression Analysis * Age at sealant placement is a significant predictor for sealant failure rate.

		B	SE	P-value	Hazard ratio	95% CI for Exp (B)
Operator type	Dental student	Reference				
	Resident	0.114	0.120	0.341	1.12	0.89-1.42
Tooth type	Lower	Reference				
	Upper	0.039	0.113	0.731	1.04	0.83-1.30
AGE at sealant placement		-0.103	0.034	0.003	0.90	0.84 - 0.97



Future Directions / Discussion

This study is unique in that no studies examined sealant performance among dental students and residents in an academic clinical setting. Sealant performance was measured by its caries preventive effect – sealed teeth were followed up for any development of occlusal caries. The study also had a longer follow up of 5 years compared to other existing sealant studies. Investigating any significant difference in sealant performance among operator type can reveal modes to increase access to preventive dental care.

Operator type (dental student vs dental resident) did not have a significant impact on sealant failure in this study. Dental students and pediatric dental residents work side by side in a large open bay clinic at Rutgers School of Dental Medicine. The same faculty supervise all operators on the clinic floor, though faculty varies with days of the week. Though all students and residents are required to work with faculty throughout the patient encounter, residents tend to be less closely supervised by faculty than the predoctoral students. The expectation is that residents have already gained clinical competency in the relatively simple procedure of sealant placement. But residents are more likely to be assigned patients needing more behavior guidance and thus it could be assumed that residents faced more challenges in obtaining adequate isolation during sealant placement than their predoctoral counterparts. Data on patient behavior was not collected in this study.

Tooth type did not have a significant impact on sealant failure. Although not statistically significant, maxillary molar sealants had less success than mandibular molars. Further investigation to determine the reason for this different outcome is warranted. One possible reason may be that both students and residents are less experienced in indirect vision.

Age at sealant placement had a significant impact on sealant failure. The later the sealant is placed, the higher the success rate and the longer it had caries preventive effect. Older patients may have better cooperation level and may be easier to isolate teeth for sealants. The first molars are more likely to have erupted fully for better isolation. It is also possible that those older patients were already at a low risk of getting dental caries- their permanent first molars did not have a cavitated lesion for those many years till sealant placement. This negative correlation between patient age and sealant success rate presents a dilemma for dentists. While sealants should be placed soon after eruption to prevent occlusal caries, clinicians may have to consider waiting until patient becomes older for sealant placement with better outcome.

In future studies, variables such as sealant material, faculty supervision, isolation method, caries risk level, and cooperation level should be included. Further investigation with a larger sample size is warranted as well.

Reference

1. Naaman R, El-Housseiny AA, Alamoudi N. The Use of Pit and Fissure Sealants-A Literature Review. Dentistry journal. 2017;5(4):34-. doi:10.3390/dj5040034.
2. Centers for Disease Control and Prevention. (2021, March 29). *Dental sealants*. Centers for Disease Control and Prevention. Retrieved March 22, 2023, from <https://www.cdc.gov/oralhealth/fast-facts/dental-sealants/index.html>