Research Paper

Medical Science



Factors Associated with Dental Sealants Retention and Effectiveness

* Alexandrina Muntean **Marioara Moldovan

* Lecturer, DDS, PhD, MScD, Paediatric Dentistry Department, Faculty of Dental Medicine, University of Medicine and Pharmacy, "I.Haţieganu", Cluj-Napoca, Romania

** PhD, Senior Researcher I, Institute for Research in Chemistry "Raluca Ripan", "Babes - Bolyai "University, Cluj-Napoca,Romania

ABSTRACT

Sealing pit and fissures appear to be not adequately applied in every day practice. The aim of this study was to assess the retention for two sealants employed under standard condition in a paediatric dental office. The study was conducted over a period of 3 years for 234 children's. First permanent molars free of cavities were sealed using two light cured resin based sealants (Fotoseal®, Admira Seal®). For Fotoseal® immediate retention was 100% and after 3 years was 73.97%. For Admira Seal® immediate retention was 100% and after 3 years was 78.57%. Re-sealing manoeuvres shown variation reliant on material brand and tooth position and morphology. Maxillary molars perform better for both sealants compared with mandibular molars. Retention values obtained permit us to encourage dental sealants use. Fotoseal® reveals an adequate retention offering a complementary alternative.

Keywords : dental sealant, retention

Introduction

Dental decay represents an oral health concern in children in Romania (Petersen PE et al, 1994). Occlusal surfaces decays are the most frequent during childhood and first permanent molar is the preference site (Dumitrache AM et al, 2005).

Preventive methods (dental hygiene, fluoride solutions) has little effect on these surfaces. More effective measures are necessary, such as the application of dental sealants (Katsumura S et al, 2008). Sealing pit and fissures look like to be not adequately applied in every day practice and the most important reason to avoid this procedure is the decreased sealant retention (McDonald RE et al, 2004).

The purpose of this study was to assess the retention for two resin based sealants applied in a paediatric dental office.

Materials and Methods

The study was conducted over a period of 3 years for a number of 234 children's divided in 2 groups assigned using the sealant commercial nomination as follows:

Group 1 Fotoseal - dental sealant Fotoseal® was designed by the Institute for Research in Chemistry "Raluca Ripan" Cluj Napoca, Romania.

Group 2 Admira - sealing material applied was Admira Seal $\ensuremath{\textcircled{B}}$ (VOCO).

Children's were selected (prior to parent's informed consent) according to school age-grade (mean age of 7 years at baseline, respectively 10 years at the end of the study) (table 1). Table 1. Numerical evolution for children's involved in study

Age (years)					
Group	7 years	8 years	9 years	10 years	
1-Fotoseal	122	118	115	112	
2-Admira Seal	112	110	110	97	

First permanent molars were assessed by a single examiner in dental office using visual and tactile examination methods. Teeth completed erupted, free of cavities were sealed with two light cured resin based sealants. Occlusal surfaces was clean using low-speed hand piece and a brush and tooth isolation was achieved with cotton rolls and saliva ejectors held by an assistant. The surface was degreased, dried and etched (37% phosphoric acid). Each tooth was rinsed using an oil free air-water syringe under continuous suction. The cotton rolls were changed without contaminated etched surfaces. The tooth was dried and the etching was confirmed by a white appearance of the enamel (if salivary contamination occurred, the surface was again cleaned, dried and reetched). The sealant were applied in pits and fissures and light cured. The immediate retention was verified with an explorer and the occlusion was tested with articulation paper. Children were instructed not to eat or drink for 30 min.

Regular check-out was carried out at 12 months intervals. Pit and fissures were the sealant has been entirely or partially dislocate were evaluated and if the enamel was free from decay, displaced sealing material was applied in respect of the original algorithm.

The data obtained every 12 month were processed statistically. To describe the survival curve Kaplan-Meier method and log rank test were used. Results were considered significant if $p \le 0.05$.

Results

When the study initiated certain permanent molars was not erupted, had active decay, fillings or have been extracted. Numerical distribution related with position on dental arch and the type of sealant was as follows (table 2):

Table 2. First permanent molars topographic distribution (initials values)

Sealant material	First permanent molars sealed (numerical values)				Total
	1.6	2.6	3.6	4.6	
1-Fotoseal	92	95	70	68	325
2-Admira Seal	92	97	75	76	340

Sealant preventive effect is in direct rapport with retention. Immediate retention on enamel surface for both sealants was 100%.

In this study retention was evaluated after 3 years dependent on the first permanent molars topography (table 3):

Table 3. Dental sealants retention

Tooth	Group	Sealed teeth- initial values (Nr.)	Deployed sealing material (Nr.)	Sealed teeth- final values (per cent)
	1-Fotoseal	92	18	80.4%
1.6	2-Admira Seal	92	14	84.8%
	Total	184	32	82.6%
2.6	1-Fotoseal	95	24	74.7%
	2-Admira Seal	97	17	82.5%
	Total	182	41	78.6%
	1-Fotoseal	70	28	60.0%
3.6	2-Admira Seal	75	17	77.3%
	Total	145	45	69.0%
	1-Fotoseal	68	13	80.0%
4.6	2-Admira Seal	76	23	69.7%
	Total	144	36	75.0%

Dental sealants follow-up entail re-application of the material when necessary to preserve the preventive effect. Re-sealing requisite is influenced by the material and tooth situation (table 4).

Table 4. Sealants evolution in time

T 41-	Devied	Re-sealing		
Tooth	Period	Fotoseal	Admira Seal	þ
	1 year	2	1	p>0.05
1.6	2 year	18	11	p>0.05
	3 year	0	3	p>0.05
	1 year	5	3	p>0.05
2.6	2 year	24	12	p>0.05
	3 year	0	2	p>0.05
	1 year	11	2	p=0.012
3.6	2 year	24	12	p=0.008
	3 year	0	3	p>0.05
4.6	1 year	4	1	p>0.05
	2 year	10	13	p>0.05
	3 year	0	10	p=0.004

Sealants evolution did not differ in terms of resealing interventions (table 4) and retention (fig. 1) for the tooth 1.6.

Figure 1-Sealants retention-tooth 1.6

Survival Functions



For 2.6, larger differences in terms of retention between the two materials were seen 2 years after the first application (table 4). For the molars sealed with Fotoseal® more re-sealing procedures were required (fig. 2).

Survival Functions

Figure 2-Sealants retention-tooth 2.6



For 3.6, Admira Seal® retention was significantly better during the first 2 years compared to Fotoseal ® (table 4) in terms of re-sealing procedures (fig. 3).

Figure 3-Sealants retention-tooth 3.6

Survival Functions

Materials used in this study had a similar approach for 4.6 in the first 2 years (fig. 4). In the 3^{rd} year, Admira Seal® had a significantly lower retention (table 4).

Figure 4-Sealants retention-tooth 4.6



We evaluate sealants retention related with patient gender. Fotoseal® exhibit a significant lower retention for girls, for mandibular molars (table 5).

Table 5. Fotoseal® retention according to patient gender

Sealed teeth	Number		
	Girls	Boys	р
1.6	50	42	0.735
2.6	52	44	0.179
3.6	39	31	0.041
4.6	35	33	0.028

For Admira Seal®, regardless patient gender the retention showed a similar evolution (table 6).

Table	6. Admira	Seal® I	retention	according	to patient	gen-
der						

Sealed teeth	Number		2
	Girls	Boys	þ
1.6	44	48	0.538
2.6	51	46	0.212
3.6	39	36	0.651
4.6	38	38	0.336

Discussion

Resin based sealant retention is mainly mechanical, ensured by the physicochemical interaction between the resin and etched enamel. (HAS, 2005). Retention after 3 years for Fotoseal® was 73.97% and for Admira Seal® 78.57%. Sealing materials evaluated in our study showed comparable values for retention, element that certified protection against decay by creating a mechanical barrier between dental tissues and cariogenic substrate (Rock WP et al, 1981). Studies on the retention rate of 54.3% after 3 years (Mascarenhas AK et al, 2001). The retention of the sealants used in our study was above the average values, because they were applied by a single operator, thus reducing inter-human variability factors.

REFERENCES

The immediate retention for both sealants was 100%; instant post-operative dislocation of the sealing material is a direct outcome of technical errors. Placement of a resin based sealant is very technique sensitive. Ensure adequate insolation and prevent salivary contamination are key elements for retention (Lavonius E et al, 2002). In this study cotton rolls and saliva ejectors were used, a technique that has been referred as partial isolation, because rubber dam application could be an overwhelming challenge for child patient (Feigal RJ et al, 1993). In addition we sealed not more than 2 antagonistic surfaces in a treatment session in order to acquire adequate moisture control and ensure a good collaboration.

Retention to the enamel surface of the sealing material is provided by respecting the application algorithm (Rodd H et al, 2006); any deviance determines an uncertain prognosis.

In order to improve sealant adhesion specific ways to prepare the enamel surfaces were proposed. All this methods are time consuming and require the use of high or low-speed instruments; these issues can affect child compliance (Lupi-Pegurier L et al, 2004). In this study the teeth were prepared very unpretentious (cleaning, etching) in conjunction with simple technical equipment. The mean values obtained for retention after three years - 74% for Fotoseal ® respectively 78.5% for Admira Seal ® -allows us to affirm that sealants used in the standard conditions of a dental practice have a good retention in time and can provide an effective decay protection.

Sealing material loss in time is in arrears to abrasion, masticatory forces and marginal infiltration. First permanent molar morphology and topographic position on dental arch represents factors that can also influence the retention. Maxillary molars allowed easier access and better isolation-this factors improved retention and required a smaller proportion of resealing manoeuvres (AAPD, 2004). The retention of Fotoseal® showed no significant differences for maxillary molars in correlation with patient gender. For mandibular molars the differences were significant, retention was considerably lower for girls compared with boys. Mandibular molars revealed smaller vertical dimension in girls, a supplementary risk factor for isolation. Admira Seal® retention exposed no significant differences for maxillary and mandibular molars in relation with patient gender in our study.

Partial or total sealant dislocation does not result in increased decay susceptibility, because fissures preserves microscopic amounts of materials (Sarmadi R et al, 2011). Oral hygiene is the easiest way to balance the pH and initiate re mineralization processes which allow us to state that the patient's involvement in dental care extending the protective effect of sealants (Brukien V et al, 2009).

Conclusions

Retention values obtained in standard condition permit us to encourage dental sealants use. Retention to the enamel surface for sealing materials employed in this study revealed that maxillary molars perform better compared with the mandibular molars. Fotoseal® demonstrate an adequate retention compared with a product already on the market, offering a supplementary alternative.

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