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One-Year Clinical Evaluation of the Retention of Glassionomer Sealant on Newly Erupted First Permanent Molars in Children

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Abstract: ***The effectiveness of dental sealants mainly depends on their retention, or that is what most authors claim. There is a great number of clinicians who believe that partial loss of a sealant leads to the same risk of caries development, identical to that of not silanizedocclusal surfaces. The aim of this clinical trial is to evaluate the retention and caries-preventive effect of glass ionomer sealant on newly erupted first permanent molars.***

Keywords: sealant, glass ionomer, retention silanization

1. Introduction

Dental sealants have been used for more than 50 years, and their main purpose is to reduce the incidence and severity of dental caries. "A fissure sealant is a material that is placed in the pits and fissures of teeth in order to prevent or arrest the development of dental caries"[16].

The application of pit and fissure sealants is effective in caries reduction. However, periodic monitoring in the dental office is required to assure the effectiveness of the sealants.

The effectiveness of sealants mainly depends on their retention, or that is what most author claim. There is a great number of clinicians who believe that partial loss of a sealant leads to the same risk of caries development, identical to that of not silanized occlusal surfaces[5-8].

The highest loss of sealant is reported during the first year after sealant application, which motivated us to perform a follow-up clinical trial[2].

2. Aim

The aim of this clinical trial is to evaluate the retention and caries-preventive effect of glass ionomer sealant on newly erupted first permanent molars.

3. Materials and methods

This clinical study involved 78 newly erupted first permanent molars of 5-6 year-old children. The inclusion criteria were children in the high risk group, with at least one sound occlusal surface of a newly erupted first permanent molar without sealant or restoration. For the assessment of the occlusal surfaces we used ICDAS II diagnostic criteria for visual diagnosis and the same criteria after exploring the magnified image received form VistaCam Macro, also we included modified Ryge criteria for the follow-up.

Reproducibility and accuracy of ICDAS-II system have already shown to be promising for occlusal caries detection [11, 13].

ICDAS-II is an accessible set of criteria for dentists, researchers and professors and presents acceptable sensitivity and specificity to the detection of occlusalcaries [9, 10, 14, 15].

Before the assessment of the occlusal surfaces they were thoroughly cleaned with brush and a low speed handpiece and hydrogen peroxide, isolated with cotton rolls and dried. We sealed only completely sound surfaces given 00code after ICDAS II system was used (Table 1). The sealant that we used is GC, Fuji Triage Pink.

Application of the sealant

The occlusal surface is cleaned from the plaque using a brush and a low-speed handpiece and hydrogen peroxide, then it is isolated with cotton rolls and dried. The sealant is applied with the help of the capsule and a microbrush whit the help of which we press the material into the bottom of pit and fissures.

4. Follow-up

The evaluation of sealant retention was performed at three-month intervals (3rd, 6^{th},12^{th} month) over the course of one year with the help of visual diagnostics and VistaCam Macro using the ICDAS II system and modified Ryge criteria. For modified Ryge criteria for retention we used codes: A (completely retained sealant); B(partially retaind) and C (completely lost sealant).When caries development was diagnosed, those teeth were excluded from the trial and were further treated.All the collected data was recoded and

frequency analysis was performed using SPSS (Ver.20) and Excel 2016[1].

Table 1: ICDAS II codes

ICDAS II			
1st digit codes	Description	2nd digit code	Description
0	Sound	0	Sonund
1	Sealant, partial	1	First visual change in enamel
2	Sealant, full	2	Distinct visual change in enamel
3	Tooth colored restorations	3	Localized enamel breakdown
4	Amalgam restoration	4	Underlying dark shadow from dentin
5	Stainless steel crown	5	Distinct cavity with visible dentin
6	Porcelain or gold or PFM crown or veneer	6	Extensive distinct cavity with visible dentin
7	Lost or broken restoration		
8	Temporary restoration		

5. Results

The data that we collected from the three diagnostic methods was recoded as follows: completely retented sealant, partially lost sealant, completely lost sealant. After three months the results from the visual diagnostics showed presence of completely retained sealant in 61,25% of the occlusal surfaces, partially lost sealant in 30% and completely lost in 8,75% of the surfaces. According to the diagnostics with VistaCam Macro, in 48,75% of the surfaces assessed the sealant was fully retained, in 46,25% paritally lost and completely lost in 5%. Ryge modified criteria showed complete retention in 65% of the cases, paritil loss in 28,75% and total loss of the sealnt was observed in 6,25% of the occlusal surfaces (Fig1).

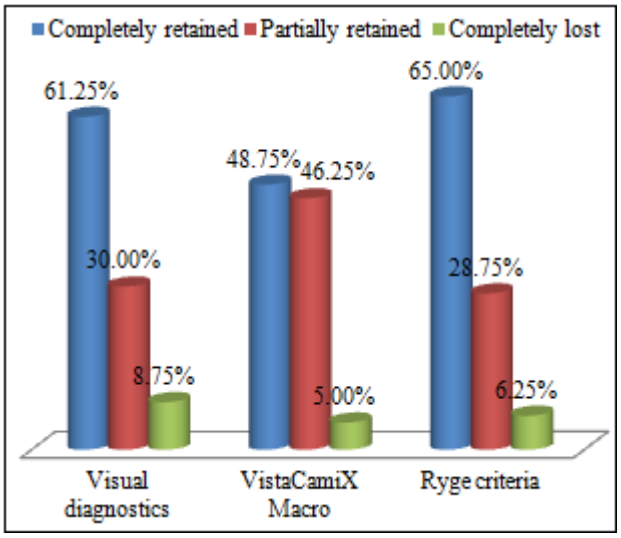

Figure 1: Retention of Fuji Tiage Pink 3 months after the application

Six months after sealant application completely retained sealant was observed in 22,2% of the occlusal surfaces according to the visual diagnostics and modified Ryge criteria, and according to VistaCam Macro in only 11,2%. Visual diagnostics determined 61,1% of the sealants as partially lost, Ryge criteria- 62,5% and VistaCam Macro 80,5%. Completely lost sealant was observed in 16,6% of the surfaces assessed by visual diagnostic method, 15,27- by modified Ryge criteria and 8,23% by VistaCam Macro (Fig.2).

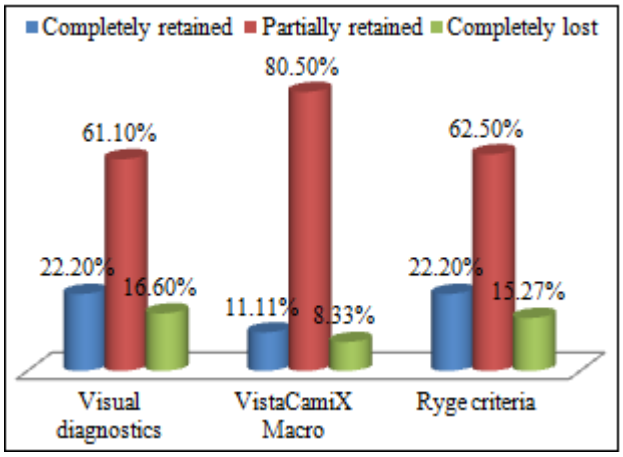

Figure 2: Retention of Fuji Tiage Pink 6 months after the application

After 12 months completely retained sealant was found in 4,87% of the examined surfaces. Between 56-65% of the sealant was marked as partially lost by all of the diagnostic methods used. And completely lost sealant was observed in 39,02% of the surfaces due to visual diagnostics an modified Ryge criteria and in 29,26%, when assessed with Vistacam Macro (Fig.3).

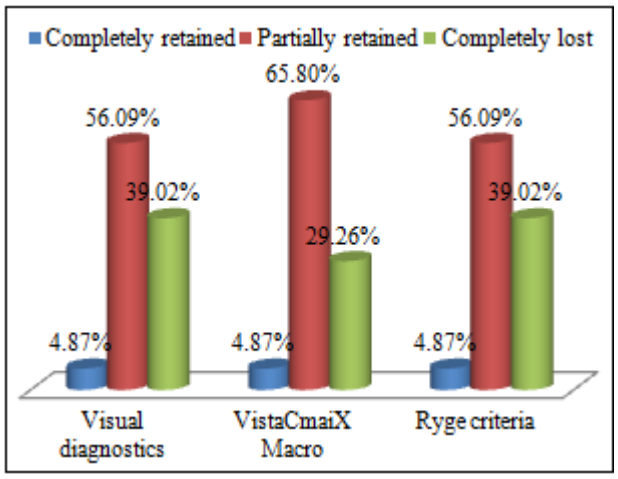

Figure 3: Retention of Fuji Tiage Pink 12 months after the application

The glass ionomer based sealant Fuji Triage Pink, GC showed great caries-prophylactic qualities, despite its poor retention, providing over 95% prevention of occlusal caries during the one-year clinical trial.

6. Discussion

In accordance to our results, the clinicians Steffen Mickenautsch and VeerasamyYengopal conducted and published a systematic review where they concluded that the risk of complete loss of sealant retention was associated with the risk of caries occurrence for resin-based sealants, but not for glass ionomer-based sealants [12]

Comparable to our results were published in 2012 in JADA, where dentists compared composite and glass ionomer-based sealants after 3,6,12,24 months, applied on occlusal surfaces of first permanent molars of children aged 5-9 years. The results consurning Fuji Triage white after 3 months showed completely retained sealants in 86% of the surfaces, partially lost in 8% and completely lost in around 6%. After 6 months the sealant is completely retained in 77,8%, partially lost in 19,4% and completely lost in 2,8% of the assessed occlusal surfaces. After 12 months the sealant is completely retained in 58,8%, partially lost in 26,5% and completely lost in 14,7% [3].

However,the results of some of the author differ from ours. For example in 2013 an article was published in Dental Materials Journal, reflecting the degree of retention and caries profilactice effect of the sealant 6,12,24 months after its application. The authers selected two types of selants: glass ionome-based- Fuji VII and composite-based Concise. They report higher retentiveness of Fuji VII glass ionomer-based sealant than compared to our results. At the 6^{th} month they reported completely lost sealant in 7,4% of the surfaces, partially retained sealant in 18,5% and complete retention they observed in 74,1% of the sealed surfaces. After 12 months the authors report again completely lost sealant in 7,4% of the surfaces, however in 37% the sealant is partially lost and in 55,6%- completely retained. At the end of the second year, they reported 44,5% fully retained sealant, 44,4%-partially retained and 11,1%-totally lost sealant [4].

The differences in the resultswe attribute to the variety of the materials and methods used by the clinicians.

7. Conclusion

Despite its poor retention (between 30-40% complete sealant loss) proven by all three methods used for diagnostics of the occlusal surfaces, glass ionomer sealants provide caries prevention in more than 95% of the occlusal surfaces in the present study.

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