

FIRST MOLARS SEALANTS – LONGITUDINAL STUDY EVALUATING THE IMPACT ON ORAL HEALTH STATUS

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Abstract: The **aim** of this study was to evaluate the results of primary and secondary prevention of first molars caries using pit and fissure sealants. **Material and methods.** The study included 247 children initially aged 6-7 years from Iași, with different socio-economic status, who had their first permanent molars sealed and the results were estimated periodically for 5 years. **Results.** The rate of successful sealants was 79.5% two years after the application and 68.5% at the end of the study. Only 9.4% of the sealed surfaces presented dental caries after 5 years and the DMFS (the Decayed, Missing, Filled, Surface) index of the occlusal surfaces had a reduced increase. The method allowed the differences in oral health status of children with different socio-economic status to be significantly reduced. **Conclusions.** This study has underlined the effectiveness of the primary and secondary prevention actions within first molars caries.

Key-words: schoolchildren, sealants, socio-economic status

Rezumat: **Obiectivul** studiului a constat în evaluarea rezultatelor sigilării ca metodă de prevenție primară și secundară a leziunilor carioase ale molarilor primi permanenți. **Material și metode.** Studiul a cuprins un număr de 247 de copii cu vârsta inițială de 6-7 ani, din Iași, provenind din familii cu nivele socio-economice diferite, ai căror molari primi permanenți au fost sigilați, iar rezultatele au fost evaluate periodic timp de 5 ani. **Rezultate.** Rata succesului sigilărilor a fost de 79,5% după 2 ani de la aplicare și de 68,5% la sfârșitul studiului. Doar 9,4% dintre suprafețele sigilate au dezvoltat leziuni carioase după 5 ani, iar indicele CAOS (Carie, Absență, Ocluzie, Suprafață) la nivelul suprafețelor ocluzale ale molarilor a prezentat o creștere redusă. Metoda a permis reducerea semnificativă a diferențelor în ceea ce privește sănătatea orală a copiilor cu nivele socio-economice diferite. **Concluzii.** Studiul subliniază eficacitatea acțiunilor preventive primare și secundare adresate leziunilor carioase ale molarilor primi permanenți.

Cuvinte cheie: școlari, sigilări, nivel socio-economic.

INTRODUCTION

Pit and fissure sealants have imposed on as a preventive measure in the years '70s, when their efficacy in the prevention of fissure caries was demonstrated, and today they are a component of the preventive programs in many countries (1). The evolution

of the adhesive techniques and the improvement of the biological qualities of dental materials allow dental caries to be treated in a preventive manner to a greater extent, making sealants useful not only in the primary, but also in the secondary caries prevention (2).

MATERIAL AND METHODS

The study design was longitudinal and assessed the results of dental sealants in the primary and secondary prevention of first permanent molars caries for 5 years. The studied population included 247 children initially aged 6-7 years, attending schools in different areas in Iasi. The condition for the subjects to be included was to present at least one caries free permanent molar. Sealants were also applied on teeth with uncertain diagnosis of caries and on teeth presenting active lesions in the enamel and / or in the external third of the dentin.

The study included equal numbers of subjects of different socio-economic status (low, medium, high), considering parents' occupation and the number of children in the family.

Application of the sealants included the following steps: cleaning of the surfaces to be sealed with Prophy-jet (Satelec) using sodium bicarbonate powder and water; remove of the powder with water; isolation with sterile cotton rolls; conditioning of the dental surface with phosphoric acid

gel for 30 seconds, applied slightly over the limits of the future sealant; the surface was then washed with water and air-dried; application of the sealant with the syringe; light-curing for 20 seconds with a halogen light-curing source; checking and correction of the occlusion.

The sealants were examined initially and 6, 12, 18 and 24 months, then annually until 5 years after the application, in what concerns the retention degree (partial or total) and the associated carious lesions. The control was clinically performed, including visual (simple or using a magnifying-glass) and tactile examination with a periodontal probe.

Data were statistically analyzed using SPSS 13.0. The values of the DMFS index were compared with the Kruskal-Wallis test. The levels of statistical significance were 0.01 and 0.05, for a confidence interval of 95%.

RESULTS

The results of the clinical examinations are presented in table 1.

Table 1. Evaluation of the sealant results

	Satisfactory sealants		Sealants requiring reapplication	
	n	%	n	%
First application	741	100	-	-
6 months	682	92	59	8
12 months	657	88.7	84	11.3
18 months	634	85.5	107	14.5
24 months	589	79.5	152	20.5
3 years	558	75.3	183	24.7
4 years	534	72.1	207	27.9
5 years	508	68.5	233	31.5

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The criteria required for a sealant to be considered satisfactory were: complete presence of the sealant or sealant partially present but covering the base of the pits and fissures; material without discoloration; no carious lesions associated. When the material was absent in some pits and fissures or completely lost it was considered that the sealant had to be reapplied.

The rate of successful sealants was 92% 6 months after the application,

79.5% after 2 years and 68.5% after 5 years from the initial application. At the end of the study, 31.5% of the sealed surfaces required reapplication of the material because of its partial (20%) or complete (11.5%) loss.

The examination performed 6 months after the application of the sealants found no carious lesions on the sealed surfaces (table 2).

Table 2. Carious lesions associated with sealants

	n (%)	Location	Treatment required
Initially	-	-	-
6 months	-	-	-
12 months	11 (1.5%)	Teeth with uncertain diagnosis	Sealant reapplication
18 months	26 (3.5%)	20 – teeth with uncertain diagnosis 6 – teeth with curative sealants	Sealant reapplication
24 months	52 (7%)	10 – initially free surfaces 30 - teeth with uncertain diagnosis 12 - teeth with curative sealants	30 – sealant reapplication 15 – restorative treatment 7 – endodontic treatment
3 years	59 (8%)	10 – initially free surfaces 32 - teeth with uncertain diagnosis 17 - teeth with curative sealants	35 – sealant reapplication 17 – restorative treatment 7 – endodontic treatment
4 years	65 (8.7%)	11 – initially free surfaces 35 - teeth with uncertain diagnosis 19 - teeth with curative sealants	40 – sealant reapplication 18 – restorative treatment 7 – endodontic treatment
5 years	70 (9.4%)	12 – initially free surfaces 37 - teeth with uncertain diagnosis 21 - teeth with curative sealants	45 – sealant reapplication 18 – restorative treatment 7 – endodontic treatment

These started to be found, although in a reduced number, at the next evaluations. At the final examination 70 lesions were found (representing 9.4% of the 741 sealed surfaces), of which 12 affected initially free surfaces, 37 affected teeth with an uncertain diagnosis and 21 were found on teeth with curative sealants. 18 of these lesions required restorative treatment and 7 required endodontic treatment, while the others were resolved by the correct reapplication of the sealant.

The DMFS index of the occlusal surfaces of the sealed molars had a reduced increase during the study, from the initial value of 0.33 (constituted exclusively of the carious component) to 0.37 after 12 months and 0.50 after 2 years. At the end of the 5 years the occlusal DMFS index of the molars was 1.9. The comparative analysis of the dental status according to the socio-economic status revealed significant differences at the beginning of the study. At the end of the 5 years the differences became not significant (table 3).

Table 3. The evolution of the caries experience indices according to the socio-economic status

Occlusal DMFS index of the first permanent molars	Socio-economic status			Total	χ^2	p CI95%
	Low	Medium	High			
Initially	0.60	0.30	0.09	0.33	13.549	<0.01
12 months	0.62	0.34	0.15	0.37	13.053	<0.01
24 months	0.68	0.44	0.38	0.50	11.392	<0.01
3 years	1.12	0.99	0.80	0.97	8.111	0.01
4 years	1.70	1.52	1.37	1.53	6.572	0.03
5 years	2.10	1.87	1.73	1.90	5.316	0.07

DISCUSSION

The results of the study confirm the observation that partial or even total loss of the sealant does not increase caries susceptibility of the surface. The development, at the final evaluation, of carious lesions on surfaces initially considered as caries-free is most probably caused by the fact that the lesions were underestimated at the first examination, and these surfaces already presented an incipient lesion that subsequently developed

following the marginal integrity loss of the sealant.

The sealant efficiency in dental caries prevention depends on the sealant duration and the degree of retention. Loss of the sealant is not, however, followed by caries development, due to the material microdigits that remain even after the sealant seems macroscopically lost, and also due to the fluoride content of the material (3). The possibility also exists that the material is still present in the deep areas (after the visible part is lost),

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where it cannot be visually or tactilely detected.

Application of the sealant over the carious lesions may lead to their sterilization. Incipient lesions can often not be detected clinically, and the sealant is applied over the lesion, while some other times sealants are intentionally applied for the preventive treatment of the incipient carious lesions. Numerous studies reported that active lesions turned into inactive ones after this technique was applied. Sealed lesions do not further progress, due to the reduction of the number of viable bacteria, conditioning that the sealant adhesion to the enamel surface and its marginal integrity are conserved and no micro-leakage appears. Therefore, seal of the carious lesions may be considered an acceptable method for fissure caries treatment (4).

As resulted in the present study, most of the sealants are lost in the first months after their application, probably because of some technique errors, while subsequent lost is considered to be caused by an incorrect occlusal adaptation.

Of all the factors influencing oral health status, the social environment seems to be the strongest. Studies conducted in industrialized countries revealed that people with low socio-economic status have a reduced rate of dental services use, are less probable to present regularly to control, use more frequently curative services and get a different type of dental care (5). All these underline the importance of school dental services and of school-based preventive and curative

programs offering all the children the opportunity of control and early treatment and thus reducing the differences of addressability (6). These aspects are highlighted by the results of the present study, as the differences in oral health status of children with different socio-economic status reduced progressively.

CONCLUSIONS

Sealants application protected the occlusal surfaces of the first permanent molars with a successful rate of approximately 89% after 1 year, 79.5% after 2 years and 68.5% after 5 years from the application.

The occlusal caries experience index of the first permanent molars had a reduced increase, from 0.33 at the beginning of the study to 1.9 at the end of it.

The present survey demonstrated by evidence the effectiveness of primary and secondary prevention actions performed within low socio-economic status groups of children, which presented an increase of the occlusal DMFS index of the first permanent molars from the initial value of 0.60 to the final value of only 2.10.

The method allowed for the differences in oral health status of the children with different socio-economic status to be reduced.

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