

EVALUATING THE EFFICIENCY OF CERTAIN PREVENTIVE MEASURES FOR DENTAL CARIES

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Abstract: Introduction: Developed countries have shown a remarkable decline in the prevalence of dental caries due to the application of several preventive measures. Objective: Evaluating the efficiency of pit and fissure sealing and topical fluoridation. Material and method: 395 children were divided into 3 groups, all of them received oral hygiene instruction, two groups benefited from pit and fissure sealings and the third group received local fluoridation, too. The assessment of the efficiency was made based on DMF index. Results: DMF index showed statistically significant differences between the group that received oral hygiene instruction and the other two groups that received specific prophylactic measures. Discussion: The study confirmed the effectiveness of sealants, but not the caries-preventive effect of fluoride. Conclusions: The evolution of DMF index demonstrates the effectiveness of applying pit and fissure sealants.

Cuvinte cheie: profilaxie, sigilant, fluor

Rezumat: Introducere: În țările dezvoltate s-a remarcat un declin remarcabil în prevalența cariei dentare datorită adoptării unui pachet de măsuri profilactice. Obiectiv: Evaluarea eficienței sigilării șanțurilor și fosețelor și a fluorizării topice. Material și metodă: 395 de copii au fost împărțiți în 3 loturi; toate cele 3 loturi au beneficiat de instructaj privind igiena dentară, două loturi au beneficiat și de sigilarea șanțurilor și fosețelor iar cel de-al treilea lot a beneficiat și de fluorizarea locală. Evaluarea eficienței metodelor s-a făcut prin intermediul indicelui CAO. Rezultate: Indicii CAO pentru cele trei loturi au prezentat diferențe semnificative statistic, între lotul care a beneficiat de instructaj privind igiena dentară și celelalte două loturi care au beneficiat de metode specifice de profilaxie. Discuții: Eficiența sigilanților este confirmată în studiul nostru, dar nu și efectul cariopreventiv al fluorului. Concluzii: Evoluția indicilor CAO demonstrează eficiența aplicării sigilanților la nivelul șanțurilor și fosețelor.

INTRODUCTION

In the recent decades, the developed countries have shown a remarkable decline in the prevalence of dental caries due to the application of several preventive measures.

These preventive measures were based on the knowledge of the carious processes and the importance of four main factors involved in the occurrence of these processes: tooth structure, dental plaque, carbohydrates and time. Thus, four prophylactic strategies have been developed over time, namely fluoridation, pit and fissure sealing, dietary habits and plaque control, all of them currently recommended by the World Health Organization.(1,2)

Changing eating habits to prevent tooth decay has had little impact globally and plaque control, as perceived by the majority of the population, is not sufficient to reduce the prevalence of caries. Therefore, caries preventive methods selected for this study were fluoridation and dental sealing. Fluorides have a major impact on smooth surfaces caries, while sealants are effective in preventing pit and fissure caries.

PURPOSE

The purpose of this study was to evaluate for a period of two years the effectiveness of pit and fissure sealing and of

local fluoridation applied in two groups of first class school children.

METHODS

The study was conducted over a period of two years (2009-2011), and included a total of 359 children. The selection of children was made based on school grade of first class, which corresponded to the age of 6-8 years old, with a mean age of 7 years old. No differentiation was made in terms of ethnicity or socio-economic status. The only eligibility criterion imposed in addition to school age was the lack of systemic fluoride usage.

Children were divided into 3 groups as follows:

- the control group – 114 children
- the Fissurit FX group -126 children
- Grandio Seal group - 119 children.

All three groups of children received proper oral hygiene instruction and training was done with the demonstrative dental models of the Department of Preventive Dentistry from the University of Medicine and Pharmacy of Târgu Mureș. The rolling tooth brushing method was explained and showed to children, which is superior to the vertical brushing technique (Leonard). This method seemed to be more appropriate than the Fones technique which is also indicated for children, because of their tendency to transform the circular

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movement of the toothbrush into a horizontal technique and due to a higher efficiency of the first method. The children's parents were informed about the dental health status and the treatment needs of their children.

The children in the control group did not receive any other caries preventive method except the oral hygiene instruction.

Besides dental hygiene training children in Fissurit FX group benefited from pit and fissure sealing on teeth with indication for sealing.

Besides dental hygiene training and pit and fissure sealing children in Grandio Seal group received fluoride varnish application (Bifluorid 10).

The first permanent molars were examined by a single operator in a dental unit in standard lighting conditions. The clinical examination of teeth in order to check the indication of pit and fissure sealing implied two examination methods described in the literature: visual assessment and palpation. The visual examination was performed on clean and air dried teeth.

The tactile examination was made with a rounded tip dental probe.

The dental probe was used only to remove plaque and food debris, as recommended in the literature, since the sharp dental explorer can brake off the occlusal pits and fissures, preventing the remineralisation of the enamel surface and it can also fasten the progression of dental caries.

In situations with doubts about the integrity of occlusal tooth structure, the suspicious teeth were excluded from the study.

Inclusion criteria of permanent molars within this study were as follows:

- sufficiently erupted teeth in order to obtain the required isolation for sealant application;
- teeth with no clinically detectable carious lesions both in pits and fissures and on smooth surfaces;
- teeth without fillings and sealants;
- teeth with no hypoplasia or other developmental abnormalities;
- teeth with deep pits and fissures susceptible to tooth decay.

Pit and fissure sealing was performed following the producer recommendation.

The Bifluorid 10 product, selected for topical fluoridation is a varnish that contains a combination of two fluorides: 5% sodium fluoride (22,600 ppm F⁻) and 5% calcium fluoride. Fluoride varnish was applied following the conventional technique, with recommendation to avoid food, drinks for 4-6 hours, tooth brushing for 12 hours, and eating soft food in the next 24 hours.

Patient monitoring was done every six months over a period of two years in Fissurit FX and Grandio Seal groups and once in the control group.

At the control visits, the sealed occlusal surfaces were assessed and resealing was performed as necessary, along with local fluoridation in Grandio Seal group.

The efficiency of the preventive measures was assessed using the DMF caries intensity index for permanent teeth, at one year and two years from baseline. The index consists of the sum of teeth with carious lesions, restorations and the number of absent teeth. The smaller its value, the better dental health status.

DMF index was used for each tooth, its value reflecting a certain number of teeth. All preventive treatments were performed by the same clinician.

For the statistical analysis, Microsoft Excel and Eviews programs were used, and for the equality of two average values from independent populations, the Student t test.

Significance level chosen was $\alpha = 0.1$, and the confidence level was 90%, according to the formula $C = (1-\alpha) \cdot 100$. Results were considered statistically significant if $p \leq 0.1$, thus p was $\leq \alpha$.

RESULTS

The evolution of DMF index during the two years is presented in table no. 1.

Table no. 1. The evolution of DMF index

Mean age	Control group		Fissurit FX group		Grandio Seal group	
	Arithmetic mean	±Standard deviation	Arithmetic mean	±Standard deviation	Arithmetic mean	±Standard deviation
7 years	0,94	1,12	0,86	1,08	0,95	0,82
8 years	2,31	1,24	1,27	1,16	1,35	0,98
9 years	3,42	0,90	1,68	1,12	1,55	1,05

The initial values of DMF index had no statistically significant differences, the baseline dental status was similar in all three groups. ($p > 0,1$)

Thus, in all three groups, an ascending trend can be noted, which is more pronounced in the control group compared to the other two groups.

The evolution of the DMF index during the two years period presented statistically significant results for the control group compared to the Fissurit Fx group ($p = 0.0086$ after the first year and $p < 0.0001$ after the second year), although at baseline the DMF values were similar, with no statistically significant differences.

When comparing the group control with the Grandio Seal group, there were also recorded statistically significant differences between the DMF values ($p = 0.01$ after the first year and $p < 0.0001$ after the second year), although the index presented similar dental health status at baseline.

Between the two groups that benefited from specific caries preventive measures, Fissurit FX and Grandio Seal group, no statistically significant differences were observed ($p = 0.81$ after the first year and $p = 0.69$ after the second year).

DISCUSSIONS

At the beginning of the study, DMF index showed high carious activity in all three groups and no statistically significant differences were found.

Since at the age of 6-8 years old, the only permanent teeth erupted are the first molars and the central incisors and the caries prevalence on incisor teeth is almost zero at this age, the positive values of the DMF index are exclusively due to the presence of caries on the first molars.

The index of dental caries intensity is similar to that reported in other epidemiological studies performed in Romania. Thus Nucă et al reported in Constanta in 2007, a DMF index of 1.09 at age 6 (3), Dănilă et al. reported in 2000 for the same age an index of 0.73 for the same city and of 0.30 for Iasi.(4) For the same age group in Cluj Napoca, a much higher DMF is reported, one of 2.30 in 1993 (5) and another one of 2.95 in 2009.(6)

Data collected within the present study are concordant with those reported by foreign authors in studies conducted in similar conditions. Thus, in Bosnia Herzegovina a DMF index of 0.66 (7) and in Argentina and index of 0.48 (8) was reported for the age of 6 years old. The differences resulted from

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comparing the DMF index during the study were statistically significant between the control group and the other two groups – Fissurit and Grandio Seal, demonstrating that the two preventive measures applied together resulted in decreased prevalence of dental caries.

Observations regarding the caries preventive effect of the pit and fissure sealants are confirmed by the present study, which is consistent with many studies in the literature.(9,10)

Comparing DMF index between the Fissurit and the Grandio Seal groups, there were no statistically significant differences and the collected data were not concordant with those described by other authors, who sustained the caries protective effect of the topical fluoride.(11,12) One possible explanation could be the insufficiently long duration of the study, since it is well known that the effects of local fluoridation are not immediate, but they appear much later in life, reducing the acceptance of their use.(13)

Another possible explanation for the lack of the efficiency of fluoride varnishes observed in this study would be the fact that carious lesions develop mostly on irregular dental surfaces rather than on smooth enamel surfaces, where fluorides can protect against tooth decay.

In a study conducted in Finland in 1986, Norblad A. concluded that until the age of 10 years old, teeth and dental surfaces with great caries risk are the occlusal surfaces of the first molars.(14) Raadal et al (1993) demonstrated that in children of 7 and 8 years old, the permanent dentition caries is represented exclusively by the occlusal caries of the first permanent molar.(15)

From the great variety of fluoridated products the fluoride varnish was selected in the present study, since many studies have demonstrated its superior efficiency compared to other products (16), and also its simple and safe use.(17,18)

Regarding the caries preventive effect of fluoride in occlusal pits and fissures, comparative studies demonstrated the superiority of pit and fissure sealing upon the use of fluoride varnishes in preventing occlusal tooth decay, but also advocated the maximum caries preventive effect when using both methods.(19)

CONCLUSIONS

The evolution of DMF index for the three groups during this study demonstrates the effectiveness of specific caries preventive methods (dental sealants).

The high baseline DMF values and the data regarding the first molar damage at the beginning of the study showed the importance of sealing occlusal pits and fissures as soon as possible after tooth eruption. In the absence of sealing occlusal surfaces might decay in the early years after the eruptive period.

Dental health status of children from the three groups and the results obtained by applying the prophylactic dental method draw the attention for the need of establishing certain national and community caries preventive programmes for children, starting at kindergarten-age in order to decrease the prevalence and severity of tooth decay in permanent dentition.

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