Global Journal of Science Frontier Research: C
Biological Science
Volume 21 Issue 1 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Results of Application of Clinpro White Varnish® and Tooth Mousse® during the Enamel Mineral Maturation and its Focal Demineralization

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GJSFR-C Classification: *FOR Code: 069999*

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Marina Mitush Markaryan [α], Izabella Frunze Vardanyan [σ], Mikayel Ervand Manrikyan [ρ] & Gayane Ervand Manrikyan [ω]

Abstract- **According to some authors, the final maturation of tooth enamel occurs in 1-2 years after eruption, and then for 2-3 years this process continues in just the fissure area. Full-fledged mineralization during this period is carried out due to the absorption of minerals from saliva, especially in respect to fluorine, calcium and phosphorus ions. As a result of the course of prophylactic treatment with Clin Pro White Varnish® and Tooth Mooth®, an activation of remineralization process was observed ended with the stabilization of the process or complete remineralization in the junior (6-7 years old) and the middle school group children (12-13 years old), which was confirmed by the obtained indices of the "DiagnodentKaVo" laser fluorometry test and the colorimetric test. The use of these preparations is a convenient and effective method in these age groups of children during the preventive treatment provision.**

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I. Introduction

The period of physiological maturation (mineralization) of the enamel of immature teeth in children can last from 2 to 5 years, and throughout the entire period of mineral maturation (especially during the first year after eruption) the child's teeth need careful and effective care[1].

The initial stage of dental caries is characterized by the efflux of calcium, phosphorus and fluoride ions from the enamel without disturbing its structural integrity, i.e. without the carious cavity formation[2,3]. In such a situation the process is reversible, since the enamel of children's teeth has a high ability to restore its structure owing to the penetration of necessary macro- and microelements from the surrounding medium. A widely used method is the remineralizing therapy with calcium, phosphorus and fluoride preparations, which is usually being performed by a specialist in a dental office[4,5,6]. More recently, such preparations as ClinPro White Varnish® and Tooth Mooth® have appeared in the arsenal of modern dentists for the treatment of caries in the chalky spot stage[7].

At the same time, making a precise diagnosis in the absence of visible manifestations of the pathological process is a very difficult problem due to the extremely small size of the focus of carious lesions and the depth of localization [3,8]. According to Costa A.M. et al. (2007), the frequency of detecting caries in the fissure area by examination with a sharp dental probe is making up 56-58%, with panoramic radiography - 67%, by the method of fiberglass transillumination - 30%, by measuring the electrical resistance of tooth hard tissues - 83%, and by the laser fluometry - more than 90% [9].

Thus, the development and scientific substantiation of new methods of diagnostics, prognosis and increasing the resistance of tooth enamel is an urgent problem in dentistry.

The aim of the study was to objectively evaluate the effectiveness of the use of preparations Clinpro White Varnish® and Tooth Mousse®in the initial form of caries in children to improve the quality of treatment.

II. Material and Methods

In a study conducted with the participation of 213 children in two age groups of 6-7 years (98 people) and 12-13 years (115 people), we treated caries in the chalky spot stage using Clinpro White Varnish® and Tooth Mousse®. Children were divided into groups not only by age, but also by the medicinal means used. To identify the risk of a carious spot, a colorimetric test was used, for which the subjected to examination rinsed his mouth with 1% glucose solution, and then with 0.1% methylene red solution, which stained dental plaque yellow. After a lapse of time (up to 5 seconds), the result was evaluated by a color marking on the test strips (pH 7 - green, pH 6.5 - yellow, pH 6 - orange, pH 5.5 - red). Later on namely in these areas that focal demineralization of the enamel can occur. The level of

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caries detection by this test usage is making up 74.8%[10]. Measuring of fluorescence with the "Diagnodent (KaVo)" at various stages of caries development implies high efficiency and reliability in the demineralization foci revealing in order to plan the adequate and easily implemented treatment options. Numerical values of the scale (5) from 0 to 14 correspond to a healthy enamel structure; from 15 to 25 – to caries within the terms of enamel; from 21 to 90 – to caries within the terms of dentin [11,12].

On control examinations after 6 and 12 months, the areas of foci of enamel demineralization of the studied teeth were assessed. Ethical clearance has been guaranteed from ethical committee in YSMU. The obtained data was statistically processed in the SPSS program.

III. Research Results

The study conditions were maximally standardized for both groups, which was of fundamental importance for assessing the effectiveness of the preparations used. In the junior school group, the children did not complain of caries. In the middle school group, 2 children complained of the presence of a chalky spot (in 3.4 ± 0.18% of cases).

In 6-7 years old schoolchildren in the group using Clinpro White Varnish®, 46 incisors (with smooth surfaces - 41.8%) and 64 first molars (58.2%) were affected. In this given group, after 6 months of using the preparation remineralization was observed just in one schoolchild (2.04%) on the first two molars, which made up 1.82%. The laser fluorescence index at the initial examination averaged 19.2 ± 2.5. The intensity of the colorimetric test before remineralizing therapy made up 5.6 ± 0.2 points on the incisors and 5.7 ± 0.3 - on the molars (Table 1). Among the schoolchildren of the middle age group, the initial indices of the colorimetric test corresponded to 5.7 ± 0.4 on the incisors and 6.2 ± 0.4 points - on the molars. After using the remineralizing agent Clinpro White Varnish® in the children with incomplete mineralization, we observed a noticeable significant increase ($p<0.01$) to 6.1 ± 0.3 and 6.2 ± 0.3 on incisors and molars, respectively. The indices of "Diagnodent (KaVo)" corresponded on average to enamel caries (Table 1).

Table 1: Changes in the colorimetry indices and those of DiagnodentKaVo device in the dynamics of Clinpro White Varnish® preventive treatment

Name of the study	Initial indices	Indices after 6 months	Indices after 12 months
primary group school children			
Colorimetry	7.8±0.84	3.5±2.01	2.3±2.3
Diagnodent indices	19.2±2.5	16.1±2.7	14.5±3.3
middle-aged group schoolchildren			
Colorimetry	7.2±1.36	2.8±1.5	1.4±1.2
Diagnodent indices	17.3±2.3	13.8±1.5	12.6±1.5

The study of the activity of initial caries in the clinic showed that in the group of primary schoolchildren prior to the remineralizing therapy with Tooth Mousse® the intensity of staining in the colorimetric test was 5.6 ± 0.3 points on incisors and 5.85 ± 0.5 points - on molars. Colorimetry indices in the group of middle schoolchildren using Tooth Mousse® before the startup of preventive measures corresponded to 5.9 ± 0.4 points both on incisors and molars.

When carrying out laser fluorometry, the values of the "Diagnodent" device during the initial examination varied within the range of 14-18 units in the group of junior schoolchildren, and from 14 to 24 - in the middle schoolchildren. The average values made up 16.2 ± 1.2 and 17.6 ± 1.9, respectively. This corresponds to the manufacturer's data of the "Diagnodent" device for enamel caries. The initial mean values of LFM before treatment in the study groups did not differ significantly ($p>0.05$, Table 2).

Table 2: Dynamics of indices of the demineralization foci during the preventive treatment with Tooth Mousse®.

Terms of observation		Age groups	
		6-7 years	12-13 years
Before treatment	Colorimetry	4.7±1.6	5.1±1.95
	Data of «DiagnodentKaVo»	16.2±1.2	17.6±1.9
6 months	Colorimetry	2.9±1.6	3.58±2.2
	Data of «DiagnodentKaVo»	12.3±1.45	14.8±1.6
12 months	Colorimetry	1.2±1.05	1.89±1.8
	Data of «DiagnodentKaVo»	11.2±1.9	13.4±1.3

IV. Discussion

In two 6-7 years old schoolchildren (4.1%) in the group using Clinpro White Varnish® after 12 months there was a progression of "Diagnodent" (KaVo) indices, which testifies about further development of the carious process despite the preventive treatment. Complete remineralization of the foci of demineralization after 12 months was observed in 12 schoolchildren (24.5%) on 26 teeth (23.6%). The laser fluorescence index after 12 months of usage of the preparation decreased 1.32 times (Table 1). In 22.4% of children of this age group a stabilization of the process was observed both on the smooth surfaces of the incisors and on the tubercles and fissures of the first molars.

The intensity of the colorimetric test after the preventive measures also tended to decrease 1.1 times ($p < 0.01$) (Table 1). Among the schoolchildren of the middle age group, the caries of fissure (fissures of the first two permanent molars) was observed in 1.71% in one child (1.7%). Stabilization of caries in 12 months after the preventive treatment occurred in only 5 people (8.6%). A decrease in the readings of the "Diagnodent" (KaVo) device as a sign of remineralization was diagnosed in 30 people (51.7%), and complete remineralization was observed in 23 schoolchildren (39.7%). At the same time, in the fissure area, complete remineralization of caries occurred in 14 people (24.1%), and on smooth surfaces of teeth - in 9 children (15.5%), while signs of mineralization prevailed on smooth surfaces of teeth in 27.6% schoolchildren of this age group (Table 1).

The initial values of the colorimetric test were above the critical level. As a result of the measures taken, a tendency to alkalization of dental plaque appeared, as evidenced by an increase in the indices of the colorimetric test 1.1 times.

In the group of junior schoolchildren after remineralizing therapy with Tooth Mousse® the susceptibility to the dye became 1.1 times lower on both incisors and molars ($p < 0.01$). Colorimetry indices in the group of middle schoolchildren using Tooth Mousse® after remineralizing therapy were 6.4 ± 0.3 and 6.25 ± 0.3 on incisors and molars, respectively.

The indices of laser fluorometry also had a pronounced significant tendency towards a decrease in indices to the normal range compared to the indices of this method before treatment in 15.8% of cases in the middle age group and 73.5% of cases in the junior schoolchildren group, which is reflected in Table 2.

In 12 months after the remineralization treatment provided there was a pronounced significant reduction in the number of complaints of stains availability in 15 cases (26.3%) in the Tooth Mousse® applying group.

V. Conclusion

The analysis of indices characterizing the resistance of tooth enamel to the action of acids showed that after the use of Clinpro White Varnish® and Tooth Mousse® preparations, the state of the surface layer of the enamel turned more steady to the effects of acids, and the enamel has become more resistant to cariogenic factors. In general, in all the observed children the intensity of the colorimetric test and the parameters of laser fluorometry after the preventive treatment procurement decreased, although the differences between the means applied were not significant ($p > 0.05$), which makes it possible to equally recommend these preparations for the widespread use.

Conflicts of Interest

The authors have declared that no conflict of interest exists.

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