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Research Article

Clinical study of the efficacy of si-containing polishing paste for the professional hygiene procedures in patients with periodontal disease

Olha Ripetska[1], Anatoliy Mahlovanyy[2], Ihor Hrynovets[3], Taras Chaban[4], Volodymyr Hrynovets[1], Anna Buchkovska[2], Stefan Harkov[5], Ihor Deneha[2], Oksana Pasko[1], Marta Renka[1]

1 *Department of Therapeutic Dentistry, Danylo Halytsky Lviv National Medical University, Pekarska 69, Lviv, 79010, Ukraine*
2 *Department of Physical training and sports medicine, Danylo Halytsky Lviv National Medical University, Pekarska 69, Lviv, 79010, Ukraine*
3 *Department of Technology of Medications and Biopharmaceutics, Danylo Halytsky Lviv National Medical University, Pekarska 69, Lviv, 79010, Ukraine*
4 *Department of General, Bioinorganic, Physical and Colloidal Chemistry, Danylo Halytsky Lviv National Medical University, Pekarska 69, Lviv, 79010, Ukraine*
5 *Department of Pharmacy, Medical College of Burgas University "Prof. Dr. Asen Zlatarov", St. Stambolov 69 Blv., Burgas, 8000, Bulgaria*

Corresponding author: Taras Chaban (chabantaras@ukr.net)

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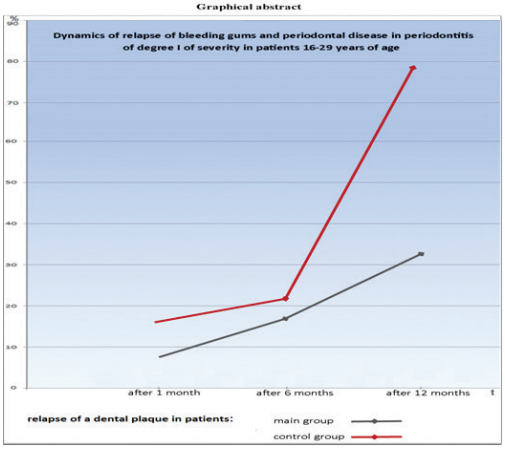
Abstract

Silicon-containing (Si-containing) polishing paste has been tested clinically in patients with chronic generalized periodontitis, I-st degree of severity. All patients have been examined for the presence of supra- and sub-gingival calculus and bleeding on probing on a six- month-testing time and within one year after conducting the professional hygienic procedures. It has been revealed that the proposed Si-containing polishing paste proved to be effective in the maintenance of gingival health in the lapse of time from 1 to 12 months after treatment. The majority of patients showed neither dental deposits nor bleeding on probing up in the interval from 1 to 12 months after dental scaling and polishing with Si-containing polishing paste.

Graphical abstract



Keywords

bleeding, dental calculus, dental plaque, dental scaling, generalized periodontitis, Si-containing polishing paste

Introduction

Providing medical care to a dental patient with a diagnosis of inflammatory periodontal disease, regardless of etiological factors, involves an instrumental procedure - the removal of dental calculus – scaling, as well as leveling and polishing the surface – root planning of the "cervix dentis" and "radix dentis" (AlJehani 2014, Drisko 1998). Frequently, the procedure of instrumental cleaning of dental enamel from the plaque or calculus – does not allow to clean the surface layer of modified cement – an amorphous structure, which is the medium for uncontrolled increase of gram-negative microflora. Due to such violation of microbiocenosis, the level of intoxication of periodontal tissues increases and the regeneration processes slow down (Mahlovanyy et al. 2015, Müller 2004). The procedure for leveling and grinding the enamel and planning of tooth root cement improves the treatment results, as pathologically altered layers are removed from the surface of the root of tooth, which contains the remains of the gram-negative microflora. The surface of the root of tooth is aligned and smoothed out after the manipulation procedures by dental scaling, which makes the plane of the dental root surface smooth up to the mirroring effect. Medical practice proves that after performing the instrumental procedure of dental scaling, the degree of smoothness of the root part of tooth is not as important criterion as the reduction of the critical number of gram-negative microflora, which can be achieved with the help of various methods: the treatment of the surface of the dental root with ultra sound, manual (mechanical) method with the use of appropriate tools, as well as using special grinding drills (Hrynovets et al. 2016, Drisko 1998).

The clinical evaluation of the feasibility and effectiveness of polishing with Si-containing polishing paste, which was used at the final stage of the dental scaling procedure, after the treatment of the root surface of tooth, and with the additional use of standard Gray curettes, in combination which the Si-containing polishing paste was performed in our investigations (Garranza et al. 2016, Sandhu et al. 1998).

Experimental part

Materials and methods

93 patients with chronic generalized periodontitis, I-st stage of severity (the depth of periodontal pockets up to 3,5 mm) were under study. All periodontal patients were previously examined for the presence of dental plaque and calculus under the gums and gingival bleeding during the probing. All patients were provided with professional hygiene procedure of root scaling, planning and polishing.

Patients were divided into two groups (the main and the control): The main group numbered 32 patients (16–29 years old) and 24 patients (30–55 years old). The control group included: 17 patients (16–29 years old) and 20 patients (30–55 years old). The procedure of removing the dental deposits from the root surfaces of the teeth (scaling) was performed for patients of both groups.

In patients from the main group, the cervical zone of the teeth was treated, there to, with Si-containing polishing paste.

Subsequently, for all patients, a basic treatment course was performed in accordance with the requirements of the Order of the Ministry of Health Care of Ukraine No 566 "On Approval of Medical Assistance Protocols" (Ripetska et al. 2000).

Results and discussion

The results of the study include indicators of clinical evaluation – the feasibility and effectiveness of the use of Si-containing polishing paste, which was additionally used to polish the root on the necks of teeth in patients with periodontitis of the I-st degree of severity (Ripetska et al. 2000, 2004).

Before the study, all patients were given a sanitary examination of the oral cavity with an analysis of the affected parts of the periodontal tissues, the presence of dental plaque in the form of a firm plaque under the gums and gingival bleeding during the probing.

Subsequently, for all patients, a principal course of treatment was performed in accordance with the requirements of the Order of the Ministry of Health of Ukraine No 566 "On Approval of Medical Assistance Protocols"(The Order of the Ministry of Health of Ukraine № 566 dated November 23, 2004).

In order to carry out a study aiming to improve the course of treatment, 56 patients were diagnosed with periodontitis, the I-st degree of severity (the depth of periodontal pockets up to 3,5 mm).

In view of age the patients were divided into two groups the main and the control. The main group included 32 patients (16–29 years old) and 24 patients (30–55 years old). The control group (groups for comparison) numbered: 17 patients (16–29 years old old) and 20 patients (30–55 years old old).

The procedure for removing the deposits from the root surface of the tooth was performed for patients of both groups using the standard Gray curettes. For patients from the main group, the cervical zone of the teeth was treated

Table 1. Dependence of the number of periodontal pockets in patients with a diagnosis – generalized periodontitis (I-st degree of gravity).

Groups of patients	Patients with generalized periodontitis by age / years old	Number of patients	Number of periodontal pockets			
			Detected during examination of patients	Surveyed areas of periodontal pockets with control		
				1 month	6 months	12 months
Main (Si-containing polishing paste usage)	16–29	32	599	596	593	585
	30–55	24	541	535	529	524
Control	16–29	17	296	293	287	277
	30–55	20	455	446	436	427

Table 2. The severity of bleeding when sensing in patients, aged 16–29 years old, with generalized periodontitis (I-st degree of gravity).

Number of periodontal pockets in patients		Observation of bleeding gums through time periods after:					
Groups ofpatients	Magnitude assessments	1 month		6 months		12months	
		no bleeding	Bleeding on probing	no bleeding	Bleeding on probing	no bleeding	Bleeding on probing
Main si-containing polishing paste usage)	absolute	447	149	430	163	129	456
	in, %	75.0 ± 1.8	25.0 ± 1.8	72.5 ± 1.8	27.5 ± 1.8	22.0 ± 1.7	78.0 ± 1.7
Control	absolute	142	151	153	134	55	222
	in, %	48.3 ± 2.9	51.7 ± 2.9	53,3±2,9	46.7 ± 2.9	20.0 ± 2.4	80.0 ± 2.4
t		7.8		5.6		0.7	
p		<0.01		<0.01		>0.1	

Table 3. Expression of bleeding when sensing in patients, aged 30–55 years old, with generalized periodontitis (I-st degree of gravity).

Number of periodontal pockets in patients		Observation of bleeding gums through time periods after:					
Groups ofpatients	Magnitude assessments	1 month		6 months		12months	
		no bleeding	Bleeding on probing	no bleeding	Bleeding on probing	no bleeding	Bleeding on probing
Main (with usage a si-containing polishing paste)	absolute	505	30	355	174	90	434
	in, %	94.4 ± 1.0	5.6 ± 1.0	67.2 ± 2.0	32.8 ± 2.0	17.2 ± 1.6	82.8 ± 1.6
Control	absolute	238	208	150	286	95	332
	in, %	53.3 ± 2.4	46.7 ± 2.4	34.4 ± 2.3	65.6 ± 2.3	22.2 ± 2.0	77.8 ± 2.0
p		<0.01		<0.01		<0.01	

there to with Si-containing polishing paste. The results are shown in the Table 1.

Control over the results obtained in the lapse of time after the procedure of dental scaling and polishing of the teeth:

After 1 month, in patients aged 16–29 years old, from the main group (Table 2) 75 % (± 1,8) areas of periodontal disease was revealed where there was no bleeding, while in the control group – 48,3 % (± 2,9) areas, which shows a significant difference of 26,7 % (t = 7,8; p <0,01) for positive effects on the condition of periodontal tissues.

The results of the studies confirm that in the main group of patients, if compared with the control group, the criteria for the treatment provided are significantly better (75 % to 48,3 %). The analysis of the obtained data results of a 6 month rehabilitation has reveal the following: in the main group of patients, 72,5%(± 1,8) cases with no bleeding, in the control group – 53,3% (± 2,9). The difference between the two groups was significant at this time (t = 5,6; p <0,01), which gives grounds to argue that the use of Si-containing polishing paste makes the gingival and roots condition of affected teeth within 6 months generally better.

After 12 months, the number of sites with periodontal absence of bleeding on probing dropped both in the main and control groups (22% (± 1,9) and 20% (± 2,3). In accordance with obtained data, there was practically no difference between the indices in patients of the main and control groups (t = 0,7; p <0,1). This indicates that after 12 months the impact of scaling and polishing on marginal periodontal condition is not manifested. The results are presented in the Table 2.

In patients with acute form of generalized periodontitis, I-st degree of severity, 30–55 years of age (Table 3) bleeding on probing was observed in 94,4% (± 1,0) cases in the main group and 53,3% (± 2,3) – in the control group. There is a significant difference between the two groups of patients (t = 16,4; p ± 0,01). Thus, the positive impact on the condition of oral cavity after procedures of professional hygiene was significant.

After 6 months, the positive impact of the procedure of dental scaling and polishing was obvious, saving significant difference observed in the obtained results. Areas of bleeding on probing in the main and control groups were 67,2% (± 2,0) and 34,4% (± 2,2) respectively. The polishing of the exposed tooth neck significantly prevents both, gum bleeding and exacerbation of inflammation for 6 months. The results are shown in Table 3.

Table 4. Frequency of detection of a dental plaque under the gums of the teeth during periodontitis (I-st degree of gravity) in patients aged 16–29 years old.

Number of periodontal pockets in patients		Observation of bleeding gums through time periods after:					
Groups ofpatients	Magnitude assessments	1 month		6 months		12months	
		no bleeding	Bleeding on probing	no bleeding	Bleeding on probing	no bleeding	Bleeding on probing
Main (with us age a si-containing polishing paste)	absolute	561	35	509	84	356	229
	in, %	94.2 ± 0.3	0.8 ± 0.3	85.8 ± 1.4	14.2 ± 1.4	60.8 ± 2.0	39.2 ± 2.0
Control	absolute	243	50	215	72	157	120
	in, %	83.0 ± 2.2	17.0 ± 2.2	75.0 ± 2.5	25.0 ± 2.5	56.7 ± 3.0	43.3 ± 3.0
t		5.1		3.7		1.17	
p		<0.01		<0.01		>0.1	

Table 5. Frequency of detection of a dental plaque under the gums of the teeth during periodontitis (I-st degree of gravity) in patients aged 30–55 years old.

Number of periodontal pockets in patients		Observation of bleeding gums through time periods after:					
Groups ofpatients	Magnitude assessments	1 month		6 months		12months	
		no bleeding	Bleeding on probing	no bleeding	Bleeding on probing	no bleeding	Bleeding on probing
Main (with usage a si-containing polishing paste)	absolute	491	44	450	79	376	148
	in, %	91.7 ± 1.2	8.3 ± 1.2	85.0 ± 1.5	15.0 ± 1.5	71.7 ± 1.9	28.3 ± 1.9
Control	absolute	367	79	296	140	285	142
	in, %	82.2 ± 1.8	17.8 ± 1.8	67.8 ± 2.2	32.2 ± 2.2	66.7 ± 2.2	33.3 ± 2.2
t		4.3		6.4		1.17	
p		<0.01		<0.01		>0.1	

The younger patients (16–29 years old) in the main group, with periodontitis, I-st degree of severity and in the older group (30–55 years old), experienced low rates of gum bleeding on probing of periodontal pockets for 6 months, if compared with control group, showed a positive effect of polishing with Si-containing polishing paste on the gums. Within 12 months after dental scaling and polishing procedures, the percentage of periodontal pockets with severe bleeding in both age groups increases, but bleeding in the younger age category was more pronounced. This tendency was maintained in a month and in 6 months. Obviously, this happens due to the predominantly acute course of the process in patients 16–29 years of age.

The effect of polishing was also studied on the exposed root cement and formation of sub-gingival calculus in patients with periodontitis, Ist stage of severity aged 16–29 years old and 30–35 years old. The obtained data are shown in the Tables 4, 5 and on Figs 1, 2.

The results of the study of the preventive effect of polishing on the exposed root cement of teeth on the formation of dental calculus, in patients with periodontitis, I-st stage of severity, 30–55 years old are shown n in Table 5.

One month after calculus removal and subsequent polishing of the exposed root cement in the main and control groups of patients, the absence of dental calculus was 91,7% (± 1,2) and 82,2% (± 1,8) respectively, and this difference was significant (t = 4,3; p ± 0,01).

After 6 months, the calculus free zones in the main group of patients reached 85,0% (± 1,5), and in the control group – 67,8% (± 2,2), which is also characterized by a significant difference (t = 4,3; p ± 0,01). On the basis of the obtained results, we can conclude as to the efficacy of scaling and polishing with Si-containing polishing paste in preventing the formation of a dental calculus for at least 6 months.

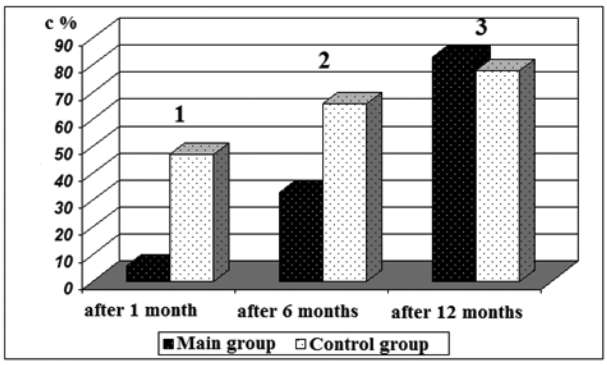


Figure 1. Dynamics of gingival bleeding in patients 30–55 years old with periodontitis (I-stage of heaviness) in the main and control groups. *On the horizontal axis – Repeated r periods of time: 1) -1 month; 2)-6 months; and 3) -12 months. *On the vertical axis: Quantity of periodontal areas with bleeding on probing (%).

After 12 months, the percent age of sites with dental calculi in the main group of patients was 71,7% (± 1,9), and in the control group – 66,7% (± 2,2), The difference between the two indices was insignificant (t = 1,7; p ± 0,05).

Comparison of the results regarding recurrent periodontal disease in periodontitis, I-st degree of severity in patients of two age groups (Tables 4, 5) revealed the similarity of data throughout all periods of observation, the same as the effectiveness of the root cement polishing in preventing the formation of dental deposits for at least 6 months and its absence after 12 months.

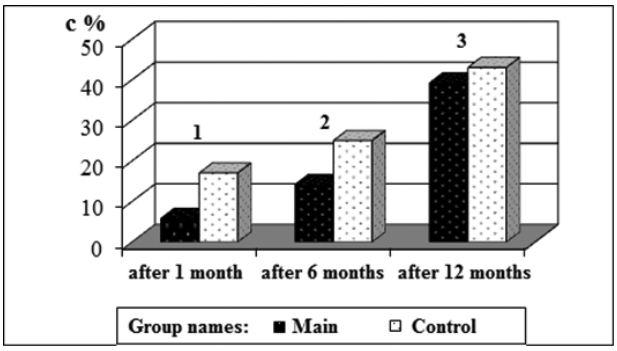


Figure 2. Dynamics of recurrence of subclinical calculus in patients 16–29 years with periodontitis (I stage of heaviness). *On the horizontalaxis – Repeated examinations in periods of time: 1) - 1 month; 2) - 6 months; and 3) - 12 months. *On the vertical axis: Quantity of periodontal areas with bleeding on probing (%).

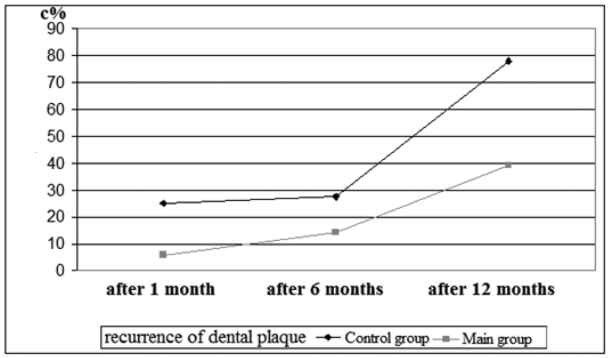


Figure 3. Dynamics of recurrence of gum bleeding and periodontal inflammation in patients 16–29 years with periodontitis (I stage of heaviness). *On the horizontal axis – Repeated examination in periods of time: 1) -1 month; 2)-6 months; and 3) -12 months. *On the vertical axis: Quantity of periodontal areas with bleeding on probing (%).

Further comparison of the data of the simultaneous presence of gingival bleeding and dental calculus after scaling with the subsequent polishing of the root surface in patients of both age categories with periodontitis I degree of severity showed that in a month period the percentage of calculus free sites and no bleeding is lower than percentage of calculus free sites. Such a pattern can be traced in all patients, but in the main group, these indicators are much better. For example, in the age group of 16–29 years, there were 94,2% of sites without dental calculi and 75% of sites with bleeding. In the control group, 83% and 48,3% of the sites, respectively. After 6 months, the majority of patients in the main group were deprived of calculus 85,8%, and bleeding was observed in 72,5% of the sites, while in the control group -75% and 53,3% of the sites, respectively. After 12 months in both groups, with a fairly significant percentage of calculus-free sites, there is a low percentage of sites without bleeding. The results are presented in the Fig. 3.

On the basis of comparative analysis of the data of bleeding and the apparent calculus in the examined patients both, of control and main groups, one can conclude of positive effect due to applied abrasive and antiseptic paste.

Accordingly, having analyzed the indicators of bleeding and the presence of sub-gingival calculus in patients with mild periodontitis starting from the age of 16 to 29 years, we can draw a conclusion that the number of sites with no bleeding is not the same as the number of calculus- free sites. In all analyzed cases, the percentage of sites without calculus was higher than the percentage of sites with no bleeding. This pattern is traced in a month, six months and a year periods after the procedure of dental scaling and polishing, in both, the main and control groups.

Conclusions

1. The obtained data allow to state that the condition of gums depends not only on the presence of the sub-gingival deposits, since there is a certain percentage of dental-free areas with signs of bleeding. In the main group, however, in comparison with the control group, there were significantly higher indicators, both in the number of areas without bleeding, and in calculus-free areas.
2. The results also confirm the effectiveness of polishing of the exposed root cement for improving the outcome of treatment in patients with I stage of periodontitis. However, it should be noted that the processing of cement even with polishing is not always effective as to the elimination of bleeding symptoms. Obviously, polishing is more effective in preventing the formation of new dental deposits.
3. From the analysis of the obtained data, it can be concluded that polishing has a positive effect on gingival condition, and this effect is noticeable within 6 months after polishing. However, polishing has more continuos effect on the prevention of dental deposits than on preventing gingival bleeding.

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