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Clinical and microbiology studies of the oral cavity under periodontal inflammation and its treatment with new hygienic means

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Violation of microbiocenosis of the oral cavity leads to the development of inflammatory periodontal diseases that presents medical and social problem.

Purpose of research: clinical and microbiological ground for local application of developed apigel for oral cavity care in the complex treatment of chronic generalized periodontitis.

Material and methods: 42 patients with chronic generalized catarrhal gingivitis and chronic generalized periodontitis of 1st degree and 14 healthy people were conducted clinical studies. All patients were divided into 3 groups: 1 – the control group (healthy patients), 2 – the basic group, patients with inflammatory diseases of periodontium having complex therapy with a local treatment with the new apigel, 3 – the comparison group, patients having a traditional therapy with local use of the dental gel with chamomile. Efficiency of treatment was estimated with clinical, laboratory, microbiological methods of examination.

Results: Local application of the new apigel based on propolis (bee glue) in the complex treatment of patients with chronic generalized catarrhal gingivitis and ChGP of the 1st degree favourably affects the clinical symptoms of inflammation in the oral mucous membrane and periodontium, that was manifested in the decline of hygienic and periodontal index figures. As compared with patients who had traditional anti-inflammation therapy with the local use to the dental gel with chamomile, the recovery terms in patients treated with local application of new apigel reduced by 2–8 days. Microbiological studies on background of changed normal microflora in the oral fluid and contents of periodontal pockets in patients with inflammatory diseases of oral mucous membrane and periodontium revealed increase of anaerobic bacteroids, Fusiformis and Prevotellas. In case of local treatment by the “Apisan” gel on the 10-14-th day after the beginning of medical treatment the considerable decline of pathogenic microflora in researched biotopes of patients with inflammatory diseases of the oral cavity, that testifies to the antibacterial action of preparation.

Conclusions: the local application of the “Apisan” gel in the complex therapy of inflammatory diseases of oral mucous membrane and periodontium promotes efficiency of medical treatment and reduces terms of renewal of structural-functional integrity of oral mucosa, improves the hygienic state of oral cavity, having bacteriostatic action, lowering the number of pathogenic microorganisms in the oral cavity, removing violations of microbiocenosis of the sulcus.

Keywords: inflammation, dental status, microbiocenosis of oral cavity, apigel, oral fluid.

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Introduction

Inflammatory periodontal diseases prevail among dental diseases, treatment and prevention of which represent a medical and social problem. In many epidemiological, biochemical and microbiological studies, the leading etiological and pathogenetic significance of dental plaque

microorganisms in the onset of inflammatory and dystrophic-inflammatory periodontal diseases was reported in clinical and experimental studies [1, 2].

In practical dentistry, antibacterial agents are used, to which many strains of microorganisms have a resistance; dysbacteriosis of the oral cavity develops, which significantly reduces the effectiveness of treatment. So, the

development of new therapeutic and prophylactic agents for topical application on the basis of biologically active substances of natural origin with antimicrobial, anti-inflammatory, analgesic properties and the study of the possibility of their use in the treatment of inflammatory periodontal diseases is a relevant area of study.

The Purpose of this study is investigating clinical and microbiological substantiation of the local application of the developed oral care apigel in the complex treatment of periodontal inflammatory diseases.

Materials and methods of research

42 patients without somatic pathology aged 30-45 years were examined. During the observation, chronic generalized catarrhal gingivitis (ChGCG) was diagnosed in 22 patients, and chronic generalized periodontitis of the first degree (ChGP) in 20 patients. The control group included 14 healthy people. All the studies were compared in 3 groups: 1 - control group, which included healthy people with a treated oral cavity without inflammatory processes, 2 - the main one, which included 22 patients: 12 patients with ChGCG and 10 patients with ChGP treated along with generally accepted recommendations by additional usage of apigel on the basis of apyproducts and biologically active substances with anti-inflammatory, antioxidant, antimicrobial effects [3], 3 - the comparison group, which consisted of 10 patients with ChGCG and 10 patients with ChGP receiving traditional therapy, including the local application of the dental gel with an extract of chamomile flowers.

The course of treatment for patients was 7-14 days. The gel Apisan was applied topically in the form of applications on the gingiva or on quilted turundas directly in the periodontal pockets within 10-15 minutes, for 7-10 days, daily (Permission for application according to prescription according to "Conclusion of the state sanitary and epidemiological expertise" Derzhprodspozhivsluzhby of Ukraine No. 602-123-20-1/28/86 dated September 11, 2017). The effectiveness of therapeutic methods was assessed according to clinical, laboratory, and microbiological study methods.

The dental examination included the collection of anamnesis, visual and instrumental examination of the oral cavity. To assess the periodontal status, the gums bleeding index was used by Muhlemann - SBI [4], the

papillary-marginal alveolar index of PMA (Parma), the periodontal index (Pi) according to Russel [5]. The hygienic state of the oral cavity was determined from the simplified hygiene index - OHI-S. Clinical studies were performed before treatment at 7, 14 days after initiation of treatment and 6 months after treatment. Microbiological studies were performed before and by the 14th day after treatment [6, 7].

Statistical analysis was conducted using the Microsoft program. Quantitative indicators are presented as the mean and standard error of the mean ($M \pm m$). To compare the average indicators in the groups, the Student's t-test was used. The difference between group averages was considered statistically significant at $p \leq 0,05$.

Results and Discussion

Data of clinical examinations of patients with inflammatory periodontal diseases before treatment showed deterioration of the hygienic state of the oral cavity, an increase in the index indicators of the periodontal tissues condition. All patients had bleeding gums at the probe test, inflammatory process took place in the periodontium, proved by changes in the periodontal indices. After complex treatment, including local anti-inflammatory therapy, there were positive changes in clinical symptoms, more pronounced in the main group of patients. Patients noted gums condition improvement, complaints of bleeding during tooth cleaning disappeared. In patients with ChGCG in the main group after topical application of apigel, the indices of clinical indices OHI-S, PMA, SBI decreased by 48%, 64% and 60% ($p < 0,05$), correspondingly, reaching the values of healthy periodontium. Six months after treatment, the indices of clinical indices remained at the same level (Table 1). During the examination of the patients of the comparison group with ChGCG after the finishing the course of treatment, the indices of OHI-S, PMA, SBI decreased on average by 43,4%, 51,3% and 48,4% ($p < 0,05$) correspondingly, to the baseline values, but did not reach the values in the main group. Six months after completion of treatment, patients of this group experienced periodontal deterioration: PMA indices and bleeding increased by 18,4% and 53,8% ($p < 0,05$) as compared to the data after treatment. exacerbation of inflammation in the periodontium were 6% of cases.

So, in the patients of the main group, both after treatment and in the long-term follow-up period, a stable positive dynamics of the clinical state is fixed in

comparison with the patients of the comparison group who had traditional therapy.

Table 1. Changes in the indices of clinical indices in patients with chronic general catarrhal gingivitis under the influence of local treatment (M ± m)

Parameters	Control Group	Main group			Comparison group		
		Before treatment	After treatment		Before treatment	After treatment	
			By the end of treatm.	After 6 months		By the end of treatm.	After 6 months
OHI-S relative units	0,86±0,03	1,02±0,02	0,53±0,03	0,55±0,04	1,06±0,04	0,60±0,03	0,68±0,04
P		<0,05	<0,05	<0,05	<0,05	<0,05	<0,05
P ₁					>0,05	>0,05	
PMA, %	6,80±0,80	16,87±0,50	6,10±0,28	6,80±0,30	17,75±0,42	8,65±0,40	10,24±0,40
P		0	>0,05	>0,05	<0,05	>0,05	<0,05
P ₁		<0,05			>0,05	<0,05	<0,05
SBI, relative units	0,80±0,03	1,44±0,11	0,58±0,06	0,62±0,06	1,51±0,20	0,78±0,08	1,20±0,03
P		<0,05	>0,05	<0,05	<0,05	>0,05	<0,05
P ₁					>0,05	>0,05	<0,05
Pi, relative units	0,78±0,06	1,66±0,10	0,90±0,08	1,00±0,07	1,73±0,10	1,30±0,10	1,45±0,12
P		<0,05	>0,05	<0,05	<0,05	<0,05	<0,05
P ₁					>0,05	<0,05	<0,05

Note. P – is the indicator of reliability of differences with a control group; P₁ – indicator of the reliability of differences between the main group and the comparison group

In patients of the main group with first-degree ChGP after complex treatment using local therapy with a new method, a significant reduction in the signs of inflammation in the periodontal tissues was observed during the clinical examination (Table 2).

After the treatment, clinical symptoms of inflammation completely disappeared. The PMA index decreased by an average 49%, the SBI index — by 66,4%, the OHI-S index — by 63,6%: (p<0,05). Six months after treatment, the indices of periodontal indices remained close to those after treatment.

In the comparison group with ChGP of the first degree after the course of treatment, there were no complaints and the clinical state of the periodontal disease was normal : the indices of PMA, SBI and OHI-S decreased by an average of 38,4%, 39,4% and 59,6% (p<0,05) as compared to the initial values, but did not reach the indicators in the main group. After 6 months in the comparison group, the indices of OHI-S increased by 86,4 as compared to their level after

treatment (p<0,05).

The duration of treatment of patients with ChGP of the first degree when carrying out local applications of Apisan gel in complex therapy was lower than in patients having traditional therapy, on average 8-10 days.

Thus, with ChCGG and ChGP of the first degree, complex treatment with local apigel application makes it possible to localize clinical manifestations of inflammation in the majority of patients, which is accompanied by normalization of the periodontal tissue condition and is proved by clinical indices accompanying in the course of observation.

During microbiological studies of the contents of the sulcus in more than half of the healthy patients examined, microorganisms of the genus *Peptostreptococcus*, *Streptococcus*, *Lactobacillus*, *Bacteroides* *Peptococcus* of the *Enterobacteriaceae* family in 28,6%, less than 20% of dentists, valinolles, *Candida* fungi and very rare (6,8%) bacilli, porphyromonads and actinomycetes. The number of

microorganisms in the sulcus was small and was from $3,86 \pm 0,40$ lg CFU/g in peptostreptococci to $(1,45 \pm 0,20)$ lg CFU/g in yeast-like *Candida* fungi. Microorganisms were allocated in associations on average up to 6 species of bacteria. The obtained qualitative and quantitative ratio of microorganisms can be regarded as normobiocenosis.

Patients with ChGP were allocated a large number of gram-positive, gram-negative microflora, criminous forms of bacteria in the periodontal pockets smears. There were gram-positive *Staphylococci*, *Streptococci*, *Rods*, *Fusobacteria*, *Lactobacilli*, *Candida* fungi and others in the periodontal pocket.

Patients with ChGP of the first degree in bacteriological examination of the periodontal pocket, microorganisms of

the genus *Streptococcus* in half of cases - *Micrococcus*, *Peptococcus*, *Lactobacillus*, *Porphiromonas*, 25% - *Actinomyces*, *Clostridium*, and 15% - *Bacteroides*, *Bacillus*, *Stomatococcus*, *Candida*, *Veillonella*, 8% *Neisseria* and bacteria of the *Enterobacteriae* family. The most numerous were bacteria of the genus *Peptostreptococcus* (6.8 lg CFU/g), *Streptococcus* (6,6 lg CFU/g), *Porphiromonas* (6,7 lg CFU/g), *Bacteroides* (6,2 lg CFU/g), *Veillonella*, *Peptococcus*, *Clostridium* (6,0 lg CFU/g), *Staphylococcus* (5,7 lg CFU/g), *Neisseria* (5,2 lg CFU/g), *Actinomyces* (5,1 lg CFU/g). Frequency of allocation of resident representatives of *Lactobacillus* *Corynebacterium* on the contrary is lower.

Table 2. Dynamics of clinical indices of the oral cavity in patients with ChGP on the background of local therapy (M ± m)

Parameters	Control Group	Main group			Comparison group		
		Before treatment	After treatment		Before treatment	After treatment	
			By the end of treatment	After 6 months		By the end of treatment	After 6 months
OHI-S, relative units P	0,86±0,03	1,48±0,05 <0,05	0,54±0,06 <0,05	0,68±0,07 >0,05	1,46±0,11 <0,05	0,59±0,05 <0,05 >0,05	1,10±0,08 >0,05 <0,05
PMA,% P	6,80±0,80	33,68±2,50 <0,05	17,2±1,34 <0,05	18,8±1,14 <0,05	37,0±3,40 <0,05 >0,05	22,8±8,0 <0,05 >0,05	23,4±3,06 <0,05 >0,05
SBI, relative units P	0,80±0,03	2,02±0,24 <0,05	0,68±0,06 >0,05	0,88±0,07 >0,05	1,98±0,06 <0,05 >0,05	1,20±0,06 <0,05 <0,05	1,29±0,03 <0,05 <0,05
Pi, relative units P	0,78±0,06	2,00±0,10 <0,05	0,58±0,10 >0,05	0,78±0,10 >0,05	2,40±0,10 <0,05 <0,05	0,90±0,10 >0,05 <0,05	1,18±0,10 <0,05 <0,05

Note. P - the indicator of reliability of differences with a control group; P₁ - the indicator of the reliability of differences between the main group and the comparison group

In the local application of apigel in patients with ChGP 2 weeks later, *Bacteroides*, *Peptostreptococcus* were not inoculated, the amount of *Fusobacterium* sowing decreased five-fold *Prevotella*, entering the complex of anaerobic pathogens, the number of *Neisseria* decreased twice. At the same time, lactobacilli were allocated in 42% of patients with ChGP. After 6 months, this picture of the microbiocenosis remained.

In patients with conventional therapy after 14 days of

treatment, the amount of *Fusobacterium*, *Peptostreptococcus* and *Prevotella* in periodontal pockets decreased twice, *Bacteroides* and *Lactobacillus*, the main resident bacteria of the oral cavity, increased by an average by 7,6%.

The above said allows us to conclude that the local application of the new apigel "Apisan" in patients with ChGCG and ChGP of the first degree in complex therapy contributed to a more pronounced clinical effect as

compared to traditional treatment. This manifested itself in a more rapid decrease in index values of OHI-S, PMA, SBI, Pi of periodontal tissue condition and normalization of oral microbiocenosis, which allowed to improve the quality of life of patients.

Conclusions

Local application of the new apigel in the complex therapy of inflammatory periodontal diseases increases the effectiveness of treatment and shortens the terms of recovery. The results of clinical studies indicate a decrease in periodontal, hygienic indices and normalization of the microflora of the oral cavity after a course of local treatment and at long-time period.

Under the influence of the proposed method of topical application of apigel with inflammatory periodontal diseases, optimal conditions are created for eliminating microbiocenosis disorders of the sulcus and restoring the structural and functional state of periodontium.

Conflict of Interests

None

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