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APPLICATION OF A NEW APIGEL WITH ULTRAPHONOPHORESIS FOR PREVENTION AND TREATMENT OF COMPLICATIONS IN DENTAL IMPLANTATION

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Introduction

The widespread use of methods for restoring dentitions using dental implants currently allows effective restoring the chewing and aesthetic ability of patients with missing teeth. Dental implants, being a reliable support of the orthopedic design, allow patients to comfortably perform a chewing function, increasing the patient's quality of life. However, the implementation of osteoplastic operations on the alveolar bone is associated with a significant risk of infectious and inflammatory complications. The use of foreign bodies such as dental implants, along with contamination of the bone wound with the microbial flora of the oral cavity, creates favorable conditions for the development of infectious and inflammatory complications [1].

In this regard, the development of methods for the prevention of possible complications in implantology is an extremely important and urgent task. Despite the success of dental implantation, there is still a fairly high percentage of postoperative complications (up to 23%) associated with trauma, wound damage and aseptic inflammation (periimplantitis), leading to implant rejection, and therefore their prevention is an important medical and social task.

The use of modern anti-inflammatory drugs does not lead to a significant reduction in the occurrence of periimplantitis, due to their inhibitory effect both on the local immune defense of the oral cavity and on the development of immune imbalance in the body as a whole [2]. Therefore it is important to study the possibility of acceleration of regenerative processes and prevention of inflammatory complications following intraosseous dental implantation using ultraphonophoresis with mucosal gel Apisan, which includes propolis known to exhibit anti-inflammatory and immunostimulatory effects.

A comparative analysis of clinical, biochemical, immunological changes after dental implantation, as well as the development and testing of new scientifically based treatment and prophylactic measures using physiotherapy determines the relevance of this study.

The aim of the study is to improve the treatment and prevention of complications during intraosseous dental implantation through the use of ultraphonophoresis with mucosal gel Apisan.

Material and Research Methods

The clinical and laboratory study of 72 patients with signs of periimplant mucositis and dental periimplantitis — I–II class were conducted. All patients were devided into two groups: basic (50) and control group (22), and distributed according to the time term of implantation 1–5 years after the implantation (18 patients) and 6–10 years after implantation (54 patients). The basic group of patients was divided into two subgroups depending on the treatment method. The first subgroup (24 patients) was applied topical treatment with a developed dental gel Apisan on the basis of biologically active substances of bee products (propolis, cap wax) and adaptogen of vegetable nature — cedar oil, etc. [3], and patients of the second subgroup (26 person) were applied topically a combination of Apisan applications with ultraphonophoresis.

All patients underwent dental plaque removal and, if necessary, oral sanitation was performed. Oral hygiene was performed using

toothpaste "Parodontacs classic" and mouthrinse "Lizomukoid", developed by the Department of Biotechnology SI "Institute of Dental and Oral Surgery AMS". The patients of the comparison group were rinsed with the Asepta tooth elixir [4].

Examinations and sampling of research materials were performed before treatment, after 1, 3, 6 months, and after a year.

The studied groups were selected uniformly by age (31–50 years), the nature of the previous surgical intervention, the number of implants installed and the number of developed periimplantitis phenomena.

To determine the thickness of plaque, the Silness Loe hygiene index was used [5], and the PMA index [6] and gum bleeding according to Muhlemann [7] were chosen to assess the degree of inflammatory changes in periodontal disease.

Biochemical studies of the oral fluid, which was collected by fasting patients included determination of the level of malonic dialdehyde (MDA) [8], catalase activity [9] and elastase [10] antioxidant-prooxidant index [11]. Local immunity was judged by the content of lysozyme [12] and the level of secretory immunoglobulin A (SIgA) [13] in the oral fluid. The qualitative and quantitative composition of microflora that caused periimplantitis was determined in microbiological studies. Studies of bone tissue were performed by ultrasonic osteometry [14], blood flow in the oral mucosa was determined using ultrasound dopplerography [15].

The materials obtained as a result of research were subjected to variation-statistic processing using Student's criterion using the Statistica program (version 6.1).

Research Results and Discussion

Analysis of clinical symptoms in patients with periimplantitis showed that during the first years after implant placement, soft tissue damage symptoms predominate, manifested by pain, bleeding, and halitosis.

Application of gel "Apisan", both independently and in combination with ultraphonophoresis significantly degrades the hygienic condition of the oral cavity Silness–Loe in patients with dental periimplantitis in all groups, regardless of the time term of implantation. The plaque thickness dicreased twice halved after 3 months and persisted throughout the observation.

Periodont protective and anti-inflammatory effect of "Apisan" on periodontal tissue was revealed, which was proved by the values of the bleeding index, which dicreased in first subgroup patients of the basic group more than 1.5 times in 3 months, and almost 2 times at the 2nd subgroup, persisting until the end of the observation.

The use of Apisan with ultraphonophoresis in the treatment of dental periimplantitis, which occurred 1–10 years after implantation, allowed to reduce not only the bleeding of periimplant tissues, but also to reduce their edema and hyperemia, that is, signs of inflammation, as evidenced by a decrease in the index PMA in the first subgroup 1.5–2 times and in the second 2.4–2.6 times within the whole observation period.

The study of the microbiocenosis of gingival fluid and tissues in the periimplant zones in patients with dental periimplantitis in the presence of fixed orthopedic structures in the oral cavity revealed a high microbial density of bacterial communities consisting of opportunistic microflora, which under certain conditions turns into pathogenic, which can give rapid development of inflammatory processes in the periimplant tissues.

Microbiological monitoring of the state of the oral biocenosis after Apisan treatment with ultraphonophoresis revealed the most pronounced decrease in the number of periodontopathogenic microorganisms and an increase in lactobacilli.

In the oral fluid of patients with dental periimplantitis, an intensification of lipid peroxidation was detected, which was recorded by increasing the level of the inflammatory marker MDA. The antioxidant system in the oral cavity, which was evaluated by the level of catalase activity, is inhibited. Under the influence of treatment, the indicators of inflammation in the oral fluid of patients (MDA and elastase) decreased to greater level in the main group regardless of the implantation period during the entire observation period, which indicated a pronounced anti-inflammatory effect of the proposed treatment methods. In this case, a stimulating effect on the activity of catalase was detected, which was determined more than 1.5 times in

Table 1

Dynamics of state of local innunity in patients after dental implantation under the influence of conducted rehabilitation, M±m

Data	Before operation	After operation			
		Basic group, n=21		Control group, n=20	
		3rd day	7th day	3rd day	7th day
SIgA, g/l	0.170±0.012	0.15±0.01 p>0.05	0.230±0.011 p<0.05	0.12±0.01 p<0.05 p_1>0.05	0.19±0.01 p>0.05 p_1<0.05
Lysocyme, mcg/ml	0.28±0.05	0.18±0.03 p<0.05	0.26±0.04 p>0.05	0.14±0.05 p<0.05 p_1>0.05	0.19±0.04 p<0.05 p_1<0.05

Notes. p — probability of difference before initial values; p_1 — probability of difference between groups.

a month and 2 times higher than the initial data at the end of the observation.

The antioxidant-prooxidant index characterizing the protective forces of the tissues of the oral cavity, which is determined before treatment at the lowest rates, after the treatment has significantly increased in the main group as compared to the initial data and the data of the comparison group.

Analysis of local immunity factors constituents strongly indicates that the developed method of treatment using gel Apisan with ultraphonophoresis against application of a rinser Asepta significantly increases lysozyme activity and the level of SIgA in the oral fluid of patients of the main group, which may be due to increased secretion of oral fluid and a decrease in the amount of microflora in the oral cavity (Table 1).

According to the data of ultrasound Doppler flowmetry for evaluating the microvasculature, it was found that patients with dental periimplantitis had increased linear blood flow velocities in periodontal tissues at the beginning of treatment, which was a compensatory reaction of tissue blood flow in response to inflammation. After application of ultraphonophoresis and Apisan dental gel, after 6 months, normalization of the studied parameters was observed in all patients of the main group (Table 2).

Table 2

Changes of blood supply in periimplant tissues after the data of ultrasonic dopplerography in patients after the operation of implantation during the conducting the first treatment procedure, M±m

Data	Normal data in healthy people (by V. A. Kozlov, 2000)	Control group, n=20	Basic group, n=21
Volume systolic speed, mm/min	0.012–0.015	0.018±0.001 p<0.05	0.019±0.001 p<0.05 p_1<0.05
Maxinun line systolic speed, mm/min	2.000–2.500	3.651±0.248 p<0.05	4.278±0.262 p<0.05 p_1<0.05
Medium speed, mm/min	2.500–3.000	3.679±0.189 p<0.05	3.263±0.168 p<0.05 p_1<0.05
Final diastolic speed after the curve of maximal speed, mm/min	2.000–2.500	3.364±0.148 p<0.05	3.895±0.174 p<0.05 p_1<0.05
Pulsation index (PI)	1.50–2.00	1.98±0.10 p>0.05	1.90±0.09 p>0.05 p_1>0.05
Pourcelt index (RI)	0.70–1.00	0.97±0.05 p>0.05	0.92±0.04 p>0.05 p_1>0.05

Notes. p — probability according to "norm" group; p_1 — probability between examined groups.

A typical feature of bone tissue lesions in the case of dental periimplantitis and those are radiolucency of bone tissue around the implant. Damage to bone tissue is already observed when installing an intraosseous implant, the elimination of which in the process of natural regeneration is a rather long process. The development of the inflammatory process around the implant exacerbates horizontal and vertical resorption of bone tissue, which may cause implant failure [16].

Study of the state of the bone tissue structure of patients diagnosed with dental periimplantitis using ultrasonic echoosteometry revealed a decrease in the ultrasound propagation rate in the damaged area (periimplant region) by an average 30% compared to normal values. Application of mucosal gel Apisan alone and in combination with ultraphonophoresis in combined treatment of patients with periimplantitis helped to strengthen and accelerate osteoregeneration, as evidenced by an increase in the speed of the ultrasonic wave propagation to normal level by the end of the treatment course.

Thus, the obtained clinical data and laboratory studies have allowed us to believe that the developed method for the combined use of Apisan dental gel based on propolis with ultraphonophoresis in complex treatment for dental implantation is pathogenetically substantiated and highly effective in the treatment of class I and II periimplantitis, which favorably distinguishes it from basic therapy methods. This method has a pronounced osteoplastic effect, contributes to a more rapid restoration of the bone structure, and, therefore, elimination of the mobility of the implant, which improves the quality and long-term prognosis of dental implantation.

Conclusions

1. Deterioration of oral hygiene, increased microbial contamination with proteolytic and acidogenic properties, lead to a decrease in bone density in the periimplant zone, which is the main reason for the development of periimplantitis. The analysis of the nature of complications after dental implantation indicates a direct dependence of the occurrence of complications in periimplant tissues on the time after implantation surgery.

2. Microbiological research in implant gingival region in patients with dental periimplantitis re-

vealed microbiocenosis that creates the conditions for the rapid development of inflammatory and destructive processes in priimplant tissues, and the use of gel Apisan with ultraphonophoresis in 1.6–2 times reduces the number of pathogenic microorganisms.

3. Biochemical studies of the oral fluid in patients with dental periimplantitis revealed a decrease in the markers of inflammation of MDA 1.6 times and elastase 1.3 times, an increase in the API index 1.5 times, catalase activity 1.7 times, and lysozyme and SIgA 1.8 times and 1.5 times respectively, after application of ultraphonophoresis and gel Apisan.

4. The use of dental apigel with ultraphonophoresis in patients with dental periimplantitis leads to normalization of the arteriolar-venular network of periodontal tissues, as well as to the strengthening and acceleration of osteoregeneration processes.

Ключові слова: дентальний періімплантит, запалення, мікробіоценоз, остеорегенерація, озонотерапія, дентальний гель.

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ЗАСТОСУВАННЯ НОВОГО АПІГЕЛЮ З УЛЬТРАФОНОФОРЕЗОМ ДЛЯ ПРОФІЛАКТИКИ ТА ЛІКУВАННЯ УСКЛАДНЕНЬ ПРИ ДЕНТАЛЬНІЙ ІМПЛАНТАЦІЇ

Стаття містить клініко-лабораторні дослідження пацієнтів з дентальним періімплантитом I і II класу, яким застосовували місцеве лікування на вогнище ускладнень у вигляді аплікацій нового апігелю та ультрафонофорезу. Показана ефективність запропонованого способу лікування та профілактики періімплантитів за зниженням маркерів запалення мікробного обсіменіння, вільнорадикального окиснення ліпідів, а також стимуляцією секреції лізоциму, секреторного імуноглобуліну й активності антиоксидантної системи, позитивним впливом на остеорегенерацію. Показано перевагу запропонованого способу лікування у порівнянні з традиційною терапією, що проявлялося у прискоренні репаративно-регенеративних процесів у кістковій тканині та швидкому купіруванні клінічних ознак локального запалення.

Ключові слова: дентальний періімплантит, запалення, мікробіоценоз, остеорегенерація, озонотерапія, дентальний гель.

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APPLICATION OF A NEW APIGEL WITH ULTRAPHONOPHORESIS FOR PREVENTION AND TREATMENT OF COMPLICATIONS IN DENTAL IMPLANTATION

The article contains the clinical and laboratory examinations of patients suffering from dental periimplantitis I and II class. The patients were applied new apigel on the injured foci of complications and ultraphonophoresis. There was demonstrated the efficiency of the offered method of treatment and prophylaxis of periimplantitis. There were revealed decline in inflammation markers, bacterial content, free-radical lipid peroxidation, as well as stimulating secretion of lysozyme, secretory immunoglobulin and activity of the antioxidant system, positive influencing on osteoregeneration. There was shown an advantage of the offered method of treatment as compared with traditional therapy, which manifested itself in acceleration of recovery processes in the bone tissue, improvement of osteoregeneration and rapid reduction of clinical signs of local inflammation.

Key words: dental periimplantitis, inflammation, microbiocenosis, osteoregeneration, ozone therapy, dental gel.