ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ

JOURNAL OF ORAL MEDICINE AND CRANIOFACIAL RESEARCH

СПЕЦИАЛЬНЫЙ ВЫПУСК

2022

SPECIAL ISSUE

МИНИСТЕРСТВО
ЗДРАВООХРАНЕНИЯ
РЕСПУБЛИКИ УЗБЕКИСТАН

САМАРКАНДСКИЙ
ГОСУДАРСТВЕННЫЙ
МЕДИЦИНСКИЙ ИНСТИТУТ

ИННОВАЦИОННЫЙ ПОДХОД И ПЕРСПЕКТИВЫ СОВРЕМЕННОЙ СТОМАТОЛОГИИ И ЧЕЛЮСТНО-ЛИЦЕВОЙ ХИРУРГИИ

МАТЕРИАЛЫ
международной научно-практической конференции,
ПОСВЯЩЁННОЙ ПАМЯТИ УЧЕНОГО С. Э. КУБАЕВА
(Самарканд, 25-26 февраля 2022 г.)

Под редакцией
Ж.А. РИЗАЕВА

САМАРКАНД-2022

COMPARATIVE EVALUATION OF HYGIENE INDEX AND PMA INDEX IN THE TREATMENT OF PATIENTS WITH GENERALIZED PERIODONTITIS

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ABSTRACT

In this article, have compared the hygienic condition of the oral cavity according to the Fedorov-Volodkin hygiene index and the condition of the gingiva according to the modified PMA index in the treatment of patients with chronic generalized periodontitis with I-II degree of severity using quercetin granule gel and liposomal quercetin-lecithin complex. Clinical examination of patients with chronic generalized periodontitis I-II degrees of severity after 12 months showed that 20% of patients in basic group and 38.8% in comparative group reported a lowering the level of hygiene index Fedorov-Volodkin. A further increase in level of PMA index was observed in 5% of basic group patients and 38.9% of comparative group of patients.

Key words: generalized periodontitis, liposomes, drug delivery systems, liposomal quercetin-lecithin complex, quercetin granule, modified PMA index, hygiene index.

СРАВНИТЕЛЬНАЯ ОЦЕНКА УРОВНЯ ИНДЕКСА ГИГИЕНЫ И ИНДЕКСА РМА ПРИ ЛЕЧЕНИИ БОЛЬНЫХ С ГЕНЕРАЛИЗОВАННЫМ ПАРОДОНТИТОМ

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АННОТАЦИЯ

В данной статье проводится сравнительная оценка гигиенического состояния полости рта, ориентируясь на гигиенический индекс Федорова-Володкиной и состояния тканей пародонта, ориентируясь на модифицированный индекс РМА, при лечении пациентов с хроническим генерализованным пародонтитом I-II степени тяжести, используя гель из гранул кверцетина и липосомальный кверцетин-лецитиновый комплекс. Клиническое обследование пациентов с хроническим генерализованным пародонтитом I-II степени тяжести через 12 месяцев показало, что у 20% пациентов в основной группе и 38,8% в группе сравнения отмечено снижение показателей индекса гигиены и повышение уровня индекса РМА наблюдалось у 5% пациентов основной группы и 38,9% пациентов группы сравнения.

Ключевые слова: генерализованный пародонтит, липосомы, липосомальный кверцетин-лецитиновый комплекс, гранулы кверцетина, модифицированный индекс РМА, индекс гигиены.

Introduction. Periodontal disease is an infectious disease caused by periodontal, opportunistic bacteria combined in a biofilm. Specialized bacterial ecosystem - biofilm, provides viability, preservation of its constituent microorganisms and increase the overall population, and over time to changes in the species composition of microorganisms [12]. A number of diseases with a long, chronic course are poorly amenable to drug therapy, require the appointment of different, combined drugs and methods of drug therapy. One such disease is generalized periodontitis (GP). GP of chronic course forms foci of chronic infection in the oral cavity [16, 7]. An integral part of the microbiota of the oral cavity is the normal microflora. It is constantly attacked by any factor, providing colonization resistance. In the development of periodontal disease, opportunistic pathogens and periodontal symbionts are play a leading role [5, 20, 6].

Currently, 95 percent of all new potential therapies have poor pharmacokinetic and biopharmaceutical properties [3]. Therefore, there is a need to develop an appropriate drug system that distributes therapeutically active drug molecules purposefully to the site of action without affecting healthy tissue or organ [14]. Known carriers of drugs, in the development of which used biodegradable polymers of natural and synthetic nature, soluble polymers, microcapsules. In addition, cells such as neutrophils, fibroblasts, artificial cells, lipoproteins, liposomes, niosomes, immune micelles, and monoclonal antibodies are used to deliver drugs [13].

Liposomes are particles-type carriers, small vesicles consisting of single- or multi-phospholipid bilayers [18, 21]. The charge, lipid composition and size (from 20 to 10000 nm) of liposomes can vary and these variations greatly affect their behavior under natural conditions. Although nanoparticles are often called

particle dispersions or solid particles with a size in the range of 10-1000 nm, the most effective are nanoparticles up to 100 nm. In this case, drug molecules are captured, encapsulated or attached to nanoparticles more productively.

For 45 years, work has been carried out in Ukraine to create diagnostic and medicinal preparations based on an extensive group of natural biologically active compounds, united by the common name "phospholipids" (PH) [1].

Phospholipids and glycolipids are important participants in biological reactions. Methods for obtaining highly purified phospholipid and ganglioside ingredients are proposed using technological methods of lipid chemistry and biotechnology. The authors have studied physicochemical and biological properties of phospholipids and gangliosides. The structure of the isolated lipid substances was confirmed. The studies of biological activity of the gangliosides with a number of models have confirmed their high biological activity: antiviral, reparative, immunostimulating. The studies allowed for creation a number of diagnostic lipid antigens and drugs, that were implemented in production in Ukraine and other countries. For the first time in CIS in Ukraine, liposomal forms of preparations having antitumor, antioxidant, anti-inflammatory and membrane-protective pharmacological properties have been developed. Nanoforms of pharmaceuticals, in particular liposomes, can solve the problem of giving new unique properties to known active pharmaceutical ingredients and consequently increase therapeutic efficacy. Research on obtaining liposomal drugs based on hydrophobic antioxidants is carried out at the Department of Biotechnology, Biophysics and Analytical Chemistry, NTU "KhPI"[11].

Modern predominant perception of the nanoscale lipid artefacts – liposomes as drug delivery systems (DDS), based on the ability of universal incorporation of active pharmaceutical ingredients (APhI). It was formed in the world process of creating and clinical application of more than 50 innovative liposomal drugs for the treatment of oncological, infectious, inflammatory and other serious diseases. These include the original drugs Lipin, Lipodox, Lioliv and Lipoflavon created in Ukraine. Along with the important role of liposomes as APhI provider, the concept of pharmacotherapeutic selfsufficiency of liposomes per se which was first proposed by academician A.V. Stefanov was convincingly confirmed. Antimicrobial, antiviral, anti-inflammatory, immunomodulatory and other manifestations of pharmacological activity have been established for «empty» liposomes according to the variability of the phospholipid composition. Attention is drawn to the potential of liposomes per se for implementing of the personalized medicine strategy and to the clinical advantages of the algorithm for the combined use of empty liposomes with DDS with the possibility of optimizing the clinical effect owing to the targeted differentiation of the phospholipid composition of liposomal partners [9].

In Ukraine, a significant amount of data has been accumulated on the effectiveness of Ls drugs: the Ls form of EPC "Lipin" is used in pulmonology, cardiology, obstetrics, dentistry and other areas of medicine [10], the Ls form of Doc - "Lipodox" is used in the treatment of tumor diseases: lymphogranulomatosis, non-Hodgkin's lymphomas; Ls form of Anthral - "Lyoliv"- hepatoprotector [2]; Ls form of Quer - "Lipoflavone" is used in ophthalmology and cardiology [17, 4]. The scope of application of bionanotechnology in this field is expanding and may already be of interest to practical medicine and business. Although the problems in this field are still far from being complete, it is already obvious that this direction will, in the future, raise the development of methods for the diagnosis and treatment of human diseases to a new level, and it should be noted that biotechnological research on phospholipids and liposomal forms is the basis of this direction [19, 15].

Thus, numerous studies on the use of local antimicrobial delivery systems in the treatment of chronic periodontitis and periodontitis characterized by an aggressive course indicate that topical application of antimicrobials in the periodontal pocket can improve periodontal health. However, these drug systems do not give a positive result without adequate SRP, from which it can be concluded that the benefits of using these systems as monotherapy are questionable.When combined with SRP, the additional use of topical drug delivery may improve outcomes at sites that do not respond to conventional therapy. Judicious administration of antimicrobial agents, taking into account basic pharmacological principles, will prevent the abuse of chemotherapeutic agents and reduce the likelihood of bacterial strains developing drug resistance. Local drug delivery systems with prolonged and controlled release demonstrate high efficacy at all stages of periodontitis

treatment, including the supportive therapy of periodontal disease, especially in the case of aggressive forms of periodontitis [8].

The aim of the study was to compare the hygienic condition of the oral cavity according to the Fedorov-Volodkin hygiene index (HI) and the condition of the gingiva according to the modified PMA index in the treatment of patients with chronic generalized periodontitis (CGP) with I-II degree of severity using quercetin granule gel (QG) and liposomal quercetin-lecithin complex (LQLC).

Materials and methods. Basic group of patients (BG) were treated with the basic treatment of periodontitis and local application of LQLC in the form of a suspension of 1/4 of a bottle with 5 ml of isotonic 0.9% sodium chloride, heated to 38ºC. Patients of the comparison group (CG) underwent basic treatment of periodontitis and local application of QG gel with the exposition of 40 mg a day for 10 days. Two packets (1 gram) of "Quercetin granules" were diluted with 10 ml of water to obtain a gel containing 40 mg of quercetin. QG gel and LQLC were placed in the periodontal delivery tray. Complex treatment of CGP with I-II degree of severity treatment has been performed for 20 patients of the BG and 18 patients of the comparative group (CG).

Quantitative and qualitative assessment of the hygienic state of the oral cavity was carried out by means of the HI by Fedorov-Volodkin. Vestibular surfaces of mandibula frontal teeth were lubricated with solution of Schiller-Pisarev. Depending on the quantity of calculus, the tooth surface was lubricated with different intensity. The quantification was made by the five-point system: 1 point - the crown is not stained; 2 points - painted on 1/4 of the crown surface; 3 points - painted on 1/2 surface; 4 points - painted on 3/4 of the surface; 5 points - the whole crown is painted. The calculation was performed according to the formula:

$$HI = \frac{\text{sum of values}}{\text{number of teeth}}$$

The results were interpreted as follows: 1.1-1.5 points - a good level of hygiene; 1.6-2.0 points - satisfactory; 2.1-2.5 points - unsatisfactory; 2.6-3.4 - bad; 3.5-5.0 - very bad.

Determination of the modified PMA index by C. Parma (1960). The PMA index allows us to judge the prevalence and severity of gingivitis. The condition of the gingival tissue near each tooth was assessed. The calculation of the index was done as follows: 0 - no inflammation; 1 - inflammation of the gingival papilla; 2 - inflammation of the gingival margin; 3 - inflammation of the alveolar gums. The index was expressed as a percentage - the average value of the examined teeth according to the formula:

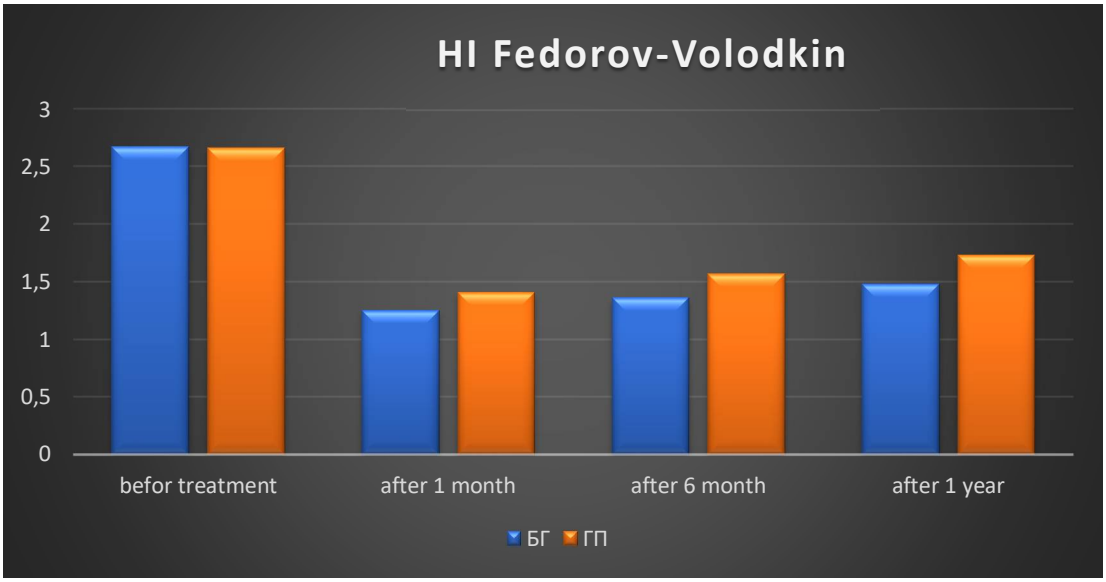
$$PMA = \frac{\Sigma \times 100}{3 \times n}\ \%$$

The results were interpreted as follows: up to 25% - mild gingivitis; 25%-50% - moderate gingivitis; more than 50% - severe gingivitis.

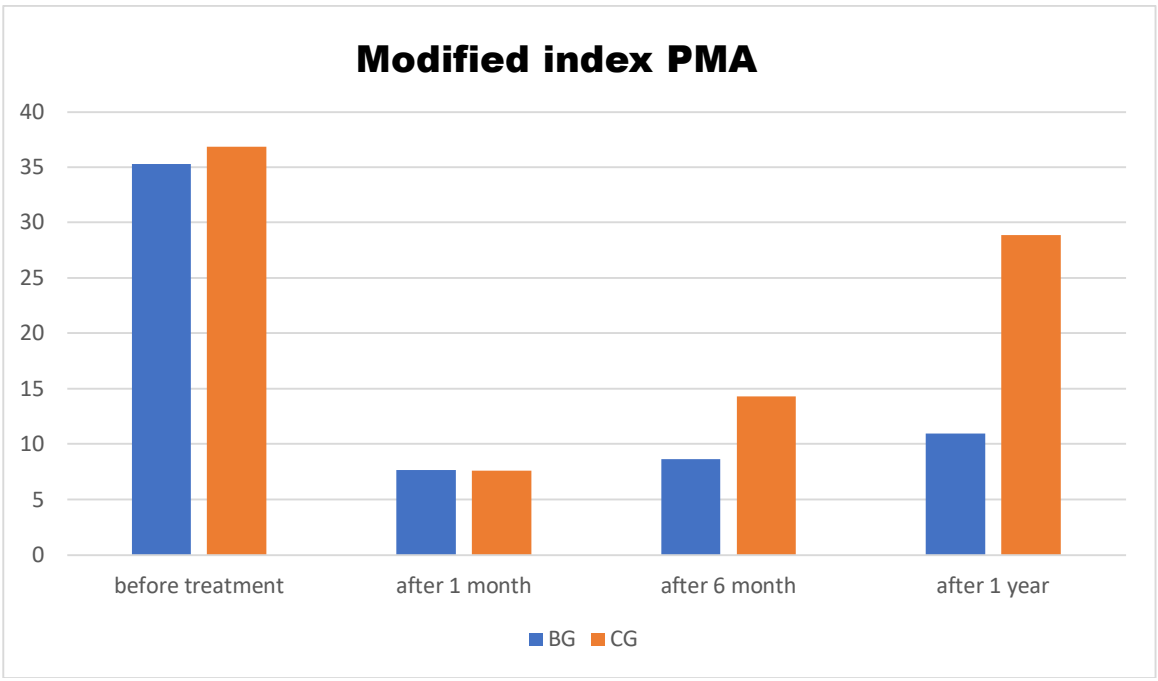
Results and discussion. Complaints of patients with I-II degree before treatment were slight bleeding and soreness of gums that occur when eating solid foods; movement of teeth, the tooth distance, a feeling of heaviness in the gums. Objective examination revealed the symptoms of chronic symptomatic catarrhal gingivitis: gums changed in color with a cyanotic tinge, pasty, gingival papillae loosely adjacent to the necks of the teeth, the relief of the gingival margin is disturbed, the surface loses its reticulate pattern, slight hyperemia and swelling of the gingival mucosa. During examination we were also revealed local stimuli. Traumatic occlusion is moderately pronounced. There is marked supragingival and subgingival tartar on the

oral side of the lower frontal teeth and on the cervical surface of the upper molars. HI was 2.67 ± 0.12 in BG and 2.66 ± 0.13 in CG. PMA was 35.25 ± 0.94% in BG and 36.83 ± 1.91% in CG. Osteoporosis of cancellous tissue and resorption in the area of the upper third of the alveolar process height and sometimes half of the alveolar process height were detected radiologically. Establishment of bone pockets is not noted.

A comparative analysis of the efficacy of the complex treatment in two groups of patients showed that all the drugs resulted in a significant decrease of the Fedorov-Volodkin HI values after 1 month treatment. In the BG, HI amounted to 1.25 ± 0.04 ($P < 0.001$), and with the use of gel with QG amounted to 1.41 ± 0.04 ($P < 0.001$). After 6 months, the HI indices increased to 1.36 ± 0.03 and 1.57 ± 0.03 ($P < 0.001$), and after 1 year to 1.48 ± 0.04 and 1.73 ± 0.03, respectively ($P < 0.001$).



Picture 1. Level of HI Fedorov-Volodkin before treatment, after 1 month and 6 months, after 1 year



Picture 2. Level of modified PMA index before treatment, after 1 month and 6 months, after 1 year

Within 1 month, the modified PMA index for stage I-II CGP decreased to 7,65 ± 0,65 % ($P < 0,001$) with LQLC and to 7,61 ± 0,83 % ($P < 0,001$) with the use of QG ($P > 0,05$). In case of stage I-II CGP, the

PMA increase up to 8,65 ± 0,63 % (LQLC) and 14,28 ± 1,11 % (QG) was registered after 6 months (P < 0,001), and after 1 year - 10,95 ± 0,47 % and 28,83 ± 1,16 % accordingly (P < 0,001).

Conclusions

1. Clinical examination of patients with CGP I-II degrees of severity after 12 months showed that 20% of patients in BG and 38.8% in CG reported a lowering the level of HI Fedorov-Volodkin. A further increase in level of PMA index was observed in 5% of BG patients and 38.9% of CG patients.
2. Thus, studies have demonstrated the ability of LQLC to normalize oral homeostasis, reduce of lipid peroxidation and enhance the activity of the antioxidant system, stabilize membrane structures, normalize cytokine regulation in periodontal tissues, which inhibits inflammation, tissue destruction and improves tissue repair conditions. It can be argued that the high therapeutic efficacy of the proposed LQLC in patients with CGP, especially I-II degrees, due to antioxidant, membraneotropic, anti-inflammatory, immunomodulatory and periodontal effects. This is the reason to recommend LQLC for local use as a pathogenetically based treatment of CGP.

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“ИННОВАЦИОННЫЙ ПОДХОД И ПЕРСПЕКТИВЫ СОВРЕМЕННОЙ СТОМАТОЛОГИИ И ЧЕЛЮСТНО-ЛИЦЕВОЙ ХИРУРГИИ”: Материалы международной научно-практической конференции, посвящённой памяти ученного С. Э. КУБАЕВА (г. Самарканд, 25-26 февраля 2022 г.) / отв. ред. РИЗАЕВ Ж.А. - Самарканд: СамГМИ, 2022. – 480 с.

ИННОВАЦИОННЫЙ ПОДХОД И ПЕРСПЕКТИВЫ СОВРЕМЕННОЙ СТОМАТОЛОГИИ И ЧЕЛЮСТНО-ЛИЦЕВОЙ ХИРУРГИИ

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Под редакцией
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