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Improvement of Conservative Treatment of Periodontal Diseases Using Advanced Technologies

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Currently, the treatment of periodontal disease is a pressing issue due to its high frequency [1]. Patients with the first signs of periodontal disease (gingival inflammation, pain, and bleeding) remain poorly motivated and receive inadequate attention. Gingival inflammation begins in the gingival sulcus, where the quantitative and qualitative composition of the gingival fluid is altered. Polymorphonuclear leukocytes increase in the gingival sulcus, lysosomes are released from the cells under the influence of endotoxin, and degranulation occurs. Lysosome-derived enzymes (proteases, hydrolases, and lysozymes) interact with surrounding structures, causing and enhancing changes. Cellular mediators include histamine, serotonin, prostoglandins, lymphokines, and slow-reacting substances, the release of which is mediated by polymorphonuclear leukocytes, mast cells, and basophils. The biologically active components cause a rapid increase in vascular permeability, microcirculation is impaired, blood flow is slowed, thrombosis is increased, and vasculitis, hypocoagulation, hyperfibrinolysis, and secondary hypoxia develop. These changes cause depolymerization of the intercellular material of the gingival sulcus epithelium, creating vacuoles, fissures, and favorable conditions for deep penetration of toxins as well as bacteria into the underlying tissue. Microcirculatory disturbances increase vascular and tissue permeability. Disruption of defense mechanisms is accompanied by inhibition of regenerative processes, formation of pathological granulation tissue, and spread of inflammation to deeper tissues such as alveolar bone [1]. The complexity and multistep nature of the pathologic processes in periodontal disease creates the need for the use of drugs with diverse mechanisms of action, including anti-inflammatory drugs, analgesics, enzymes, drugs that stimulate microcirculation, drugs that improve immune defense, and many others that affect the etiologic links in the pathologic process. Although the pharmacotherapeutic armamentarium is vast, it should be noted that all drugs have side effects and toxicities associated with overdose, bioaccumulation, allergies and idiosyncrasies, and biological abnormalities. Many patients with periodontal disease have a constitutional condition and are treated by a medical doctor without considering an appointment with a dentist. More often than not, one pathology is replaced by another as a result of pharmacotherapy. In this regard, the development of treatments other than drug therapy and free from these drawbacks remains important. This group includes physiotherapeutic methods widely used in periodontology to influence the individual etiologic links of the process as well as symptomatic treatment during the diagnostic, complex treatment, preventive, and rehabilitative phases [4]. Physical factors can stimulate the body's immunological response, reduce the phenomena of systemic and local sensitization, and alter neuro-humoral processes

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in the body and pathological focus. They enhance the local selective effect of medicinal substances and restore microcirculation [4]. Timely and precise selection of physical factors in combined treatment can stop the initial symptoms of the pathological process, reduce its severity, reduce the severity of clinical symptoms and the possibility of complications, or promote phase transitions of the pathological process, allowing other treatment methods to be implemented in the most favorable conditions [1, 3]. One promising direction is the development of different options for the therapeutic use of pulsed current. Currents can be easily controlled and, in a fairly wide range of properties, are an effective stimulus for structures concentrated in the reflexogenic zone or in the area of the acupuncture points [4]. Dynamic electrical stimulation (DENS) is a further development of transcutaneous electrical stimulation and acupuncture. The method uses short bipolar current pulses of various frequencies to produce a therapeutic effect on reflexogenic zones or acupuncture points, the shape of which varies according to the total electrical resistance (impedance) value of the tissue. DENS is performed with a portable transcutaneous electrical stimulation device, which is a sub-electrode zone with The DiaDENS device offers a wide range of frequencies from 10 Hz to 200 Hz for the treatment of various diseases. For the treatment of periodontal disease, the range is 60 to 77 Hz, 15 minutes. The design of the device allows for rapid movement during treatment, selectively affects the functional state of internal organs, the regulatory mechanisms of physiological responses, and hyperalgesia, improves blood circulation, has an anti-inflammatory effect, activates the formation of biologically active substances and metabolic processes in the tissues, and normalizes muscle and vascular tone. Dynamic electrical stimulation can help increase overall well-being, improve mood, and enhance performance. Many studies have shown that the therapeutic effects of dynamic electrical stimulation are based on multi-level reflex responses and neurochemical responses that trigger a cascade of body regulatory and adaptive mechanisms [5t. The treatment is performed by a health care professional [5]. Another method of physiotherapy is the use of magnetic or electromagnetic fields that locally alter ion concentrations within cells. Calcium ions are known to be important in the regulation of membrane potential. In mitochondrial membranes, the concentration of hydrogen ions rises sharply due to the potential difference and is used by the cell to synthesize ATP. Apparatus for magnetic therapy, magnetophoresis, electrophoresis, electrical stimulation, and anesthesia in dentistry - "AMO-ATOS-E". Under the influence of magnetic fields, the elasticity and tone of blood vessels are normalized, the blood flow velocity in the vessels increases, and the diameter of capillaries is increased. The activation response induced by magnetic fields with specific parameters is accompanied by an increase in the functional activity of the adrenal glands and thyroid gland, an increase in the nucleic acid content of the blood, and stimulation or normalization of immunological reactivity. The therapeutic effects of magnetic fields are due to their vasodilatory, antispasmodic, anti-inflammatory, decongestive, immunostimulating, and sedative effects.The AMO-Atos-E device provides dynamic effects due to "traveling" magnetic fields with maximum biomechanical parameters. The device produces resonance effects within the functional range of the major body systems. The frequencies are 1 to 2 Hz, close to the normal heart rate, 6 to 12 Hz, close to the normal alpha rhythm of the brain, and 50 Hz, the most physiological

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frequency in terms of neuromuscular currents. The shocks performed by this device are multi-channel, since this device has multiple outputs and two emitters of the traveling magnetic field can be connected at the same time. With this device, a combined effect of pulsed magnetic field and electric current can be obtained. In addition, the emitters of the magnetic fields can act through a napkin coated with the drug during electrophoresis. At the same time, the combination of electrophoresis and magnetophoresis gives a significantly higher effect than the sum, since the kinetic properties of the magnetic field become more pronounced as the number of drug ions increases and the electrophoresis only contributes to the increase The effects of absorption, anti-inflammatory, vasodilation, and decongestion therapy with the AMO-ATOS-E device are metabolic processes and improvement of axonal conduction. The use of this device in dental treatment is due to its influence on the etiology of inflammation, microcirculatory disorders, increased vascular permeability, tissue edema and hypoxia, failure of general and local mechanisms of immunological protection, allergic phenomena, etc.
The aim of our study is to enhance the therapeutic efficacy of patients with chronic generalized catarrhal gingivitis using dynamic electrical stimulation and magnetic therapy techniques during the conservative treatment phase.

Materials and methods: Summary of the Study: 112 patients with chronic generalized catarrhal gingivitis (44 males and 68 females aged 18-26 years) were examined and treated conservatively over a 2-year period from January 2008 to January 2010. The study was conducted at the UGMA Dental Clinic and included systemically conservative patients. During treatment, patients complained of gingival bleeding during brushing (42.3% of those examined), bad breath (43.7%), and gingival itching and pain (48.2%). The collection of anamnesis, identification of errors in individual oral hygiene (Green - Vermillion index), examination of the oral cavity, condition of the oral mucosa, evaluation of the alveolar process of the upper and lower jaws (papillary-veolar-alveolar index PMA) were considered important, periodontal Russell index (PI), gingival papilla in periodontitis Bleeding index (RVI), occlusion, tooth CPU index, dentition, and presence of traumatic occlusion were recorded. Functional research methods included evaluation of gingival capillary vacuum resistance by the Kulazhenko method in the mandibular central incisor area. Orthopantomographic examination for diagnosis (ORTHOPHOS device, average radiation dose 36 m Sievert). During the conservative treatment phase, all the examined patients were trained in the rules of oral hygiene, selection of individual hygiene products, professional oral hygiene, removal of local irritants, oral hygiene, and anti-inflammatory periodontal therapy. Patients were divided into three groups. Group 1 - those who received conventional treatment; Group 2 treatment plan included dynamic electrical stimulation using the device DiaDENS-PCM, with 10 treatments per day; Impact force was administered individually. Patients in Group 3 received magnetic therapy with the AMO-ATOS-E device 10 times a day. The effect was performed externally by applying a traveling magnetic field emitter directly to the projected point of gingival inflammation using two remote magnetic coils for 5 minutes for each exposure zone, according to the instructions for use of the device. The modulation frequency was set at 1 Hz and increased to 10 Hz in the middle of the treatment. The duration of the treatment was 15 minutes.

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The number of treatments was 10. The effectiveness of the treatment was evaluated 10 days, 3 months, and 6 months after the start of treatmentThere were no statistically significant differences between the main and control groups in objective data, index evaluation, or additional functional tests at the time of the initial examination. Indicative evaluation indices of the main and control groups in patients with chronic generalized catarrhal gingivitis before treatment and during follow-up (see table). Ten days after the start of conservative treatment, patients in all groups noted improvement in subjective feelings and effectiveness of treatment. Objective investigations revealed a decrease in the inflammatory phenomenon of the periodontal ligament after specialized deposits. However, 62% of patients in the first group and 32% of subjects in the third group noted that after professional oral hygiene, tooth hard tissue sensitivity and discomfort appeared and lasted from 3-5 days to 1 week. In the second group, only 20% of the patients complained of such complaints and noted that the unpleasant sensations disappeared after the second dynamic electrical stimulation. In addition, PMA and bleeding indices were significantly lower than in the control group at all follow-up periods. In general, the results of conservative treatment of periodontal patients in all groups can be evaluated as satisfactory. Oral hygiene improved and signs of inflammation decreased. In the post-treatment questionnaires, the analgesic effect of dynamic electrical stimulation was more pronounced.

Conclusions: The results of this study demonstrate the effectiveness of the use of The rapid progression of analgesic effects during treatment allows patients to perform adequate oral hygiene and to feel comfortable; Dynamic electrical stimulation therapy proved to be more effective.

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