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TECHNIQUE OF THERAPEUTIC EFFECT OF LOW-INTENSITY LASER RADIATION IN CASE OF ORAL TRAUMA

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Abstract:

Currently, hundreds of methods have been developed for the treatment and prevention of recurrence of many diseases, including in dentistry. Laser therapy technologies are easy to implement, do not require expensive equipment, are effectively combined with almost all other methods of treatment (both therapeutic and surgical), so they can be used in their work by any practicing dentist, not just a physiotherapist. The book presents both a review of the literature on the topic and the most effective scientifically grounded methods of combined and combined laser therapy.

Keywords: LILR - low-intensity laser radiation, epithelium, mucous membrane, oral microflora, inflammation, prevention, treatment.

RELEVANCE:

In the area of the hard palate, gums, tongue, the epithelial layer is more pronounced, in the area of the lips and cheeks, the mucous membrane itself is well expressed, in the area of the bottom of the oral cavity, transitional folds, the submucosal layer is developed, which is absent in other parts of the oral cavity [2, 8].

In the therapeutic effect of low-intensity laser radiation (coherent, monochromatic and polarized light), three main stages can be conventionally distinguished: primary effects (change in the state of electronic levels and stereochemical rearrangement of molecules, local thermodynamic shifts, the appearance of an increased concentration of Ca2 + in the cytosol); secondary effects (propagation of waves of increased concentration of Ca2 + in the cell and between cells, stimulation of bioprocesses at the cellular level, changes in the functional state of individual cells and the organism as a whole); the aftereffects (the formation of tissue metabolism products, the response of the immune, neurohumoral and endocrine regulation systems, etc.).

The broadest spectrum of body responses to laser action is observed, starting from the primary act of photon absorption and ending with the response of various regulatory systems [15]. We have shown that the initial triggering moment of the biological action of LILRis not a photobiological process, but local heating (more correctly, a local violation of thermodynamic equilibrium). This explains many, if not all, known phenomena in this area of biology and medicine. Local heating causes the release of calcium ions from the intracellular depot with further propagation of waves of increased Ca2 + concentration in the cell cytosol, triggering calcium-dependent processes [5, 13].

Numerous studies show that laser radiation plays the role of a sensitizer and stimulator of many cellular reactions aimed at restoring and normalizing the bioenergetic status of body tissues and regulatory systems at various levels [7]. LILR increases enzymatic and catalase activity, the permeability of cytoplasmic membranes, helping to accelerate transport processes in tissues and reduce hypoxia by increasing oxygen metabolism [1].

LILR stimulates regenerative processes in pathological conditions (trauma, surgical manipulations, transplantation) by changing the cellular composition in the area of a wound or ulcer due to an increase in the number of neutrophils, as well as by accelerating the growth of capillaries and the accumulation of collagen produced by them, on which the activity of epithelialization of the wound or ulcerative surface. In addition, the hormonal and mediator links of the adaptation mechanism are activated [9].

Nonspecific activation of immunity after exposure to LILRis confirmed by an increase in the titer of hepaglutinin, hemolysins, lysozyme, activation of neutrophils and interferon, an increase in the synthesis of immunoglobulins, a change in the function and structure of the plasma membranes of

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lymphocytes, an increase in the number of blast forms of lymphocytes [17].

Low-intensity laser radiation reduces the concentration of lipid peroxidation products in the blood, activating the antioxidant system, increases the level of catalase, activates the cellular elements of mononuclear phagocytes (macrophages) that stimulate cell proliferation [10, 22]. The restoration of the morphofunctional state of erythrocyte cell membranes and the lipid spectrum of lymphocyte membranes is accelerated. A significant role is played by the beneficial effect of LILRon the blood, which has an effect both systemic and local, due to the generality of hemocirculation. Studies using vital microscopy, computerized capillaroscopy and photographic recording have shown an increase in the number of functioning capillaries, acceleration of blood flow and normalization of microcirculation [12].

The direct impact of pulsed LILRof the infrared and red spectrum on the pathological focus in a variety of processes gives a better therapeutic effect than continuous radiation. The combination of LILR with a magnetic field also increases the effectiveness of treatment - magnetic laser therapy [14].

Laser procedures carried out before the start of the operation in order to prevent infiltration and suppuration, improve local blood circulation, metabolic processes, oxygenation and tissue nutrition, which stabilizes the entire postoperative period and significantly reduces the likelihood of postoperative complications [6, 18].

The ability of low-intensity laser radiation to increase the content of neurohormones in tissues, to involve in the process a variety of specific proteins of cell membranes, which cause the activation of enzymes such as adenocyclase, adenylatecyclase, denylcyclase, phosphodiesterase, as well as calcium ions that alter intra- and extracellular metabolism, affect intercellular space sensitive elements to the normalization of local and general physiological reactions, contributes to the preservation or restoration of homeostasis and adaptation of the body to stressful conditions [4, 16].

Absorption of the energy of an active factor with the formation of primary effects in the form of heat causes, in some cases, the excitation of receptors

and subsequent specific reactions, in others - a change in the ratio of the pH environment with the release of biologically active substances: histamine, acetylcholine, serotonin, etc. These changes excite receptors (extero-, proprio- and intero-), creating afferent impulses coming through sensitive fibers to the posterior roots of the spinal cord at its level and at the level of the 1st or 2nd segment above and below it.

Then, along the ascending pathways of the spinal cord, the signal goes to the thalamus, which is closely connected with higher vegetative formations and is the subcortical center of unconditioned reflexes. In response to afferent signals, efferent impulses are formed, coming to various organs and systems, mainly through the hypothalamic-pituitary link of regulation, influencing the activity of the endocrine glands, metabolic processes and the state of the immune system. The body's response to an external factor depends on the specificity of the points of application, the functional state of the regulatory systems and the area of stimulation [2, 3].

With a small area of exposure and a low intensity of the generated heat, equilibrium is achieved by local reactions, but with the inclusion of reflex mechanisms, which make it possible to obtain a generalized response

LILRis considered as a nonspecific physical factor, the action of which is not directed against the pathogen or symptoms of the disease, but at increasing the resistance (vitality) of the organism. It is an external bioregulator of both cellular biochemical activity and physiological functions of the body as a whole - neuroendocrine, endocrine, vascular and immune systems. Understanding this feature of the mechanisms of biological action of LILRis extremely important for the methodological support of laser therapy [11, 21].

The data of scientific research allow us to say with complete confidence that LILRis not actually a therapeutic agent at the level of the organism as a whole, but, as it were, removes obstacles, an imbalance in the central nervous system that interferes with the sanogenetic function of the brain. Under the influence ofLILR, it is possible to change the physiology of tissues both in the direction of strengthening and in the direction of inhibition of their metabolism, depending on the initial state of the body and the dose of exposure, which leads to attenuation of pathological processes, normalization of physiological reactions and restoration of the regulatory functions of the nervous system [20].

Laser therapy, if used correctly, allows the body to restore disturbed systemic equilibrium. Consideration of the CNS and ANS as independent control systems in recent years has already ceased to suit many researchers. Located more and more facts confirming their closest interaction. Based on the analysis of numerous scientific research data, a model of a single regulating and maintaining homeostasis system was proposed, called a neurodynamic generator (NDG). The main idea of NDG is that the dopaminergic division of the and the sympathetic division of the, combined into a single structure, named by V.V. Skupchenko by the phasic motor-

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vegetative systemic complex, closely interact with another mirror-interacting structure - the tonic motor-vegetative (TMV) systemic complex. The presented mechanism functions not so much as a reflex response system, but as a spontaneous neurodynamic generator, rebuilding its work on the principle of self-organizing systems. Such a mechanism, possessing a certain neurodynamic mobility, is not only capable of providing a continuously changing adaptive adjustment of the regulation of the entire range of energy, plastic and metabolic processes, which was first discovered by V.V. Skupchenko, but, in fact, controls the entire hierarchy of regulatory systems from the cellular level to the central nervous system, including endocrine and immunological rearrangements. In clinical practice, the first positive results of a similar approach to the mechanism of neurohumoral regulation were obtained in neurology and in the treatment of keloid scars [2, 3].

The scheme is rather arbitrary, which is also emphasized by the representation of LILRas the only method for regulating the neurodynamic state. In this case, we are only demonstrating the well-known fact that one nonspecific therapeutic factor is capable of providing a multidirectional response depending on the dose. At the same time, laser radiation is the most versatile, far beyond just one of the physical fields used for treatment. With regard to its biological action, it is more correct to use the term "regulation" rather than "activation", since LILR is capable of shifting the state of homeostasis in one direction or another [19].

The complex of adaptive and compensatory reactions developing in the body is aimed at restoring homeostasis, the effects of LILRdepend on the initial state of functioning of a particular system. This explains the versatility of the therapeutic effects ofLILR. An example is the hypotensive effect ofLILR in hypertensive patients with different initial types of hemodynamics. So, in patients with essential hypertension with an initial hyperkinetic type, when blood pressure is increased due to the minute volume of the heart, in the course of treatment, this indicator is corrected (decreased).At the same time, in patients with an initial hypokinetic type of blood circulation, when the total peripheral resistance is primarily increased, blood pressure decreases against the background of normalization of the tone of resistive vessels, which determine the total peripheral vascular resistance.

Laser therapy leads to positive changes in metabolic processes, helps to reduce hypoxia in tissues, increase their regenerative potencies, and ultimately increases the level of vital activity of the body, resistance to adverse environmental factors, and expands the limits of its adaptive capabilities. The response of the body to laser irradiation is always an integral systemic response, including changes at the level of cells, tissues, organs and control systems of the body. Of particular importance is the effect of laser radiation on the immune system and nonspecific resistance of the organism [2, 20].

It is known that LILRis capable of activating the functional state of the cellular and humoral links of immunity. In this case, the effect

laserbiomodulation is manifested by the elimination of various defects and disorders in the immune system, the phenomena of imbalance of its links and subsystems, the normalization of defense mechanisms at the local and systemic levels. The polypotent properties of LILRin complex interactions with biosystems provide a prolonged aftereffect.

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