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ADVANTAGE OF TREATMENT WITH INTRAVENOUS LASER BLOOD IRRADIATION IN CHRONIC TONSILLITIS

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ABSTRACT

Laser therapy (LT), using the healing properties of low-intensity laser radiation (LLLT), has long occupied a strong position in modern medicine due to its unique efficacy, the absence of side effects and specific contraindications, as well as its simplicity and low cost. Moreover, the scientific and practical basis of LT is actively developing, new, more effective methods and equipment for their implementation are being developed. Microcirculation is one of the first to respond at the tissue level to the effect of LILI, its activation is universal for all organs and accompanies their restructuring associated with the intensification of the specific functions of cellular components. The development of disposable sterile light guides KIVL-01 made it possible to make this procedure absolutely safe and comfortable for the patient. In the 20s of the last century in Germany and a little later in Russia, the method of ultraviolet irradiation (UFO) of blood became widespread. Thus, the entire set of changes observed in ILBI should be considered largely as a systemic response. Laser radiation acts only as an external factor triggering the mechanism through the system of nonspecific regulation and maintenance of homeostasis.

KEYWORDS: *Laser Therapy, Low-Intensity Laser Radiation, Intravenous Laser Blood Irradiation, Efficiency.*

INTRODUCTION

Modern laser devices make it possible to apply LT methods in the treatment of many diseases and pathological conditions, for which there were no effective methods of treatment until recently. One of the most widespread methods of RT is intravenous laser blood irradiation (ILBI), which is currently successfully used in almost all areas of medicine. Deep scientific study of the issue and the predictability of treatment results contribute to the use of ILBI both independently and in combination with other methods of therapy. It is difficult to find an analogue of ILBIs in terms of ease of use, versatility and efficiency. Numerous publications report on the positive results of using a helium-neon laser (continuous radiation of the red spectrum, wavelength 0.63 μm) in medicine.

However, modern devices based on diode lasers (for example, ALT "Matrix-ILBI") not only have better mass-dimensional and energy characteristics, but also, due to the optimization of radiation parameters, and are more efficient. The development of disposable sterile light guides KIVL-01 made it possible to make this procedure absolutely safe and comfortable for the patient. In the 20s of the last century in Germany and a little later in Russia, the method of ultraviolet irradiation (UFO) of blood became widespread. The procedures were carried out using ultraviolet lamps extra corporeally - the blood, irradiated by the light of the lamps, was pumped through special cuvettes. The method was conceived as a way to destroy microorganisms in sepsis, however, it almost immediately became clear that there was no direct bactericidal effect (it could not be implemented in principle), and later the method found application in diseases characterized by immunodeficiency and disorders of blood rheology, implying the non-specificity of UV action. -rays.

Unfortunately, such a morally outdated and complex technique is still being used today. It has been shown that the intravenous ultraviolet irradiation of blood has an effect comparable to the extracorporeal method: anti-inflammatory, desensitizing, analgesic and bronchodilating. In patients with COPD, dyspnea decreases, cyanosis disappears, active sputum discharge, a more rapid regression of the clinical picture, and accelerated healing of soft tissue wounds are observed. In patients with skin disease (psoriasis, dermatitis), involution is observed at the lesion sites. In diabetes mellitus, blood UVR causes a noticeable hypoglycemic effect. The advantage of the intravenous method is not only in greater ease of use, but also in the fact that in the course of treatment there are no side reactions, both local (phlebitis, thrombosis) and general (chills, changes in hemodynamic parameters).

In the early 60s of the XX century, lasers appeared - a much more convenient tool in the hands of a doctor, since radiation can be delivered to any place without loss. But most importantly, laser radiation, due to its monochromaticity, also turned out to be much more effective in terms of treatment results. Lasers have replaced lamps, which have replaced outdated sources everywhere, except for UFO blood. This is due not only to a certain conservatism, but also to the lack of lasers with the required parameters at an affordable price - they used what was available, not what was needed. In the early 80s of the last century, the method of intravenous laser irradiation of blood appeared - the unique properties of laser light made it possible to carry out intravenous exposure to the blood, which is much more effective, cheaper and easier. For the first time, the method itself was proposed by E.N. Meshalkin and V.S. Sergievsky (1981) in cardiac surgery, and already in 1989 by the Institute of Oncology Problems named after V.I. R.E.

In the ILBI technique, the radiation of the red spectrum (0.63 μm) was initially used, and not ultraviolet (UV), since, we repeat, only lasers with this wavelength were available. ILBI began to be associated only with continuous radiation of the red spectrum (0.63 microns), and the effect on blood with radiation of the ultraviolet range and only with external exposure to appropriate lamps. It's time to eliminate this misconception! It is time to get away from widespread practice, when the techniques are determined by the available technical capabilities, and not optimized based on their knowledge of the mechanisms of action of LILI and the regularities of regulation of biochemical, physiological and other processes in the human body. At present, the capabilities of modern equipment have grown many times over, there are all prerequisites for the implementation of a more correct approach to the development of new techniques and optimization of LILR parameters. The observed effects for LLLT, both UV and red, are similar due to their nonspecificity, but there are also some peculiarities. Research Center "Matrix" in conjunction with the State Scientific Center for Laser Medicine of the Federal Medical and Biological Agency of Russia and the Specialized Center for Surgery named after Acad. V. Vakhidov of the Ministry of Health of the Republic of Uzbekistan carried out a large-scale research work on the creation of the newest technology of laser therapy - ILBI-405 and a device for its technical implementation - the emitting head KL-ILBI-405 for the Matrix-ILBI apparatus. Laser therapeutic device "Matrix-ILBI" provides exposure to radiation with several wavelengths (from 0.365 to 0.9 microns) and power from 1 to 35 mW, which provides the most effective treatment modes. ALT "MatrixILBI" is the only device that allows intravenous laser irradiation of blood in the ultraviolet and red LILI spectra, as well as the use of the latest technology - ILBI-405.

Mechanisms of action of laser radiation on blood

Acting with low-intensity laser radiation for therapeutic purposes, something is not introduced into the human body from the outside, but only gently corrected, a system of self-regulation and maintenance of homeostasis is directed. This explains not only the exceptional versatility of the method, but also its high efficiency and safety, since only the regulation, direct or indirect, of the normal physiological reactions of the body is carried out. Most often, we are talking about the intensification of these reactions, which is the reason for the use of the term "stimulation", but sometimes it is important to weaken the excessive action of regulatory systems, and ILBI allows you to cause multidirectional reactions depending on the dose, the state of the body as a whole and the characteristics of the pathological process. Understanding of this fact, as well as knowledge of the mechanisms of action of LILI, provides an absolutely safe and most effective application of the method.

It is shown that after ILBI there is a response at three main levels: - activation of blood corpuscles (erythrocytes and immunocompetent cells); - changes in blood properties as a whole (plasma composition, rheological properties, etc.); - systemic response at the level of various organs and tissues. Thus, the entire set of changes observed in ILBI should be considered largely as a systemic response. Laser radiation acts only as an external factor triggering the mechanism through the system of nonspecific regulation and maintenance of homeostasis. And today a lot is known both about the very results of such influence, and, most importantly, about the patterns of the processes taking place. In particular, it was shown that the response of the biological system directly depends on the degree of absorption of LILR, i.e., it is important to determine the

primary structure that absorbs the energy of the laser beam. Evaluation of the degree of absorption of LILR with a given wavelength is fundamental for predicting the effect. Earlier, a model of thermodynamic interaction of LILI with intracellular components was proposed and substantiated, followed by the release of calcium ions inside the cell and the development of calcium-dependent processes. This approach allowed not only to unambiguously explain the existing effects both in vitro and in vivo, but also to explain numerous clinical results, trace the entire chain of physiological reactions of the body, substantiate effective laser therapy techniques and predict treatment results. Full correspondence of theoretical concepts to practical results allows us to consider the multifaceted aspects of ILBI mechanisms in this vein, taking as the initial thermodynamic mechanism of the development of calcium-dependent processes in blood components under the influence of LILI, namely: normalization of electrostatic relationships in the blood; - laser radiation restores the disturbed Ca2 + homeostasis on both sides of the erythrocyte membrane; - an increase in the concentration of Ca2 + under the influence of LILI leads to activation and increased proliferation of leukocytes. Studies have revealed numerous changes in blood properties under the influence of LILI at different levels. It was found that even a single laser irradiation of blood causes a significant and long-term (up to a month) change in a number of morphological and functional and biochemical parameters of blood, which are most pronounced on the 15th day after the procedure.

Microcirculation is one of the first to respond at the tissue level to the effect of LILI, its activation is universal for all organs and accompanies their restructuring associated with the intensification of the specific functions of cellular components. The non-specific nature of microcirculation enhancement under the influence of LILI allows us to consider it as a kind of indicator of the effect of LILI on organs and tissues. The reaction of the microcirculation system to the impact of LILI ensures the adaptation of local hemodynamics to the local needs of cells performing specific functions of organs, as well as long-term adaptation of trophic relations in tissue microregions. The latter is associated with the activation of neovasculogenesis, which is based on an increase in the proliferative activity of endothelial cells. Improvement of microcirculation and oxygen supply to various tissues when using ILBI is also closely related to the positive effect of LILI on metabolism: the oxidation of energy materials - glucose, pyruvate, lactate - increases. Intravenous laser irradiation of blood most actively affects almost all components of the immune system. If we analyze the data of numerous studies, which was done earlier, then the above changes can be combined into the following main mechanisms of ILBI therapeutic action: - correction of cellular and humoral immunity; - increasing the phagocytic activity of macrophages; - enhancing the bactericidal activity of blood serum and the complement system; - a decrease in the level of C-reactive protein, the level of medium molecules and plasma toxicity; - an increase in the content of immunoglobulins IgA, IgM, IgG in the blood serum, as well as a change in the level of circulating immune complexes; - an increase in the number of lymphocytes and a change in their functional activity; - an increase in the ability of T-lymphocytes to form rosette and DNA-synthetic activity of lymphocytes, stabilization of the ratio of the T-helper / T suppressor subpopulation; - increasing the nonspecific resistance of the organism; - improving the rheological properties of blood and microcirculation; - regulation of the hemostatic potential of the blood; - vasodilating action; - anti-inflammatory effect; - analgesic effect; - normalization of the ionic composition of blood; - an increase in the oxygen-transport function of the blood, as well as a decrease in the partial

tension of carbon dioxide; - an increase in the arteriovenous oxygen difference, which is a sign of the normalization of tissue metabolism; - normalization of the proteolytic activity of the blood; - increasing the antioxidant activity of the blood; - normalization of LPO processes in cell membranes; - stimulation of erythropoiesis; - stimulation of intracellular DNA repair systems in radiation injuries; - normalization of metabolic processes (protein, lipid, carbohydrate, intracellular energy balance); - normalization and stimulation of regenerative processes. Attention is drawn to the fact that all the effects caused by LLLT can be conditionally divided into two main directions: the immune system and trophic supply of tissues.

This fact is especially important in the framework of the considered aspect of the mechanisms of the biological action of laser radiation, namely: increasing the efficiency of laser action on blood by optimizing the LLLT wavelength.

Indications and contraindications for the use of ILBI Indications for intravenous laser blood irradiation are determined by the mechanisms of the biological action of LILI and the features of the clinical application of the method, which are presented in the corresponding special sections.

Contraindications It is necessary to pay attention to the fact that some contraindications for general clinical practice are by no means the same for narrow specialists working in specialized institutions or units. There are also a number of restrictions for conducting ILBI. The following contraindications are mentioned in the literature: - all forms of porphyria and pellagra; - photodermatosis and hypersensitivity to sunlight; - hypoglycemia and tendency to it; - acquired hemolytic anemias; - hemorrhagic stroke; - subacute period of myocardial infarction; - renal failure; - hemoblastosis in the terminal stage; - cardiogenic shock; - extremely severe septic conditions; - severe arterial hypotension; - hypocoagulation syndrome; - congestive cardiomyopathy; - febrile conditions of unknown etiology; - increased bleeding.

CONCLUSIONS

The most relevant for the development of the method is the transition to a more efficient and modern method of ILBI + UFOK, and in the near future - to the widespread introduction of the ILBI-405 technology.

Intravenous laser therapy can be performed in almost any hospital or clinic. The advantage of outpatient laser therapy is the reduction of the possibility of nosocomial infection development, a good psycho-emotional background is created, allowing the patient to maintain working capacity for a long time, while carrying out procedures and receiving full treatment.

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