INTRAVENOUS BLOOD LASER IRRADIATION IN THE TREATMENT OF CHRONIC TONSILLITIS

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ABSTRACT

The article discusses the rationale and assessment of the effectiveness of the use of intravenous laser blood irradiation (ILBI) and local laser therapy in the optimization of conservative treatment of chronic tonsillitis.

Keywords: Laser therapy, intravenous laser blood irradiation, chronic tonsillitis, antioxidant system.

1. INTRODUCTION

Intravenous laser irradiation of blood (ILBI) - is the effect on the blood of light energy of a wave of a certain wavelength directly in the vascular bed through a disposable optical fiber inserted into any easily accessible vein. Laser therapy has a positive effect on biochemical reactions and physiological processes in the body. The effect of the laser is highly effective in the complex treatment of the disease.

ILBI has found wide application in the following areas:

Obstetrics and gynecology (purulent-septic complications, female infertility, vaginal candidiasis, salpingo-oophoritis, colpitis, ovarian sclerocystosis, endomyometritis, endometriosis);
Urology (secondary renal amyloidosis, glomerulonephritis, diabetic nephropathy, pyelonephritis, urogenital infection, urethritis, chronic inflammation of the scrotal organs, chronic nonspecific infectious prostatitis);
Dermatology (allergic skin vasculitis, angiitis (vasculitis) nodose, atopic dermatitis, herpes simplex relapsing, dermatophytosis stop, psoriasis, erysipelas, syndrome, Lyell, eczema, furunculosis, atopic dermatitis, acne, pyoderma, rosacea, eczema, urticaria, allergodermatoses);
Angiosurgery (atherosclerotic arteriopathy of the lower extremities, diabetic angiopathy of the lower extremities, thrombophlebitis of the lower extremities, chronic ischemia of the lower extremities, chronic obliterating diseases of the arteries of the lower extremities);
Gastroenterology (dysplastic changes in the gastric mucosa, pancreatitis, chronic diffuse liver diseases, chronic colitis, enteritis, chronic cholecystitis, gastric ulcer and duodenal ulcer);
Diseases of the musculoskeletal system (deforming osteoarthritis, rheumatoid arthritis);
Cardiology (hypertension, myocardial infarction, coronary heart disease, angina, lowering the level of cholesterol);
Otorhinolaryngology (Meniere's disease, sensorineural hearing loss, tonsillitis, rhinitis, sinusitis, otitis externa and otitis media);
Neurology (ankylosing spondylarthrosis (ankylosing spondylitis), vegetative-vascular dystonia, vibration disease, hypothalamic syndromes, degenerative-dystrophic diseases of the spine, disc circulatory encephalopathy, ischemic and traumatic myelopathy, neuroinfection (meningitis and meningo enema) trauma, prosopathy, radiculoalgiic syndrome after discectomy, multiple sclerosis, chronic fatigue syndrome, cerebral stroke);
Ophthalmology (diabetic retinopathy, vitreous hemorrhage (hemophthalmus), retinal vein thrombosis);
Pulmonology (bronchial asthma, bronchiectasis, chronic nonspecific lung diseases, chronic obstructive bronchitis);

Endocrinology (autoimmune thyroiditis, hypothyroidism, diabetes mellitus);

Cosmetology (accelerating the rehabilitation period following chemical peeling and laser resurfacing, preventing the formation of a keloid scar, under the action of a laser the elasticity of the skin increases, its blood supply improves, wrinkles, age spots and swelling of the subcutaneous layer disappear).

In addition, ILBI is a good prevention of infectious diseases (including viral infections), with a decrease in overall performance, to enhance the body's recovery processes after diseases, stress (psychological, physical), to prolong the period of remission of chronic diseases, in order to rejuvenate, improve and prolongation of active longevity.

The impact of laser radiation on most of the physiological processes of the body determines the following effects:

- antispasmodic - leveling spasm of smooth muscles of organs;
- vasodilator - relaxation of the walls of venous, arterial, lymphatic vessels, improving blood and lymph flow;
- hematopoietic - stimulation of the bone marrow, normalization of the content of erythrocytes and lymphocytes in the blood;
- anti-inflammatory - a detrimental effect on pathogens;
- immunostimulating - activation of cellular and humoral immunity, increasing the body's resistance to infections;
- analgesic - normalization of the synthesis of inflammatory enzymes (prostaglandins), effect on nerve endings;
- biostimulating - restoration of metabolic reactions (protein, fat, carbohydrate);
- desensitizing - reducing the excessive response of the immune system to the action of an allergen;
- antioxidant - improving the supply of oxygen molecules to tissues and excretion of under-oxidized metabolic products.

**Chronic tonsillitis**

Inflammation of the tonsils, lymph of the adenoid pharyngeal ring, a very common disease of the pharynx in both adults and children.

The problem of chronic tonsillitis to this day remains very relevant in medicine and goes far beyond the limits of otorhinolaryngology. According to the latest data, chronic tonsillitis in children occurs in 12-15% of cases, and in adults under 40 in 4-10%.

Currently, there are many treatments for chronic tonsillitis that do not lead to change. Therefore, the search for a treatment for chronic tonsillitis has not lost its importance in otorhinolaryngology. The palatine tonsils provide an optimal microenvironment for the proliferation and maturation of lymphocytes, followed by the delivery of mature immune cells. The very anatomical and physiological structure of the tonsils leads to the development of a chronic inflammatory process in them.

Therefore, the search for new methods of treating chronic tonsillitis is still an urgent problem in otorhinolaryngology. They can lead to the development of severe complications and a number of disabling diseases for the patient on the part of vital organs and systems. [2]

Currently, when making a diagnosis, as a rule, only local manifestations of the disease are considered and do not take into account the state of the adaptive systems of the child's body, including the antioxidant defense system AOS.
Lipid hyperoxidation processes play an important role in the pathogenesis of inflammatory diseases of various localization. It is noted that the severity of the inflammatory process and its transition to a chronic form coincides with an increase in the concentration of lipid peroxidation products in the blood. In recent years, in ENT practice, considerable attention has been paid to the study of lipid peroxidation processes in the development of inflammatory diseases such as sinusitis, otitis media, adenoiditis.

In connection with the above, the goal of our study was to increase the effectiveness of the treatment of chronic tonsillitis in children based on the study of the characteristics of the state of the antioxidant system and the correction of its disorders.

The effectiveness of ILBI is associated with the activation of calcium-dependent metabolic processes, as a result of which the release of products of biochemical reactions - active forms of oxygen: hydrogen peroxide, superoxide dismutase - increases. Accordingly, a specific enzymatic defense system is activated, which prevents the damaging effect of ROS (reactive oxygen species) on cell membranes, that is, an increase in the activity of catalase and superoxide dismutase occurs [3].

**Biochemical characteristics of catalase as one of the enzymes of the antioxidant system of the human body**

Antioxidants are substances that have the ability to interact with various reactogenic oxidants - reactive oxygen species and other free radicals - and cause their partial or complete inactivation. Activation of free radical oxidation processes, including lipid peroxidation, is a typical process of disorganization of the structures and functions of organs and systems in various pathological conditions.

The principle of operation of a biosensor consists in direct or mediatory (using electron carriers) transformation of the energy of an enzymatic reaction into an electrical signal. Electrochemical biosensors make it possible to quickly, with high sensitivity and selectivity, quantitative determination of various substances in complex biological fluids. Screenprinted electrochemical biosensors are economical, easy to use, and have stable analytical characteristics.

The method is based on obtaining specific protein membranes directly on the biosensor surface by cathodic copolymerization of a specific enzyme (catalase and superoxide dismutase) with glutaraldehyde.

We used screen printed - the electrodes are a polymer substrate, on which three electrically conductive silver sites are applied using a special technology. One of the sites serves as a working electrode (S = 1 mm²) and is covered with carbon paste. The second site acts as a reference electrode, the third site acts as a reference electrode and is coated with AgCl.

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2. \text{ RESEARCH MATERIALS AND METHODS}
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This study was based on 40 patients aged 5 to 18 years suffering from chronic tonsillitis of toxic-allergic form of grade 1 and toxic-allergic form of grade 2, who were treated in the children's department of otorhinolaryngology of the Regional Multidisciplinary Children's Clinical Medical Center of the Samarkand Region.

The patients were divided into 2 groups

Group 1 consisted of 21 patients with chronic tonsillitis of toxic-allergic form of grade 1 and toxic-allergic form of grade 2, who underwent complex treatment and intravenous laser blood irradiation (ILBI).

The control group 2 consisted of 19 patients with chronic tonsillitis of the toxic-allergic form of the 1st degree and the toxic-allergic form of the 2nd degree who received traditional treatment and local laser therapy.

In the survey of children with chronic tonsillitis, a large proportion were children aged 7 to 16 years. Examination and treatment were carried out in accordance with the standards approved by the Ministry of Health of the Republic of Uzbekistan. Among the specific research methods, the activity of catalase and superoxide dismutase in saliva was studied using a biosensor.
The data of statistical processing before and after ILBI treatment of the obtained measurements are shown in the following table:

<table>
<thead>
<tr>
<th>Index</th>
<th>Before treatment</th>
<th>After ILBI treatment</th>
<th>T criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>catalase</td>
<td>0.60333 ± 0.1028</td>
<td>2.37476</td>
<td>263,093</td>
</tr>
<tr>
<td>superoxidedismutase</td>
<td>26.8095</td>
<td>0.09205</td>
<td>199,478</td>
</tr>
</tbody>
</table>

for all calculations p < 0.05, t tab = 2.04

In the study group, during the study, we observed a decrease in catalase and superoxide dismutase indices before treatment, which can be seen in the first table. After treatment, 8 months later, an increase in catalase and superoxide dismutase indices was observed, which indicates that intravenous laser irradiation of blood gives high clinical efficacy.

The statistical processing data before and after the local laser therapy treatment of the obtained measurements are shown in the following table.

<table>
<thead>
<tr>
<th>Index</th>
<th>Before treatment</th>
<th>After ILBI treatment</th>
<th>T criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>catalase</td>
<td>0.63368 ± 0.10972</td>
<td>1.23158 ± 0.08494</td>
<td>79.6886</td>
</tr>
<tr>
<td>superoxidedismutase</td>
<td>25.7895 ± 1.83929</td>
<td>27.0684 ± 1.80362</td>
<td>9.18146</td>
</tr>
</tbody>
</table>

The data of statistical processing before and after treatment with local laser therapy showed that the indicators of catalase and superoxide dismutase did not change significantly. This testifies to the low clinical efficacy of local laser therapy in the treatment of chronic tonsillitis in children.

**Based on this study, the following conclusions were made:**

1) The clinical efficacy of intravenous laser blood irradiation in chronic tonsillitis in children with toxic-allergic form 1 and toxic-allergic grade 2 was determined in comparison with the control group.

2) It is noted that in chronic tonsillitis, the antioxidant system decreases, a picture of a reduced activity of peroxidase and superoxide dismutase is revealed.

3) The high clinical efficacy of intravenous laser blood irradiation in chronic tonsillitis in children has been established: it leads to an improvement in the indicators of the antioxidant system, prevents local signs of the disease and helps to reduce their hospital stay.

**Practical recommendations:**

1) The method for determining peroxidase and superoxide dismutase is a specific non-invasive and also the most accurate diagnostic criterion and an effective method for treating chronic tonsillitis in children.

2) In chronic tonsillitis toxic-allergic grade 1 and 2, ILBI is recommended in an average daily dose 1 time per day, red 650 nm, blue 405 nm daily for 10 days.
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