Quantum therapy in correction of the lipidic metabolism at acute pancreatitis

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Abstract. Attempt to establish efficiency of laser therapy in correction of a lipid metabolism at patients with acute pancreatitis was the purpose of work. There were clinical laboratory researches of 48 patients with acute heavy pancreatitis. To the first clinical group (comparison) standard therapy was carried out. To patients of the second clinical group (main) in addition to basic therapy within 10 days daily sessions of laser therapy by the device "Matrix" were held later. Radiation with the wavelength of 635 nanometers, 2 MW was used. Percutaneous laser radiation of blood was carried out to projections of a cubital vein within 30 minutes daily. Inclusion of laser therapy in complex treatment of patients with pancreatitis led to more significant positive dynamics. Reduction of weight of endotoxemia in the main group is set that was verified by decrease in level of both hydrophilic, and hydrophobic toxins. The analysis of the data obtained as a result of research in the main group revealed decrease in concentration of products of free radical oxidation of lipids in comparison with group of comparison for 12.1 – 17.3% of % (p < 0.05). Laser radiation of blood as a part of complex treatment led to reliable inhibition of activity of enzymes of phospholipase system in blood plasma, in particular activity of a phospholipase of A2 fell for 13.2 – 34.4% (p <0.05).

Thus, inclusion of laser therapy in structure of complex treatment of sharp pancreatitis allowed to reduce significantly expressiveness of endogenous intoxication, intensity of processes of free radical oxidation of membrane lipids and activity of phospholipase systems.

1. Introduction

In modern emergency abdominal surgery the most complex problem is acute pancreatitis. It is caused not only by growth of incidence and development of heavy complications, but also the remaining high lethality which in general makes 4.3 – 5.5%, and at destructive forms reaches 28 – 80% (Andreyev A. V., etc., 2015; Kubyshkin V. A., etc., 2015 Aranda-Narvaez J.M. et al., 2014; Feng Y.C. et al., 2014).

At acute pancreatitis against the expressed endotoxemia reduction of speed of a blood-groove in capillaries, deterioration in rheological properties of blood and forming of a circulator and metabolic hypoxia with activation of processes of peroxide oxidation of lipids is observed that as a result leads to the membrane destructive phenomena (Vlasov A. P., etc., 2009; Dibirov M. D., etc., 2014; Bradley E.L. et al., 2010). Proceeding from specified, one of possible pathogenic medical agents can act such which are capable to reduce expressiveness of endotoxemia, to improve microcirculation, to effectively correct pathological transformations of a lipidic matrix biomebran (Tsedrik N. I., etc., 2008; Kudelich O. A., 2014). In the last decades the special attention is drawn by laser therapy which
exerts positive impact on a number of pathogenic links at various diseases (Geynits A. V., etc., 2013; Musikhin L. V., etc., 2014). However effects of its action at acute pancreatitis on the relation of a lipidic exchange are studied insufficiently fully.

Work purpose. To establish a role of disturbances of a lipidic metabolism in a pathogeny of acute pancreatitis; to estimate pathogenic effects of laser therapy.

2. Materials and methods
Clinical laboratory researches of 48 patients with acute heavy pancreatitis are conducted. To the first clinical group (comparison) standard therapy was carried out. To patients of the second clinical group (main) in addition to basic therapy within 10 days daily sessions of laser therapy were held by the device "Matrix" (the registration certificate No. FSR 2007/00589, the certificate of conformity of ROSS RU.AV35.D00082). The head of "KLO-3" was used (radiation with the wavelength of 635 nanometers, 2 MW). Percutaneous laser radiation of blood was carried out to projections of a cubital vein within 30 minutes daily. Blood sampling was carried out to control terms (the 1, 2, 4 and 6 days).

In work the following methods of research are used. Chromatographic research of a lipidic range of a blood plasma and erythrocytes (Higginsdzh. And., 1990); determination of level of spontaneous low-nanow dial (Egorov of Yu., Kozlov A. V., 1988); studying of activity of a phospholipase of A2 (Trofimov V. A., 1999); definition maintenance of molecules of average weight (Pikuza O. I., Shakirova L. Z., 1994); studying of the general and effective concentration of albumin (Grzyunov Yu. A., Dobretsov G. E., 1994); a laser Doppler flowmetry by means of the LAKK-02 analyzer (LLC NPP LAZMA, Russia).

The obtained digital data processed by method of variation statistics with use of a criterion of Styyudent. Calculations made on CPU3,10GHz "Intel® Core™ i3-2100" by means of the software package of MicrosoftOffice 2007. Dynamics of indicators is reflected in the schedules constructed with use of the program of the spreadsheets MicrosoftExcel 2007.

3. Results and discussion
Distribution of patients on a sex, age, a prescription and disease severity, laboratory data and data of tool researches in the studied groups was comparable.

The syndrome of endogenous intoxication is diagnosed for patients of the first group at receipt in clinic and during the period of supervision that was expressed in increase in a blood plasma of level of toxins of the hydrophilic and hydrophobic nature. So, increase of maintenance of molecules with lengths of waves of 254 and 280 nanometers at 27,3 is registered – 142,9 % (p < 0,05) and 39,5 – 96,8 % (p < 0,05) respectively. The general concentration of albumine decreased on 13,0 – 34,6 % (p < 0,05), effective – on 32,4 – 58,3 % (p < 0,05) that caused its low ability to binding of toxic ligands. When calculating falling of a reserve of binding of an albuminan 17,3 is established – 65,2 % (p < 0,05), increase of an index of toxicity of plasma – on 168,3 – 378,1 % (p < 0,05), and the maximum growth of an indicator is recorded for the fourth days of the postoperative period. Despite some positive shifts by the end of supervision, in group of comparison it is not recorded normalization of the studied indicators. Thus, the carried-out treatment of acute pancreatitis did not interfere with progressing of endogenous intoxication and did not eliminate an imbalance in system of a homeostasis.

For the purpose of studying of a condition of microcirculation at patients with acute pancreatitis record doppler-gramm was carried out in points Zhang-Men (the free end of the XI edge) - an alarm point of a meridian of a pancreas (Briskin B. S., Bukatko V. N., 2002). Researches showed a reliable deviation of indicators from a norm. So, indicators of microcirculation and shunting increased in comparison with a norm on 25,3 – 78,3 and 20,4 – 83,2 % (p < 0,05) respectively, the Index of efficiency of microcirculation increased on 15,2 – 40,8 % (p < 0,05). The relation of the maximum respiratory and low frequencies exceeded a norm on 31,3 – 121,7 % (p < 0,05) with a maximum for the first days of research. The relation of cardiac and low frequencies was 60,2 – 98,4 norms higher % (p < 0,05) on – the sixth days of supervision. The obtained data confirmed development of
disturbance of microcirculation of the I-II degree with turning on of respiratory and cardial compensatory mechanisms (existence of R-and C-wave on different terms of supervision). Use of traditional therapeutic actions did not bring to elimination of disorders of microcirculation.

Definition of indicators of quantitative and qualitative spectral structure of lipids, intensity of free radical reactions of a lipoperoxidation, activity of a phospholipase of A2 and catalase in a blood plasma at patients with acute pancreatitis showed an intensification of processes of peroxide oxidation of lipids and increase in activity of a phospholipase of A2. Concentration of primary products the FLOOR in a blood plasma was 46,3 - 211,3 norms higher % (p < 0,05). Level of low-new dial exceeded normal value for 87,3 – 158,2% (p <0,05). Activity of a phospholipase of A2 was increased on 320,2 – 647,3 % (p < 0,05). Increase in activity of the catalase participating in an inactivation of free radicals on 20,3 was registered –79,7 % (p < 0,05) that, probably, is connected with compensatory and adaptive reactions in response to an intensification of free radical oxidation of lipids.

Disturbances of a lipidic exchange in a blood plasma remained throughout research. So, the amount of total phospholipids in a blood plasma was reduced concerning a norm by 15,1 – 20,4% (p <0,05), sphingomyelin – for 10,2 – 16,7% (p <0,05), phosphatidylserine – for 15,1 – 20,3% (p <0,05), a phosphatidylcholine – for 19,6 – 31,4% (p <0,05), phosphatidylethanolamine – for 15,3–16,1% (p <0,05). Content of free fatty acids was authentically raised in comparison with a norm for 26,2 – 50,1%, cholesterol ethers – for 38,1 – 54,2%, and lizophospholipid – for 350,4 – 514,2% (p <0,05).

Research of indicators of a lipidic metabolism of erythrocytes similar changes in a type of change of maintenance of the main membrane-based fractions of lipids, growth of level of chaotropic fractions against increase in intensity of free radical processes of oxidation of membrane lipids and a superactivity of a phospholipase of A2 were revealed.

Carrying out traditional medical actions promoted reduction of the revealed changes of a lipidic metabolism at patients acute pancreatitis, but did not lead to full elimination of the dislipid phenomena in blood.

Laser radiation of blood as a part of complex therapy led to a reliable detoxification effect. Against use of laser therapy decrease in level of middlemolecular peptides on 24,1 was registered –50, 3% (p < 0,05) concerning group of comparison; increase of the general and effective concentration of albumine on 15,1 –25,6% (p < 0,05) and 28,6 –80,7% (p < 0,05) respectively, the index of toxicity decreased on 35,9 –64,5 % (p < 0,05) concerning group of comparison. Clinical trials confirmed reduction of expressiveness of endogenous intoxication and normalization of the arising homeostatic disturbances at acute pancreatitis under the influence of laser therapy in earlier terms, than at the patients receiving only basic treatment.

At patients of the main group against use of laser therapy positive dynamics of indicators of microcirculation was revealed that was shown on early terms of a disease in transition of extent of disturbance of microcirculation from II in I in a look decrease in amplitude of a R-wave, emergence of the S-wave, decrease in an indicator of microcirculation by 10,3–25,2% (p <0,05) and a shunting indicator – for 9,7 – 15,2% (p <0,05) concerning data of group of comparison (figure 1).

Studying of concentration of products of a lipoperoxidation in the main group showed the following: content of low-new dial decreased on 11,6 –29,0 % (p < 0,05). Also reduction of enzymatic activity in a blood plasma is registered: catalases for 19,1% (p <0,05), A2 phospholipases for 21,8 – 64,3% (p <0,05) (figure 2).
**Figure 1.** An indicator of microcirculation of patients with acute pancreatitis against laser therapy use. The established norm is taken for 100%, * – reliability of difference from data of group of comparison (p <0.05); I – comparisons; II – the main group.

**Figure 2.** Concentration of by-products the FLOOR and activity of enzymes in plasma of patients with acute pancreatitis against laser therapy use. The established norm is taken for 100%, * – reliability of difference from data of group of comparison (p <0.05); I – comparisons; II – the main group.

At comparative analysis of fractional structure of lipids of a blood plasma at patients with acute pancreatitis in group of comparison and the main group it turned out that the content of total
phospholipids in a blood plasma of the patients receiving laser therapy was above data of group of comparison for 10.3 – 16.8%, phosphatidylsincaline – for 10.1 – 15.2% (p <0.05), the indicator of triacylglycerols was below control for 12.0 – 20.3%, lizophospholipid – for 25.1 – 30.1%, free fatty acids – for 12.8 – 17.3% (p <0.05). Studying of indicators of a lipidic metabolism of erythrocytes in the main group showed decrease in contents primary and by-products the FLOOR in erythrocytes of patients of the main group there was less than that in control group for 21.1 – 17.0% (p <0.05) and reduction of activity of a phospholipase of A2 by 53.2% (p <0.05). Authentically the lipidic structure of erythrocyte membranes concerning data of group of comparison (figure 3) improved.

**Figure. 3.** Indicators of lipidic structure of erythrocytes of patients with acute pancreatitis against laser therapy use (TPhL – total phospholipids; SFA – free fatty acids). The established norm is taken for 100%, * – reliability of difference from data of group of comparison (p <0.05); I – comparisons; II – the main group.

In conclusion it should be noted that use of laser therapy at acute pancreatitis showed high performance in correction of disturbances of a lipidic metabolism – one of the leading pathogenetic components of this serious illness. lipid modulating potential of laser radiation of blood is verified by increase in a blood plasma and cellular membranes of erythrocytes of a share of total phospholipids, phosphatidylsincaline, phosphatidylserine and decrease in concentration of free fatty acids, acylglycerofishing and lizophospholipid. The specified positive action of the approved way of therapy is implemented through inhibition of processes of peroxide oxidation of lipids and reduction of activity of phospholipazny systems. Possibly, the above-stated effects of laser therapy are defined by its ability to improve microcirculation, to activate enzymes of own antioxidant protection, to increase synthesis of ATP, nucleic acids and proteins, and also to intensify cellular respiration (Nechipurenko N. I., 2014). Certainly, reduction of the membrane destabilizing phenomena was one of significant factors of correction of a syndrome of endogenous intoxication at acute pancreatitis. Use of laser radiation of blood allowed to reduce quickly concentration in a blood plasma of toxic metabolites of both the hydrophilic, and hydrophobic nature.

**4. Conclusion**
Let's note that productivity laser radiation of blood in recovery of indicators of a homeostasis significantly exceeded possibilities of standard therapy both on expressiveness, and on manifestation time.

Thus, use of laser therapy in complex treatment of acute pancreatitis allows to level dislipid changes in an organism and to prevent progressing of the membrane destabilizing phenomena, and
also to quickly correct a syndrome of endogenous intoxication, significantly improving a current and the forecast of a disease in general.

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