Cardiovascular

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Low-level laser irradiation inhibits abdominal aortic aneurysm progression in apolipoprotein E-deficient mice.

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AIMS: Increased early detection of abdominal aortic aneurysm (AAA) and the severe complications of its current treatment have emphasized the need for alternative therapeutic strategies that target pathogenetic mechanisms of progression and rupture. Recent in vitro studies from our laboratory have shown that low-level laser irradiation (LLLI) (780 nm) modifies cellular processes fundamental to aneurysm progression. The present study was designed to determine whether LLLI retards the progression of suprarenal AAA in vivo. METHODS AND RESULTS: High-frequency ultrasonography (0.01 mm resolution) was used to quantify the effect of LLLI on aneurysmatic aortic dilatation from baseline to 4 weeks after subcutaneous infusion of angiotensin II by osmotic minipumps in the apolipoprotein E-deficient mouse. At 4 weeks, seven of 15 non-irradiated, but none of the 13 LLLI, mice had aneurysmal dilatation in the suprarenal aneurysm-prone segments that had progressed to >/=50% increase in maximal cross-sectional diameter (CSD) over baseline (P = 0.005 by Fisher's exact test). The mean CSD of the suprarenal segments (normalized individually to inter-renal control segments) was also significantly lower in irradiated animals (LLLI vs. non-irradiated: 1.32 +/- 0.14 vs. 1.82 +/- 0.39, P = 0.0002 by unpaired, two-tailed t-test) with a 94% reduction in CSD at 4 weeks compared with baseline. M-mode ultrasound data showed that reduced radial wall velocity seen in non-treated was significantly attenuated in the LLLI mice, suggesting a substantial effect on arterial wall elasticity. CONCLUSION: These in vivo studies, together with previous in vitro studies from this laboratory, appear to provide strong evidence in support of a role for LLLI in the attenuation of aneurysm progression. Further studies in large animals would appear to be the next step towards testing the applicability of this technology to the human interventional setting.

Klin Lab Diagn. 2009 Apr;(4):19-21.

[Platelet aggregatory properties in patients with chronic pancreatitis and possibilities of correcting their impairments]

[Article in Russian]

Burduli NM, **Gutnova SK**.

The purpose of the investigation was to study the impact of low-intensity laser therapy (LILT) on platelet aggregatory properties in patients with chronic pancreatitis (CP) on an exacerbation. A total of 105 patients aged 36 to 77 years who were divided into a study group (n = 60) and a control one (n = 45) were examined. Thirty persons who formed a healthy group were additionally examined. In the study group patients, drug therapy was supplemented by LILT via various methods. The control group received only drug therapy. The investigation revealed that patients with CP on an exacerbation showed diverse changes in platelet aggregatory properties towards hyperaggregation. LILT was ascertained to have a normalizing effect on platelet aggregatory properties in the study group patients.

Kardiol Pol. 2007 Jan;65(1):13-21; discussion 22-3.

Laser biostimulation in end-stage multivessel coronary artery disease--a preliminary observational study.

\[Article in English, Polish]

Zyciński P, **Krzemińska-Pakuła M**, **Peszyński-Drews C**, **Kierus A**, **Trzos E**, **Rechciński T**, **Figiel L**, **Kurpesa M**, **Plewka M**, **Chrzanowski L**, **Drozdz J**.

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BACKGROUND: Low-energy laser radiation through its direct influence on tissue repair processes without heating effect may have vital importance in the therapy of patients with advanced coronary artery disease (CAD). AIM: The introductory assessment of the effects of laser biostimulation applied to patients with advanced multivessel CAD. METHODS: 39 patients with advanced CAD were assigned (mean age 64.8+/-9.6, male gender 64%, CCS class 2.5+/-0.5, EF=46+/-11%, 69% with a history of acute myocardial infarction), to undergo two sessions of irradiation of low-energy laser light on skin in the chest area from helium-neon B1 lasers. The time of irradiation was 15 minutes while operations were performed 6 days a week for one month. Before including the patients in the experimental group a full clinical evaluation, basic biochemical tests, ECG, 24h Holter recordings, 6-minute walk test, treadmill test using Bruce protocol and full echocardiographic examination were performed. After the first and second period of laser therapy with a one-month break between them analogical parameters with the initial examination were measured. RESULTS: No side effects associated with the laser biostimulation or performed clinical tests were noted. Lower CCS class (2.5+/-0.5 --> 2.2+/-0.4 --> 2.0+/-0.4, p<0.001), higher exercise capacity (5.1+/-2.2 --> 5.8+/-2.2 --> 6.6+/-2.5 [METS], p=0.023), longer exercise time (257+/-126 --> 286+/-127 --> 325+/-156 [s], p=0.06), less frequent angina symptoms during the treadmill test (65% --> 44% --> 38%, p=0.02), longer distance of 6-minute walk test (341+/-93 --> 405+/-113 --> 450+/-109 [m], p <0.001), lower systolic blood pressure values (SP 130+/-14 --> 125+/-12 --> 124+/-14 [mmHg], p=0.05) and trend towards less frequent 1 mm ST depression lasting 1 min during Holter recordings were noted. CONCLUSIONS: An improvement of

functional capacity and less frequent angina symptoms during exercise tests without a significant change in the left ventricular function were observed. Laser biostimulation in short-term observation was a very safe method. These encouraging results should be confirmed in a larger, placebo-controlled study

EMLA Laser Health J 2007;2:46-67
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Successful treatment of finger atheroembolism with low-level laser irradiation (LLLI): report of a case.

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Atheroembolism constitutes a subset of acute arterial occlusion, in which, multiple small deposits of fibrin, platelet, and cholesterol debris embolize from proximal atherosclerotic lesions or aneurysmal sites. Ischemia resulting from atheroemboli in extremities is notoriously difficult to treat and circulatory disturbance in these regions usually results in amputation. During past 30 years, low-level lasers have been widely used in medical fields. Low-level laser irradiation in red and near infrared region, locally or intravenously may result in vasodilatation, increased tissue perfusion and neovascularization.

A 64 years-old Iranian man referred to our clinic with acute atheroembolism of right index finger distal phalanx. There was no predisposing cardiovascular factor except for a mild hypercholesterolemia, and physical examination was generally normal. During 12 sessions (about 30 days) of low-level laser therapy with infrared light, 980 nm/ 100 mW and red light, 650 nm/ 30 mW, associated with 3 sessions of intravenous red light laser, 2 mW, ischemia disappeared and the finger was quite normal. On 12 months of follow-up, the patient was uneventful.

Our observations during treatment process confirmed the results of previous experimental and clinical observations about LLLI effects on tissue healing of ischemic areas demonstrating that delivery of laser energy to the ischemia-induced necrotic area may have an important beneficial effect on patients with acute thromboembolism of fingers, preventing them from amputation or other invasive surgical interventions. However, additional studies and more clinical evidences are to be needed to demonstrate the various aspects of this application of lasers in medical practice.

Photomed Laser Surg. 2006 Apr;24(2):111-20.

Photoengineering of tissue repair in skeletal and cardiac muscles.

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This review discusses the application of He-Ne laser irradiation to injured muscles at optimal power densities and optimal timing, which was found to significantly enhance (twofold) muscle regeneration in rats and, even more, in the cold-blooded toads. Multiple and frequent (daily) application of the laser in the toad model was found to be less effective than irradiation on alternate days. It was found that in the ischemia/reperfusion type of injury in the skeletal leg muscles (3 h of ischemia), infrared Ga-Al-As laser irradiation reduced muscle degeneration, increased the cytoprotective heat shock proteins (HSP-70i) content, and produced a twofold increase in total antioxidants. In vitro studies on myogenic satellite cells (SC) revealed that phototherapy restored their proliferation. Phototherapy induced mitogen-activated protein kinase/extracellular signal-regulated protein kinase (MAPK/ERK) phosphorylation in these cells, probably by specific receptor phosphorylation. Cell cycle entry and the accumulation of satellite cells around isolated single myofibers cultured in vitro was also stimulated by phototherapy. Phototherapy also had beneficial effects on mouse, rat, dog and pig ischemic heart models. In these models, it was found that phototherapy markedly and significantly reduced (50-70%) the scar tissue formed after induction of myocardial infarction (MI). The phototherapeutic effect was associated with reduction of ventricular dilatation, preservation of mitochondria and elevation of HSP- 70i and ATP in the infarcted zone. It is concluded that phototherapy using the correct parameters and timing has a markedly beneficial effect on repair processes after injury or ischemia in skeletal and heart muscles. This phenomenon may have clinical applications.

Progress in Low-level Laser Therapy

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Abstract
The presentation covers fundamental operating principles of some of the most widely used methods of low-level laser therapy (LLLT). It includes also recently developed LLLT technologies and medical devices such as LLLT cardiovascular and brain therapy, tissue regeneration and pain relive. The mechanism of LLLT involving interaction with mitochondria. The effects of LLLT are wavelength specific upon a known mitochondrial receptor (cytochrome C oxidase). Targeting of this receptor results in formation of adenosine triphosphate (ATP), enhanced mitochondrial survival and maintenance of cytochrome C oxidase activity

Likars'ka sprava. 2001; (5-6): 111-114.

Evaluation of quantum therapy for the treatment of stable angina

[Otsinka efektyvnosti vplyvu kvantovoi terapii na perebig stabil'noi stenokardii].

A total of 68 patients were examined. Of these, 21 had functional class (FC) I stabile angina, 23 presented with FC II angina, 24 had FC III angina. Instituted in the control group patients (n = 30) was standard antianginal therapy (SAT). Laser therapy against the background of SAT employed has been found to improve the functional state of the myocardium, enhance tolerance to physical loads, improve indices for intracardiac hemodynamics. HeNe laser irradiation has an analgecizing effect. Patients with FC I-III exertional angina can derive benefit from laser therapy due to its cardioprotective effect. Positive hemodynamic shifts were accompanied by improvement in general health of patients manifested by lower frequency of angina attacks and episodes of pain-free ischemia of the myocardium. Laser therapy had an effect on relation between painful and painless ischemia of the myocardium as evidenced by a predominant decrease in pain-free episodes of myocardial ischemia, this being regarded as a prognostically favourable fact.

Klin Med (Mosk). 2003;81(1):24-7.

[Clinico-functional efficacy of medicinal and photon stabilization of cell membrane in patients with angina pectoris]

[Article in Russian]

Vasil'ev AP, **Senatorov IuN**, **Strel'tsova NN**, **Gorbunova TIu**.

Modification of erythrocytic membrane and the trend in clinicofunctional indices were studied in 90 patients with angina of effort (FC I-IV) in the course of treatment with a combination of membranoprotective drugs (group 1), magneto-laser radiation (group 2) and imitation of laser radiation (group 3). In patients of groups 1 and 2 the treatment resulted in stabilization of cell membrane accompanied with a hypotensive effect and increased exercise tolerance due to more effective cardiac performance.

Chin Med J (Engl). 2004 Oct;117(10):1476-80

Low-power Helium-Neon laser irradiation enhances the expression of VEGF in murine myocardium.

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BACKGROUND: Low-power helium-neon (He-Ne) lasers have been increasingly widely applied in the treatment of cardiovascular diseases, and its vasodilation effect has been proven. The aim of this study was to determine the effects of low-power He-Ne laser irradiation directed at the precardial region of Wistar rats on capillary permeability in the myocardium and the expression of myocardial vascular endothelial growth factor (VEGF). METHODS: Sixteen rats were divided randomly into control and irradiated groups (n = 8, each). A He-Ne laser (632.8 nm) was applied to the irradiated group with a dose of 60.5 J/cm(2). Ferritin was perfused into the left femoral vein and capillary permeability was examined under an electron microscope. VEGF expression in the myocardium was investigated by immunohistochemical methods, RT-PCR, and image analysis. RESULTS: The ultrastructures of the myocardial capillaries were examined. Compared to the control group, more high-density granules (ferritin), which were present within the capillary endothelium and the mitochondrions of myocardial cells in the internal layer of the myocardium, were observed in the irradiated group. VEGF staining of the myocardium was stronger in the irradiated group than that in the control group. The optic density of the irradiated group (0.246 +/- 0.015) was significantly higher than that of the control group (0.218 +/- 0.012, $P < 0.05$). Finally, the levels of RT-PCR products of VEGF165 mRNA were 2.79 times higher in irradiated rats than in the control rats. CONCLUSIONS: Our study demonstrates that He-Ne laser irradiation (in doses of 60.5 J/cm(2)) increases myocardial capillary permeability and the production of VEGF in myocardial microvessels and in myocardium. Our study provides experimental morphological evidence that myocardial microcirculation can be improved using He-Ne laser irradiation.

Fifteen-year experience with low-energy laser applications for patient treatment in emergency-care clinics

Nemtsev, Igor Z.; Lapshin, V. P.
Proc. SPIE Vol. 2100, p. 284-291, Cell and Biotissue Optics: Applications in Laser Diagnostics and Therapy, Valery V. Tuchin; Ed.

Low energy lasers have been successfully applied for the treatment of more than 10 thousand patients in the Sklifosovsky Scientific Research Institute for Emergency Medicine. We have reviewed and generalized the results of clinical investigations of 34 patients with trauma of motor-locomotive system, 15 patients with muscular atrophy occurred as a result of lower extremity fracture immobilization, 124 patients with burns

and of 88 post-infarction patients with ischemic heart disease, who underwent laser therapy with He-Ne laser, N_2 Ultra-Violet and GaAs Infra-Red lasers.

INFLUENCE OF LOW DOSE LASER HERAPY ON ENDOTHELIAL FUNCTION IN PATIENTS WITH CAD

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The purpose of this study was the evaluation of arterial relaxation ability in 15 patients with CAD before and after the course of infrared laser therapy. 18 controls (healthy men). With high-resolution ultrasound and impulse wave doppler we measured the increasing of volumic velocity flow (%) of the arteria poplitea at rest and during reactive hiperaemia (with increased flow causing endothelium-dependent dilatation). In controls flow-mediated mean dilatation was normal. Endothelial dysfunction is present in majority of patients with CAD, flow-mediated dilatation was much reduced of absent. Course of infrared laser therapy was benefit to restore endothelial function in patients with CAD.

Vopr Kurortol Fizioter Lech Fiz Kult. 2003 Jul-Aug;(4):10-3.

[Efficacy of laser therapy in patients with ischemic heart disease]

[Article in Russian]

Vasil'ev AP, Strel'tsova NN, Senatorov IuN.

Modification of erythrocytic membrane and the trend in clinicofunctional indices were studied in 93 patients with angina of effort (FC i-IV) in the course of treatment with laser radiation (group 1) and imitation of laser radiation (group 2). In patients of group 1 the treatment resulted in stabilization of cell membrane accompanied with positive cardiodynamic changes.

Klin Med (Mosk). 2002;80(4):31-3.

[Diagnostic implications of changed red cell count in low-intensity laser radiation of blood in elderly patients with coronary heart disease]

[Article in Russian]

Simonenko VB, Siuch NI, Vokuev IA.

Intravenous laser therapy in combination with medication was conducted in 41 elderly patients with coronary heart disease (633 nm, 1 mW, 124 mW/cm2). The study of qualitative and quantitative (osmotic resistance) erythrocyte indices of blood demonstrated the change of erythrocyte number in circulating blood by the third laser procedure. Frequency of these changes correlated with duration of the treatment course. Intravenous laser therapy had a wider spectrum of effects on erythrocyte number than

medication. Changes in erythrocyte number in the peripheral blood upon intravenous laser radiation reflects efficiency of treatment of coronary heart disease patients.

Vopr Kurortol Fizioter Lech Fiz Kult. 2001 Jul-Aug;(4):3-6.

[The efficiency of low-intensity laser radiation in the treatment of arterial hypertension complicated by ischemic heart disease]

[Article in Russian]

Shuvalova IN, **Klimenko IT**, **Svinina NG**, **Tsereteli MV**, **Zankina VG**, **Miasoed FR**.

The efficiency of low-intensity laser radiation (LILR) was studied in the treatment of 291 patients with arterial hypertension and ischemic heart disease. Clinical grounds are given for use of LILR red and infrared rays in rehabilitation of hypertensive patients with ischemia. The rehabilitation regimens can be differentiated according to the disease severity, type of hemodynamics, state of cerebral circulation.

Vopr Kurortol Fizioter Lech Fiz Kult. 2001 Nov-Dec;(6):10-3.

[Laser irradiation in the treatment of ischemic heart disease]

[Article in Russian]

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Vasil'ev AP, Strel'tsova NN, Senatorov IuN.

Cardiodynamic changes due to beta-blocker carvedilol and low-intensity infrared laser radiation were compared in 115 patients with ischemic heart disease (IHD). The comparison has shown a similar positive effect on heart contractility and diastolic function. This gave arguments for feasibility of laser beam usage as a neurohormonal modulator in IHD patients to reduce cardiac remodulation and prevent cardiac failure.

Vopr Kurortol Fizioter Lech Fiz Kult. 2003 May-Jun;(3):22-5.

[Antioxidant action and therapeutic efficacy of laser irradiation of blood in patients with ischemic heart disease]

[Article in Russian]

Volotovskaia AV, Ulashchik VS, Filipovich VN.

Laser irradiation in therapeutic doses (gamma = 632.8 nm, 14 mW) has an antioxidant effect in blood irradiation in vitro as shown by activation of superoxide dismutase (SOD)

which is a key enzyme of the antioxidant system (AOS) and suppression of lipid peroxidation. Adjuvant supravascular He-Ne laser irradiation of blood in combined therapy of 82 patients with ischemic heart disease (IHD) produces a positive trend in the clinical picture, hemostasis, lipid metabolism, blood SOD activity. Thereby, this method of laser hemotherapy is recommended for use in IHD patients. The dependence of the treatment results on the initial blood AOS necessitates consideration of AOS state in deciding on laser therapy in this group of patients.

Vopr Kurortol Fizioter Lech Fiz Kult. 2002 Jul-Aug;(4):9-11.

[Use of infrared laser therapy in patients with ischemic heart disease associated with diabetes mellitus type 2 in health resort]

[Article in Russian]

Zin'kovskaia TM, Zavrazhnykh LA, Golubev AD.

Infrared laser therapy (300 Hz) combined with balneotherapy and patients' education is more effective than standard sanatorium rehabilitation in patients with ischemic heart disease associated with diabetes mellitus type 2. 81.8% patients showed good response manifesting in less frequent anginal attacks, episodes of pain and painless ischemia and lower doses of antianginal drugs. Systolic and diastolic arterial pressure lowered by 18 and 10 mm Hg on the average, respectively. Multimodality rehabilitation of IHD patients with type 2 diabetes mellitus improves hemostasis, carbohydrate and lipid metabolism. Coronary circulation response lasted for 24 weeks.

EFFECTS OF LASER THERAPY ON VENTRICULAR AND SUPRAVENTRICULAR EXTRASYSTOLES IN PATIENTS WITH ANGINA PECTORIS OF 1-3 FUNCTIONAL CLASSES

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The aim of the present investigation is to study the effect of low level laser on extrasystoles. The amount of citrasystoles is registered before treatment and on the 10th day after the therapy. 64 patients with angina pectoris underwent laser therapy. We registered patients with more than 200 supraventricular extrasystoles and with more than 100 ventricular extrasystoles before our therapy. The treatment was carried out the keep of GaAs laser - "Elat" (890 nm) with pulse regime. The region of projection of carotide sinuses and heart were irradiated with pulse repetition rate 150 - 300 Hz with expositions 20 min. The amount of extrasystoles was counted by Holter monitor device. Laser therapy lessened supraventricular citrasystoles from 308,4±29,6 to 134,6±21,8 ($p<0,001$) and ventricular extrasystoles - from 182,1±31,3 to 41,5±16,3 ($p<0,05$) in patients with 1-3 functional class. We observed a decreased number of extrasystoles in 2 FC by 39,9

percent and by 13,7 percent, respectively. On patients with 3 FC - by 38,7 percent ($p<0,001$) and by 13,3 percent ($p<0,05$), respectively. This effect could still be observed after two months after the treatment. The results showed, that laser therapy lessened extrasystoles and that it can be applied as an effective means when treating ventricular and supraventricular extrasystoles in patients with angina pectoris 1-3 FC.

THE EFFECTIVENESS AND INFLUENCE ON RHEOLOGICAL BLOOD FEATURES AND ENDOTHELIAN VESSELS FUNCTION OF INFRARED LASER THERAPY IN PATIENTS WITH ANGINA PECTORIS

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One can observe the impairment of endothelian vessels function (EVF) and rheological blood features (RhBF) in patients with various forms of ischemic heart disease. The task of this investigation is the study of infrared laser therapy (IRLT) influence to RhBF, EVF; the dependence of treatment effectiveness from above stated functions. 58 patients with stable angina pectoris III and IV functional class where under supervision. IRLT was performed by means of USOR and ASOR-2K apparatus with rate 300 Hz, the procedure lasted 10 minutes and it was given 10 times. To evaluate treatment effectiveness and its dependence on RhBF we have studied erythrocyte aggregation (EA), we have counted erythrocyte aggregation coefficient (EAC), the erythrocyte flowing (HF), it was marked by the index of flowing (IHF), spontaneous thrombocytcs aggregation (SThA) before and after IRLT and capillary fragility test (CFT). Before IRLT EAC was 0.78 ± 0.04, after it was 0.89 ± 0.06 ($p<0.05$), standard - 1.0. Before IRLT 1EF was $80,44\pm0.96\%$, after it was $90.47\pm0.91\%$ ($p<0.05$). SThA was higher standard in the majority of patients before therapy. It decreased after the therapy. After CFT SThA reduced in patients given IRLT ($25.81\pm1.50\%$, $20.39\pm0.91\%$ and $17.51\pm0.11\%$). The lowering of SThA did not occur in patients treated only with medical preparations. The IRLT was effective in 91.7%. The effect of therapy was higher in patients with reliable lowering of EA, SThA, increased IEF. Therefore the IRLT is highly effective method of angina pectoris treatment and improves rheological properties of blood and endothelium vessels function.

RESULTS OF 10-YEAR USE OF LOW INTENSITY LASER THERAPY AND CONVENTIONAL TREATMENT OF PATIENTS WITH STENOCARDIA

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The improvement of treatment and rehabilitation of patients with CHD remains to be a vital problem in cardiology, as morbidity, disability and mortality rates keep steadily growing. However, insufficient efficacy of therapeutic methods, the development of retraction to antianginal drugs, their intolerance make medical men search for the new methods of CHD treatment, nonmedicamental ones inclusive. This paper presents the results of 10-year observation over two groups of patients with CHD (the main and control). 280 patients, who underwent a course of laser therapy (LT), have been included in the main group (A), the control (B) 155 patients have been treated conventionally. Prospective observation demonstrated new cases of acute myocardial infarction (AMI), mortality from CHD as well. There were 26 cases of AMI (II, 9 cases per 1000 population a year) in the main group, 27 AMI cases (27.4 per 1000 people a year) in the control over the observation period. The analysis of the acute attack and AMI development incidence in II - IV functional class (FC) stenocardia patients for 5 years before and after LT annual course demonstrated that the patients who underwent the repeated antirelapsing course of low intensity LT during remission showed reliable advantage ($p<0,01$ to $p<0,05$) of the method used as well as its prophylactic effect to prevent CHD progressing which was confirmed by biochemical blood analysis (lipid metabolism and rheologic properties). During the observation period there were 54 deaths: 8,9% in the main and 18,7% in the control group. CHD was the main cause of death in both groups which made 84% and 89.6% respectively of all death causes. Mortality rate was 17,4 and 32,6 respectively per 1000 population a year ($p<0,01$). On the whole, prospective analysis of the obtained data showed that LT course is directly dependent on its type and frequency of repeated courses and enables to prolong therapeutic remission of CHD by 2,5 times on the average. Thus, low intensity LT is a method of choice for patients suffering from different forms of angina pectoris and is carried out either in combination with conventional drug therapy or alone.

Cardiovasc Radiat Med. 1999 Jul-Sep;1(3):265-9.

Augmentation of the expression of proangiogenic genes in cardiomyocytes with low dose laser irradiation in vitro.

Khanna A, **Shankar LR**, **Keelan MH**, **Kornowski R**, **Leon M**, **Moses J**, **Kipshidze N**.

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BACKGROUND AND OBJECTIVE: Several reports suggest that low power red laser light (LPRLL) is capable of affecting cellular processes in the absence of significant thermal effect. The objective of the present study was to determine the effect of LPRLL on proliferation of fetal cardiomyocytes in vitro and on the expression of proangiogenic genes, transforming growth factor-beta (TGF-beta), and vascular endothelial growth factor (VEGF). STUDY DESIGN/MATERIALS AND METHODS: All cell cultures were irradiated with single-dose LPRLL using a He-Ne continuous wave laser (632 nm) with different doses. The effect of LPRLL on new DNA synthesis was studied by 3H thymidine-incorporation assay. VEGF and TGF-beta expression by cardiomyocytes was studied by reverse transcription-polymerase chain reaction (RT-PCR). RESULTS: We observed that a dose-dependent increase in cardiomyocytes proliferation can be obtained

with LPRLL and that there is a significant increase in VEGF and TGF-beta mRNA expression by cardiomyocytes. CONCLUSIONS: These data may have significant importance leading to the establishment of new methods for myocardial photoangiogenesis and photoregeneration as well as in vitro proliferation of cardiac myocytes

Vopr Kurortol Fizioter Lech Fiz Kult. 1997 Sep-Oct;(5):9-11.

[The dynamics of the clinico-functional indices in patients with ischemic heart disease under the influence of repeated courses of laser therapy]

[Article in Russian]

Vasil'ev AP, **Strel'tsova NN**.

Repeated courses of laser therapy given to patients with ischemic heart disease, angina of effort class I-IV for 2 years brought about stabilization of coronary insufficiency and improvement of clinical and functional conditions. Microcirculatory picture of the bulbar conjunctiva, coronary reserve improved. The treatment had also a hypotensive effect.

INTRAVENOUS A LASER IRRADIATION OF BLOOD IN COMPLEX REHABILITATION OF THE PATIENTS WITH ISCHEMIC HEART DISEASE IN THE SENIOR AGE GROUPS

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The problem of rehabilitation of the ischemic heart disease (IHD) patients remains essential. Use of physical methods of treatment of the given category of the patients in connection with numerous lacks in drug treatment (collateral action, decrease of tolerance with long treatment, sometimes their inaccessibility for continuous treatment) gets the increasing distribution. 32 IHD patients are surveyed, from them 6 IHD patients had a combination with arterial hypertension. Average age explore patients - 66±4 years. On a background of a dietary nutrition and basic treatment with nitrates have carried out an irradiation of blood by the helium-neon laser through light-guide in cubital vein with capacity 1,5 mW, exposition - 30 minutes once per day within ten days. As a result of complex treatment there has come an improvement of a common condition of the patients was noted, normalization of rheological parameters of blood. Thus, intravenous laser blood irradiation can be used for the treatment of patients with IHD in stage of the ambulatory rehabilitation, including the patients of the senior age groups.

THE APPLICATION OF LOW-INTENSITY LASER RADIATION FOR THE TREATMENT OF INFARCTIONAL PATIENTS WITH EARLY ANGINA PECTORIS REFRACTERING TO THE DRUG THERAPY

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The results of treatment by low-intensity laser radiation of blood are given with taking into account of individual sensitivity in process of laser therapy. 600 patients with myocardial infarction and early angina pectoris (500 patients simultaneously with drug therapy were given laser therapy, 100 patients were given only drug therapy) were examined. The selecting of dose of laser radiation was based on refraction index of blood plasma in the field of laser radiation *in vitro*. Before the starting of laser therapy, in the middle of the course and at the end of it the state of health was estimated according to the theory of stress by Selie. In the group of patients, receiving laser therapy, the pronounced positive clinical effect has been registered. According to our data this effect reflects the changing of blood coagulation.

EFFICIENCY OF INTRAVASCULAR BLOOD IRRADIATION WITH HE-NE LASER IN PATIENTS WITH STABLE EFFORT ANGINA PECTORIS DEPENDING ON FUNCTIONAL CLASS

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The aim of this study was the comparison of antianginal effect of intravascular He-Ne laser irradiation of blood (ILIB) in patients with different functional classes of angina pectoris. The tolerance to exercise was studied in 44 men with stable angina, functional classes I-II have been registered in 20 patients, functional classes III-IV - in 24 patients. Four veloergometer tests both before and after the course of invasive treatment were performed for every patient under circumstances of total abolition drugs. All 44 patients were randomized by the blind method into ILIB and placebo groups. Nine men with the slight angina pectoris and 15 patients with the painful angina pectoris were subjected to 6 ILIB seances, the total course dose was 21,6±0.8 J. We used the He-Ne laser radiation (wavelength 632,8 nm) from the three-wave laser therapy device "Adept", the light power in the end of intravenous light-guide was from I to 2 mW. Other 11 patients with angina functional classes I-II and 9 patients with angina pectoris functional classes III-IV received the placebo course of six invasive procedures. The effect of ILIB was calculated as a difference of increases in the mean-sample maximum workload between the laser therapy group and the placebo group. In patients with severe angina ILIB increased the exercise power reached on veloergometer on the average by 7,3±3,2 W ($t = 5,26$; $p = 0$).

In contrast, in patients with the high tolerance to exercise ILIB did not significantly affect this parameter. We obtained the great difference in effects of ILIB in patients with the serious angina pectoris and the mild stenocardia ($t = 2,41$, $p = 0,03$), Thus, efficacy of the invasive blood irradiation with He-Ne laser in patients with stable effort angina pectoris depended on the initial tolerance to exercise.

INFLUENCE OF INTRAVENOUS BLOOD IRRADIATION WITH HE-NE LASER ON THE ANTIANGINAL EFFECT OF NITROGLYCERIN IN PATIENTS WITH STABLE EFFORT ANGINA PECTORIS

A.I. Koryakov, N.N. Koryakova, A.I. Iofin
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We reported about the significant antianginal effect of intravenous He-Ne laser irradiation of blood (ILIB) in patients with serious stable effort angina functional classes 3-4. The goal of this work was to investigate an action of ILIB on an increase of the tolerance to exercise after the sublingual taking nitroglycerin in dose 0.5 mg in patients with stenocardia. We observed 27 men with stable effort angina functional classes II-IV. All patients were subjected two conjugate loading tests on veloergometer with nitroglycerin both before and after of the seven-day treatment. The antianginal effect of nitroglycerin was calculated as the magnitude of the increase maximum workload after taking nitroglycerin in comparison with the initial level of the maximum exercise power. Patients were divided randomly into main and control groups (17 and 10 men accordingly). Patients from the master group were subjected to six seances of ILIB. Power at the light-guide end was 1-2 mW, the accumulated dose was 21.6±0.8 J. The control group received the course of 6 invasive 45-minute placebo procedures that outwardly were like seances of ILIB. Both the intravascular laser treatment and its imitation were performed with three-wave laser therapy device "Adept". In all patients invasive procedures were combined with antianginal medication treatment that was abolished 1 -2 days before loading tests. Although after the treatment the increase of antianginal effect of nitroglycerin was not statistically significant in both groups, nevertheless after ILIB the rise of nitroglycerin's effect was more by 63 per cent as compared with placebo ($p > 0.9$). Thus, ILIB not only increases tolerance to exercise in patients with severe stable effort angina, but also it is not decreases the antianginal effect of nitroglycerin.

Vopr Kurortol Fizioter Lech Fiz Kult. 2002 Jul-Aug;(4):9-11.

[Use of infrared laser therapy in patients with ischemic heart disease associated with diabetes mellitus type 2 in health resort]

[Article in Russian]

Zin'kovskaia TM, Zavrazhnykh LA, Golubev AD.

Infrared laser therapy (300 Hz) combined with balneotherapy and patients' education is more effective than standard sanatorium rehabilitation in patients with ischemic heart disease associated with diabetes mellitus type 2. 81.8% patients showed good response manifesting in less frequent anginal attacks, episodes of pain and painless ischemia and lower doses of antianginal drugs. Systolic and diastolic arterial pressure lowered by 18 and 10 mm Hg on the average, respectively. Multimodality rehabilitation of IHD patients with type 2 diabetes mellitus improves hemostasis, carbohydrate and lipid metabolism. Coronary circulation response lasted for 24 weeks.

Sov Med. 1990;(3):12-5.

[Helium-neon laser therapy in the combined treatment of unstable stenocardia]

[Article in Russian]

Korochkin IM, Kapustina GM, Babenko EV, Zhuravleva NIu.

He-Ne laser therapy included in complex of therapeutic methods for patients with unstable angina pectoris is a highly effective treatment modality; it helps essentially reduce the risk of acute myocardial infarction in these patients. Clinical efficacy of laser therapy is confirmed by its favorable action on hemostasis plasma factors, consisting in reduction of fibrinogen level, normalization of antithrombin-III (AT-III), decrease of the level of soluble fibrinomonomer complexes, this indicating a lowering of the blood coagulation potential. Absence of significant changes in plasminogen level may be an indicator of the nonenzymic route of fibrinogen system activation. Sessions of intravenous laser therapy should be administered 2-3 times a week to unstable angina pectoris patients with low AT-III levels, whereas for patients with initially high or normal AT-III levels combined laser therapy is advisable (4-5 daily invasive procedures and 6-8 skin surface ones on the Zakharyin-Head's zones). Measurements of endogenic anticoagulants is an effective means for monitoring laser therapy in this patient population.

Vestn Khir Im I I Grek. 2000;159(2):60-4.

[The effect of different methods of photohemotherapy on the rheological properties of the blood in patients with ischemic heart disease]

[Article in Russian]

Gavrisheva IA, Dutkevich IG, Pleshakov VT, Kolesnik VS.

The authors made an analysis of results of examination of 41 patients with ischemic heart disease treated by the standard medicamentous therapy and when using different methods of photohemotherapy against its background. It was established that medicamentous therapy during 2 weeks failed to result in a substantial improvement of rheological properties of blood, while its combination with photohemotherapy could give a considerable positive effect coinciding with clinical improvement of the patient's state. Shorter terms are required to correct hemorheological indices when autotransfusions of photomodified blood are used.

Vopr Kurortol Fizioter Lech Fiz Kult. 1995 Jan-Feb;(1):5-7.

[The effect of different types of laser therapy on the reactivity of the peripheral blood neutrophils in patients with ischemic heart disease]

[Article in Russian]

Siuch NI, **Illarionov VE**.

The responses to laser therapy (intravenous, continuous skin exposure without a magnet, magnetic laser therapy) of 83 patients with coronary heart disease aged 50-80 demonstrated the advantages of noninvasive laser irradiation of blood. Myeloperoxidase activity may serve a criterion for estimating the number of irradiation procedures needed.

Kardiologiia. 1993;33(2):22-3.

[Changes in central hemodynamics and microcirculation during laser therapy in patients with coronary insufficiency]

[Article in Russian]

Gel'fgat EB, **Samedov RI**, **Kurbanova ZN**, **Gadzhiev GG**.

The study was undertaken to examine 45 patients with Stages IIB-III heart failure (HF) by the classification developed by V. Kh. Vasilenko and N. D. Strazhesko. Thirty patients had laser therapy in addition to the routine treatment, 15 patients served as a control group. The combined drug treatment along with laser therapy in patients substantially improved peripheral circulatory parameters than in the controls. There was a positive dynamics of central hemodynamic parameters as shown by lower left ventricular volumes and higher myocardial contractile and pump functions. Improvement of microcirculatory and central hemodynamic parameters in patients treated with laser occurred in earlier periods of hospital stay than in the controls.

Vopr Kurortol Fizioter Lech Fiz Kult. 1996 Mar-Apr;(2):3-5. \

[The laser therapy of patients with hypertension in combination with coronary insufficiency]

[Article in Russian]

Kniazeva TA, **Badtieva VA**, **Zubkova SM**.

Hypertensive patients with coronary insufficiency have received infrared (lambda = 0.85 microns) laser radiation to the skin. The treatment is shown to have antianginal, antihypertensive effects, to improve cardiac performance, myocardial contractility, to increase myocardial, coronary and aerobic reserves. This clinicofunctional efficacy is accompanied by positive shifts in lipid metabolism, lipid peroxidation activity, antioxidant defense, hemocoagulation and microcirculation.

Vopr Kurortol Fizioter Lech Fiz Kult. 2005 May-Jun;(3):13-7.

[Metabolic determinants of efficacy of infrared laser therapy in hypertensive patients with combined pathology]

[Article in Russian]

Krysiuk OB, **Ponomarenko GN**, **Obrezan AG**, **Kostin NA**.

By a distinct pathogenetic direction of a therapeutic action of laser therapy (LT) on different regulators of blood pressure (BP) and metabolism, 109 patients with essential hypertension (EH) and atherosclerosis and/or diabetes mellitus were studied for LT efficacy depending on metabolis disorders. LT demonstrated metabolic neutrality and unefficacy in patients with multiple marked disorders of fat metabolism and hyperglycemia. Metabolic factors determining LT efficacy comprise hypercholesterinemia, hypertriglyceridemia and hyperglycemia. The factorial analysis points to essential factor restructuring in metabolic disorders. The obtained equation of multiple regression allows prognostication of the degree of a fall of mean BP in response to LT depending on the degree of metabolic disorders.

{Klin Med(Mosk). 2001; 79 (1): 41-44.

[Efficiency of low-intensity laser radiation in essential hypertension].

Velizhanina I A, Gapon L I, Shabalina M S, Kamalova N N.

In a placebo-controlled study an antihypertensive activity of low- intensive laser radiation (LILR) was evaluated in 52 males with essential hypertension stage I. The placebo group consisted of 14 matched patients. LILR was used as monotherapy of 10

daily procedures. This treatment significantly lowered systolic, diastolic and mean arterial pressure. Moreover, diastolic arterial pressure did not rise high at submaximal bicycle exercise. Total peripheral vascular resistance also decreased. A good hypotensive effect was achieved in 90.4% cases. Thus, LILR is a highly effective treatment in essential hypertension stage I.

Vopr Kurortol Fizioter Lech Fiz Kult. 2001 Jul-Aug;(4):3-6.

[The efficiency of low-intensity laser radiation in the treatment of arterial hypertension complicated by ischemic heart disease]

[Article in Russian]

Shuvalova IN, Klimenko IT, Svinina NG, Tsereteli MV, Zankina VG, Miasoed FR.

The efficiency of low-intensity laser radiation (LILR) was studied in the treatment of 291 patients with arterial hypertension and ischemic heart disease. Clinical grounds are given for use of LILR red and infrared rays in rehabilitation of hypertensive patients with ischemia. The rehabilitation regimens can be differentiated according to the disease severity, type of hemodynamics, state of cerebral circulation.

Lik Sprava. 1998 Oct-Nov;(7):141-3.

[The effect of low-intensity laser radiation in the infrared and red ranges on arterial pressure regulation in patients with borderline hypertension]

[Article in Russian]

Shuvalova IN, Klimenko IT, Zhukova LP, Oborin IuI.

Effectiveness was studied of low-intensity laser irradiation on regulation of arterial blood pressure (BP) in 185 patients (51 men, 134 women). The above patients were prescribed four therapeutic complexes: group I was exposed to infra-red irradiation by zones; group II--to scanning Helium-Neon laser across the portal zone and paravertebrally CIII-Th5; group III--to helium-neon laser in the area of right sinocarotid zone; group IV underwent hydrolaser shower (in red and intra-red range). Complaints were studied as were data from laboratory investigations, the condition of different bodily systems, BP level, the functional state of the cardiovascular system as per electrocardiography and rheography findings. A positive clinical effect was achieved in all the groups studied. Employment of low-intensity laser irradiation in the rehabilitation of patients with borderline hypertension during the sanatorium stage was noted to strikingly enhance the efficiency of the therapy administered. It can be prescribed to patients irrespective of their hemodynamic types. Irradiation of the right sinocarotid zone and hydrolaser therapy are indicated to patients presenting with hypo- and eukinetic types of hemodynamics and baseline sympatheticotonia.

Lik Sprava. 1997 May-Jun;(3):110-1.

[The effect of plasmapheresis and laser irradiation of the blood on the hemorheological and hemodynamic indices in hypertension patients]

[Article in Russian]

Alizade IG, **Karaeva NT**.

Results are submitted of investigation designed to study effects of a combined use of plasmapheresis and laser irradiation of blood on hemorheologic and hemodynamic characteristics in 36 patients with stage II hypertensive disease. The course exposure of patients to a combined use of plasmapheresis and laser irradiation of blood led to a drop of arterial pressure in different hemodynamic groups at the expense of different parameters characterising the hemodynamic status. Thus combined use of plasmapheresis and laser irradiation of blood can be considered a promising nonmedicamentous therapeutic alternative in patients with hypertensive disease being associated with a drop of arterial blood pressure, and what is more, improvement in viscous- and elastic properties of blood as well as its hemodynamic indices.

Med Tr Prom Ekol. 1996;(8):10-2.

[Effects of laser therapy on psychophysiological parameters and arterial blood pressure in drivers with hypertension]

[Article in Russian]

Umetov MA.

The study covered possibility to use laser therapy for correction of arterial hypertension in car and track drivers suffering from high blood pressure. Laser irradiation of infrared waves with wavelength of 0.89 micrometers appeared to have positive influence on the drivers facing arterial hypertension.

Lik Sprava. 1994 May-Jun;(5-6):29-32.

[Experience in the use of autotransfusions of laser-irradiated blood in treating hypertension patients]

[Article in Russian]

Alizade IG, **Karaeva NT**.

Autotransfusion of laser light-irradiated blood (5-7 sessions) was found to facilitate a

steady arterial blood pressure fall by an average 24% of the initial level in patients with hypertensive disease. Drop in the arterial blood pressure following the course of autotransfusion of laser light-irradiated blood was accompanied by improvement in general condition of the patients, enhancement of the effectiveness of antihypertensive preparations, favourable shifts in immunological and haemorheological indices. After discharge from hospital beneficial clinical effect persisted for up to 4-8 months. The preliminary data obtained suggest that autotransfusion of laser light-irradiated blood may well be used as adjunct to a complex of therapeutic measures to be taken to control hypertensive disease.

Vopr Kurortol Fizioter Lech Fiz Kult. 1996 Mar-Apr;(2):3-5.

[The laser therapy of patients with hypertension in combination with coronary insufficiency]

[Article in Russian]

Kniazeva TA, **Badtieva VA**, **Zubkova SM**.

Hypertensive patients with coronary insufficiency have received infrared (lambda = 0.85 microns) laser radiation to the skin. The treatment is shown to have antianginal, antihypertensive effects, to improve cardiac performance, myocardial contractility, to increase myocardial, coronary and aerobic reserves. This clinicofunctional efficacy is accompanied by positive shifts in lipid metabolism, lipid peroxidation activity, antioxidant defense, hemocoagulation and microcirculation.

Gig Tr Prof Zabol. 1992;(4):32-3.

[The correction of hemodynamic disorders with low-intensity infrared laser radiation in agricultural machinery operators with borderline arterial hypertension]

[Article in Russian]

Mokretsov VV, **Utts SR**.

Data on the influence of low-intensity infrared laser on the central and peripheral hemodynamics in 76 agricultural machine operators facing transitory arterial hypertension are presented. Analysis revealed that low-intensity laser is more effective at the early stages of cardiovascular diseases. Low-intensity infrared laser exposure of reflexogenic zones can be effectively used to correct hemodynamic disorders in subjects facing transitory arterial hypertension.

[A possible mechanism of the hypotensive effect of laser irradiation in patients with ischemic heart disease with arterial hypertension]

[Article in Russian]

Vasil'ev AP, Strel'tsova NN.

93 patients with ischemic heart disease, 44(47.3%) of them with arterial hypertension, were exposed to laser irradiation (LI). LI was accompanied with lowering of arterial pressure, more prominent in hypertensive patients. Mechanism of the hypotensive effect of laser therapy operates largely through stabilization of the lipid bilayer of the cell membrane demonstrated on the model of erythrocyte.

Vopr Kurortol Fizioter Lech Fiz Kult. 2001 Jan-Feb;(1):15-8.

[Evaluation of the effectiveness of normobaric hypoxia and low-intensity laser radiation in hypertensive patients from 24-hour arterial pressure monitoring data]

[Article in Russian]

Velizhanina IA, Evdokimova OV.

A randomized parallel study was performed to compare the antihypertensive effect of normobaric hypoxia and low energetic laser irradiation in 57 patients with essential hypertension stage I using 24-hour blood pressure monitoring. High hypotensive efficacy of both methods is demonstrated. A course of normobaric hypoxia decreased mean 24-h and mean daytime systolic and diastolic blood pressure. Low energetic laser irradiation reduced mean 24-h, mean daytime and mean night systolic and diastolic blood pressure.

Vopr Kurortol Fizioter Lech Fiz Kult. 1998 Jan-Feb;(1):9-11.

[The laser therapy of hypertension patients in the initial stages]

[Article in Russian]

Velizhanina IA, Shabalina MS, Gapon LI, Kamalova NN, Sergeichik OI.

The effect of low-energy laser irradiation used as monotherapy was studied in 42 patients with early essential hypertension. Hypotensive and antioxidant effects of laser therapy, its ability to decrease total peripheral resistance were more pronounced in patients with stage I hypertension.

Fiziol Zh. 2003;49(1):104-8.

Vopr Kurortol Fizioter Lech Fiz Kult. 2003 Mar-Apr;(2):7-10.

[Laser-, ultraphono-, and acupuncture in complex treatment of patients with hypertension]

[Article in Russian]

Sobetskii VV.

368 patients with hypertensive disease stage I and II were examined and treated either with laser puncture or acupuncture. Laser puncture was effective at stage I of hypertensive disease while acupuncture had a more potent hypotensive effect and can be used both in hypertensive disease stage I and II. Action on the acupuncture points and zones normalizes also parameters of the central and peripheral hemodynamics in hypertensive patients.

Vrach Delo. 1990 Jun;(6):19-21.

[The effectiveness of laser puncture in hypertension patients]

[Article in Russian]

Odud AM, **Potapenko PI**.

A study is presented of the results of laser puncture in combination with drug treatment of patients with hypertensive disease using an association of different acupuncture points. The values of hemodynamics were evaluated by routine techniques of tetrapolar chest rheo- and kinetocardiography. The use of laser puncture allowed to reduce the dose of hypotensive drugs.

Vrach Delo. 1991 Jul;(7):34-6.

[The use of laser puncture for managing hypertensive crises]

[Article in Russian]

Odud AM, **Potapenko PI**.

The authors report efficacy of using laser puncture and pointed massage in controlling hypertensive crises in patients suffering of hypertensive disease. The arterial pressure was reduced mainly due to decrease of the peripheral resistance. This method of treatment was more effective in patients with moderate and significant hypertrophy of the left ventricle as compared with patients showing marked hypertrophy of the left ventricle.

Kardiologiia. 1991 Feb;31(2):67-70.

[Optimization of the treatment of patients with hypertensive disease from the rheological viewpoint]

[Article in Russian]

Shabanov VA, **Kitaeva ND**, **Levin GIa**, **Karsakov VV**, **Kostrov VA**.

The efficacy of various modes of correcting rheological disorders (membrane-protective agents, laser irradiation, plasmapheresis was compared in hypertensive patients. In 30% of the patients, the conventional antihypertensive therapy was demonstrated to deteriorate hemorheological parameters, which was due to its atherogenic impact on the blood lipid spectrum. Essential phospholipids, laser irradiation, and plasmapheresis, which are supplemented to the multimodality therapy promote a significant improvement of hemorheological parameters, which makes it possible to recommend them for management of hypertensive patients with a stable (essential phospholipids), complicated (laser irradiation), and refractory (plasmapheresis) course.

Ter Arkh. 2001;73(10):70-3.

[Changes in blood rheological properties in patients with hypertension]

[Article in Russian]

Shabanov VA, **Terekhina EV**, **Kostrov VA**.

AIM: To study hemorheology in patients with essential hypertension (EH), to improve EH treatment in terms of blood rheology. MATERIAL AND METHODS: Blood rheology, microcirculation, lipid plasm spectrum, central hemodynamics were studied in 90 patients with mild and 83 patients with moderate or severe EH as well as 30 healthy controls before and after treatment (hypotensive drugs, essential phospholipids, intravenous laser blood radiation, plasmapheresis). RESULTS: Hemorrheological disorders (subnormal deformability of the red cells and elastoviscosity of their membranes, disk-spherical transformation and hyperaggregation of blood cells, high dynamic viscosity) correlated with the disease severity, arterial pressure and total peripheral vascular resistance. Long-term (1-1.5 years) hypotensive therapy, especially with combination of beta-blockers with diuretics, has a negative effect on blood rheology. Optimisation of EH treatment in terms of blood rheology consists in using essential phospholipids in stable hypertension, intravenous laser radiation in complicated hypertension, plasmapheresis in drug-resistant hypertension. Such an approach not only significantly improves hemorheology but also provides good clinical and hypotensive effects in 75-80% patients. CONCLUSION: Blood viscodynamics should be taken into consideration in individual treatment of hypertensive patients.

[Effect of infrared laser irradiation on the arterial blood pressure in liquidators of the accident at the Chernobyl power plant]

[Article in Ukrainian]

Korkushko OO.

Kiev Medical Institute UAPM.

Liquidators of Tchernobyl accident with discirculatory post-irradiation encephalopathy were treated with infra-red lazer irradiation together with a half doze of pharmacological agents usually used. Infra-red lazer irradiation has been shown to result in a significant reduce in the arterial pressure level, so it can be effective in correcting the disturbances in haemodynamics.

Sov Med. 1990;(3):21-3.

[Intravenous laser irradiation of the blood in occlusive vascular diseases of the extremities]

[Article in Russian]

Shval'b PG, Zakharchenko AIa, Sigaev AA, Kataev MI.

The authors analyze the results of clinical application of intravenous He-Ne laser irradiation of the blood in patients with obliterating diseases of the limb vessels. Starting from 1984, this method was employed in the treatment of 133 patients, of these 102 ones with atherosclerosis obliterans of the lower limb vessels, 17 with endarteritis obliterans, and 14 with Raynaud's syndrome. Intravenous laser therapy proved to the most effective in atherosclerotic involvement of the vessels, when positive result was achieved in 77.5 percent of patients. The length of remission was up to 6 months. the method of treatment is described.

GENOTYPE OF HYPERTENSIVE PATIENT DETERMINES TREATMENT SUCCESS

St. Petersburg , Chair of Balneology and Physical Therapy, Kirov Army Medical

Success of hypertension treatment depends on how well the chosen treatment mode matches the patient's genotype. Specialists of the Chair of Balneology and Physical Therapy (Kirov Army Medical College) have

College **13.09.2005**	*determined how the hypertensive patient's genotype impacts the efficiency of magnetic-laser therapy.*
ИнформНаука InformNauka	**Scientist:** G.N. Ponomarenko , St. Petersburg **For additional information:** **ponomarenko_G@mail.ru**
	Photo, pictures:
	Keywords:

Primary hypertension is one of the most frequent diseases, the treatment of which is still a problem to contemporary medicine. The disease is determined by some genes, each of the genes may exist in several variants. Respective combination of these genes forms the so-called "risk threshold" of disease origin. The major contribution to the hypertension evolution is made by the genes of angiotensinogen (AGT), angiotensin converting enzyme (ACE) and some others. Their combination determines not only the risk of disease occurrence, but also a potential success of its treatment. Thus, adrenolytic drugs act differently on central hemodynamics depending on the AGT and ACE genes' polymorphism. Besides drug therapy, there exist physical treatment modes, specifically - magnetic-laser therapy. The St. Petersburg physicians have researched how its effectiveness depends on genotype.

Magnetic-laser therapy effectiveness was evaluated with 101 patients with different variants of genes' polymorphism. The polymorphism itself was determined with the help of the polymerase chain reaction, having taken some venous blood from the patients. Participants to the experiment underwent a radiation treatment course consisting of ten everyday sessions, the patients being examined before and after the course. Physicians watched the blood pressure changes within 24 hours and the reaction to physical activity (the patients were placed on the bicycle ergometer). Polymorphism of different genes determines the clinical behavior and treatment effectiveness to different extent. Magnetic-laser therapy helps the majority of hypertensive patients. The ACE gene has the highest influence on the magnetic-laser therapy results. In case of one variant of polymorphism (it is called MM- polymorphism) the blood pressure falls down to the greatest degree. The researchers have also found the combinations where the effect is the lowest (this is TT-polymorphism of the angiotensinogen gene). It is interesting to note that the variant of angiotensin converting enzyme (ACE) polymorphism is the worst for success of magnetic-laser therapy but it is optimal for drug treatment of high blood-pressure.

There are several genes that determine effectiveness of hypertension treatment. To clearly perceive their joint impact it is necessary to continue the research. However, it is evident already which genes determine to the largest extent the blood pressure and the value the blood pressure can be lowered in this or that way. Probably the patients will be soon undergo genetic blood test first, and then, depending on its results, the treatment will be prescribed.

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