

Platelet Effects

[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.

[Vopr Kurortol Fizioter Lech Fiz Kult.](#) 2008 Jan-Feb;(1):15-8.

[Influence of laser radiation of the whole blood in vitro on adhesion and aggregation of blood platelets]

[Article in Russian]

[Brill' GE](#), [Budnik IA](#), [Gasparian LV](#), [Shenkman B](#), [Savion N](#), [Varon D](#).

The authors revealed dependence of reaction blood plates to photoeffect on the dose and rate of blood movement at laser radiation of donor blood in vitro. The red light decreases adhesion and aggregation of blood plates both at high and low rate of shift. Infrared laser radiation is effective only at high rate of shift leading to increase of adhesion and decrease of aggregation of blood plates. Blue laser is effective in small doses only and at low rate of shift it leads to decrease of adhesion and at high rate it provokes increase of adhesion. Blue laser do not have a significant influence on aggregation of blood plates.

These results make possible to suppose ambiguity of biological response of venous and arterial blood to radiation.

[Klin Med \(Mosk\)](#). 2006;84(2):61-4.

[The influence of low-intensive laser therapy on the aggregation properties of thrombocytes in patients with peptic ulcer]

[Article in Russian]

[Burduli NM](#), [Gutnova SK](#).

The purpose of the study was to evaluate the influence of low-intensive laser therapy (LILT) on the aggregation properties of thrombocytes in patients with exacerbation of peptic ulcer (PU). The subjects, 111 patients aged 18 to 63, were divided into two groups: the main group (n = 81), and the control group (n = 30). In addition there were 15 healthy people who also underwent examination. Patients in the main group received complex treatment with antiulcer drugs and different methods of laser therapy: intravenous laser irradiation of blood, cutaneous irradiation, and a combination of both. The control group was treated with drugs only. The study found various changes in the aggregation properties of thrombocytes in patients with PU exacerbation, which consisted mostly in hyperaggregation. LILT had a normalizing effect on the aggregation properties of thrombocytes in patients of the main group.

[J Photochem Photobiol B](#). 2005 Apr 4;79(1):43-50. Epub 2005 Jan 13.

The effect of green laser light irradiation on whole blood platelets.

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BACKGROUND: Laser light irradiation is assumed to have biostimulating effect in various cell types. However, there is still a lack of information concerning response of blood platelets to laser light irradiation. **METHODS:** In our study we used flow cytometry to monitor the effect of a green Nd-YAG laser (532 nm, 30 mW) irradiation on platelet activation and the expression of activated GPIIb/IIIa glycoprotein complex (fibrinogen receptor) of whole blood platelets stained with fluorolabelled monoclonal antibody PAC-1. Also the formation of platelet microparticles and aggregates in a population of whole blood platelets following such irradiation was evaluated. **RESULTS:**

Effects of laser light on platelet activation and reactivity were significant over a wide range of applied energies ($p < 0.01$). While low and medium laser light energies (18 and 54 J) increased platelet activation, the irradiation with a high-energy laser light (108 J) resulted in depressed platelet reactivity and attenuated platelet response to activators. In addition, laser light irradiation had significant influence on the formation of platelet microparticles in either resting ($p < 0.05$) or ADP-activated ($p < 0.05$) platelets, while no significant effect was observed in collagen-activated platelets. On the other hand, laser light irradiation significantly increased the formation of platelet aggregates both in resting ($p < 0.01$) and agonists-activated ($p < 0.05$) platelets. CONCLUSIONS: Our results clearly point that the laser light irradiation of blood platelets can trigger signal transduction, leading to platelet activation, as well as the gradual loss of natural platelet reactivity and platelets' ability to respond to activating agents.

[Klin Med \(Mosk\)](#). 2004;82(8):34-7.

[Platelet aggregatory impairments in chronic obstructive bronchitis and a role of laser therapy in their correction]

[Article in Russian]

[Burduli NM](#), [Aksenova IZ](#).

A comparative follow-up was made to study platelet aggregatory function in patients with chronic obstructive bronchitis (COB) prior to and following treatment. The patients were divided into study and control groups. In addition to conventional treatment, the patients of the study group received laser therapy as intravenous blood irradiation. According to the type of baseline platelet aggregatory changes, all the patients were divided into 3 subgroups: 1) patients with hyperaggregation; 2) those with normal aggregation; and 3) those with hypoaggregation. In the patients from the study group, the performed treatment corrected platelet aggregatory disorders--the degree of aggregation decreased from $78 \pm 8.6\%$ to $56.8 \pm 6.9\%$ in Subgroup 1, increased from $23 \pm 4.8\%$ to $54.6 \pm 6.21\%$ in Subgroup 3. The similar positive changes in aggregation rates and the cumulative aggregation index was observed in the study group. In the control group, conventional drug therapy caused no substantial changes in platelet aggregatory function. Thus, intravenous blood laser irradiation is an effective technique in correcting thrombocytic dysfunction in COB.

[Thromb Haemost](#). 2001 Oct;86(4):1087-93.

Alterations of platelet aggregation kinetics with ultraviolet laser emission: the "stunned platelet" phenomenon.

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Platelets, a major constituent of thrombus, play a crucial role in the pathogenesis of acute ischemic coronary syndromes. The effect of ultraviolet laser emission on platelets within thrombi is unknown. The effects of increasing levels of laser energy on platelets in whole blood were investigated. Blood samples were obtained by aseptic venipuncture and anticoagulated with 3.8% sodium citrate. Samples were exposed to increased levels (0, 30, 45, 60 mJ/mm²; 25 Hz) of ultraviolet excimer laser fluence (308 nm wave-length) and then tested for ADP and collagen induced platelet aggregation, platelet concentration, and for platelet contractile force (PCF) development. Scanning electron microscopy was used to detect laser induced morphologic changes of platelets and by flow cytometric analysis to detect changes in expression of platelet surface antigens p-selectin (CD 62) and glycoprotein IIb/IIIa (CD 43). Exposure to excimer laser energy produced dose dependent suppression of platelet aggregation and force development ("stunned platelets"). ADP aggregation decreased from 8.0±1.1 Ohms (mean±SEM) to 3.7±0.8 Ohms (p<0.001) to 2.7±0.6 Ohms (p <0.001) and to 1.8±0.5 Ohms (p <0.001) as the laser energy increased from 0 to 30 to 45 to 60 mJ/mm², respectively. Collagen induced aggregation decreased from 21.4±1.4 Ohms to 15.7±1.2 Ohms (p <0.001) to 11.7±1.1 Ohms (p <0.001) and to 9.9±1.0 Ohms (p <0.001), in response to the same incremental range of laser energy. Platelet contractile forces declined from 34,500±3700 to 27,800±2700 dynes as laser energy increased from 0 to 60 mJ/mm² (p <0.03). Platelet concentration did not change with increasing laser energy. The expression of platelet surface antigen p-selectin (CD 62) remained stable through increasing levels of laser energy exposures while the percentage of CD 43 positive platelets significantly increased with exposure to laser energy, yet the level of expression did not exceed 0.5% of cells. Thus, aggregation kinetics are altered in platelets exposed to ultraviolet laser energy as manifested by decreased platelet aggregation and reduction in platelet force development capability. The response is dose dependent and most pronounced at higher energy levels such as 60 mJ/mm².

[Platelets](#). 2000 Mar;11(2):87-93.

Blood irradiation by He-Ne laser induces a decrease in platelet responses to physiological agonists and an increase in platelet cyclic GMP.

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The effect of He-Ne laser irradiation on platelet adhesion, activation and aggregation was investigated. Citrated whole blood was irradiated in vitro by He-Ne laser (632.8 nm, 7 mW) and then subjected to shear stress (1300 s⁻¹) on subendothelial extracellular matrix (ECM)-coated plates. Laser irradiation was followed by a decrease in platelet adhesion and aggregation on ECM under flow conditions in a time exposure-dependent manner (by 30-40%). The inhibiting effect of laser light on platelets was detectable up to 1 h after the termination of irradiation. Laser irradiation of either platelet-rich plasma, gel-filtered platelets, platelet-poor plasma, or packed blood cells followed by whole blood reconstitution revealed a marked decrease in platelet deposition on ECM only in the cases of platelet-rich plasma or gel filtered platelets. In conventional aggregometry, laser-treated platelet-rich plasma demonstrated a diminished platelet response to both thrombin receptor-activating peptide (TRAP), converting a two-wave aggregation curve to reversible, and to the protein kinase C activator PMA (by 45%). In flow cytometry analysis, irradiated platelets presented lower fibrinogen binding and P-selectin expression in response to TRAP. Laser irradiation had no additional inhibitory effect on dibutyl cGMP- and dibutyl cAMP-pretreated platelets. A 50% increase in cGMP level was observed in laser-treated gel filtered platelets, both in the presence and in absence of the phosphodiesterase inhibitor, isobutylmethylxanthine. The results suggest that guanylate cyclase is one of the primary mediators of the laser effect on platelet function.

Cell Biol Int. 1998;22(3):245-8.

The biostimulatory effect of red laser irradiation on pig blood platelet function.

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The molecular mechanisms of laser-induced changes in the cell structure and function are not well known. The authors examined the effects of low-power laser irradiation on unnuclated pig blood platelets. The obtained results showed that laser irradiation (1-5 J) caused in blood platelets lipid peroxidation (measured as thiobarbituric acid reactive substances) and superoxide anion generation, concomitant with the release of adenine nucleotides and proteins from platelets. The maximum platelet response to laser irradiation was observed when doses of 1.8-2 J were used. Our results indicate that red laser irradiation induces: (1) platelet secretory process and the release of substances stored in the specific granules (adenine nucleotides, proteins); and (2) lipid peroxidation partly due to stimulation of endogenous arachidonate and production of its metabolites reacting with thiobarbituric acid.

[Am Heart J.](#) 1993 Feb;125(2 Pt 1):357-62.

Laser-induced stimulation of thromboxane B₂ synthesis in human blood platelets: role of superoxide radicals.

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Exposure of platelet-rich plasma to laser radiation at 3.5 W for 30 seconds reduced the threshold concentrations of adenosine diphosphate and L-epinephrine needed from complete platelet aggregation by 20% to 60% and by 30% to 50%, respectively. The irradiation of platelet-rich plasma with laser also increased the basal level of thromboxane A2 from < 0.5 pmol/10(8) platelets for each second of exposure. In contrast, the exposure of gel-filtered platelets to laser produced no effect on the prostanoid formation. However, the addition of laser-exposed platelet-free plasma to gel-filtered platelets stimulated the synthesis of thromboxane A2 in these cells. The effect of laser was completely blocked by adding superoxide dismutase or catalase to the platelet-rich plasma, indicating that the radiation-induced stimulation of thromboxane A2 production was mediated through the generation of superoxide radicals. Electron microscopic studies indicated that the laser-induced stimulation of thromboxane A2 production in platelet can occur without any noticeable damage in the cellular structure.

[Lasers Surg Med.](#) 1988;8(3):259-63.

Carbon dioxide laser effect on platelet function and surface ultrastructure in vitro.

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Platelet aggregation may be an important factor in the feasibility of transcatheter laser angioplasty. The in vitro effects of increasing doses of CO2 laser irradiation on platelet number, function, and surface ultrastructure were examined. Results indicated a progressive dose-response reduction of both platelet number and function following laser irradiation. By scanning electron microscopy the irradiated platelets showed dose-related changes in pseudopods as well as progressive damage of the cell membrane.

[Thromb Res.](#) 1988 Jun 1;50(5):657-67.

The effects of argon laser on in vitro aggregation of platelets in platelet rich plasma and whole blood.

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The effects of an Argon laser on platelet aggregation were studied, since platelets may be exposed to laser energy when used intravascularly. Various preparations of platelets in platelet rich plasma (PRP) and whole blood, with or without aspirin, were tested with the aggregating agents ADP, collagen, thrombin, and epinephrine. Simultaneous release of ATP was also measured in PRP. At relatively low levels of irradiation, platelet aggregation was potentiated. Enhancement was evidenced by an increase in percent aggregation, earlier onset of the reaction, and reduction in the amount of aggregating agent required. In PRP, the mechanism of laser potentiation appeared to be the release of endogenous ATP from platelets. At relatively high levels of irradiation, platelets were destroyed and aggregation abolished. In whole blood, the mechanism was somewhat more complicated since release of ATP occurred from RBCs as well as platelets. Spontaneous aggregation following laser treatment occurred in isolated instances in PRP and in every trial in whole blood preparations. Aspirin ingestion inhibited the laser's effects in PRP but not in whole blood. These results may have important clinical implications for laser angioplasty, and the potentiated aggregation response may prove useful in laboratory studies of platelet function.