HIGH-POWERED GAALAS DIODE LASERS

(NOTE: All are translated from Italian. Spelling is left as published.)

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Muscular Trauma Treated with a Ga-Al-As Diode Laser: In Vivo Experimental Study

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Abstract. The aim of the study was to verify in an experimental model the effects of laser therapy performed with Ga-Al-As diode lasers (780 nm, 2500 mW) on traumatised muscles. Forty adult New Zealand male rabbits were divided into four groups (A, B, C and D) of ten animals each. Each group of animals was further divided into two subgroups of five animals each. The animals were submitted to muscular trauma for 7 min by clamping the posterior muscles of the left thigh under general anaesthesia. Four days later, the rabbits in the B1, B2, C1, C2, D1 and D2 subgroups started daily laser therapy. The parameters utilised were: 150 J/cm2 energy density, 3 W, 50 Hz in group B; 250 J/cm2, 3 W, 100 Hz in group C; and 800 J/cm2, 3 W, 0 Hz (continuous output) in group D. The animals in subgroups A1 and A2 were used as untreated controls and allowed to heal spontaneously. In order to prepare samples for histological, histochemical and histomorphometrical studies, dissection of the posterior muscle of the thigh was performed under general anaesthesia and before sacrifice, after five days of laser therapy in the subgroups B1, C1 and D1 and after ten days of laser therapy in subgroups B2, C2 and D2. The samples of untreated subgroups A1 and A2 were subjected to the same procedure and at the same times as the corresponding laser-treated groups. The following parameters were analysed on muscular samples: qualitative histological aspect (lactate dehydrogenase (LDH), cytochrome oxidase, acid phosphatase and alkaline phosphatase concentration with histoenzymatic methods) and quantitative histomorphometric evaluation of muscular damage and tissue repair. Blood samples were drawn from each subgroup before the trauma and again before sacrifice to measure the creatine phosphokinase (CK) and LDH levels. The results obtained in the tables are shown. Analysis of the results showed a better qualitative and quantitative healing process in traumatised muscles treated with Ga-Al-As diode laser therapy than in spontaneously healed ones. The results obtained with laser therapy were confirmed as haematic, histoenzymatic and histomorphometric values. According to these results, there is a positive relationship between the biostimulation properties of the laser and the healing of traumatised muscular tissue.

Keywords: Diode laser; Experimental model; Laser biostimulation; Low energy laser therapy; Muscle trauma

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Biostimulation of human chondrocytes with Ga-Al-As diode laser: 'in vitro' research.

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The aim of this study was to verify the effects of laser therapy performed with Ga-Al-As Diode Lasers (780 nm, 2500 mW) on human cartilage cells in vitro. The cartilage sample used for the biostimulation treatment was taken from the right knee of a 19-year-old patient. After the chondrocytes were isolated and suspended for cultivation, the cultures were incubated for 10 days. The cultures were divided into four groups. Groups I, II, III were subject to biostimulation with the following laser parameters: 300 J, 1 W, 100 Hz, 10 min. exposure, pulsating emission; 300 J, 1 W, 300 Hz, 10 min. exposure, pulsating emission; and 300 J, 1 W, 500 Hz, 10 min. exposure, pulsating emission, respectively. Group IV did not receive any treatment. The laser biostimulation was conducted for five consecutive days. At the end of the treatment, the Calcium, Alkaline Phosphate, MTT tests and proteoglycan were performed to assess cell metabolism and toxicity level. The data showed good results in terms of cell viability and levels of Ca and Alkaline Phosphate in the groups treated with laser biostimulation compared to the untreated group. The results obtained confirm our previous positive in vitro results that the Ga-Al-As Laser provides biostimulation without cell damage.

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In vitro experimental research of rabbit chondrocytes biostimulation with diode laser Ga-Al-As: a preliminary study.

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The scope of our study was to verify the effects of a new diode laser device with active material composed of Gallium, Aluminum and Arsenic (Ga-Al-As) configured as MOCVD (780 nm., 3000 mW) for the biostimulation of the cartilage cells in vitro. The condrocytes cells, withdrawn from the cartilage of the medial condyle of the femur of the rabbit, were cultivated, incubated and subject to biostimulation treatment with the laser. The condrocytes cells were placed in 24 Petri dishes at the concentration of 0.25 x 10(5)/ml and divided into 4 groups: 3 group (I, II, III) were treated with the laser and the fourth group (IV) was used as the control group. At the end of the treatment, all four groups, were evaluated with a MTT test and a cell count of the condrocytes cells. Group III (300 J, 1 Watt, 300 Hz, 10' of exposure time with a pulsating emission) provided the best results in terms of cell viability (MTT test) and for the number of cells found in the dishes when compared to the other treated groups and the control group. The results obtained with the use of this new diode laser Ga-Al-As device in the biostimulation of the cartilage tissue, permits us to consider the use of this device clinically.

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[Cartilage cell stimulation with low-power laser: experimental assessment]

[Article in Italian]

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The aim of this study was to verify the effects of laser therapy performed with Ga-Al-As diode laser (780 nm, 2500 mW) on cartilage cells in vitro. The cartilage sample used for biostimulation was taken from the knee of an adult patient. The cultures were divided into four groups: Groups I, II, III were subjected to biostimulation with different laser parameters; Group IV did not received any treatment. The laser biostimulation was conducted for five consecutive days. At the end of the treatment, cell count and MTT tests were performed to assess cell metabolism. The data showed good results in terms of cell viability in the groups treated with laser biostimulation compared to the untreated group. The results obtained with the use of this new low-power diode laser Ga-Al-As device in the biostimulation of the cartilage tissue, permits us to consider the use of this device clinically.

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Laser biostimulation of cartilage: in vitro evaluation.

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An in vitro study was performed to evaluate the laser biostimulation effect on cartilage using a new gallium-aluminium-arsenic diode laser. Chondrocyte cultures were derived from rabbit and human cartilage. These cells were exposed to laser treatment for 5 days, using the following parameters: 300 joules, 1 watt, 100 (treatment A) or 300 (treatment B) hertz, pulsating emission for 10 minutes, under a sterile laminar flow. Control cultures (no treatment) received the same treatment with the laser device off. Cell viability was measured by MTT assay at the end of the laser treatment and then after 5 days. Neither rabbit nor human cultured chondrocytes showed any damage under a light microscope and immunostaining control following laser treatment. The MTT test results indicated a positive biostimulation effect on cell proliferation with respect to the control group. The increase in viability of irradiated chondrocytes was maintained for five days following the end of the laser treatment. The results obtained with the Ga-Al-As diode laser using the above tested parameters for in vitro biostimulation of cartilage tissues provide a basis for a rational approach to the experimental and clinical use of this device.