Low-Intensity Laser Irradiation Improves Skin Circulation in Patients With Diabetic Microangiopathy

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Abstract

OBJECTIVE Diabetic foot problems due to angiopathy and neuropathy account for 50% of all nontraumatic amputations and constitute a significant economic burden to society. Low-intensity laser irradiation has been shown to induce wound healing in conditions of reduced microcirculation. We investigated the influence of low-intensity laser irradiation by means of infrared thermography on skin blood circulation in diabetic patients with diabetic microangiopathy.

RESEARCH DESIGN AND METHODS Thirty consecutive patients with diabetic ulcers or gangrenes and elevated levels of glycosylated hemoglobin were randomized by blocks of two to receive either a single low-intensity laser irradiation with an energy density of 30 J/cm² or a sham irradiation over
both forefoot regions in a double-blind placebo-controlled clinical study. Skin blood circulation as indicated by temperature recordings over the forefoot region was detected by infrared thermography.

RESULTS After a single transcutaneous low-intensity laser irradiation, a statistically significant rise in skin temperature was noted ($P < 0.001$ by ANOVA for repeated measurements), whereas in the sham-irradiated control group, a slight but significant drop in temperature ($P < 0.001$) was found. Subsequently performed contrasts for comparison of measurements before and after irradiation revealed significant temperature increases at 20 min of irradiation time ($P < 0.001$), at the end of the irradiation ($P < 0.001$), and 15 min after stopping the irradiation ($P < 0.001$). In the sham-irradiated feet, the drop in local skin temperature was not significant at 20 min ($P = 0.1$), but reached significance at the end of the sham-irradiation procedure ($P < 0.001$) and 15 min after the end of sham irradiation ($P < 0.001$).

CONCLUSIONS The data from this first randomized double-blind placebo-controlled clinical trial demonstrate an increase in skin microcirculation due to athermic laser irradiation in patients with diabetic microangiopathy.

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