

# 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/cm<sup>2</sup> 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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