

# The Effect of Low-Level Laser in Knee Osteoarthritis: A Double-Blind, Randomized, Placebo-Controlled Trial

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## Abstract

**Introduction:** Low-level laser therapy (LLLT) is thought to have an analgesic effect as well as a biomodulatory effect on microcirculation. This study was designed to examine the pain-relieving effect of LLLT and possible microcirculatory changes measured by thermography in patients with knee osteoarthritis (KOA). **Materials and Methods:** Patients with mild or moderate KOA were randomized to receive either LLLT or placebo LLLT. Treatments were delivered twice a week over a period of 4 wk with a diode laser (wavelength 830 nm, continuous wave, power 50 mW) in skin contact at a dose of 6 J/point. The placebo control group was treated with an ineffective probe (power 0.5 mW) of the same appearance. Before examinations and immediately, 2 wk, and 2 mo after completing the therapy, thermography was performed (bilateral comparative thermograph by AGA infrared camera); joint flexion, circumference, and pressure sensitivity were measured; and the visual analogue scale was recorded. **Results:** In the group treated with active LLLT, a significant improvement was found in pain (before treatment [BT]: 5.75; 2 mo after treatment : 1.18); circumference (BT: 40.45; AT: 39.86); pressure sensitivity (BT: 2.33; AT: 0.77); and flexion (BT: 105.83; AT: 122.94). In the placebo group, changes in joint flexion and pain were not significant. Thermographic measurements showed at least a 0.5°C increase in temperature—and thus an improvement in circulation compared to the initial values. In the placebo group, these changes did not occur. **Conclusion:** Our results show that LLLT reduces pain in KOA and improves microcirculation in the irradiated area.

## Introduction

SINCE ENDRE MESTER began his pioneering investigations, numerous clinical and basic research studies have demonstrated the physiological effects and medical applicability of low-level laser therapy (LLLT). Its application was initiated based on previous work that demonstrated properties of low-level laser that exert a positive influence on fibroblast<sup>1</sup> and osteoblast<sup>2</sup> proliferation, collagen synthesis,<sup>3</sup> and bone regeneration.<sup>4</sup> In vivo examinations have also shown that LLLT significantly stimulates the activity of alkaline phosphatase and calcium accumulation.<sup>5</sup> In addition to cartilage damage and bone metabolism, pathological alterations are also known to exhibit reduced circulation in the vessels of the joint parallel to the degenerative changes. Numerous authors have reported increased microvascularization as a histological effect of the laser beam.<sup>6,7</sup> While examining revascularization—a phase of wound healing—Mester found a significant increase in the number of vascularized areas in laser-treated patients.<sup>8</sup> In

light of the domestic and international literature, the aim of this study is to gather evidence of the analgesic effect of low-level laser as well as its possible effect in increasing microcirculation. In order to obtain objective data, thermographic measurements were taken, and follow-up examinations were performed to control for the permanency of the effects obtained.

## Patients and Methods

Both female and male patients with mild to moderate knee osteoarthritis (KOA) were recruited to the study. Reasons for exclusion included considerable deformity of the varus or valgus, ankylosis, intense synovitis, or gonitis observed during physical examination; erosive or destructive alterations detected by radiograph (Kellgren-Lawrence stage 4); and the usual contraindications for laser therapy (Table 1).

Thirty-five patients were selected for the examinations, but only 27 patients (22 women and 5 men) completed the

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