

Effects of low-level laser therapy on joint pain, synovitis, anabolic, and catabolic factors in a progressive osteoarthritis rabbit model.

[Wang P](#)¹, [Liu C](#), [Yang X](#), [Zhou Y](#), [Wei X](#), [Ji Q](#), [Yang L](#), [He C](#).

Author information

- ¹Rehabilitation Medicine Center of West China Hospital, Sichuan University, ChengDu, People's Republic of China, wangpu0816@qq.com.

Abstract

The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on short-term and long-term joint pain, synovitis, anabolic, and catabolic factors in the cartilage of a rabbit model with progressive osteoarthritis (OA) induced by anterior cruciate ligament transection (ACLT). A total of 160 New Zealand white rabbits were randomly assigned into two groups (ACLT group and LLLT group). All rabbits received ACLT surgery, and 2-, 4-, 6-, and 8-week treatment after the surgery, with 20 rabbits being tested biweekly over every study period. The LLLT group received LLLT with a helium-neon (He-Ne) laser (830 nm) of 1.5 J/cm² three times per week, and the ACLT group received placebo LLLT with the equipment switched off. Long-term and short-term pain was tested via weight-bearing asymmetry; synovitis was assessed histologically; and knee joint cartilage was evaluated by gross morphology, histology, and gene expression analysis of anabolic and catabolic factors. The histological assessment of pain and synovitis showed that at least 6-week intermittent irradiation of LLLT could relief knee pain and control synovium inflammation. Gross morphologic inspection and histological evaluation showed that 6 weeks of LLLT could decrease cartilage damage of medial femoral condyle and 8 weeks of LLLT could decrease cartilage damage of medial and lateral femoral condyles and medial tibial plateau. Gene expression analysis revealed two results: At least 6 weeks of LLLT could decrease production of catabolic factors, for example, interleukin 1 β (IL-1 β), inducible nitric oxide synthase (iNOS), and MMP-3, and slow down the loss of anabolic factors, mainly TIMP-1. Eight weeks of LLLT treatment could slow down the loss of collagen II, aggrecan, and anabolic factors, mainly transforming growth factor beta (TGF- β). The study suggests that LLLT plays a protective role against cartilage degradation and synovitis in rabbits with progressive OA by virtue of the regulation of catabolic and anabolic factors in the cartilage.

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