

# Wound Healing of Animal and Human Body Sport and Traffic Accident Injuries Using Low-Level Laser Therapy Treatment: A Randomized Clinical Study of Seventy-Four Patients with Control Group

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## ABSTRACT

**Background and Objective:** The main objective of current animal and clinical studies was to assess the efficacy of low level laser therapy (LLLT) on wound healing in rabbits and humans. **Study Design/Materials and Methods:** In the initial part of our research we conducted a randomized controlled animal study, where we evaluated the effects of laser irradiation on the healing of surgical wounds on rabbits. The manner of the application of LLLT on the human body are analogous to those of similar physiologic structure in animal tissue, therefore, this study was continued on humans. Clinical study was performed on 74 patients with injuries to the following anatomic locations: ankle and knee, bilaterally, Achilles tendon; epicondylus; shoulder; wrist; interphalangeal joints of hands, unilaterally. All patients had had surgical procedure prior to LLLT. Two types of laser devices were used: infrared diode laser (GaAlAs) 830 nm continuous wave for treatment of trigger points (TPs) and HeNe 632.8 nm combined with diode laser 904-nm pulsed wave for scanning procedure. Both were applied as monotherapy during current clinical study. The results were observed and measured according to the following clinical parameters: redness, heat, pain, swelling and loss of function, and finally postponed to statistical analysis via  $\chi^2$  test. **Results:** After comparing the healing process between two groups of patients, we obtained the following results: wound healing was significantly accelerated (25%–35%) in the group of patients treated with LLLT. Pain relief and functional recovery of patients treated with LLLT were significantly improved comparing to untreated patients. **Conclusion:** In addition to accelerated wound healing, the main advantages of LLLT for postoperative sport- and traffic-related injuries include prevention of side effects of drugs, significantly accelerated functional recovery, earlier return to work, training and sport competition compared to the control group of patients, and cost benefit.

## INTRODUCTION

Effects of low level laser therapy (LLLT) on wound healing have been observed for sometime.<sup>1-5</sup> However various other laser units and treatment parameters are more often used to accelerate the healing process. There is still some question about the effectiveness of LLLT as a clinical tool.<sup>1,2,6</sup>

Biochemically and biostimulatory effects of LLLT on wound healing have been explored. The following are some of these

effects on the cellular level that have been already established: stimulation of mitochondrial activity<sup>1,2,5,7-10</sup>; enhanced adenosine triphosphate (ATP) production<sup>1,2,5,7-10</sup>; stimulation of DNA and RNA synthesis<sup>11</sup>; increased protein production<sup>1,7</sup>; modulation of enzymatic activity<sup>1,7</sup>; variation of intracellular and extracellular pH<sup>1,7</sup>; and acceleration of cellular metabolism.<sup>7,12</sup>

It is scientifically determined that on the microscopic and histologic level of the wound, the following changes are trig-

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