Lasers Med Sci

DOI 10.1007/s10103-011-0925-y

AN EXPERIMENTAL STUDY OF LOW-LEVEL LASER THERAPY IN RATS- ACHILLES TENDON INJURY

JON JOENSEN & NILS ROAR GJERDET & STEINAR HUMMELSUND & VEGARD IVERSEN & RODRIGO ALVARO B. LOPES-MARTINS & JAN MAGNUS BJORDAL.

Received: 29 November 2010 / Accepted: 6 April 2011

ABSTRACT

The aim of this controlled animal study was to investigate the effect of low-level laser therapy (LLLT) administered 30 min after injury to the Achilles tendon. The study animals comprised 16 Sprague Dawley male rats divided in two groups. The right Achilles tendons were injured by blunt trauma using a mini guillotine, and were treated with LLLT or placebo LLLT 30 min later. The injury and LLLT procedures were then repeated 15 hours later on the same tendon. One group received active LLLT (1=904 nm, 60 mW mean output power, 0.158 W/cm2 for 50 s, energy 3 J) and the other group received placebo LLLT 23 hours after LLLT. Ultrasonographic images were taken to measure the thickness of the right and left Achilles tendons. Animals were then killed, and all Achilles tendons were tested for ultimate tensile strength (UTS). All analyses were performed by blinded observers. There was a significant increase in tendon thickness in the active LLLT group when compared with the placebo group ($p<0.05$) and there were no significant differences between the placebo and uninjured left tendons. There were no significant differences in UTS between laser-treated, placebo-treated and uninjured tendons. Laser irradiation of the Achilles tendon at 0.158 W/cm2 for 50 s (3 J) administered within the first 30 min after blunt trauma, and repeated after 15 h, appears to lead to edema of the tendon measured 23 hours after LLLT. The guillotine blunt trauma model seems suitable for inflicting tendon injury and measuring the effects of treatment on edema by ultrasonography and UTS. More studies are needed to further refine this model.

KEY WORDS: LLLT, Acute injury, Rat Achilles, Ultrasonographic imaging, Edema, Ultimate tensile strength

INTRODUCTION

Animal models are commonly used in tendon disorder research. They have the advantages of incorporating invasive evaluation techniques, and the possibility for detailed tissue examination and analysis of biochemical substances. These models may be useful in reproducing some aspects of human tendon disorders because in animal models it is easier to control single factors.