

Comparison of Photobiomodulation and Anti-Inflammatory Drugs on Tissue Repair on Collagenase-Induced Achilles Tendon Inflammation in Rats

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Abstract

Background: Tendinopathy is characterized by pain, edema, and structural changes in tendon tissue. **Objective:** In this animal study we decided to compare the short- and medium-term effects of low-level laser therapy (LLLT), dexamethasone, and diclofenac on inflammation and tendon tissue repair in collagenase-induced tendinitis. **Materials and methods:** Two hundred five female Wistar rats were randomly divided into five groups. Animals in the control group were given a saline injection and the experimental groups received a collagenase injection (100 µg/tendon) in the peritendinous Achilles and received no treatment, LLLT (3 J, 810 nm, 100 mW), diclofenac (1.1 mg/kg), or dexamethasone (0.02 mg/kg). Histological analyses were performed at 10 time points up to 60 days ($n = 5$ /group each time point), and included an assessment of the severity of inflammation, collagen fiber content, and organization. **Results:** Collagenase injection induced a severe inflammatory reaction with significant reduction in collagen content for 48 h, and disorientation of collagen fibers lasting between 14 and 21 days. Diclofenac and dexamethasone reduced inflammatory signs during the first 2 days, although there was prolongation of the inflammatory phase and slower normalization of tendon quality, particularly in the dexamethasone group. LLLT prevented hemorrhage, reduced inflammation severity, and preserved tendon morphology compared with the other groups. **Conclusions:** LLLT showed a significant superiority over commonly used anti-inflammatory pharmaceutical agents in acute collagenase-induced tendinitis.

Keywords: tendinopathy, tendinitis, inflammation, low-level laser therapy, photobiomodulation

Introduction

TENDINOPATHY IS A clinical condition characterized by palpation tenderness, edema, activity-related pain, and disability. Pain during tendon loading is the major symptom. Tendinitis is a diagnostic subgroup of tendinopathies indicating a presence of inflammation, although a lack of inflammatory cells found in biopsies of chronic tendinopathies has raised debate about specific pathophysiology and the appropriateness of the term tendinitis. Nevertheless, inflammation possibly due to the rupture of collagen fibers appears to be an important factor.^{1,2}

In recent decades, there has been an increase in the incidence of tendinous lesions partly due to increased participation in recreational and competitive exercise.^{3–5} Tendon lesions represent 30–50% of sports-related injuries, and Achilles tendinopathy represents 55–65% of total tendon injuries.⁶ Risk factors include gender, ageing, obesity, comorbid musculoskeletal conditions,^{6,7} and antibiotics, especially Quinolones⁸ and corticosteroids.⁹

Tendon injury is followed by an inflammatory phase with edema, leukocyte infiltration, phagocytosis of dead tissue, and the production of humoral mediators. Hereafter, a proliferative phase with production of type III collagen follows,

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