

# Systematic Review of the Literature of Low-Level Laser Therapy (LLLT) in the Management of Neck Pain

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**Background and Objectives:** Low-level laser therapy (LLLT) is widely used in the treatment of musculoskeletal pain. However, there is controversy over its true efficacy. We aimed to determine the efficacy of LLLT in the treatment of neck pain through systematically reviewing the literature.

**Study Design/Materials and Methods:** A search of computerized bibliographic databases covering medicine, physiotherapy, allied health, complementary medicine, and biological sciences was undertaken from date of inception until February 2004 for randomized controlled trials of LLLT for neck pain. A comprehensive list of search terms was applied and explicit inclusion criteria were developed a priori. Twenty studies were identified, five of which met the inclusion criteria.

**Results:** Significant positive effects were reported in four of five trials in which infrared wavelengths ( $\lambda = 780, 810\text{--}830, 904, 1,064$  nm) were used. Heterogeneity in outcome measures, results reporting, doses, and laser parameters precluded formal meta-analysis. Effect sizes could be calculated for only two of the studies.

**Conclusions:** This review provides limited evidence from one RCT for the use of infrared laser for the treatment of acute neck pain ( $n = 71$ ) and chronic neck pain from four RCTs ( $n = 202$ ). Larger studies are required to confirm the positive findings and determine the most effective laser parameters, sites and modes of application. *Lasers Surg. Med.* 37:46–52, 2005. © 2005 Wiley-Liss, Inc.

**Key words:** 830 nm; laser therapy; infrared

## INTRODUCTION

Despite receiving less attention than low back pain, neck pain is a highly prevalent condition, with cross sectional studies reporting that between 10% and 24% of the population are troubled by neck pain at any one time [1–4]. Such frequent morbidity incurs significant costs to the community and to the individual. In the Netherlands for example, total cost of neck pain management was estimated to be \$US686 million in 1996 [5]. Standard general practitioner initiated treatment includes simple analgesics, anti-inflammatory medications, or referral to a physiotherapist [6,7]. Non-invasive treatments for neck pain lack a strong evidence base [8,9].

A potential non-invasive treatment for neck pain is low-level laser therapy (LLLT). The term LLLT encompasses a heterogeneous group of applications varying from local point treatment to scanning techniques covering large areas. The putative effects of LLLT results from the photochemical and photophysical effects of light occurring with less than a 0.5°C increase in temperature of the exposed tissue [10]. Output power of “low-level” lasers varies from 1 to 500 mW in the continuous mode, with considerably higher peak powers when pulsed. Wavelengths used extend from the visible ( $\lambda = 400$  nm) to the infrared ( $\lambda = 1,064$  nm) end of the spectrum. LLLT lasers are grouped into Classes I, II, IIIa, and IIIb according to international standards. Class IV lasers, which produce their effects by heating (i.e., thermic lasers) are not considered further in this review.

Extant systematic reviews of physical medicine modalities which include an evaluation of LLLT have been hampered by using restricted search terms and relatively narrow database searches, potentially leading to some trials being missed [9,11]. Moreover, studies of related but different techniques such as laser acupuncture have been “lumped” with trials of LLLT, risking distortion of true effects. Similarly, some reviews have included studies with a crossover design or the use of the contralateral body side as a control that may have compromised their outcomes. These latter two reviews reported no positive effect of LLLT. However, the heterogeneity of the small number of included trials was recognized as a confounding factor in assessing laser therapy.

Systematic reviews of LLLT in which trials of neck pain were included with other painful conditions are confounded by a different set of factors. “Non-specific” neck pain was lumped together with systemic inflammatory conditions, as rheumatoid arthritis and/or chronic pain syndromes, such as chronic oro-facial pain, though the pathophysiology of

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