Curr Pain Headache Rep (2010) 14:325–327
DOI 10.1007/s11916-010-0133-7

CLINICAL TRIAL REPORT

Low-Level Laser Therapy in the Management of Neck Pain

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Published online: 30 July 2010
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Chow RT, Johnson MI, Lopes-Martins RA, Bjordal JM: Efficacy of low-level laser therapy in the management of neck pain: a systematic review and meta-analysis of randomised placebo or active-treatment controlled trials. Lancet 2009, 374:1897–1908. (Published erratum appears in Lancet 2010, 375:894.)

Rating

••Of major importance

Introduction

Chronic neck pain is a highly prevalent condition with high economic costs affecting 10% to 24% of the population [1]. Sometimes, the pain can be brief and inconsequential, but for many people the pain can be severe and disabling. Many therapies are used in this condition including NSAIDs, cervical epidurals, therapeutic massages, acupuncture, percutaneous radiofrequency neurotomy, neck muscle training, stretching exercise, botulinum neurotoxin A, and low-level laser therapy (LLLT) among others.

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LLLT uses laser to aid tissue repair, relieve pain, and stimulate acupuncture points. Laser light is generated by high-intensity electrical stimulation of a medium, which can be a gas, liquid, crystal, dye, or semiconductor [2].

LLLT is noninvasive, painless, and can be easily administered in primary-care settings. Incidence of adverse effects is low and similar to that of placebo, with no reports of serious events. Research into the use of LLLT for pain reduction and tissue repair spans more than 30 years. However, reports do not identify this therapy as a potential treatment option, possibly because of skepticism about its mechanism of action and effectiveness [3].

Aims

The authors undertook a systematic review and meta-analysis of LLLT in neck pain to establish whether LLLT relieves acute and chronic neck pain and to systematically assess parameters of laser therapy to identify treatment protocols and dose ranges (therapeutic windows) associated with positive outcomes.

Methods

The authors carried out a search of published work without language restriction, using MEDLINE, EMBASE, CINAHL, the Physiotherapy Evidence Database, BIOSIS, Allied and Complementary Medicine, and the Cochrane Central Register of Controlled Trials (from 1926 to 2008). A variety of keywords were used for neck pain and related conditions. They also consulted experts and searched reference lists of retrieved reports and textbooks for additional references.

Citations were screened and full reports of potentially relevant studies obtained. Authors applied inclusion and exclusion criteria, assessed methodological criteria, and extracted data including trial characteristics, demographic data, laser parameters, pain outcome measures, and cointerventions.

Randomized or quasi-randomized controlled trials of LLLT for acute or chronic neck pain were included. Study participants were restricted to those aged 16 years and older. They excluded studies in which specific pathological changes could be identified, such as systemic inflammatory conditions, and also excluded abstracts and studies for which outcome measures for neck pain could not be separated from data for other regions of the body.

The authors then compared efficacy of LLLT using any wavelength with placebo or with active control in acute or chronic neck pain. Effect size for the primary outcome, pain intensity, was defined as a pooled estimate of mean difference in change in millimeter on 100 mm visual analogue scale.

Results

The authors identified 16 of a possible 38 randomized controlled trials that were suitable for inclusion; 820 patients were studied. Of the studies included, 648 (79%) of the sample of patients with chronic neck pain were women, and patients had a mean age of 43 years (SD, 9.8 years), mean symptom duration of 90 months (SD, 36.9 months), and mean baseline pain of 56.9 mm (SD, 7.5 mm) on a 100 mm visual analogue scale in any trial. Ten trials reported cointerventions, and six studies did not report or limit cointerventions. Of the studies reporting cointerventions, five groups of investigators explicitly excluded use of concurrent physical therapies, and four excluded use of NSAIDs. Four studies allowed use of simple analgesic drugs as needed. Methodological quality assessment values for the trials by Jadad scoring ranged from 0 to 5.

In acute neck pain, results of two trials showed a relative risk (RR) of 1.69 (95% CI, 1.22–2.33) for pain improvement of LLLT versus placebo. Five trials of chronic neck pain reporting categorical data showed an RR for pain improvement of 4.05 (CI, 2.74–5.98) of LLLT. Patients in 11 trials reporting changes in visual analogue scale had pain intensity reduced by 19.86 mm (CI, 10.04–29.68). Seven trials provided follow-up data for 1 to 22 weeks after completion of treatment, with short-term pain relief persisting in the medium term with a reduction of 22.07 mm (CI, 17.42–26.72). Side effects from LLLT were mild and not different from those of placebo. The results showed moderate statistical evidence for efficacy of LLLT in treatment of acute and chronic neck pain in the short and medium term. For chronic pain, the average reduction in visual analogue scale of 19.86 mm across all studies could be considered a clinically important change.

Discussion

Laser irradiation tissue effects might account for the broad range of conditions that are amenable to LLLT treatment. Whether specific treatment protocols are necessary to elicit different biological mechanisms is unknown. Heterogeneity of treatment protocols might be due partly to variation in LLLT parameters and protocols, eliciting different effects. Whatever the mechanism of action, clinical benefits of LLLT occur both when LLLT is used as monotherapy and in the context of a regular exercise and stretching program. In clinical settings, combination with an exercise programme probably is preferable. The results of LLLT in this review compare favorably with other widely used therapies, and especially with pharmacological interventions, for which evidence is sparse and side effects are common.

Comments

Neck pain is a public health problem [1]. Its treatment is difficult and sometimes onerous. Noninvasive alternatives of treatment could beneficiate millions of people and should be investigated rigorously.

Chow and colleagues brought a well-performed systematic review bringing new perspectives to this issue. They found that LLLT treatment has benefits over placebo in acute and chronic neck pain.

Some studies point to an anti-inflammatory effect of red and infrared laser irradiation [4]; action on muscle tissue reducing oxidative stress and skeletal muscle fatigue [5]; inhibition of transmission at the neuromuscular junction on myofascial pain and trigger points [6]; and laser-induced neural blockade [7], among others.

These results seem stronger if we compare to other meta-analyses, such as manual therapy [8], chiropractic spinal manipulation [9], or acupuncture [10].

Another aspect of interest is the lack of important side effects with this type of therapy. The use of NSAIDs is a major concern due to gastrointestinal bleeding and renal failure, especially in chronic neck pain.

LLLT therapy seems to be a good option for treatment of acute and chronic neck pain. Other populations with limitations in the use of pain medications or interventions, due to age (ie, children and the elderly), more sensitivity to medications and its side effects, specific scenarios (eg, pregnancy, lactation) should be studied in more detail.

Headache disorders related to the neck or with cervical related pain should also benefit from LLLT.

Disclosures No potential conflicts of interest relevant to this article were reported.

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