Low-Level Laser Therapy in acute pain: a systematic review of possible mechanisms of action and clinical effects in randomized placebo-controlled trials.

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Abstract

OBJECTIVE: The aim of this study was to review the biological and clinical short-term effects of Low Level Laser Therapy (LLLT) in acute pain from soft-tissue injury.
BACKGROUND DATA: It is unclear if and how LLLT can reduce acute pain.
METHODS: Literature search of (i) controlled laboratory trials investigating potential biological mechanisms for pain relief and (ii) randomized placebo-controlled clinical trials which measure outcomes within the first 7 days after acute softtissue injury.
RESULTS: There is strong evidence from 19 out of 22 controlled laboratory studies that LLLT can modulate inflammatory pain by reducing levels of biochemical markers (PGE(2), mRNA Cox 2, IL-1beta, TNFalpha), neutrophil cell influx, oxidative stress, and formation of edema and hemorrhage in a dose-dependent manner (median dose 7.5 J/cm(2), range 0.3-19 J/cm(2)). Four comparisons with non-steroidal anti-inflammatory drugs (NSAIDs) in animal studies found optimal doses of LLLT and NSAIDs to be equally effective. Seven randomized placebo-controlled trials found no significant results after irradiating only a single point on the skin overlying the site of injury, or after using a total energy dose below 5 Joules. Nine randomized placebo-controlled trials (n = 609) were of acceptable methodological quality, and irradiated three or more points and/or more than 2.5 cm(2) at site of injury or surgical incision, with a total energy of 5.0-19.5 Joules. Results in these nine trials were significantly in favor of LLLT groups over placebo groups in 15 out of 18 outcome comparisons. Poor and heterogeneous data presentation hampered statistical pooling of continuous data. Categorical data of subjective improvement were homogeneous (Q-value = 7.1) and could be calculated from four trials (n = 379) giving a significant relative risk for improvement of 2.7 (95% confidence interval [CI], 1.8-3.9) in a fixed effects model.
CONCLUSION: LLLT can modulate inflammatory processes in a dose-dependent manner and can be titrated to significantly reduce acute inflammatory pain in clinical settings. Further clinical trials with adequate LLLT doses are needed to precisely estimate the effect size for LLLT in acute pain.