

Review

Current indications for low level laser treatment in maxillofacial surgery: a review

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Abstract

Low level laser treatment (LLLT) is currently being used for various disorders, but with no convincing scientific evidence. Most recently we have noticed an increase in published randomised controlled trials (RCTs) that have focused on its applications in wound healing, scarring, disorders of the temporomandibular joint (TMJ), oral mucositis, and dental pain.

Our aim therefore was to assess the scientific evidence about its current efficacy in maxillofacial surgery. We reviewed PubMed from January 2003 to January 2013 using the key phrase “low level laser treatment”. Our inclusion criterion was intervention studies in humans of more than 10 patients. We excluded animal studies and papers in languages other than English, French, and German. We found 45 papers that we screened independently. The resulting full texts were scrutinised by two authors who awarded a maximum of 5 points using the Jadad scale for assessing the quality of RCT, and extracted the data according to sample size, variables of LLLT, the authors’ conclusions, and the significance of the result. LLLT seems to be effective for the treatment of oral mucositis after treatment for head and neck cancer. However, it cannot yet be considered a valid treatment for disorders of the TMJ. It seems to improve gingival healing, and myofacial and dental pain. © 2015 The British Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved.

Keywords: Low level laser treatment; Maxillofacial surgery

Introduction

The transfer of light energy through photon absorption in humans can lead to both harmful and beneficial effects. Endre Mester in 1967 pioneered low level laser treatment (LLLT) when he used a ruby laser at 694 nm to find out if radiation might cause cancer in mice.¹ Contrary to his initial hypothesis they did not get cancer, but the hair on the treated mice grew more quickly than those in the control group. This was the first demonstration of the concept of laser “biomodulation/stimulation”. Histological analyses from both *in vitro* and *in vivo* studies have since attempted to clarify the mechanism of action of LLLT in human therapeutics.¹

LLLT uses light in the visible light spectrum (400–700 nm) and in the near-infrared region of the light spectrum (700–1000 nm). The two main theories that have been postulated involve the instigation of various cellular and intracellular components in the predictable biological cascades of wound healing and acute pain (Table 1). Recently the study by Rodrigo et al. on wound repair in rats, reported that LLLT not only helped local wound healing, but also had a systemic effect on distal wounds through photo-biomodulation.² Bjordal et al. also concluded from their systematic review that LLLT has repeatedly proved to modulate inflammatory processes in a dose-dependent manner, and at optimal doses has even been shown to be equally as effective as non-steroidal anti-inflammatory drugs in acute pain in four comparative animal studies.^{3,4}

The number of publications on this subject has increased dramatically during the last 10 years, with many new

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Table 1
Mechanisms of action of wound healing and pain.

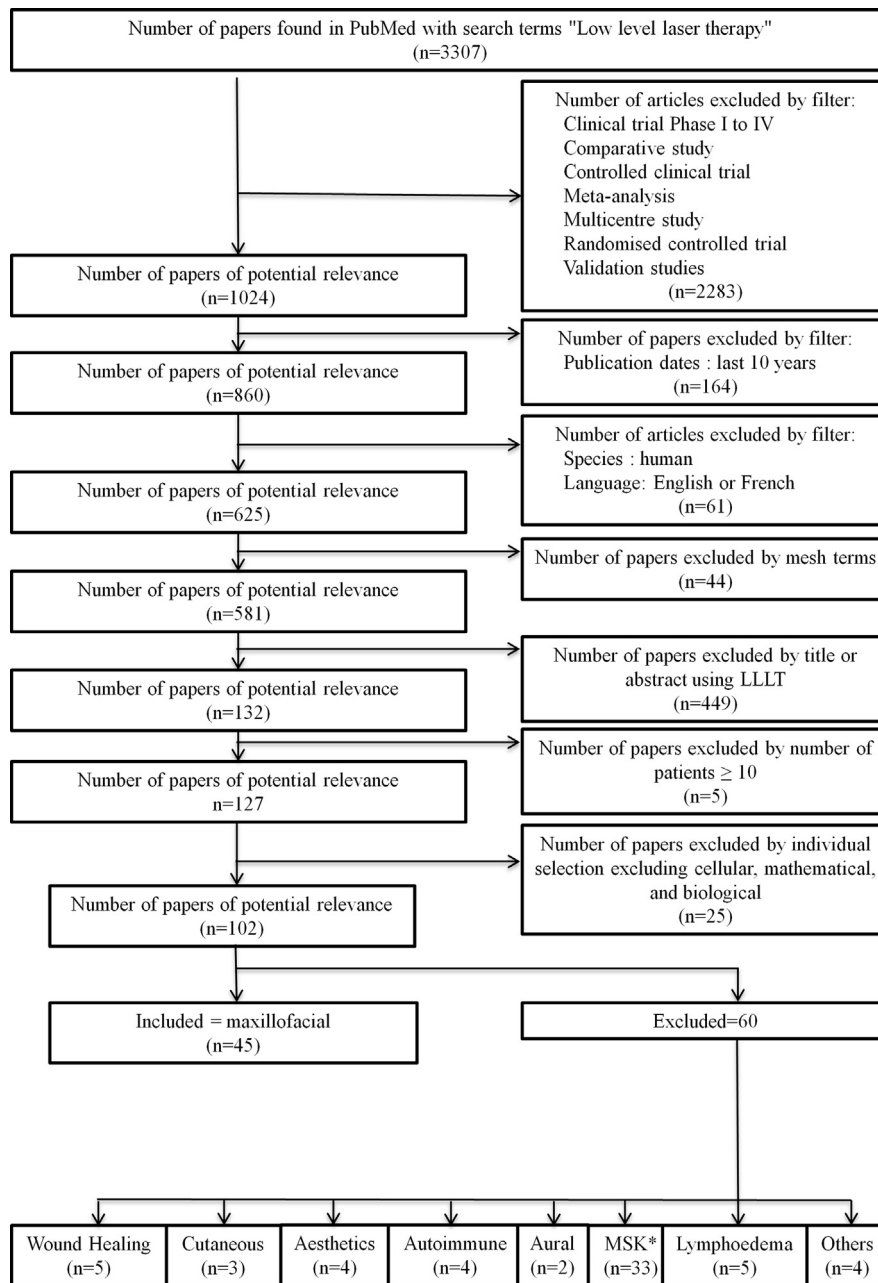
Wound healing	Pain
Mitochondrial ATP production increases	Endogenous opiate and endorphin production increase
Proliferation, migration, and adhesion of cells ^a increase	Sensory nerve production slows
Cell apoptosis increases	Cellular resonant energy is restored
Vascularisation and lymphatic drainage increase	Sodium/potassium pump in the cell membrane is restored

^a Cells include: collagen, fibroblasts, lymphocytes, and neutrophils.

therapeutic targets. Although there are a growing number of clinical uses for LLLT, they are not supported by good evidence. Some maxillofacial surgeons have asked whether there are indications that could be validated by studies in their discipline, so we have reviewed those available.

Material and methods

We used the search engine PubMed to find studies published during the 10 years 2003–2013. The key phrase “low-level laser treatment” was used either as a MeSH (Medical Subject



*Musculoskeletal disorders

Fig. 1. Algorithm showing the design of the study.

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