

LASER THERAPY IN WOUND- AND PAIN-MANAGEMENT

A LITERATURE STUDY

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DOCUMENTATION

CLINICAL EVIDENCE for and LITERATURE on
the Effect Statements of Low-Level Laser Therapy
concerning Wound Healing and Pain Relief

Preliminary Note

The following document contains 34 pages. The appendix (B) contains 36 pages. The appendix (C) contains 19 pages. In this document we analyze, discuss and assess the benefits of the application of LLLT concerning the following two claims:

- promotion of wound healing
- pain relief

We will demonstrate clearly that there is ample evidence for justifying these claims, in particular with regard to special indications, such chronic ulcers and pain conditions of the musculoskeletal system.

This document is divided into four parts:

In Part I we define and explain our approach for identifying clinical evidence

In Part II we list our findings and subject them to study analysis

In Part III we sum up the results and provide conclusions and final considerations

As Part IV we added three **appendicies**: appendix A contains the CV's of the authors, the appendix B contains two case study series conducted with PowerTwin21, appendix C contains all abstracts for the studies listed in Part II.

We confirm that this analysis was performed to the best of our knowledge.

Munich, 17 January 2013

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1. OBJECTIVE AND METHODOLOGICAL APPROACH

1.1 Objective of this documentation

This documentation provides evidence for low-level laser therapy (LLLT) with respect to the following therapeutic claims:

- promotion of wound healing processes
- pain reduction

1.2 Approach

1.2.1 Search strings

1.2.1.1 Clinical studies:

We searched the Pubmed Database for the following key words:

Low Level Laser +/- Therapy OR acronym: LLLT OR Low Energy Laser +/- Therapy OR Laser Photo Therapy / acronym: LPT – Laser Therapy – Low Intensity Laser

AND for wound healing: Wound – Tissue Repair

AND for pain relief: Pain

1.2.1.2 Further literature

We added a list of books focusing on low-level laser therapy and journals focusing on low-level laser therapy, biostimulation through light therapies and/or lasers in medicine, including the therapeutic application of low energy lasers.

1.2.1.3 Case study series with POWERTWIN21

We added two case study series performed with the laser shower PowerTwin21, one of them under the supervision of the authors, though not listed in Pubmed.

1.2.2 Selection criteria

1.2.2.1 Clinical studies

Inclusion criteria:

- (1) Clinical trials limited to low-level laser therapy performed with the PowerTwin21 or devices which are equivalent to the PowerTwin21 (clinical studies which were performed with laser showers – such as the PowerTwin21 – and not with laser pens or laser needle devices).
- (2) Clinical investigations, studies and further appropriate literature, which intend to clarify the effectiveness of low-level laser therapy with respect to its capacity to

- **promote wound healing**

and where at least one index of wound healing can be identified as the dependent variable, such as

- wound healing time
- reduction in wound area
- tissue strength
- decrease of inflammation
- prevention of necrotic processes or of formation of keloids

and where the indication for which low-level laser therapy is applied is clearly defined, such as

- diabetic, venous or pressure ulcers
- decubitus / bed sores
- surgical wounds
- superficial scars
- etc.

- **relief pain**

and where effectiveness measurements with the aid of VAS are used and/or where at least one index of pain-associated parameters is identified, such as

- grasp or finger grip force
- weight tests
- muscle tests (e.g., manual muscle testing / MMT)
- range of motion (ROM) (goniometer)
- pain pressure threshold (pressure algometer)

and where the pain condition for which low level laser therapy is applied is clearly defined, such as

- tendinopathy, epicondylitis
- joint areas, neck pain
- myofascial pain dysfunction syndrome
- postoperative pain
- carpal tunnel syndrome
- fibromyalgia
- temporomandibular pain
- acute back pain and radiculopathy

- (3) Clinical investigations which were performed with laser showers with a wavelength spectrum within the red and infrared range (600–900 nm).
- (4) Combined clinical trials where the laser is clearly identified as the independent variable.

The use of LLLT to boost wound healing processes and/or pain reduction is not meant to replace the therapeutic standards as defined by the guidelines, but to promote and support them. In the existing literature, LLLT is almost always treated as an addition to standard wound care rather than an alternative to it. No non-inferiority claim is made.

E.g., a clinical trial on the promotion of wound healing with LLLT will very often be a combined study, that includes standard wound care measures with the placebo and a control group.

- (5) Comparative clinical trials of highly informative value.

Especially in the field of pain relief, some studies compare the effects of LLLT to established measures of pain management with proven benefits (primarily for muscle pain, such as TENS). In special cases they render highly meaningful results.

- (6) Combined animal and human studies with a human subgroup for which the results are stated separately.

Exclusion criteria:

- (1) In vitro studies
- (2) Animal studies
- (3) Studies performed with wavelengths <600 nm
- (4) Studies without abstracts in English
- (5) Studies on LLLT which were performed with laser pens and/or laser needle systems and/or intravascular LLLT
- (6) Studies which try to evaluate combined methods of laser therapy and non-standard methods, such as laser acupuncture
- (7) Studies evaluating different dose intensities with LLLT in terms of how well they promote wound healing and/or pain relief, which therefore do not question the basic benefit claims.