WHAM Evidence summary: Managing lymphoedema: Low level laser therapy

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CLINICAL QUESTIONS

What is the best available evidence on the effectiveness of low level laser therapy (LLLT) for managing lymphoedema?

KEYWORDS

Lymphoedema, oedema, lymphatic system, low level laser therapy, laser therapy, biophysical agents

SUMMARY

Low level laser therapy (LLLT) is a biophysical modality in which low powered laser light is applied to the tissues to reduce the signs and symptoms of lymphoedema. Early *Level 1* evidence failed to demonstrate effectiveness of this therapy,[1] but more recent *Level 1* evidence[2, 3]and *Level 3* evidence[4] suggests that patients with breast cancer treatment related lymphoedema may achieve limb volume reduction and relief of pain that contributes to improved quality of life. In general, LLLT is used as part of a multi-component regimen.

CLINICAL PRACTICE RECOMMENDATIONS

All recommendations should be applied with consideration to the wound, the person, the health professional and the clinical context:

There is some evidence that low level laser therapy is associated with reduction in limb volume, improved function and reduced pain in women with breast cancer treatment-related lymphoedema (Grade B).

There is insufficient evidence to make recommendations on the most appropriate low level laser therapy regimen. Greater benefit from treatment is expected to be achieved when combined with compression therapy or manual lymphatic drainage.

SOURCES OF EVIDENCE

This summary was conducted using methods published by the Joanna Briggs Institute.[5-8] This evidence summary is based on a structured database search using variations of the search terms describing lymphoedema and LLLT. Searches were conducted in EMBASE, Medline, AMED and the Cochrane Library for evidence from 1990 to 2015 in English. Levels of evidence for intervention studies are reported in the table below.

Table 1: Sources of evidence and the level

Level 1 Evidence	Level 2 Evidence	Level 3 Evidence	Level 4 Evidence	Level 5 Evidence
Experimental Designs	**Quasi-experimental Designs**	**Observational – Analytic Designs**	**Observational – Descriptive Studies**	**Expert Opinion/ Bench Research**
1.a Systematic review of RCTs[1, 9] 1.b Systematic review of RCTs and other designs[9, 10] 1.c RCT[2, 3]	None	3.e Observational study without a control group[4, 11]	4.c Case series[12]	5.b Expert consensus[13, 14] 5.c Expert opinion[15-21]

 First published 2015

BACKGROUND

Lymphoedema is a form of chronic, progressive oedema in which there is significant, persistent swelling of a limb or other body region due to excess and abnormal accumulation of protein-rich fluid in body tissues. This fluid contains a range of inflammatory mediators and adipogenic factors.[10, 14-16, 20] The lymphatic system is unable to manage the volume of accumulated fluid.[16]

Lymphoedema occurs due to primary, secondary or mixed causes. Primary causes are described as congenital (e.g. an inherited disorder such as Milroy's disease), praecox (onset at puberty, e.g. Meige's disease) or tarda (sudden onset no apparent cause).[13, 17, 18] Secondary causes arise from direct damage or trauma to the lymphatic system such as injury surgery or radiotherapy (usually related to treatment of breast cancer), or parasitic invasion.[11, 13, 17] Lymphatic filariasis (also called elephantitis) is a cause of secondary lymphoedema endemic in areas primarily in Africa and Asia. Lymphatic filariasis is a parasitic (roundworm) infection that is spread by mosquitoes and causes damage to the lymphatic system that may result in lymphoedema. Infection generally occurs in childhood, although. Management focuses on large-scale treatment programs to reduce disease spread.[21] Mixed lymphoedema describes lymphoedema arising from decompensation or failure of the lymphatic system associated with other disease or conditions, including but not limited to obesity, immobility, venous disease or lipoedema.[12, 13, 17]

Without management, lymphoedema may lead to:[16, 19]

- progressive swelling,
- physical and functional limitations,
- chronic infection,
- fibrosis,
- lymphorrhoea (leaking of lymph fluid)
- pain and discomfort, and
- reduced ability to undertake activities of daily living (ADLs).

Low level laser therapy (LLLT) is a therapeutic modality that involves the application to the body of near-infrared or red-beam light at wavelengths up to approximately 1,000 mW. The light particles are absorbed into the tissue without production of heat. The wavelength (measured in nanometres [nm]) determines the depth the light penetrates into the tissue. The way in which LLLT provides a therapeutic benefit in managing lymphoedema is poorly understood, but it is thought to increase lymph flow through the lymph system, and reduce excess protein and fluid in tissues.[4, 16] The therapy is generally performed by physiotherapists with specific training..

CLINICAL EVIDENCE

Effectiveness in reducing oedema

A systematic review[1] of RCTs identified two trials at high risk of bias that investigated LLLT for the treatment of lymphoedema. Neither trial presented a comparison on the reduction of lymphoedema between participants treated with LLLT versus other or no treatments. No evidence was found to support the treatment modality[1] (*Level 1*).

A meta-analysis[9] of six studies with mixed methodologies found LLLT was associated with a moderate reduction in limb volume for women with upper extremity breast cancer-related lymphoedema. Using a fixed effect model, the pooled effect size (ES) for within group comparison was statistically significant (pooled ES –0.52, 95% confidence interval [CI] –0.78 to –0.25) equating to a reduction in arm volume of 75.7 ml. The between group comparison that included four studies reporting a treatment regimen including LLLT versus a treatment regimen without LLLT showed a pooled ES of –0.62 (95% CI –0.97 to –0.28). Although this was not statistically significant, the clinical impact was equivalent to 90.9 ml reduction in arm volume. Comparative treatment regimens included intermittent compression therapy (bandage, garment or pneumatic), manual lymphatic drainage or exercise regimen with education[9] (*Level 1*).

Regimens of LLLT that showed effect for reducing limb volume either alone or concurrently with other management strategies reported in studies in the above meta-analysis[9] included (*Level 1*):

- Direct contact, 904 nm, applied to 17 places in the axilla each 2 cm apart, 1 minute at each place per session for 18 sessions.
- Direct contact, 904 nm, applied to 3 places in the antecubital fossa and 7 places in the axilla, 2 minutes at each place per session for 36 sessions.
- Direct contact, 904 nm, applied to 3 places in the antecubital fossa and 7 places in the axilla, 20 minutes per session for 12 sessions.

- Non-contact scanned 50 cm above the skin, 808 nm (increased to 905 nm for 2 sessions) applied to entire axilla, 20 minutes per session for 12 sessions.
- Non-contact scanned, 904nm, applied to axilla, forearm and arm, 10 minutes per area (30 minutes total) for 16 sessions.

(*Level 1*).

Effectiveness in reducing pain

A meta-analysis[9] of three RCTs found LLLT was associated with a statistically significant reduction in pain for women with upper extremity breast cancer-related lymphoedema. Using a fixed effect model, the pooled ES for within group comparison was –0.62, (95% CI –1.06 to –0.25) equating to a reduction in pain of 13.5 mm on a 100 mm visual analogue scale (VAS). Pooled results from the two studies that measured pain immediately post-intervention had non-significant results[9] (*Level 1*).

Effectiveness improving function

In an RCT,[2] LLLT (20 minutes at 2800 Hz, 1.5 J/cm^2 three times weekly for four weeks) was effective in significantly improving grip strength measured using a hand dynamometer in women with breast cancer treatment related lymphoedema (n = 23) immediately following treatment and at three, six and 12 month follow up (p = 0.05 or p <0 .01 for all). There was no significant difference in effect compared with a group (n = 24) receiving pneumatic compression therapy[2] (*Level 1*).

Low level laser therapy (two courses of nine sessions each over three weeks each) was associated in improved shoulder range of movement in women with breast cancer treatment related lymphoedema (n=17). Improvements were reported for 76.4% of the women[4] (*Level 3*).

CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

FUNDING

The author would like to acknowledge the support of the Australian Government's Cooperative Research Centres Program.

ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in

Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, Worldviews Evid Based Nurs. 2015;12(3):131-8.

Methods are provided in detail in resources published by the Joanna Briggs Institute as cited in this evidence summary. WHAM evidence summaries undergo peer-review by an international review panel. More information is available on the WHAM website: https://www.whamwounds.com/ .

WHAM evidence summaries provide a summary of the best available evidence on specific topics and make suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.

PUBLICATION

This evidence summary has been published in Wound Practice and Research:

Haesler E. Evidence summary: Managing lymphoedema: Low level laser therapy. Wound Practice and Research, 2015; 24(2): 119-21.

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