WHAM Evidence summary: Venous leg ulcers: Compression with short stretch (inelastic) bandages

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CLINICAL QUESTIONS

What is the best available evidence on effectiveness of short stretch bandages (SSBs) for healing venous leg ulcers (VLUs)?

KEYWORDS

Venous leg ulcer, leg ulcer, compression, bandages, short-stretch bandage

SUMMARY

Venous leg ulcers (VLUs) are chronic wounds that occur on the lower leg as a result of venous disease. Compression therapy is recognised as gold standard treatment for promoting healing of VLUs.[1, 2] The best available evidence on SSBs indicates that this form of compression therapy is effective in promoting VLU healing, although other forms of compression (e.g. compression stockings or 4-layer bandaging) appear to achieve superior healing outcomes[2-5] and might heal VLUs slightly faster[2, 5] (*Level 1*).

CLINICAL PRACTICE RECOMMENDATIONS

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

When there are no contra-indications, use short stretch (inelastic) bandages for achieving VLU healing when other types of compression therapy are not appropriate for the specific individual (Grade A).

Note: Compression therapy carries a higher risk for individuals with peripheral arterial disease, peripheral neuropathy, heart failure or vasculitic ulcers, but may still be indicated.[6]

SOURCES OF EVIDENCE

This summary was conducted using methods published by the Joanna Briggs Institute.[7-9] The summary is based on a literature search combining search terms describing VLUs and compression therapy. Searches were conducted in EMBASE, Medline, AMED and the Cochrane Library for evidence from 1990 to May 2018 in English. Where high level evidence was available, lower level evidence was not reviewed. Levels of evidence for intervention studies are reported in the table below.

BACKGROUND

Venous leg ulcers occur due to venous insufficiency. Venous insufficiency describes a condition in which the venous system does not carry blood back to the heart in the most efficient manner, causing blood to pool in the veins of the lower limbs.

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[2, 5] 1.b Systematic review of RCTs and other designs[10, 11] 1.c RCT[3, 4, 12, 13]	2.c Quasi-experimental prospective controlled study[14, 15]	3.e Observational study[16]	None	5.b Expert consensus[1, 6, 17, 18]

Venous insufficiency occurs due to:[2, 10]

- previous blood clots,
- impaired valves in the veins in the lower leg do not close sufficiently after each muscle contraction, allowing blood to flow back to a previous section of the vein (venous reflux), and
- calf muscle pump function not adequately assisting in returning blood to the heart.

Compression therapy works by generating external pressure on the superficial veins and tissues, thereby assisting in venous return. This helps to reduce peripheral oedema and induration, and to promote lower limb wound healing.[18] Compression systems usually utilise graduated pressure. Traditionally, higher pressure is attained at the ankles with pressure decreasing up the leg, although some contemporary systems use a negative pressure gradient.[14, 15]

Short stretch bandages, which are bandages that have few or no elastomers, are also called inelastic compression bandages. A SSB system usually consists of one or two rolls of SSBs. SSBs have low extensibility (ability to stretch) and a high static stiffness index (SSI).[1, 16, 17] This means that there is higher level of compression during standing or walking and a lower level of compression during rest (i.e. there is high fluctuation in the level of pressure).[1, 16, 17]

CLINICAL EVIDENCE

Short stretch bandaging compared with no compression therapy for healing VLUs

Evidence provides support for all forms of compression therapy compared to no compression therapy for treating VLUs.[2, 5] One RCT (n = 53) comparing SSBs to care without compression therapy reported superior rates of complete healing at three months associated with SSBs (71% versus 25%). Additionally, 21% of individuals who did not receive compression therapy had an increase in ulcer size over three months, compared with 0% of people receiving SSBs[12] (*Level 1*).

Short stretch bandaging compared with other types of compression therapy for healing VLUs

A meta-analysis that included individual patient data from five randomized controlled trials (RCTs) found that there was no significant difference in number of ulcers that completely healed using SSB compared to 4-layer bandaging (risk ratio [RR] 0.96, 95% confidence internal [CI] 0.88 to 1.05, p = 0.34). Using a fixed-effects analysis model, 4-layer bandaging treatment was shown to be associated with significantly faster VLU healing compared with multi-layer SSBs (hazard ratio [HR] 1.32, 95% CI 1.09 to 1.60, p = 0.0039). When a random-effects model was used, there was no significant difference in healing time between compression types (HR 1.30, 95% CI 0.94 to 1.80, p = 0.11)[2] The 4-layer bandaging systems reported in these trials generally included an elastic bandage as the third layer in the system and are designed to deliver 40mm Hg pressure at the ankle, decreasing to 17mm Hg at the knee (*Level 1*).

A second meta-analysis that included the same five RCTs as the above review also found no significant difference in VLU healing rates between 4-layer bandaging and SSBs (HR 0.88, 95% CI 0.76 to1.02, p = 0.08)[19] (*Level 1*).

A third meta-analysis that included 18 RCTs, showed no significant difference in healing between SSBs and elastic (3 or 4 layer) bandaging systems (risk ratio [RR] 0.98, 95% CI 0.91 to 1.06, p = 0.61). When limiting this analysis to only high quality RCTs, a trend favouring elastic bandaging systems for VLU healing at 12 months was noted. The same review reported a non-significant difference in time to achieve VLU healing outcomes between SSB and elastic bandaging of 0.5 months (5 RCTs, 95% CI, –0.6 to 0.16, p = 0.41).[5] Most of the elastic bandaging systems included in the review were 4-layer systems. Some of the systems included an elastic bandage as the third layer in the system and were designed to deliver 40mm Hg pressure at the ankle, decreasing to 17mm Hg at the knee. However, most systems are not reported in detail (*Level 1*).

Another meta-analysis showed that high compression stockings are more effective than SSBs for achieving complete VLU healing in two to four months (4 RCTs, risk ratio [RR] 1.62, 95% CI 1.26 to 2.10, p = 0.06). The result was the same when using a random effects model (p = 0.06).[2] A second meta-analysis that included eight RCTs supported the finding that SSBs are not as effective as compression stockings for VLU healing outcomes (RR 1.33, 95% CI 1.02 to 1.74)[5] (*Level 1*).

In studies published more recently,[3, 4] SSBs are shown to achieve significant improvements in wound surface

area, length, width and volume, although other forms of compression therapy continue to show superior results.[3] Ulcers treated with SSBs showed a mean decrease in wound area of 16.66% compared to 58.62% (p = 0.03) for 4-layer bandaging and 20% (p = 0.03) for Unna's boot[3] (*Level 1*). In another trial, individuals with superficial venous disease and individuals with deep vein reflux showed significantly better healing with compression stockings or pneumatic compression compared with SSBs.[4] An Australian trial found more ulcers healed after 12 weeks of treatment with a multi-layer tubular bandage compared with SSBs (74% versus 46%, p = 0.056).[13]

A narrative review[11] reported evidence that the amount of pressure applied by some SSB systems can reduce after application, although pressure loss slows over time and is maintained at about the same level as other systems by seven days after application.[11] The review also reported that clinical staff were less able to achieve desired sub-bandage pressure when applying SSBs compared to other compression therapy.[11] These findings may explain the inferior clinical effectiveness of some SSB systems compared to other compression therapy reported in the literature (*Level 1*).

CONFLICTS OF INTEREST

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

FUNDING

The development of this WHAM evidence summary was supported by a grant from The Western Australian Nurses Memorial Charitable Trust.

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: Venous leg ulcers: Compression with short stretch (inelastic) bandages. Wound Practice and Research, 2019; 27(2) 100-2.

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