

Evidence summary: Venous leg ulcers – pneumatic compression

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QUESTION

What is the best available evidence on effectiveness of pneumatic compression for healing venous leg ulcers (VLUs)?

SUMMARY

Venous leg ulcers (VLUs) are ulcers that occur on the lower leg as a result of venous insufficiency. Compression therapy is recognised as gold standard treatment for promoting healing of VLUs^{1,2}. The best available evidence indicates that pneumatic compression is effective in promoting VLU healing, when used as the only form of compression therapy²⁻⁵, or in conjunction with continuous compression from bandages or stockings⁶ (Level 1).

BEST PRACTICE RECOMMENDATIONS

When there are no contra-indications, use pneumatic compression therapy for achieving VLU healing (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 indicated⁵.

BACKGROUND

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. Venous insufficiency occurs due to^{2,7}:

- previous blood clots,
- impaired valves in the lower leg veins that 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 healing⁸. 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^{9,10}.

Pneumatic compression is compression applied by continuous, intermittent or sequential cycles of pressure applied by an air inflatable boot. The intermittent compression cycle, achieved with inflation and deflation of different air chambers in the boot, can be programmed to individualised cycles^{1,11}. Unlike bandaging or stockings that are worn continuously, pneumatic compression is used intermittently, usually on a daily basis.

EVIDENCE

Pneumatic compression compared with no compression therapy for healing VLUs

There is significant evidence that any compression therapy intervention is superior to no compression for healing VLUs. One trial reports specifically on pneumatic compression therapy compared to no compression therapy. The pneumatic compression regimen consisted of one hour sessions, five days per week for up to six months using sequential pressure of 50mmHg at the ankle and 40mmHg at the thigh. Significantly more VLUs healed when pneumatic

SOURCES OF EVIDENCE

Level 1	Level 2	Level 3	Level 4	Level 5
Experimental designs	Quasi-experimental designs	Observational – analytic designs	Observational - descriptive studies	Expert opinion Bench research
Systematic reviews 2, 6, 7 RCT 3,4,12-14	9, 10	None	None	Expert consensus 1, 5, 8, 11

compression was used ($p=0.004$) (risk ratio [RR] 2.27, 95% confidence interval [CI] 1.30 to 3.97)^{6,12} (Level 1).

[Pneumatic compression in conjunction with compression bandages or stockings](#)

Pooling of results from three small RCTs favored the addition of pneumatic compression to a regimen of continuous compression bandaging or stockings. Significantly more VLU healed with the addition of pneumatic compressions (risk ratio [RR] 1.31, 95% CI 1.06 to 1.63, $p=0.013$)⁶ (Level 1)

Overall, there is no strong evidence on whether pneumatic compression should be used alone or as an adjuvant with other types of compression therapy⁶ (Level 1).

[Pneumatic compression compared with other compression therapy interventions](#)

A RCT⁴ compared intermittent pneumatic compression with compression stockings and 2-layer short stretch bandaging (SSB). There was a significant difference based on treatment in VLU healing rates in individuals with superficial vein reflux, with both compression stockings (27% healed) and intermittent pneumatic compression (25% healed) demonstrated to be superior to SSBs (10%, $p=0.01$). Similar results were observed in individuals with deep reflux⁴ (Level 1).

Intermittent pneumatic compression has been shown to be more effective than 2-layer short stretch bandages ($p=0.003$) and Unna's boot ($p=0.03$) in an RCT. A multi-chamber intermittent pneumatic compression system used once a day, five days per week for two months achieved significantly better reduction in VLU surface area, length, width and volume. There was no difference in efficacy between pneumatic compression and 4-layer bandaging or compression stockings³. These results were supported by another RCT that compared an intermittent pneumatic compression regimen that used both intermittent and sustained cycles to 4-layer bandaging. There were similar VLU healing rates after 12 weeks of therapy (31.6 vs 42.3%, $p=0.30$)¹³.

[Comparison of different pneumatic compression regimens](#)

One RCT reported a fast pneumatic cycle compared to a slow cycle. The fast cycle consisted of 60 seconds inflation, maintain peak pressure (45mmHg at the foot and 30 mmHg at the thigh) for 30 seconds, then 90 seconds deflation. Therapy was delivered for one hour each day. There was a significant difference for number of VLUs healed, favoring the fast cycle (RR 1.41, 95% CI 1.11 to 1.79, $p=0.0054$)¹⁴ (Level 1).

Overall, there is no strong evidence for one regimen over another, and most reports provide no rationale for the regimen used in research studies⁶ (Level 1).

METHODOLOGY

The development of this evidence summary is based on the Joanna Briggs Institute methodology¹⁵. A structured database search was employed using variations of the search terms describing VLUs and pneumatic compression therapy. Searches were conducted in EMBASE, Medline, AMED and the Cochrane Library for evidence for 1900 to June 21018 in English.

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CORRIGENDUM

Title: Ankle Brachial Pressure Index and compression application: Review summary

Volume: 27

Issue: 2

Page number: 76

Correction: Box 1: Clinical practice recommendations.

There was an error in the Box 1: Clinical practice recommendations.

The corrected information should read as follows:

If a patient's ABPI is between 0.6 and 0.8, but the patient does not exhibit signs or symptoms of peripheral arterial disease (PAD) or diabetes mellitus, graduated compression therapy should aim for equal or lesser than 30 mmHg (elastic) or the use of a high stiffness system (inelastic).

The authors apologise for any inconvenience caused.

+ Better Outcomes

UK's NICE medtech guidance supports adopting PICO to reduce surgical site complications across various surgical specialties.

PICO[◇] 7

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