Local warming/heat therapy for chronic wounds: a WHAM evidence summary

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CLINICAL QUESTION

What is the best available evidence for local warming/heat therapy for healing chronic wounds?

SUMMARY

Local warming/heat therapy has historically been used to promote blood flow, tissue oxygenation and healthy granulation in chronic wounds. Application of radiant heat using non-contact heat sources has been demonstrated to effectively raise the temperature of the wound bed and peri-wound skin[1]. However, the available Level 1 evidence is insufficient to determine whether this translates to improved healing in chronic wounds[2,3]. Three small Level 1 studies[4–6] conducted in pressure injuries (PIs), two small Level 1 studies[7,8] in venous leg ulcers (VLUs) and one small Level 1 study[9] in diabetic foot ulcers (DFUs) provided some evidence that a non-contact heated dressing might have an impact on healing, but this evidence was at high risk of bias, meaning no conclusions could be made on the role of local warming/heat therapy for chronic wound healing.

CLINICAL PRACTICE RECOMMENDATIONS

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

The current evidence is insufficient to recommend the use of local warming/heat therapies to promote healing in chronic wounds.

SOURCES OF EVIDENCE

This summary was conducted using methods published by the Joanna Briggs Institute[10–12]. The summary is based on a systematic literature search combining search terms related to local heat therapy (e.g. warming, heat, normothermic) and chronic wounds. Searches were conducted in Embase, MEDLINE, CINAHL, the Joanna Briggs Institute database and Cochrane library for evidence published up to April 2023 in English. Levels of evidence for intervention studies are reported in the table below.

BACKGROUND

Local warming therapy (also referred to as heat therapy or non-contact normothermic wound therapy) is a treatment by which heat is applied to a wound. Radiant heat can be applied using an infrared heating lamp, a non-contact warming unit or specially designed wound dressings that include a heating element[2,3]. Less often, conductive heat can be applied through moist compresses or heat packs applied directly to the wound[14]. The rationale for using local warming/heat is to increase local blood flow, thereby increasing delivery of oxygen to the wound bed, promoting collagen deposition and formation of granulating tissue[1,15] and reducing microbial activity[14]. These theories require further investigation, particularly in people with peripheral arterial disease[18]. Observational studies[14,15,17] have demonstrated that warming dressings[6-8,13,15,17] and warm, moist towels[14] can effectively increase the local skin-surface temperature[14,15,17] and are associated with an increase in subcutaneous oxygen tension[14,15].

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] 1.b Systematic reviews of RCTs and other designs[3] 1.c RCT[4–7,9]	2.c Quasi-experimental prospectively controlled study[13] 2.d Historic/ retrospective control group study[8]	3.c Cohort study with control group[14,15]	None	5.b Expert consensus[16] 5.c Expert opinion[1] 5.c Bench research[17]

Most of the identified research on local warming/heating for chronic wound healing focuses on non-contact normothermic wound dressing therapy (Warm Up® Active Wound Therapy [Augustine Medical, Inc., Eden Prairie, MN]). This dressing includes a bandage component consisting of a foam border dressing that creates a collar around the wound and a non-contact transparent film that sits over (but not touching) the wound bed. An infrared warming device is inserted into a pocket within the film that heats the wound according to the therapy parameters while maintaining 100% relative humidity[5,7]. The findings are likely to be transferable to other mechanisms of applying radiant heat whilst maintaining a moist healing environment because the evidence[6,13] indicates that the dressing device effectively achieved the environmental conditions it claimed.

There was no evidence available on the effect of conductive heat (e.g., from a moist towel or heat pack) applied directly to a wound.

CLINICAL EVIDENCE

Two reviews indicated were unable to identify sufficient evidence to recommend the use of local warming therapies across different types of chronic wounds[2,16] (Levels 1 and 5).

Local heat therapy for healing pressure injuries

Evidence for local warming/heat therapy in PIs comes from three small Level 1 studies[4–6] and one Level 2 study[13]. All but one study had a high risk of bias. In all the studies, participants with full thickness PIs (Stage 3 or 4) received standard PI care, including pressure relieving surfaces and repositioning, in conjunction with their wound treatment. All the studies explored local warming/heath therapy using the same non-contact heated dressing that provides radiant heat in a high humidity micro-environment. Given the small study sizes, the methodological concerns and the inconsistent findings, this evidence is insufficient to recommend radiant heating of PIs to increase healing. The evidence included:

- An RCT[5] at low risk of bias comparing hydrocolloid dressing (n=20) with the heated dressing (n=21). Warming was administered every 8 hours in 1-hour sessions for 12 weeks. There was no significant difference in rates of complete healing (57% in experimental group versus 44% in the control group, p=0.46)[5] (Level 1).
- An RCT[4] at high risk of bias comparing alginate dressing (n=25) with the heated dressing (n=25). Warming was administered twice daily in 1-hour sessions for up to 6 weeks. PIs that completely healed within 6 weeks were not different between groups (p>0.05). Nor was there any difference in time taken to achieve 75% or 50% reduction in wound surface area (p>0.05)[4] (Level 1).
- An RCT[6] at high risk of bias comparing standard wound care (n=14) with the heated dressing (n=15). Warming was administered via the dressing 3 times daily until 38˚C was reached, for up to 8 weeks. Complete healing rate was 53% in the warming therapy group and 43% in the standard care group (p = not reported)[6] (Level 1).
- A non-randomised study[13] at high risk of bias comparing standard wound (n=6) to the heated dressing (n=20). Heat was applied 4.5 hours per day, 5 days per week for 4 weeks. Mean reduction in wound surface area at 4 weeks favoured the treatment group (60.73% versus 19.24%, p<0.05)[13] (Level 2).

Local heat therapy for healing venous and other lower leg ulcers

Evidence for warming/heat therapy in hard-to-heal VLUs comes from two small studies[7,8] at high risk of bias. In both studies, participants received concurrent management of their venous disease. The evidence was insufficient to recommend radiant heating of VLUs to increase healing. The evidence included:

- An RCT[7] at high risk of bias comparing heated dressing (n=8) with daily calcium-alginate dressing (n=5). Warming was delivered for 1 hour on/1 hour off cycles over 8 hours/day for 2 weeks. VLUs treated with heat showed a mean reduction in surface are of 32% and people reported a 39% reduction in pain. VLUs receiving the control treatment had a mean 25% reduction in surface area and pain decreased by 27% (p = not reported)[7] (Level 1).
- A small study[8] in which people with VLUs (n=17) acted as their own historic control. The heated dressing was applied for 1 hour on/1 hour off cycles, 5 hours/day for 2 weeks (Level 2). No VLUs completely healed, but a statistically significant reduction in wound size (mean 21.6±45.8cm^2 versus 12.1±27.3cm^2, p=0.0024) and a reduction in pain scores (3.2±2.6 versus 0.9±3.2, p=0.005) was observed[8] (Level 2).

Local heat therapy for healing diabetic foot and neurological ulcers

Evidence for warming/heat therapy in DFUs comes from two studies[3,9]. The evidence included:

- An Australian evidence-based guideline[3] which was unable to identify adequate evidence to recommend the use of local warming/heat therapy for DFUs (Level 1).
- One small RCT[9] at high risk of bias which provided evidence on local warming/heat therapy for healing DFUs. People with DFUs received either daily moisture retentive dressing (n=18) or a heated dressing changed daily (n=18). Warming was delivered for 3 hours (1 hour heat cycle – 1 hour off – 1 hour heat cycle), 5 days/week for 2 months. Both groups delivered their own treatment at home, and wound assessments were conducted weekly at a wound clinic. Complete healing occurred more frequently in the heated dressing group (72% versus 28%, p=0.0003). The participants were described as having poor diabetes control[9] (Level 1).

CONSIDERATIONS FOR PATIENTS WHO CHOOSE TO USE LOCAL WARMING/HEAT THERAPY

The heated dressing device reported in the included studies was considered experimental when the research was published in the 1990s and early 2000s, and is not currently registered as a medical device in Australia and New Zealand. Wound clinicians should check local licensing/regulation before using medical devices for applying local heat to a wound.

The evidence on whether heat reduces pain was mixed and at high risk of bias. In two studies[4,7] there was no difference in the experience of wound pain in people with chronic wounds treated with radiant heat, but a third study showed clinically and statistically significant pain reduction in people with VLUs[8].

In a small study in VLUs, there was no increase in skin irritation associated with a radiant heat[7]. In another small study[6], a person using a heated dressing experienced peri-wound skin maceration necessitating cessation of treatment. None of the studies reported on the potential for local warming/heat therapy to increase wound bleeding or inflammation, or the risk of burns, particularly in people with impaired neurological function.

Limitations of a non-contact heated dressing are the inability to ambulate during treatment[9].

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CONFLICTS OF INTEREST

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

ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in Munn et al[19]. Methods are provided in detail in resources published by the Joanna Briggs Institute[10–12]. WHAM evidence summaries are peer-reviewed by an International Expert Reference Group. For more information see: 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 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.

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