The clinical effectiveness of negative pressure wound therapy: a systematic review

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CRD summary
This review concluded that sufficient evidence existed (for safety and accelerated healing) to justify negative pressure wound therapy use in diabetes-associated chronic leg wound treatment; there was some evidence of accelerated healing of other wounds. The authors' conclusions reflect the data presented, but the possibility of publication and language bias should be borne in mind during their interpretation.

Authors' objectives
To evaluate the effectiveness of negative pressure wound therapy.

Searching
PubMed and EMBASE were searched from January 2005 to May 2010 for full-text studies published in English or French in peer-reviewed journals. Search terms were reported. Reference lists of previous systematic reviews and HTA reports were also searched.

Study selection
Randomised controlled trials (RCTs) of negative pressure wound therapy that reported outcomes describing the rate of wound healing were eligible for inclusion. Trials in which negative pressure wound therapy was used for skin grafts were excluded. Infection and bacteriological studies and systematic reviews were only considered for inclusion in the context of safety.

The included trials compared negative pressure wound therapy with control therapy (standard wound dressing, wet-to-dry dressing, advanced moist wound therapy and standard moist gauze dressing). The age of the included patients ranged from 37 to 74 years across treatment groups; their wounds varied in site, chronicity, infection and the pathology underlying the wound. A variety of outcomes were extracted including time to granulation, time to healing, change in wound depth and volume, relative wound score, and readiness for surgery. The observation period ranged from 21 to 112 days, or until stated clinical changes in the appearance of the wound occurred. Wound evaluation varied between trials, but most commonly involved the use of photography or tracing of the wound area.

The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The methodological quality of the included trials was assessed by two reviewers using a previously developed tool described in a previous study (see Other Publications of Related Interest). The tool assessed trial randomisation, similarity at baseline, blinding, drop-outs, use of intention-to-treat analysis, and statistical analysis. Quality was graded as high (A), moderate (B) or low (C). Disagreements were resolved through discussion with a third reviewer.

Data extraction
Data were extracted for the outcomes of interest and for the main safety outcomes. To determine whether the change in wound healing was clinically significant, the authors stated that they set an arbitrary limit of 33% of any wound healing index as being clinically significant. The statistical significance of negative pressure wound therapy versus control therapy was also reported.

The authors did not report how many reviewers extracted data.

Methods of synthesis
The data were synthesised narratively and grouped by type of wound: diabetic foot, pressure ulcers, mixed wounds (chronic and acute), and special applications of negative pressure wound therapy. The authors stated that meta-analysis was precluded by the variety of different indicators used for wound healing.
Results of the review
Seventeen RCTs were included in the review (n=990 patients; range 10 to 335). The quality rating was high for two RCTs, moderate for six RCTs and low for nine RCTs.

**Diabetic foot ulcers** (seven RCTs, n=580 patients): Negative pressure wound therapy was associated with clinically significant wound healing compared with control in all seven RCTs. Five RCTs were statistically significant.

**Pressure ulcers** (three RCTs, n=68 patients): Negative pressure wound therapy was associated with clinically and statistically significantly better wound healing than control therapy in one RCT. One RCT found faster wound healing (although not statistically significant) with negative pressure wound therapy compared with control therapy. One RCT showed no evidence of benefit with negative pressure wound therapy compared with control therapy.

**Mixed (various) wounds** (five RCTs, n=267 patients): Negative pressure wound therapy was associated with a clinically and statistically significant benefit in one RCT of leg ulcers due to microangiopathies and venous congestion. Four RCTs found that negative pressure wound therapy was associated with faster healing times for a mixture of acute and chronic wounds, but these results were not statistically significant.

**Special wounds** (two RCTs, n=75 patients): Unusual applications of negative pressure wound therapy were reported in two RCTs. Further details were available in the paper.

There was no evidence of adverse events associated with negative pressure wound therapy (11 RCTs).

Authors’ conclusions
There was sufficient evidence (showing negative pressure wound therapy was safe and accelerated healing) to justify its use in the treatment of diabetes-associated chronic leg wounds. There was evidence, although of poor quality, that suggested healing of other wounds may also be accelerated.

CRD commentary
The research question was supported by inclusion criteria for intervention, outcomes and study design. Language and publication biases were possible as the search was restricted to published studies in French or English. Although study quality was assessed by two reviewers (reducing the risk of reviewer error and bias), it was not reported whether similar steps were taken for study selection and data extraction.

Trial quality was assessed using criteria appropriate to the study design included; it was taken into account in the analysis. The use of an arbitrary limit to determine the clinical significance of wound healing was not well justified, so the validity of this was not known.

The authors’ conclusions reflected the data presented, but the possibility of publication and language bias should be borne in mind during their interpretation.

Implications of the review for practice and research
**Practice**: The authors stated that sufficient evidence had accumulated to support the use of negative pressure wound therapy in the management of diabetic ulcers on the lower limbs.

**Research**: The authors stated that further RCTs that focus on more specific clinical scenarios are urgently required.

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