Four layer bandage compared with short stretch bandage for venous leg ulcers: systematic review and meta-analysis of randomised controlled trials with data from individual patients


CRD summary
The authors of this review of individual patient data concluded that the four layer bandage increases the chance of healing by approximately 30%, when independent prognostic characteristics are taken into account, and benefits are consistent across different prognostic profiles. This was a well-conducted and reported review and the conclusions are likely to be reliable.

Authors' objectives
To compare the effectiveness of the four layer bandage with the short stretch bandage in compression treatment for venous leg ulceration.

Searching
Eligible studies were sought from the Cochrane Central Register of Controlled Trials and Cochrane Wounds Group Specialised Register. MEDLINE, EMBASE, and CINAHL (2002 to 2005) and the National Research Register were also searched to identify additional studies. All database searches were updated in March 2008. Reference lists of eligible trials were scanned, and collaborating trialists were consulted to provide details of any further studies.

Study selection
Randomised controlled trials (RCTs) comparing the four layer bandage with the short stretch bandage for treating participants with venous leg ulcers (defined as ankle brachial pressure index (ABPI) ≥0.8 plus clinical history) were eligible for inclusion in the review. The primary outcome of interest was time to healing (days). Secondary outcomes included: time to ulcer recurrence; change in ulcer area at follow up points during the trial (as a predictor of time to healing); change in ulcer area during the trial (as an outcome of treatment); and adverse events. In the meta-analysis dataset, 60% of patients were female, 66% were ambulant without assistance and the mean age across all participants was 70 years.

Two reviewers independently selected trials for inclusion in the review and disagreements were resolved by discussion.

Assessment of study quality
Trial quality was evaluated using the Cochrane Collaboration tool to assess the adequacy of randomisation, allocation concealment and blinding. The quality of individual patient data was assessed in collaboration with relevant trialists by checking for data completeness, duplication, consistency, feasibility and integrity of randomisation. Discrepancies were resolved by discussion.

Data extraction
Baseline individual patient data were requested from trialists on sex, age, primary or recurrent ulceration, ulcer duration, ulcer area and diameter, appearance of wound bed, ulcer infection, ABPI, ankle circumference, ankle mobility, patient mobility and history of co-morbidities. Outcome data were requested on healing status (healed or not), date of healing, recurrence status, date of recurrence, ulcer area at follow up points during the trial and adverse events. [A: Trialists were also asked to provide date of randomisation, allocated treatment, date of last follow-up and details of patients excluded from analysis.]

Methods of synthesis
Analyses were undertaken on an intention to treat basis. Initially, non-stratified Kaplan-Meier survival curves were generated for both treatment groups with time to healing (days) as the dependent variable, healing as the event and bandage type as the factor. Next, Cox proportional hazards models were run (fixed-effect), using a backward elimination method in order to generate hazard ratio estimates of time to healing. Sensitivity analysis was performed to allow for random-effects by making the trial a cluster and estimating robust standard errors. A preliminary analysis was
performed unadjusted for baseline characteristics, followed by further analysis where statistically significant covariates had been entered simultaneously into the model. Tests were carried out for interactions between bandage type and baseline characteristics. Checks were conducted to assess: the proportional hazards assumption; the linearity of the relationship between the dependent variable and continuous covariates; whether time to healing was similar during early and late accrual; and the adequacy of model fit between the number of events and number of covariates included in each model. Heterogeneity was assessed using the $\chi^2$ test and $I^2$ statistic.

**Results of the review**

Individual patient data were available for five trials (n=797). Follow-up ranged from 3 to 12 months. All five trials were reported to have adequate randomisation and allocation concealment. Data checking revealed a small number of errors and discrepancies, and all were corrected in discussions with the trialists. Lack of data prevented the analysis of recurrence and ulcer area outcomes.

A preliminary analysis of the five trials (n=797; unadjusted for baseline characteristics) revealed the median time to healing was 90 days for the four layer bandage and 99 days for the short stretch bandage.

Further unadjusted analysis (five trials; 20/797 cases dropped) using bandage type as the covariate revealed no statistically significant difference for time to healing. When all statistically significant covariates were included in the analysis (type of bandage, ulcer duration, and ulcer area), the HR was 1.31 (95% CI: 1.09, 1.58; p=0.005) in favour of the four layer bandage (five trials; 75/797 cases dropped). There was no significant heterogeneity between the trials. Similar results were reported for a subset of four trials for which additional covariates were available (primary or recurrent ulceration and patients’ mobility). There were no significant interactions between bandage and baseline ulcer area or ulcer duration, and bandage and primary or recurrent ulceration.

There were no statistically significant differences in adverse events between bandage types in the two trials (n=546) that provided data.

**Cost information**

Data from one of the included trials revealed the mean annual costs of treatment (in year 2001) were £1298.41 (95% CI: £1187.83, £1471.89) for the four layer bandage and £1525.73 (95% CI: £1373.92, £1716.66) for the short stretch bandage, showing a difference of £227.32 (95% CI: 16.53, £448.30).

**Authors’ conclusions**

The four layer bandage increases the chance of healing by approximately 30%, when independent prognostic characteristics are taken into account, and benefits are consistent across different prognostic profiles.

**CRD commentary**

This review addressed a clear research question and was supported by detailed inclusion criteria for study design, participants, interventions and outcomes. The search strategy included several sources which appeared to be relevant to this topic area and attempts were made to minimise publication and language biases. The processes of study selection and the collection/checking of individual patient data involving relevant trialists were conducted with appropriate methodological rigour. Study details and patient characteristics were adequately reported and the absence of statistically significant heterogeneity suggested that the method of synthesis was appropriate. This was a well-conducted and reported review and the authors’ conclusions are likely to be reliable. Some competing interests of the authors were noted.

**Implications of the review for practice and research**

Practice: The authors stated that findings from this review are likely to be generalisable to most patients treated as outpatients or in the community.

Research: The authors stated that further research should address related outcomes such as ulcer recurrence, change in ulcer area (as a predictor and an outcome) and cost effectiveness. Detailed recording of adverse events and the collection of data on staff skills at baseline is also recommended.
Funding
National Institute of Health Research, Research Scientist Award in Evidence Synthesis.

Bibliographic details

Other publications of related interest

Indexing Status
Subject indexing assigned by CRD

MeSH
Bandages; Humans; Leg Ulcer; Varicose Ulcer; Wound Healing

AccessionNumber
12009104248

Date bibliographic record published
22/04/2009

Date abstract record published
29/04/2009

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.