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The effectiveness of pressure garment therapy for the prevention of abnormal scarring after burn injury: a meta-analysis☆

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Summary *Objectives:* This study had three objectives. First, to conduct a systematic review to identify the available evidence for the use of pressure garment therapy (PGT); second, to assess the quality of the available evidence; and third, to conduct a meta-analysis to quantify the effectiveness of PGT for the prevention of abnormal scarring after burn injury.
Background: Standard care for the prevention of abnormal scarring after burn injury includes pressure garment therapy (PGT); however, it is associated with potential patient morbidity and high costs. We hypothesise that an assessment of the available evidence supporting the use of pressure garment therapy will aid in directing clinical care and future research.
Methods: Randomised control trials were identified from CINHAL, EMBASE, MEDLINE, CENTRAL, the 'grey literature' and hand searching of the *Proceedings of the American Burn Association*. Primary authors and pressure garment manufacturers were contacted to identify eligible trials. Bibliographies from included studies and reviews were searched. Study results were pooled to yield weighted mean differences or standardised mean difference and reported using 95% confidence intervals.
Results: The review incorporated six unique trials involving 316 patients. Original data from one unpublished trial were included. Overall, studies were considered to be of high methodological quality. The meta-analysis was unable to demonstrate a difference between global assessments of PGT-treated scars and control scars [weighted mean differences

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(WMD): −0.46; 95% confidence interval (CI): −1.07 to 0.16]. The meta-analysis for scar height showed a small, but statistically significant, decrease in height for the PGT-treated group standardised mean differences (SMD): −0.31; 95% CI: −0.63, 0.00. Results of meta-analyses of secondary outcome measures of scar vascularity, pliability and colour failed to demonstrate a difference between groups.

Conclusions: PGT does not appear to alter global scar scores. It does appear to improve scar height, although this difference is small and of questionable clinical importance. The beneficial effects of PGT remain unproven, while the potential morbidity and cost are not insignificant. Given current evidence, additional research is required to examine the effectiveness, risks and costs of PGT.

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In North America each year, 1 in every 3000 persons experiences a burn injury.[1] The most common complication for burn survivors is the development of abnormal scarring.[1] These may take the form of either hypertrophic or keloid scars.[1] The estimated rate of abnormal scarring after burn injury may be as high as 70%,[2] although the true prevalence is unknown.[3] The tendency to develop abnormal scarring may be related to patient age, ethnic origin, as well as severity and location of the injury.[3,4]

Pressure garment therapy (PGT) is the most common therapy used for the prevention of abnormal scars after burn injury.[1] Virtually all patients who undergo skin grafting are prescribed elastic stockings which are used to apply pressure in the range of 15—25 mmHg to the maturing scar.[5] Patients are instructed to wear pressure garments 23 h each day for 12 months from the time of wound closure.

Unfortunately, pressure garments are associated with significant costs and potential patient morbidity.[5—7] They are unattractive and have been reported to cause overheating, pruritis, wound breakdown, and abnormal bone growth.[6—8] The primary author's hospital spends over 100,000 Canadian dollars each year on PGT.[9]

The highest level of evidence regarding treatment efficacy is a rigorously designed meta-analysis of randomised controlled trials (RCTs).[10] Individual RCTs are often limited by inadequate sample size that leaves them open to missing important differences between treatment groups. A meta-analysis can overcome this problem by combining data from several RCTs. The most significant challenge for investigators conducting meta-analyses is publication bias. Publication bias is the selective publication of manuscripts based on study size, and statistically significant positive results.[11] In order to avoid publication bias reviewers must conduct an exhaustive search for studies published in obscure journals and unpublished studies.[12—14]

To date, there have been no systematic reviews assessing the available evidence supporting the use of PGT for the prevention of abnormal scarring after burn injury. We hypothesise that an assessment of the available evidence supporting the use of PGT will aid in directing clinical care and future research. The objectives of this study were threefold. First, to conduct a systematic review to identify the available evidence for the use of PGT. Second, to assess the quality of the available evidence. Third, to conduct a meta-analysis to quantify the effectiveness of PGT for the prevention of abnormal scarring after burn injury.

Methods

Study inclusion criteria

The aim of this review was to include all RCTs assessing the effectiveness of PGT compared to no or control treatment in adults or children with burns. Review articles, case series, and nonrandomised studies were excluded.

Outcomes

The primary outcome for our meta-analysis was any validated measure of global scar appearance. Secondary outcomes included measures of scar height, vascularity, pliability, and colour. Colour was defined as pigmentation measured by an observer or automated measures of colour, such as chromatography.

Search strategy

In order to identify all relevant articles we developed a comprehensive search strategy. Search terms included 'cicatrix, hypertrophic, keloid, scar, burns, burn contracture, burn scar, hypertrophic skin disease, hypertrophic scar, pressure, compress, bandages, stockings, tubigrip, jobst, wraps, gauze, and dressings'. We incorporated a previously validated search strategy to identify all clinical trials.[15]

The following computerised databases were searched: Cochrane Wounds Group and Cochrane Skin Group Specialized Trials Registers, MEDLINE (1966—2006), EMBASE (1988—2006), CINAHL (1982—2006), PEDro (the Physiotherapy Evidence Database), Cochrane CENTRAL Register of Controlled Trials, Web of Science, and Evidence Base Medicine ACP Journal Club (1991—2006). Our search of the grey literature included the following internet sites: Clinical Trials.gov, CenterWatch Clinical Trials Listings Service, Current Controlled Trials, Rehab Trials, Dissertation Abstracts, Index to Theses (UK), Networked Digital Library of Theses, CRISP database, Grey Literature Report, Google, and Dogpile. Abstracts from the annual American Burn Association Meeting (1990—2003), published in the *Journal of Burn Care and Rehabilitation*, were hand searched.

An ISI Web of Science® specific search was conducted using the cited reference search function, to search for

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