Meta-analysis of effectiveness of intermittent pneumatic compression devices with a comparison of thigh-high to knee-high sleeves

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Authors' objectives
A meta-analysis to examine the clinical effectiveness of intermittent pneumatic compression (IPC) devices in preventing deep vein thrombosis (DVT) and pulmonary embolism and to compare the results of knee-high sleeves to thigh high sleeves.

Searching
MEDLINE (1966 to June, 1996) was searched for English medical literature. Bibliographies of obtained papers were checked. Articles presented at national society meetings submitted by product company representatives were also reviewed.

Study selection
Study designs of evaluations included in the review
Prospective, randomised controlled trials involving routine surveillance for deep vein thrombosis with either nuclear venography, impedance plethysmography, venous duplex and/or doppler ultrasound, intravenous contrast venograms or a combination of these.

Specific interventions included in the review
Intermittent pneumatic compression devices. Knee-high and thigh-high devices were considered as were devices giving either uniform or graded sequential compression. Controls included mini-dose heparin, warfarin and placebo.

Participants included in the review
Hospitalised patients. Subgroups included patients undergoing general surgery, gynaecological cancer surgery, neurosurgery and major orthopaedic surgery.

Outcomes assessed in the review
Incidence of deep vein thrombosis, recorded as involving the proximal or the calf veins only, and pulmonary embolism.

How were decisions on the relevance of primary studies made?
One reviewer assessed the studies for inclusion, according to whether they fulfilled the criteria of being: prospective RCTs of routine surveillance for deep vein thrombosis.

Assessment of study quality
No formal assessment of validity was undertaken.

Data extraction
The author does not state how the data were extracted for the review. One reviewer extracted the data into a standardised table of results.

Methods of synthesis
How were the studies combined?
The studies were grouped by control arm. Within these groups, knee- high and thigh-high devices were considered both separately and also combined. The incidences of deep vein thrombosis(and pulmonary thrombosis where reported)in the intervention and control arms were summed across trials. Chi square was used to analyse categorical data.
How were differences between studies investigated?
Subgroup analyses considered patients who had undergone general surgery, gynaecological cancer surgery, neurosurgery and major orthopaedic surgery.

Results of the review
Thirty studies involved knee high sleeves; 21 studies involved thigh high sleeves and six studies compared the two. Numbers of patients in individual studies were not presented.

Overall, patients treated with the intermittent compression device had a lower incidence of deep vein thrombosis compared with placebo (11% versus 29%, p<0.001), graduated compression stockings (8% versus 15%, p = 0.04) and heparin (7% versus 14%, p = 0.01). There were no significant differences in the incidence of pulmonary embolism. There were lower incidences of deep vein thrombosis among patients treated intermittent compression device compared with placebo in the following subgroups: general surgery (8% versus 16%, p = 0.04); neurosurgery (12% versus 33%, p<0.001) and major orthopaedic surgery (14% versus 45%, p < 0.001).

Authors' conclusions
Intermittent pneumatic compression (IPC) devices are effective in decreasing the incidence of deep vein thrombosis in patients who are at moderate to high risk and are probably more efficacious than graduated compression stockings or min-hep. IPC devices are not protective against pulmonary embolism. The data comparing the various methods of compression (knee-high versus thigh-high sleeves and graded-sequential versus uniform compression) is sparse and conflicting. More studies are needed to delineate whether any of these methods are better than another. There is no compelling scientific evidence to unequivocally conclude that any-one method of IPC is superior over another, so it would be reasonable to base this decision on cost.

CRD commentary
The question on which this review is based specifies both treatment and outcomes but not patients. Although the search was confined to English language papers in MEDLINE, bibliographies of retrieved papers and manufacturers' information was included. The inclusion criteria were detailed in terms of study design but the relevance criteria were not clearly outlined. There was no systematic assessment of the quality of included studies but a few studies were discussed. General review processes, such as numbers of reviewers were not specified. This lack of detail prevents proper assessment of the rigour of the review. No details of individual studies were given. The studies were pooled in subgroups by length of stocking and control and also by patient groups. Other than subgroup analysis, there was no investigation of heterogeneity.

The author was appropriately cautious in drawing conclusions from the review and emphasised the need for further research.

Implications of the review for practice and research
Practice: The author states 'Intermittent pneumatic compression (IPC) devices are effective in decreasing the incidence of deep vein thrombosis in patients who are at moderate to high risk and are probably more efficacious than graduated compression stockings or mini-hep. IPC devices are not protective against pulmonary embolism'.

Research: Further good quality research is required to compare the various methods of compression (knee high versus thigh high sleeves and graded-sequential versus uniform compression).

Bibliographic details

PubMedID
Indexing Status
Subject indexing assigned by NLM

MeSH
Bandages; Gravity Suits; Humans; Pulmonary Embolism /prevention & control; Treatment Outcome; Venous Thrombosis /prevention & control

AccessionNumber
11998001884

Date bibliographic record published
30/11/2000

Date abstract record published
30/11/2000

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.