Intermittent pneumatic compression and deep vein thrombosis prevention: a meta-analysis in postoperative patients
Urbankova J, Quiroz R, Kucher N, Goldhaber S Z

CRD summary
This review evaluated the effectiveness of intermittent pneumatic compression devices to prevent deep vein thrombosis (DVT) in post-operative patients. The authors concluded that the risk of DVT was reduced by 60%. Given the limitations of the review, the results should be considered with some caution.

Authors' objectives
To evaluate the effectiveness of intermittent pneumatic compression (IPC) devices to prevent deep vein thrombosis (DVT) in post-operative patients.

Searching
MEDLINE, meta Register of Controlled Trials and the Cochrane Library were searched from 1970 to October 2004; the search terms were reported.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) with follow-up for at least the duration of hospital stay were eligible for inclusion. The duration of follow-up ranged from 1 to 14 days post-operatively, or until patients were fully ambulatory.

Specific interventions included in the review
Studies of IPC devices compared to no prophylaxis were eligible for inclusion. Initiation of IPC was defined as pre-operative, peri-operative or post-operative. Fifty per cent of the included studies initiated IPC peri-operatively, 25% pre-operatively and 25% post-operatively.

Participants included in the review
Studies of at least 20 post-operative patients were eligible for inclusion. The studies included patients from general, gynaecological, oncologic, neurosurgery, or orthopaedic surgery populations. Where reported, the mean age ranged from 51 to 70 years in the treatment group and from 48 to 69 years in the control group; the proportion of females ranged from 28 to 100%.

Outcomes assessed in the review
Studies using at least one diagnostic imaging test for DVT in all patients were eligible for inclusion. The primary outcome was the development of DVT during the surveillance period pre-defined in each study (discharge or ambulation). The included studies used either the fibrogen uptake test (FUT) or a combination of FUT with venography, plethysmography and/or ultrasonography to diagnose DVT. Where provided (all but one study), the authors preferentially used results from the FUT.

How were decisions on the relevance of primary studies made?
The authors did not state how studies were selected for the review, or how many reviewers performed the study selection.

Assessment of study quality
The authors did not state that they assessed validity.
Data extraction
Two reviewers independently extracted the data, with any differences resolved by referral to a third reviewer. The incidence of DVT was extracted from each trial, from which the relative risk (RR) and 95% confidence interval (CI) for the development of a DVT were calculated. The RR of developing a pulmonary embolism was also calculated where data were available.

Methods of synthesis

How were the studies combined?
The pooled RR and 95% CI were calculated using both random-effects and fixed-effect models. The results of the random-effects model were presented. Publication bias was assessed using Egger's test and Begg's funnel plot.

How were differences between studies investigated?
Heterogeneity was assessed using the Q statistic. Forest plots were provided for visual inspection of heterogeneity, and differences between the studies were discussed in the text. A meta-regression was used to assess the influence of duration of prophylaxis and method used to diagnose DVT on estimates of effectiveness. An influence analysis (progressive omission of one study at a time from the summary effect estimate) was used to assess the impact of each individual study on the results of the review.

Results of the review
Fifteen RCTs, reporting data for 16 treatment groups, were included in the review (n=2,171).

In comparison with no prophylaxis, IPC devices significantly reduced the risk of DVT by 60% (RR 0.40, 95% CI: 0.29, 0.55, P<0.001). The authors used a random-effects model because of statistically significant heterogeneity between the studies (P=0.003). The results were unaffected by the removal of four studies that used only FUT to diagnose DVT, or time of initiation of prophylaxis. The influence analysis showed no evidence of individual study dominance. There was no significant reduction in the incidence of pulmonary embolism with the use of IPC devices.

The authors stated that there was evidence of publication bias (P=0.019) when using Begg's funnel plot, and borderline evidence of publication bias (P=0.06) when using Egger's test.

Authors' conclusions
The prophylactic use of IPC devices reduced the risk of DVT by 60% in surgical patients.

CRD commentary
The review question was clear with well-defined inclusion criteria. Considering the area of research, a limited search was conducted; the authors stated that there was some evidence for publication bias. It was unclear whether language restrictions were applied, therefore there is also a potential for language bias. Two reviewers independently extracted the data, but it was unclear whether similar measures to reduce error and bias were conducted at the study selection stage. In addition, the quality of the included studies was not assessed. There was significant clinical and statistical heterogeneity between the studies (five studies showed non significant results), making the pooled result of the meta-analysis of limited value. Forest plots were presented and heterogeneity between the studies was investigated. Given the potential for missed studies, the lack of reporting of review methodology, and the lack of a quality assessment, the results of the review should be considered with some caution.

Implications of the review for practice and research
Practice: The authors stated that there was a trend in favour of pre-operative IPC device use, and evidence supported their use until patients were fully ambulatory.

Research: The authors stated that further RCTs are required to test the effectiveness of IPC devices in hospitalised medical patients, and to test combination pharmacological-IPC prophylaxis in both medical and surgical patients.
Bibliographic details

PubMedID
16411391

DOI
10.1160/TH05-04-0222

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Adult; Aged; Aged, 80 and over; Female; Humans; Intermittent Pneumatic Compression Devices; MEDLINE; Male; Middle Aged; Postoperative Period; Randomized Controlled Trials as Topic; Venous Thrombosis /prevention & control

AccessionNumber
12006000120

Date bibliographic record published
31/12/2006

Date abstract record published
31/12/2006

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.