Graduated compression stockings in the prevention of postoperative venous thromboembolism: a meta-analysis

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Authors' objectives
To establish the effectiveness of graduated compression stockings in the prophylactic setting of post-operative venous thromboembolism.

Searching
MEDLINE was searched from 1966 to 1992, using combinations of the terms 'clothing', 'bandages', 'thromboembolism', 'thrombophlebitis' and 'postoperative complications'. Bibliographies of retrieved articles were examined and recent journals were checked using Current Contents.

Study selection
Randomised controlled trials, comparing the use of graduated compression stockings with an untreated or unconfounded control group.

Specific interventions included in the review
Prophylaxis of post-operative venous thromboembolism, using graduated compression stockings. Studies using non-graduated compression stockings were excluded. The identified studies evaluated graduated compression stockings used in the prevention of venous thrombosis for abdominal, gynaecological and neurosurgical surgery and total hip replacement.

Participants included in the review
No inclusion criteria for patients were reported. Clinical and demographic characteristics of the patients were recorded. In the included studies, patients were generally aged over 40 years, females and males were equally represented, patients with malignant neoplasms were included, and patients with previous deep vein thrombosis were uncommon or excluded.

Outcomes assessed in the review
Deep vein thrombosis (measured by venography or fibrinogen I 125 leg scanning) and pulmonary embolism (based on high-probability ventilation-perfusion scan, angiography or autopsy, with diagnosis blinded to treatment assignment).

How were decisions on the relevance of primary studies made?
Each article was critically reviewed by at least 2 independent researchers.

Assessment of study quality
Only studies fulfilling the following 3 criteria were included: (1) proper randomisation; (2) use of reliable objective tests with proven accuracy for the diagnosis of post-operative deep vein thrombosis; and (3) independent and blind interpretation of venography by observers, or predefined criteria for an abnormal fibrinogen I 125 leg scan. Each article was critically reviewed by at least 2 independent researchers.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.
Methods of synthesis
How were the studies combined?
The odds ratios (ORs) of the risk of developing deep vein thrombosis were combined across studies, weighting by sample size, using the Mantel-Haenszel procedure. Risk reduction was also calculated, using the summary OR and average control group risk.

How were differences between studies investigated?
The Breslow-Day test of homogeneity was used to analyse the moderate- and high-risk surgical studies separately. Five of the studies were randomised by limb, and the analysis was repeated excluding these studies.

Results of the review
Twelve studies were included, of which 11 were in patients with moderate-risk non-orthopaedic surgical procedures, and 1 was in patients who underwent orthopaedic surgery.

1,752 patients were studied in the 11 moderate-risk surgical studies, of which 380 acted as their own control, i.e. wore a stocking on one leg; 90 patients were studied in the high-risk orthopaedic surgery study.

The summary OR for moderate-risk surgery is 0.28 (95% confidence interval, CI: 0.23, 0.42), with an associated risk reduction of 68% (95% CI: 53, 73); both results are significant (p<0.0001). The test for heterogeneity was non significant (p=0.2716). Identical results were obtained when excluding the 5 studies which were randomised by limb.

The 1 study assessing orthopaedic surgery had an OR of 0.50 (95% CI: 0.19, 1.29), and the results were non significant (p=0.17). The risk of pulmonary embolism was reported in 3 of the studies, suggesting that graduated compression stockings may result in a risk reduction for pulmonary embolism. However, since none of these studies used the predefined criteria for diagnosis of pulmonary embolism, definite conclusions cannot be made.

The results may not apply to knee-high graduated compression stockings, since the majority of the studies used thigh-high stockings (in studies where it is not stated it is implied that thigh-high stockings were used as well).

No methodologically sound studies could be found to assess the use of a combination of graduated compression stockings with other forms of prophylaxis, compared with graduated compression stockings alone.

Authors’ conclusions
The use of graduated compression stockings for prophylaxis of venous thromboembolism after moderate-risk surgery results in significant risk reduction. It is unknown whether the use of graduated compression stockings in combination with other forms of prophylaxis results in further risk reduction. The efficacy of graduated compression stockings in orthopaedic surgery has been assessed by only one study that used sound methods. Hence, no definitive conclusions can be made in these high-risk patients. Further research is required.

CRD commentary
A thorough, methodologically-robust review, with inclusion criteria such that the included studies provide a high level of evidence. No detail is given about how data were extracted, and no attempt was made to identify unpublished studies in the search.

Implications of the review for practice and research
Graduated compression stockings should be used for the prevention of post-operative deep vein thrombosis after moderate-risk (non-orthopaedic) surgery. Further research is required for high-risk surgery, as well as the risk of pulmonary embolism.

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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.