CRD summary
The authors concluded that the incidence of deep vein thrombosis following arterial surgery varied widely, largely attributable to differences between studies in outcome measurement and inclusion criteria. There was insufficient evidence to make recommendations regarding the use of anticoagulant prophylaxis. Given the unclear study quality and differences in study outcome measurements, the authors’ conclusions are appropriately cautious.

Authors' objectives
To determine the risk of deep vein thrombosis in arterial surgery and to assess the need for and safety of prophylactic anti-coagulants.

Searching
MEDLINE, EMBASE and the Cochrane Library were searched for articles in English. Search terms were reported. Reference lists of identified articles were handsearched.

Study selection
Randomised and prospective non-randomised studies assessing the incidence of deep vein thrombosis in arterial surgery regardless of prophylaxis were eligible for inclusion. To assess the need for and safety of anticoagulant prophylaxis, only randomised controlled trials (RCT) of anti-coagulants, with or without mechanical methods, were eligible for inclusion.

The included studies assessed a variety of aortic surgeries, general arterial surgery, peripheral non-aortic reconstructive surgery and amputations. Prophylaxes used in the included studies were low molecular weight heparin, unfractionated heparin, heparin-dihydergot, dextran-60, dipyridamole, acetylsalicylic acid, enoxaparin or warfarin compared to no treatment, saline or one another. Some studies also used compression devices. Some studies excluded below the calf deep vein thrombosis from their calculation of deep vein thrombosis rates. Deep vein thrombosis was measured using fibrinogen uptake test, venogram, Doppler ultrasound or duplex ultrasound. Incidence and mortality of pulmonary embolism were also recorded. The dates of the included studies ranged from 1974 to 2002.

The authors did not state how the 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
The number of patients with deep vein thrombosis, pulmonary embolism and major bleeds and the number of patients dying from pulmonary embolism was extracted for each study.

The authors did not state how the data were extracted for the review.

Methods of synthesis
The studies were combined in a narrative synthesis and discussed separately according to the types of arterial surgery. For the incidence of pulmonary embolism and mortality from pulmonary embolism, a pooled incidence rate across studies was calculated. For aortic surgery, an average of incidence rates of deep vein thrombosis was calculated.

Results of the review
Twenty-three studies were combined for review (n=2,382 patients); 17 prospective non-randomised studies (n=1,570 patients) and six RCTs (n=812 patients). Methodological quality was not assessed, but potential for bias in some study
designs was noted in the text, including the inclusion of patients with preoperative deep vein thrombosis, the inclusion of patients receiving anti-coagulants preoperatively, and the use of tests with high false positive rates to detect deep vein thrombosis.

When only prospective non-randomised studies were considered, the deep vein thrombosis rate ranged from 0% to 20.5% in patients undergoing aortic surgery (seven studies, n=407 patients), from 2.5% to 41% in patients undergoing general arterial surgery (four studies, n=114 patients), from 2.8% to 8% in patients undergoing peripheral non-arterial surgery (three studies, n=531 patients) and from 0% to 14.3% in patients with amputations (three prospective non-randomised studies, n=167 patients).

Results on the effectiveness of prophylactic anticoagulants were mixed. One RCT of patients undergoing general vascular surgery, reported no significant difference in the incidence of deep vein thrombosis between the group receiving anti-coagulants (12.5%) and the control group (10.5%) based on a total of 43 patients; as did one RCT of patients undergoing aortic surgery (both 2%) based on 98 patients. One RCT of patients undergoing aortic surgery reported an incidence of deep vein thrombosis of 24% in the control group compared to 8% in the low molecular weight heparin group (n=49 patients). The results comparing different types of anti-coagulants were also reported.

The incidence of pulmonary embolism ranged from 0% to 2.3%, with an overall incidence rate of 0.4%, based on a total of 1,848 patients. Mortality from pulmonary embolism ranged from 0% to 6.3% with an overall pulmonary embolism mortality of 0.1%. Twenty-one studies did not report any incidents of major bleeding. The incident rate for major bleeds in the other two studies was 2.7% and 2.5%

Authors’ conclusions
The incidence of deep vein thrombosis following arterial surgery varied widely, largely attributable to differences between studies in screening methods and inclusion criteria for deep vein thrombosis. There was insufficient evidence to make recommendations regarding the use of anticoagulant prophylaxis.

CRD commentary
The review addressed a clear question with well-defined inclusion criteria. Several relevant databases were searched. The search was restricted to English and no attempts appeared to have been made to have been made to identify unpublished data, so the possibility of language and publication bias cannot be ruled out. It was unclear whether appropriate steps were taken in the review process to minimise reviewer error and bias. The methodological quality of included studies was not formally assessed, but the reviewers did identify potential sources of bias in some of the included studies. The decision to combine the studies in a narrative synthesis was appropriate given the clinical heterogeneity between studies. Given the unclear quality of the included studies and differences between studies in the measurement of outcomes, the authors' conclusions are appropriately cautious.

Implications of the review for practice and research
Practice: The authors stated that anticoagulant prophylaxis in vascular patients will continue to be based on evidence from studies of general surgical patients.

Research: The authors stated that further large-scale, possibly multi-centred RCTs, are needed into the incidence of deep vein thrombosis and the efficacy and safety of anticoagulant prophylaxis. However, agreement first needs to be reached on the most appropriate screening tools and on the inclusion criteria for outcomes. High risk patients with additional co-morbidities and longer recovery should be included in a separate arm of the trial.

Funding
Not stated.

Bibliographic details

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.