

# Review: Pneumatic compression and LMWH are more effective for preventing DVT after total knee arthroplasty than is aspirin or warfarin

Westrich GH, Haas SB, Mosca P, Peterson M. Meta-analysis of thromboembolic prophylaxis after total knee arthroplasty. *J Bone Joint Surg Br.* 2000 Aug;82-B:795-800.

**QUESTION**

What are the relative benefits of aspirin, warfarin, low-molecular-weight heparin (LMWH), and intermittent pneumatic compression devices for preventing venous thromboembolic events (VTEs) (deep venous thrombosis [DVT] and pulmonary embolism [PE]) after total knee arthroplasty?

**DATA SOURCES**

English-language studies were identified by searching MEDLINE (1980 to 1997) with the terms thrombosis and embolism, conference proceedings and abstracts published in *Orthopaedic Transactions* and *Thrombosis and Haemostasis*, and bibliographies.

**STUDY SELECTION**

Randomized controlled trials were selected if they included an adequate description of the patients, the radiologist who assessed the outcomes was blinded to the treatment received, outcome assessment was done on all patients, dropouts were described, and the prophylaxis regimen and outcomes assessment were adequate. Adequate treatment included aspirin, 325 to 650 mg/d; warfarin, 5 to 10 mg before surgery with the prothrombin time kept at 1.3 to 1.5 of normal; any LMWH; and pneumatic compression started during or just after surgery with the boots or sleeves removed only for walking and physiotherapy. DVT had to be assessed by venography and PE by lung perfusion scans or angiography.

**DATA EXTRACTION**

Data were extracted or obtained on study quality and type, prophylaxis regimens, patient characteristics, and outcomes.

**MAIN RESULTS**

23 studies that included 6001 patients met the selection criteria. Meta-analysis showed that with aspirin the rate of DVT was 53%, asymptomatic PE was 11.7%, and symptomatic PE was 1.3%. For warfarin, the rates were 45% for DVT, 8.2% for asymptomatic PE, and 0.4% for symptomatic PE; for LMWH, the rates were 29% for DVT and 0.5% for symptomatic PE; and for intermittent pneumatic compression devices, the rates were 17% for DVT, 6.3% for asymptomatic PE, and 0% for symptomatic PE. LMWH and pneumatic compression were

more effective than aspirin and warfarin for preventing DVT; pneumatic compression was less effective than were aspirin and warfarin for preventing asymptomatic PE (Table). The data for symptomatic PE were insufficient for firm conclusions to be drawn.

**CONCLUSION**

Pneumatic compression and low-molecular-weight heparin are more effective than is aspirin or warfarin for preventing deep venous thrombosis after total knee arthroplasty.

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*For correspondence: Dr. G.H. Westrich, Hospital for Special Surgery, Cornell University Medical Center, 535 East 70th Street, New York, NY 10021, USA. FAX 212-746-8370.* ■

**Prophylactic methods to prevent deep venous thrombosis (DVT) and asymptomatic pulmonary embolism (PE) after total knee arthroplasty\***

Outcomes	Comparisons	RRR (95% CI)	NNT (CI)
DVT	LMWH vs aspirin	53% (48 to 59)	4 (4 to 4)
	PC vs aspirin	51% (45 to 57)	4 (4 to 5)
	LMWH vs warfarin	36% (29 to 43)	7 (6 to 8)
	PC vs warfarin	34% (24 to 42)	7 (6 to 10)
Asymptomatic PE	PC vs aspirin	57% (38 to 72)	15 (12 to 23)
	PC vs warfarin	39% (8 to 60)	32 (21 to 147)

\*LMWH = low-molecular-weight heparin; PC = intermittent pneumatic compression devices; other abbreviations defined in Glossary. RRR, NNT, and CI calculated from data in article. Follow-up data were not provided.

**COMMENTARY**

Prolonged periods of limited mobility after orthopedic surgery are associated with increased risk for VTE. Although intermittent pneumatic compression is appealing (i.e., it has no adverse side effects), the optimal regimen for VTE prophylaxis for patients after total knee arthroplasty has not been established because most trials have had insufficient power to detect differences between different prophylactic regimens. It has been estimated that 400 orthopedic patients would need to be studied to reliably detect a 40% relative risk reduction in DVT and 4000 patients would be needed to detect a similar reduction in PE (1). The randomized controlled trials in the review by Westrich and colleagues had a combined total of 379 patients in the pneumatic compression studies that evaluated PE.

Furthermore, the higher incidence of DVT with aspirin in this study is contrary to the Antiplatelet Trialists' Collaboration results in which the incidence was 38% (160 of 427 patients) for elective orthopedic surgery with antiplatelet therapy (mean duration 2 wk) compared with 53% (232 of 436 patients) for control-group patients after adjustment

(1). The lower level of anticoagulant effect may have contributed to the higher incidence of DVT among patients in the warfarin group. Finally, the issue of "late" VTE and the need for extension of prophylaxis after hospital discharge was not addressed.

Recently, aspirin was shown to reduce the risk for VTE by one third over placebo throughout a 35-day period in the multinational Pulmonary Embolism Prevention trial, which enrolled over 17 000 patients after hip surgery (2). Similar studies involving total knee arthroplasty are needed.

The ideal regimen for prophylaxis should be simple and easy to administer, even after discharge from the hospital when the risk for VTE may still be present. Whether that regimen should combine intermittent pneumatic compression with antiplatelet therapy is still not known.

*Rebecca J. Beyth, MD, MS  
Baylor College of Medicine  
Houston, Texas, USA*

**References**

1. Antiplatelet Trialists' Collaboration. *BMJ.* 1994;308:235-46.
2. Pulmonary Embolism Prevention (PEP) Trial. *Lancet.* 2000;355:1295-302.