

Orthopaedic surgeons and thromboprophylaxis

M D Laverick, S A Croal, R A B Mollan

Abstract

Objective—To assess attitudes to the use of thromboprophylaxis among orthopaedic surgeons in the United Kingdom.

Design and subjects—Single page postal questionnaire to all 926 active orthopaedic surgeons who are members of the British Orthopaedic Association.

Results—The response rate was 70% (659 surgeons), of whom 595 (90%) used some form of prophylaxis. Most (548; 83%) used drugs but 47 (7%) used only elasticated stockings. A history of thromboembolic disease, hip surgery, and obesity was seen as the main risk factor. Ineffectiveness was the principal reason for not using prophylaxis.

Conclusions—Most orthopaedic surgeons use regimens of thromboprophylaxis, though many of these are of limited value. Improvements in the efficacy and safety of prophylactic agents, combined with ease of administration, would increase the use of such agents and make orthopaedic surgery safer for the patient.

Introduction

Deep venous thrombosis and its sequel, pulmonary embolism, are major problems in orthopaedic surgery. The incidence of thrombosis after arthroplasty of the hip and knee exceeds 50% in many studies¹⁻⁴ and it is a feared though less widely recognised complication of lower limb fractures. Even apparently benign procedures such as fixation of ankle fractures and diagnostic arthroscopy of the knee have resulted in fatal pulmonary embolism.^{5,6}

Many prophylactic agents such as heparin, warfarin, and dextran are reported to be less effective in orthopaedic practice than in other forms of surgery.^{3,4} In addition, the possibility of inducing bleeding, which may lead to wound haematoma, infection, and implant failure, is perceived as an unacceptable risk by some surgeons.

TABLE I—Orthopaedic surgeons' use of mechanical forms of prophylaxis for deep venous thrombosis. Figures are numbers (percentages) of all 659 replies

Method	No	With stockings	With drug
All mechanical forms			432 (66)
Elasticated stockings	454 (68)		406 (62)
Calf compression	79 (12)	68 (10)	76 (12)
Calf stimulation	29 (4)	19 (3)	26 (4)
Venous foot pump	11 (2)	7 (1)	8 (1)
No mechanical forms		180 (27)	116 (18)

TABLE II—Orthopaedic surgeons' use of drugs for deep venous thrombosis. Values are numbers (percentages) of those using drugs

Agent	For high risk patients only	Total
All	325 (59)	548 (100)
Heparin	249 (45)	388 (71)
Warfarin	140 (26)	179 (33)
Dextran	98 (18)	165 (30)
Hydroxychloroquine	16 (3)	35 (6)
Aspirin	11 (2)	18 (3)

A recent article suggested that prophylactic drugs were given routinely by less than half of all British orthopaedic surgeons who carry out total hip replacement, and it concluded that they were not convinced of the value of using antithrombotic prophylaxis.⁷ We considered that this conclusion was mistaken and determined to investigate more fully.

TABLE III—Risk factors for deep venous thrombosis considered most important by orthopaedic surgeons who used prophylaxis

Factor	No (%) of surgeons (n=595)
Type of surgery:	472 (79.3)
General term	183 (30.8)
Hip surgery	161 (27.1)
Knee surgery	65 (10.9)
Pelvic surgery	38 (6.4)
Long bone structure	25 (4.2)
Previous deep venous thrombosis or pulmonary embolism	447 (75.1)
Obesity	185 (31.1)
Immobility	150 (25.2)
Venous disease	75 (12.6)
Hormone therapy	69 (11.6)
Age of patient	54 (9.1)
Smoking habit	18 (3.0)

Method

A questionnaire on a single A4 size sheet was sent to 926 active orthopaedic surgeons who are members of the British Orthopaedic Association. They were asked whether or not they used prophylaxis. Those who answered no were asked to reply to a supplementary question about their reasons for not doing so. Those who answered yes were asked for more details about the nature, timing, duration, and indications for the use of prophylaxis and for their assessment of the major risk factors for thromboembolism. All were invited to comment on the reverse of the form if they wished.

Results

Replies were received from 659 surgeons (70%). Over 90% of these (595) said that they used prophylaxis against deep venous thrombosis, 548 (83%) using a drug and only 47 relying solely on elasticated stockings. Table I gives details of the use of mechanical methods of prophylaxis with and without drugs. Table II shows the use of drugs. Many surgeons used more than one drug, either in combination or for different patients depending on their assessment of risk factors.

With regard to timing of drug prophylaxis, 349 (58%) started before operation, 153 (26%) during operation, and 93 (16%) afterwards. Prophylaxis was continued for a specific period by 265 (45%) and until the patient was mobile or discharged by 330 (55%). These regimens usually fell into patterns depending on the agents used—for example, subcutaneous heparin given preoperatively and continued for seven to 10 days or dextran started intraoperatively and given for two or three days.

The factors most frequently cited as contributing to a high risk state are presented in table III. The answers given reflect conventional wisdom. Although most of those mentioning age as a risk factor considered increasing age to give increased risk, 12 suggested the

Queen's University of Belfast, Department of Orthopaedic Surgery, Musgrave Park Hospital, Belfast BT9 7JB

M D Laverick, FRCS, orthopaedic registrar
S A Croal, BSC, research fellow

R A B Mollan, FRCS, professor of orthopaedic surgery

Correspondence to: Mr Laverick.

BMJ 1991;303:549-50

reverse. This may reflect the dramatic impact that the sudden death of young patients has on the clinicians responsible for their care.

Among those not using prophylaxis, perceived lack of efficacy was the most widely quoted reason for not doing so (table IV). Of those for whom deep venous thrombosis was "not a problem" about half had practices confined largely to hand surgery or paediatric surgery. Organisational problems reported included a shortage of junior medical or nursing staff to supervise prophylactic regimens.

TABLE IV—Reasons given by orthopaedic surgeons for not using prophylaxis for deep venous thrombosis

Reason	No (%) of surgeons (n=64)
Not effective	42 (66)
Not a problem	31 (48)
Too risky	29 (45)
Organisational	8 (13)
Too expensive	4 (6)
Increases infection	1 (2)

Discussion

The results of this survey show that venous thromboembolism is regarded as a frequent and sinister complication of orthopaedic surgery, and that most orthopaedic surgeons take active steps to try to prevent its occurrence. The variety of techniques and drugs used reflects the conflicting evidence available in the many reports on this subject. As might be expected, low dose heparin is the most popular regimen as it is the most convenient to administer and requires no laboratory monitoring. It seems effective in reducing the incidence of calf thrombosis but may not be effective against proximal segment deep venous thrombosis^{8,9} and subsequent pulmonary embolism. The new low molecular weight heparins given once daily will increase the acceptability of this method to nursing staff and patients, so may become even more widely used.¹⁰ Warfarin is also commonly used, especially for those regarded as being at high risk. Most surgeons who use it do not start until after the operation and may thereby limit its effectiveness. Hydroxychloroquine (Plaquenil) given orally after total hip replacement was popularised by the late Sir John Charnley, but there is considerable doubt about its efficacy.^{11,12} Dextran is commonly used, especially for hip surgery, and seems to be effective in decreasing the incidence of pulmonary embolism in these circumstances. Problems with anaphylaxis seem to be much less common in the United Kingdom than in Europe.¹³

Physical methods of prophylaxis are generally perceived as being safe to use^{14,15} but of limited effectiveness in orthopaedic practice. None the less most orthopaedic surgeons use elasticated stockings. Relatively few use the more active methods of preventing venous stasis, although these may be increasing in popularity.

Despite evidence that the thrombotic risk persists for many weeks following surgery,¹⁶ prophylaxis is usually stopped much earlier. The restoration of mobility is seen as the time for stopping, but many patients continue to be admitted to medical units with thromboembolic disease between hospital discharge and routine review.

In assessing the effectiveness of prophylactic drugs, reports on the subject must be interpreted with caution. It is becoming increasingly difficult to obtain ethical permission for studies of thromboprophylaxis that use a matched control group receiving no prophylaxis because the controls are seen to be put at risk. Thus when one regimen is compared with another the resultant small differences in effectiveness can be shown to be statistically significant only with large numbers of patients. If phlebography (and some would argue that this should be bilateral) is accepted as the only reliable end point, then trials become very expensive, time consuming, and prolonged as volunteer patients withdraw their consent for an invasive procedure. Trials using non-invasive tests such as scanning with iodine-131 and fibrinogen concentration

as the end point can produce misleading figures. Although phlebography is accepted as the optimal test,¹⁷ a negative phlebogram does not preclude the subsequent development of a deep venous thrombosis. All reports of the effectiveness of thromboprophylaxis need to be interpreted very carefully with these factors in mind; the results of different authors are rarely comparable. A single, large scale trial with clearly defined end points would provide much more valuable information on which to base prophylactic policy.

Many surgeons commented that they would welcome guidelines from a consensus group similar to those published in the United States,¹⁸ and that they are receptive to new ideas which will improve and simplify the prevention of deep venous thrombosis in orthopaedic practice. The problem of deep venous thrombosis also extends into detection and treatment and there is great opportunity for advances in these areas to improve the care of our patients.

Conclusions

Orthopaedic surgeons are aware of the problem of deep venous thrombosis and pulmonary embolism and knowledgeable about the risk factors for thromboembolism in their practice. Most use recognised regimens of prophylactic drugs, often combined with elasticated stockings or other mechanical methods, but many would be receptive to new ideas in prophylaxis that would simplify its administration and improve its safety and effectiveness.

We thank all the surgeons who responded to the questionnaire for their help and Rhone-Poulenc (UK) for financial assistance.

- Beisaw NE, Comerota AJ, Groth HE, Merli GJ, Weitz HH, Zimmerman RC, et al. Dihydroergotamine/heparin in the prevention of deep-vein thrombosis after total hip replacement. *J Bone Joint Surg [Am]* 1988; 70:2-10.
- Stulberg BN, Insall JN, Williams GW, Ghelman B. Deep vein thrombosis following total knee replacement. *J Bone Joint Surg [Am]* 1984;66:194-201.
- Salzman EW, Harris WH. Prevention of venous thromboembolism in orthopaedic patients. *J Bone Joint Surg [Am]* 1976;58:903-12.
- Everts CM, Feil EJ. Prevention of thromboembolic disease after elective surgery of the hip. *J Bone Joint Surg [Am]* 1971;53:1271-7.
- Stringer MD, Steadman CA, Hedges AR, Thomas EM, Morley TR, Kakkar VV. Deep vein thrombosis after elective knee surgery. *J Bone Joint Surg [Br]* 1989;71:492-7.
- Wolfe JHN. Postphlebotic syndrome after fractures of the leg. *BMJ* 1987;295: 1364-5.
- Brenkel IJ, Clancy MJ. Total hip replacement and antithrombotic prophylaxis. *Br J Hosp Med* 1989;42:282-4.
- Planes A, Vochelle N, Fagola M. Total hip replacement and deep vein thrombosis. *J Bone Joint Surg [Br]* 1990;72:9-13.
- Torngren S. Low dose heparin and compression stockings in the prevention of postoperative deep venous thrombosis. *Br J Surg* 1980;67:482-4.
- Planes A, Vochelle N, Ferru J, Przyrowski D, Clerc J, Fagola M, et al. Enoxaparin low molecular weight heparin: its use in the prevention of deep venous thrombosis following total hip replacement. *Haemostasis* 1986;16: 152-8.
- Johnson R, Loudon JR. Hydroxychloroquine sulphate prophylaxis for pulmonary embolism for patients with low-friction arthroplasty. *Clin Orthop* 1986;211:151-3.
- Chrisman OD, Snook GA, Wilson TC, Short JY. Prevention of venous thromboembolism by administration of hydroxychloroquine. *J Bone Joint Surg [Am]* 1976;58:918-20.
- Ljungstrom K-G. The antithrombotic efficacy of dextran. *Acta Chir Scand* 1988;suppl 543:26-30.
- Cotton LT, Roberts VC. The prevention of deep vein thrombosis with particular reference to mechanical methods of prevention. *Surgery* 1977; 81:228-35.
- Nicolaides AN, Miles C, Hoare M, Jury P, Helms E, Venniker R. Intermittent sequential pneumatic compression of the legs and thromboembolism deterrent stockings in the prevention of postoperative deep venous thrombosis. *Surgery* 1983;94:21-5.
- Scurr JH, Coleridge-Smith PD, Hasty JH. Deep venous thrombosis: a continuing problem. *BMJ* 1988;297:28.
- Whitehouse G. Radiological diagnosis of deep vein thrombosis. *BMJ* 1987; 295:801-2.
- Consensus Conference. Prevention of venous thrombosis and pulmonary embolism. *JAMA* 1986;256:744-9.

(Accepted 23 July 1991)