

Frequency and Risk Factors for Deep Vein Thrombosis after Orthopaedic Surgery

TANVEER AHMAD, ATIQ UZ ZAMAN, IJAZ AHMAD, RIZWAN AKRAM, AMER AZIZ

ABSTRACT

Background: Major orthopaedic surgery of lower limb presents considerable risk of deep vein thrombosis. Occurrence of deep vein thrombosis is different in different parts of the globe. In western countries it is 40-80 percent. In Asian countries it is said to be very low. Deep vein thrombosis may remain silent and can cause fatal pulmonary embolism without being clinically evident. There are definite risk factors recognized for deep vein thrombosis.

Aim: To determine the frequency and risk factors for deep vein thrombosis after orthopaedic surgery of and around hip and knee.

Study Design: This was descriptive case series

Setting: The study was conducted at Ghurki Trust Teaching Hospital, Lahore.

Duration: The study duration was one year starting from December 13, 2006.

Methods: 150 patients of either sex aged > 40 who were admitted through A & E department and OPD. They were operated on and around hip and knee. All were examined clinically for DVT preoperatively. If any doubt, color doppler was done to rule out DVT. All patients were subjected to color doppler ultrasonography on 4th to 7th post operative day. In the patients who showed a positive report, risk factors were identified.

Result: DVT was found in 12 patients out of 150 patients (8%). The risk factors found in these patients were multiple trauma, immobility more than 4 days, surgical time more than 2 hours, ischemic heart disease and hypertension.

Conclusion: Postoperative DVT in orthopaedics patients has a lower frequency and it can be lowered further if risk factors are identified and addressed properly.

Keywords: Deep Vein Thrombosis, Color Doppler Ultrasonography.

INTRODUCTION

Deep vein thrombosis is a frequent complication of various surgical procedures and becomes a cause of significant discomfort, disability and death¹. Deep veins of lower limbs are the most frequent site to be affected. The most fearful sequel of deep vein thrombosis is pulmonary embolism².

Major Orthopaedic surgery of lower limbs makes a patient at high risk for deep vein thrombosis and in Western countries its occurrence is reported 40% to 80%¹. But in Asian countries like China³, Japan⁴ and Pakistan⁵ it is found 5.3%, 15.8% and 12.5% respectively. In Alaska Natives, when 67 patients were subjected to doppler ultrasonography, only one patient was found to have deep vein thrombosis⁶. This all data above reveals that occurrence of deep vein thrombosis is not uniform throughout the world.

Clinically it presents with pain, swelling, redness, superficial dilated veins and low grade fever but 20% patients having clinical signs and symptoms of deep vein thrombosis have normal deep veins¹. It means

only clinical picture can not be relied upon but further evaluation of the patient is necessary. This evaluation includes laboratory tests, Doppler ultrasonography and venography². Out of these, color doppler ultrasonography is non-invasive, cost effective, easily repeatable with good patient compliance and alone is sufficient to diagnose deep vein thrombosis⁷.

There are certain mechanical and pharmacological measures which lead to low frequency of deep vein thrombosis in high risk patients. These measures include graduated compression stockings and anticoagulants as heparins and warfarin².

Risk factors for development of deep vein thrombosis involve immobility for more than 72 hours, surgery lasting more than 2 hours, malignancy, obesity⁸ and others^{1,2}. Identification of these risk factors is important in predicting and preventing post operative deep vein thrombosis by benefiting the patients from prophylaxis². Thus determination of frequency and identification of risk factors for deep vein thrombosis after major lower limb Orthopaedic surgery leads to its prediction and prevention. Keeping this fact in view I am interested to conduct this study.

*Department of Orthopaedics, Lahore Medical & Dental College/Gurki Trust Teaching Hospital, Lahore
Correspondence to Dr. Atiq uz Zaman*

The objectives of this study were to determine the frequency of deep vein thrombosis after orthopaedic surgery of and around hip and knee joints and to identify the risk factors for development of deep vein thrombosis after Orthopaedic surgery of and around hip and knee joints. Where surgery of and around hip means Open fixation of pelvic fracture, total hip replacement and proximal femur fracture fixation and surgery of and around knee means fixation of distal femoral and proximal tibial fractures and total knee replacement. Deep vein thrombosis is determined by clots on Doppler ultrasonography in deep veins of pelvis and legs on 4th to 7th post operative day. Clots in popliteal veins and above will be proximal thrombi and clots in tibial veins will be distal thrombi.

MATERIAL AND METHODS

This Descriptive case series data is collected prospectively at Orthopaedic department in association with Radiology Department Ghurki Trust Teaching Hospital / Lahore Medical and Dental College, Lahore in one year starting from December 13, 2006.

Using convenience non probability sampling method 150 patients of less than forty years age undergoing orthopaedic surgery of and around hip and knee were included in the study. Patients who have varicose veins, nephrotic Syndrome, congenital or acquired thromboembolic disorder or hypercoagulable state, Pregnancy and indwelling central vein catheters had been excluded. Pre-operatively if deep vein thrombosis was suspected clinically the patient were subjected to color Doppler ultrasonography to rule out deep vein thrombosis.

Written informed consent, demographic information like name, age and gender, history with emphasis on the risk factors for deep vein thrombosis were taken. Physical examination with special consideration of signs of deep vein thrombosis, presence of infection and any heart pathology was done. Investigations as complete blood examination, complete urine examination, renal function tests, chest X-ray, ECG and other investigations required to diagnose basic medical problem and fitness for anaesthesia were obtained. All information about the patients were kept confidential. Peri-operative assessment was done as duration of surgery, use of tourniquet and duration of anaesthesia. Post operatively their time of immobilization was noted. These patients got neither mechanical nor pharmacological prophylaxis. All the patients were subjected to color Doppler ultrasonography before discharge on 4th to 7th post operative day. In hospital pre-discharge period, patients were continuously

assessed for clinical signs and symptoms of deep vein thrombosis. If there was clinical suspicion, the patient was subjected to ultrasonography irrespective of post operative day. In the patients who showed positive report, risk factors were identified. Color Doppler Machine Nemio XG (TOSHIBA) used for color Doppler ultrasonography. All doppler USG was done by single person.

The collected data was transferred and analysed according to SPSS version 11.0. The variables to be analysed included demographic information like age and gender, risk factors for deep vein thrombosis, clinical signs and symptoms of deep vein thrombosis, presence or absence of deep vein thrombosis on doppler ultrasonography. These variables were analysed by using simple descriptive statistics, using mean and standard deviation for quantitative data like age and frequency, percentage for qualitative data like gender, risk factors, ultrasound report and clinical signs and symptoms of deep vein thrombosis. Risk factors, signs and symptoms of post-operative deep vein thrombosis and deep vein thrombosis proved on color Doppler ultrasonography were associated with demographic variables. If association became significant it was assessed by using Chi-square analysis as these variables was qualitative in nature. P value ≤ 0.05 was considered significant.

RESULTS

A total of 150 patients were studied. They underwent surgery of and around knee and hip. The mean age was 61.9 ± 10.21 (Graph 1). Out of these 150 patients, 96 were males and 54 were females. Male to female ratio was 1.7:1 (Table I). In this study of one hundred and fifty patients, 48 patients had per trochanteric femoral fracture, 27 had fracture neck of femur, 21 patients came with hip arthritis, 33 were having arthritis of the knee, 15 patients presented with supracondylar femoral fracture and 6 with pelvic fracture (Graph 4). From these one hundred and fifty patients THR was done in 27 patients, TKR in 33 patients, DHS in 48 patients, hip hemiarthroplasty with Austin Moore prosthesis in 21 patients, DCS fixation of supracondylar femoral fracture in 15 patients and 6 patients were operated with open reduction and internal fixation with plate for pelvic fractures.

Twelve patients out of 150 patients had positive report of color doppler ultrasonography (Table 3) (Graph 3). Their mean age was 71 ± 13.34 . Out of these 12 patients, 4 patients showed no clinical signs and symptoms of DVT. Three patients had pain and swelling, five patients showed swelling and redness. In these 5 patients pain was not the major concern. Homan's sign was positive in two patients.

It took more than 2 hours to be operated in 36 patients out of 150 patients and 4 patients (11.11%) had DVT out of these 36 patients. Ischemic heart disease was found in 21 patients out of 150 patients 2 patients (9.52%) out of these 21 patients had DVT. Out of 150 patients 26 were diabetics and out of these 26 diabetics only 1 patient (3.84%) had DVT. Forty two patients were hypertensive out of 150 patients and 2 patients (4.76%) out of these 42 patients got DVT. Sixteen patients out of 150 patients were having multiple trauma and 3 patients (18.75%) out of these 16 patients had DVT. Immobilization more than 4 days was found in 78 patients and 7 patients (8.97%) out of these 78 patients had DVT, Out of these 150 patients included in my study no patient was taking drugs like oral contraceptives. Out of these 12 patients who had DVT, no patient showed signs and symptoms of pulmonary embolism.

All the patients with established diagnosis were put on anticoagulation therapy. All 12 patients responded to treatment and no complication was observed.

Table 1: Distribution of sex of patients (n=150)

Gender	n	%age
Male	96	64
Female	54	36

Male to female ratio=1.7:1

Table 2: Distribution of Surgical procedures done in patients.

Procedures names	n	%age
THR	27	18
TKR	33	22
DHS fixation	48	32
Hemiarthroplasty hip.	21	14
DCS fixation of S/C femoral Fx.	15	10
ORIF of pelvic Fx.	6	4

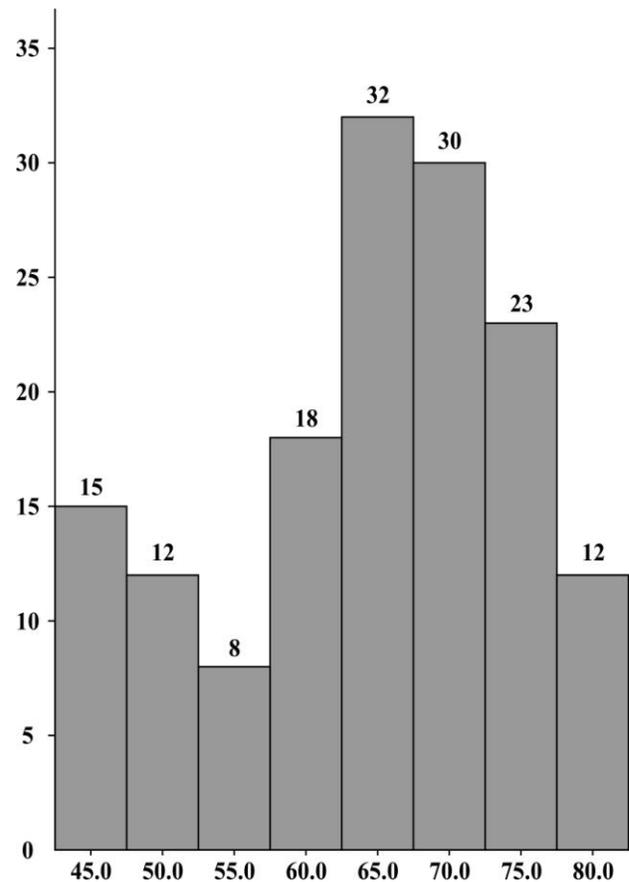
Table 3: Diagnosis by color Doppler ultrasonography

Color Doppler ultrasound report	n	%age
Positive	12	8
Negative	138	92
Total	150	100

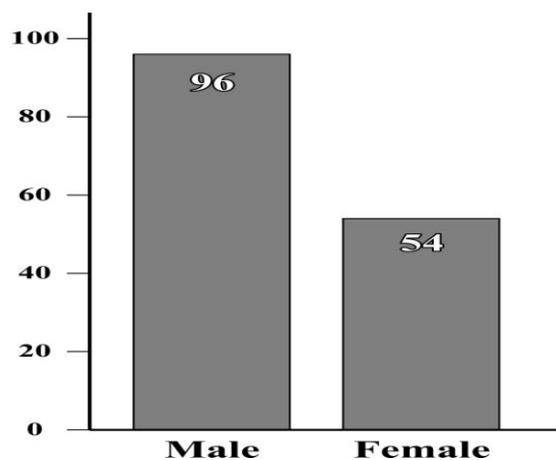
Table 4: Identified risk factors in descending order

Risk factors	n/150	n/DVT	%age
Multiple trauma	16	3	18.75%
Operative time more than 2 hours	36	4	11.11%
HTN	42	2	9.52%
Immobilization more than 4 days	78	7	8.97%
IHD	21	2	4.76%
DM	26	1	3.84%

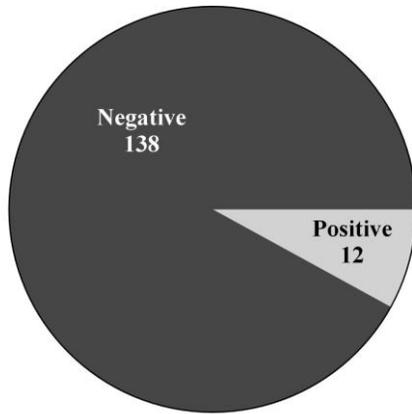
Graph 1: Distribution of the age of the patients



Graph 2: Distribution of the Sex of the Patients

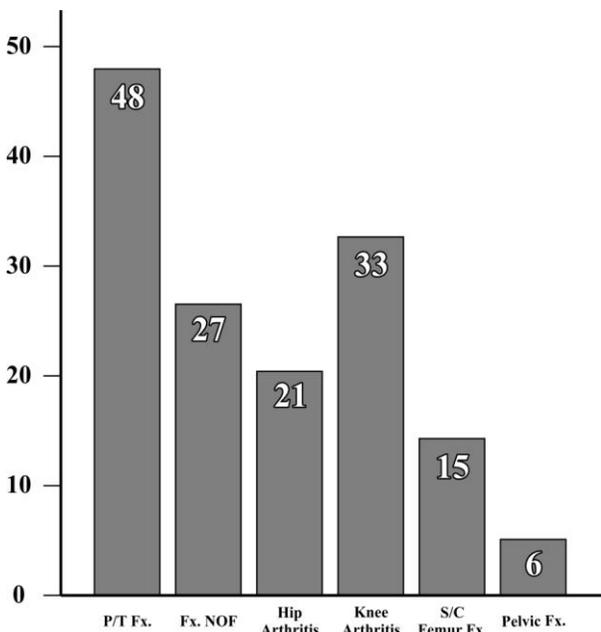


Graph – 3: Color Doppler Ultrasound Results



Colour Doppler Ultrasound Results

Graph 4: Distribution of orthopaedics surgical procedures done in 150 patients



DISCUSSION

In the United Kingdom, 10% of hospital deaths occur due to pulmonary embolism following lower limb DVT and the most common cause of lower limb venous thrombosis is hospital admission for medical or surgical problem.¹ Its associated significant discomfort, disability, death and costs has made it a major health problem in the Western world^{9,10,11,12,13}.

In the Western society, DVT prophylaxis is considered as a routine because there is unacceptability high incidence of post-operative DVT

is documented without prophylaxis¹. But in Asia, incidence is considered too low to use routine prophylaxis³. As Bagaria et al (2006) has proved this idea to be true⁵.

There is recent emphasis upon considering routine prophylaxis because DVT is not so rare as it is considered in Asia^{24,25,26}. Ishtiaq (2005) has recommended prophylaxis in selected patients on basis of his work on determination of frequency⁵. Nighat (2005) has highlighted the importance of anticoagulation after surgery²⁴. Mahmood (2005) has suggested to use anticoagulation as prophylaxis in trauma patients. Inaam-u-Rahman (1997) reported 7% frequency of post operative DVT in his study while in my study the incidence is 8%²⁷. This difference of 1% can be result of improvements in ultrasound technology.

Post operative anticoagulation is not cost effective^{10,11} and is not without risk²⁹. There is continuous work on finding such a regimen which is safe and cheaper³⁰. Even in well developed countries post operative anticoagulation is taken as a big financial burden to bear¹². My study justifies the present routine of not using routine postoperative anticoagulation in my country where financial constraints are even more pronounced. Another problem with post operative anticoagulation is its time duration which is said to be from 2 weeks to 3 months and even more^{31,32,33}. One limitation of my study is the patients were not followed beyond one week. Clinical diagnosis of DVT is unreliable³⁵. My study also highlights this fact as four patients did not show any sign or symptom of DVT. Homan’s sign was negative in 83% patients. Pain was not major concern of many patients that can be attributed to post operative analgesia. These facts are well accepted in other studies as well^{35, 36, 37}.

Deep vein thrombosis is a preventable medical condition. The implementation of the risk factor assessment could potentially save lives and reduce the hospital costs of treating and managing the complications of DVT³⁸. The risk factors established in western population are not valuable for evaluating DVT risk in Asian patients³⁹. My study is consistent to these studies as maximum correlation (18%) was found with multiple trauma and only one diabetic patient had DVT out of 26 patients. The mean age of the patients who got DVT was 71±13.34. It means elderly patients are at greater risk for DVT. The same risk factor was identified by Edmonds in his study.⁴⁰ Other risk factors with different magnitude of association identified in this study of 150 patients are operative time more than 2 hours, hypertension, immobility more than 4 days and ischemic heart disease (Table 4). These results are consistent to other international studies in which the similar risk

factors were found.^{8, 34, 38, 39} There is no evidence to support the other risk factors which are believed to be associated with DVT as obesity, smoking, prior orthopaedic surgery, stroke, infection, contraceptive pills, family history of DVT which were identified by other researchers^{41,42,43,44}. This can be due to small sample size of my study. DVT is associated with many complications and pulmonary embolism is the most dreadful⁴⁵. Its incidence is reported less than 0.5% in international studies⁴. My study is consistent to these studies as no patient in my study had pulmonary embolism. I have used color doppler ultrasound to diagnose DVT. Zahid et al (2005) has reported color doppler ultrasound alone is sufficient to diagnose DVT⁷. Sadaf et al (2005) has shown its importance in exclusion of suspected DVT in leg swelling.

CONCLUSION

Deep vein thrombosis after major lower limb orthopaedic surgery is not as common in my study as in western world and present practice of surgeons not to use post operative anticoagulation as a routine is justified. However, anticoagulation can be considered in selected patients as multiply injured patients. Benefits must be weighed against risks. Clinical diagnosis is unreliable. Color doppler ultrasonography provides good source of diagnosis of DVT. It has limitation to be observer dependent. Further studies with larger sample size are required to settle this controversial issue of difference of incidence of deep vein thrombosis. The reason of this difference also remains to be investigated.

REFERENCES

- Scur JH. Venous disorders. In: Russell RC, Williams NS, Bulstrode CJ, editors. Bailey & Love's short practice of surgery. 24th ed. London: Arnold 2004;954-73
- Liu, LT, Ma BT. Prophylaxis against venous thromboembolism in orthopaedic surgery. Chin J Traumatol 2006;9:249-56
- Chan YK, Chiu KY, Cheng SW, Ho P. The incidence of deep vein thrombosis in elderly Chinese suffering hip fractures is low without prophylaxis. A prospective study using serial duplex Ultrasound. J Orthop Surg 2004;12:178- 83
- Horie H, Endo N, Sata N, Yasuda Y, Nagai H. Postoperative venous thrombosis in general surgery patients and peri-operative prophylaxis. Nippon Geka Gakkai Zasshi 2005;106:232-6
- Aziz I. Frequency of deep vein thrombosis in high risk surgical patients. J Coll Physicians Surg Pak 2005;15:299-301
- Rosenzweig T. Postoperative deep vein thrombosis is infrequent in Alaska Natives. Int J Circumpolar Health 2003;62:388-96
- Zahid M, Tahir M, Sadaf R, Khan MN, Khattak I. Appraisal of clinical features and color flow doppler studies in diagnosing deep vein thrombosis in clinically suspected cases of DVT. J Med Sci 2005;13:157-60
- Bagaria V, Modi N, Panghate A, Vaidyas S. Incidence and risk factors for development of venous thromboembolism in Indian patients undergoing major orthopaedic surgery. Post grad Med J 2006;82:136-9
- Heit A, Fallon M, Petterson M. Relative impact of risk factor for deep vein thrombosis and pulmonary embolism: a population-based study. Arcch Inter Med 2002;162:1245-8
- Gallus A. Screening for venous thrombosis by ultrasonography before hospital discharge after major joint surgery. Med J Aust 2005;182:149-150.
- Reilly R, Burgess I, Zicat B. Screening for venous thrombosis by ultrasonography before hospital discharge after major joint surgery. Med J Aust 2005;183: 221-222
- Measurement of the clinical and cost effectiveness of non-invasive diagnostic testing strategies for deep vein thrombosis. Health Technol Assess 2006;10:1-168
- Skedgel C, Goeree R, Pleasance S, Thompson K, Brien B, Anderson D. The cost effectiveness of extended-duration antithrombotic prophylaxis after total hip arthroplasty. J Bone Joint Surg Am 2007;89:819-28
- Friedman M, van den Bovenkamp GJ. The pathogenesis of a coronary thrombus. Am J Pathol 1966; 48:19-44
- Falati S, Liu Q, Gross P, et al. Accumulation of tissue factor into developing thrombi in vivo is dependent upon microparticle P-selectin glycoprotein ligand 1 and platelet P-selectin. J Exp Med 2003;197:1585-1598
- McEver RP. Adhesive interactions of leukocytes, platelets, and the vessel wall during hemostasis and inflammation. Thromb Haemost 2001;86:746-756
- Sullivan VV, Hawley AE, Farris DM, et al. Decrease in fibrin content of venous thrombi in selectin-deficient mice. J Surg Res. 2003;109:1-7
- M Morris RJ, Woodcock JP. Evidence-based compression: prevention of stasis and deep vein thrombosis. Ann Surg 2004;239:162-171
- Westrich H, Böttner F. Prophylaxis Against Venous Thromboembolic Disease in Patients Having a Total Hip or Knee Arthroplasty. J Bone Joint Surg Am 2002;84: 466 - 477
- Colwell C, Berkowitz S, Lieberman J, Comp P, Ginsberg J, Paiement G, McElhattan J, Roth A, Francis C. Oral Direct Thrombin Inhibitor Ximelagatran Compared with Warfarin for the Prevention of Venous Thromboembolism after Total Knee Arthroplasty. J Bone Joint Surg Am 2005;87:2169-2177
- Scott T, Bateson T, Coyle C, Gillespie L, Pearse A, Villines C, Cassimatis C; Finelli N, Taylor J, Grabenstein D. Venous thromboembolism among United States soldiers deployed to Southwest Asia. Thromb Res 2006;117:379-83
- Ahmad M, Niazi P, Mumtaz N, Khan M, Rustam Z. Occurrence of deep vein thrombosis in spinal cord injured patients. Pak Armed Forces Med J 2005;55:193-7

23. Jain V, Dhaon K, Jaiswal A, Nigam V, Singla J. Deep vein thrombosis after total hip and knee arthroplasty in Indian patients. *Postgrad Med J* 2004;80:729-31
24. Bilal N, Prophylactic anticoagulation for perioperative deep venous thrombosis. *J Pakistan Inst Med Sci* 2001;12:603-5
25. Liew C, Moissinac K, Gul Y. Postoperative venous thromboembolism in Asia. *Asian J Surg* 2003;26:154-58
26. Dhillon K, Askandar A, Doraisamy S. Postoperative deep vein thrombosis in Asian patients is not a rarity. *J Bone Joint Surg Br* 1996; 78: 427-30
27. Inaam-ur-Rahman. Incidence of post operative deep venous thrombosis in hip surgery (Dissertation). College of Physicians and Surgeons Pakistan
28. Pookarnjanamorakot C, Sirisriro R, Eurvilaichit C, Jaovisidha S, Koysombatolan I. The incidence of deep vein thrombosis and pulmonary embolism after total knee arthroplasty: the screening by radionuclide venography. *J Med Assoc Thai* 2004;87:869-76
29. Prandoni P, Lensing AW, Piccioli A, et al. Recurrent venous thromboembolism and bleeding complications during anticoagulant treatment in patients with cancer and venous thrombosis. *Blood* 2002;100:3484-3488
30. Dorr L, Gendelman V, Maheshwari A, Boutary M, Wan Z, Long W. Multimodal thromboprophylaxis for total hip and knee arthroplasty based on risk assessment. *J Bone Joint Surg Am* 2007;89: 2648-57
31. Finsen V. Duration of thrombosis prophylaxis in orthopaedics. *Ann Chir Gynaecol* 2001;90:105-8
32. Campbell A, Bentley P, Prescott J, Routledge A, Shetty G, Williamson J. Anticoagulation for three versus six months in patients with deep vein thrombosis or pulmonary embolism, or both: randomised trial. *BMJ* 2007;334:674
33. Agnelli G, Prandoni P, Santamaria MG, et al. Three months versus one year of oral anticoagulant therapy for idiopathic deep vein thrombosis. *N Engl J Med* 2001;345:165-169
34. Tan K, Koh P, Chao K. Risk factors and presentation of deep venous thrombosis among Asian patients: a hospital-based case-control study in Singapore. *Ann Vasc Surg* 2007;21:490-5.