

# DEEP-VEIN THROMBOSIS FOLLOWING HIP SURGERY FOR FRACTURE OF THE PROXIMAL FEMUR

A K Mitra, T K Khoo, C C L Ngan

## ABSTRACT

This is a prospective study involving seventy-two consecutive admissions of patients with fractures of the proximal femur over a period of eleven months. It reviews the incidence, pattern and clinical course of deep vein thrombosis in this group of patients.

The method of detection of deep vein thrombosis was that of ascending phlebography of the injured limb.

Results show that the incidence of deep vein thrombosis is low and complications of thromboembolism and local complications secondary to venous stasis are nil.

It appears that prophylaxis and active treatment of deep vein thrombosis in this group of patients may not be essential.

**Keywords:** Deep vein thrombosis, proximal femur, surgery.

SING MED J. 1989; NO 30: 530-534

## INTRODUCTION

Deep vein thrombosis following surgery is very common in Western countries (1,2). It is however a rare condition among Asians and Africans (3-5).

In the West, venous thromboembolism is the most common fatal complication following operations or trauma involving the lower extremities (14,16,17). Clinical observations indicated that venous thromboembolism is rare among the Chinese in Beijing with proximal fractures of the femur (6,15). But subsequent prospective studies showed that overall incidence of deep vein thrombosis among Hong Kong Chinese patients after hip surgery for proximal femoral fractures is similar to that reported in the West. But autopsy studies revealed that the incidence of pulmonary embolism is low among the Chinese. It has also been observed that deep vein thrombosis is relatively free from complications and is associated with a rather low mortality rate in Chinese patients who have proximal femoral fractures regardless of conservative or operative treatment (6,7).

---

Department of Orthopaedic Surgery  
'O' Unit  
Singapore General Hospital  
Outram Road  
Singapore 0316

A K Mitra, FRCS, Senior Registrar

Department of Diagnostic Radiology  
Toa Payoh Hospital  
Toa Payoh Rise  
Singapore 1129

T K Khoo, FRCR, Consultant & Head

Department of Orthopaedic Surgery  
Tan Tock Seng Hospital  
Moulmein Road  
Singapore 1130

C C L Ngan, MBBS

---

This study reviews the incidence and pattern of deep vein thrombosis in a group of patients who underwent surgery for fractures of the proximal femur.

## METHODS

Seventy-two consecutive admissions of patients with proximal femoral fractures from September 1984 to July 1985 were studied. The fractures included fractures of the femoral neck, intertrochanteric and subtrochanteric fractures of the femur. (Intertrochanteric and subtrochanteric fractures of the femur are grouped together under trochanteric fractures in our discussion). The patients' biodata were noted, together with pre-existing medical conditions.

They were examined daily for clinical symptoms and signs of deep vein thrombosis. The patients all underwent appropriate surgery: hemiarthroplasty, pin or screw fixation for femoral neck fractures and pin and plate fixations for trochanteric fractures. The average time between injury and surgery was 7 days, depending on the availability of operating time. Patients were mobilised as soon as pain and soft tissue healing would permit.

While it is known that lower limb thrombi may develop before injury or operation, for the purposes of this study, it was decided to examine the limbs by radiological means in the first few weeks after fixation of the fracture.

The patients all underwent routine preoperative biochemical, hematological and electrocardiographic tests. None of the patients received any prophylaxis for deep vein thrombosis.

Phlebographic studies were carried out on the ipsilateral leg, using 40 ml of Conray 280, diluted with 20 ml of normal saline. The veins cannulated were the long saphenous vein and/or the dorsal vein on the foot. A table tilt of 10° to 15° was employed and a 2 tourniquet method was used. The phlebographic results were used as the criteria of diagnosis of deep vein thrombosis, as the condition is notoriously elusive clinically. The average time interval between surgery and phlebographic study was seven days. The phlebographic studies were not repeated subsequently (as there were no clinical indications).

Table I  
CLINICAL PROFILE OF THE PATIENTS

Profile	Male (20)	Female (52)
Age groups (years)		
10 - 19	2	
20 - 29	2	
30 - 39	2	
40 - 49	2	
50 - 59	1	4
60 - 69	2	10
70 - 79		19
80 - 89	7	16
90 - 99	2	3
Total	20	52
Type of fracture		
Fracture neck of femur	9	29
Intertrochanteric fracture	9	23
Subtrochanteric fracture	2	
Total	20	52

## RESULTS

The age range of the seventy-two patients studied varied from 18 years to 95 years. Majority of the patients were in the age bracket of 60 to 89 years. (Fig. 1). The sex ratio was 20 males to 52 females. The race of the patients were predominantly Chinese (94%), with 3% Indians and 3% Malays.

The fractures were predominantly left-sided. There were 38 femoral neck fractures, 32 intertrochanteric fractures and 2 subtrochanteric fractures (Table I). The time span between injury and surgery averaged about 7 days.

None of the patients showed any clinical symptoms or signs of deep vein thrombosis in either leg.

The criteria accepted for the diagnosis of venous thrombosis were based on those used by De Weese and Rogoff (21), the recognition in at least 2 radiographs of (1) well-defined filling defects in clearly visualised veins, (2) non-visualisation of the popliteal or the femoral veins (superficial or common), with good delineation of the proximal and distal veins and the preservation of collateral circulation.

With the use of phlebographic studies using these criteria, 7 cases of deep vein thrombosis were identified (Table II). This gives an incidence of 9.7% out of the 72 patients. The age range was 44 years to 95 years. 3 had fractures of the femoral neck, 3 had intertrochanteric fractures and 1 had a subtrochanteric fracture. All the patients were Chinese.

The average time lapse between injury and surgery was also 7 days. Venogram was performed on the 8th post-operative day. In terms of medical conditions, 2 had anaemia, and one had congestive cardiac failure. Of the 2 that had anaemia, one had associated atrial fibrillation and the other obesity. None had any coagulation abnormalities. The average amount of blood loss was 216 ml.

The patients who developed deep vein thrombosis had thrombi in the popliteal veins, peroneal veins and tibial veins. (Table III). In 3 patients, incompetence of the perforators of the calf were noted. It was found that all the thromboses were limited to veins below the knee. There were no thrombi extensions into the femoral or iliac veins (Fig 2).

There was no correlation of clinical symptoms and signs with phlebographic results. There was also an absence of thrombo-embolic complications on follow-up. None of the patients developed clinical pulmonary embolism, and they did not suffer from problems of venous stasis in the affected limb: Mortality related to deep vein thrombosis was nil.

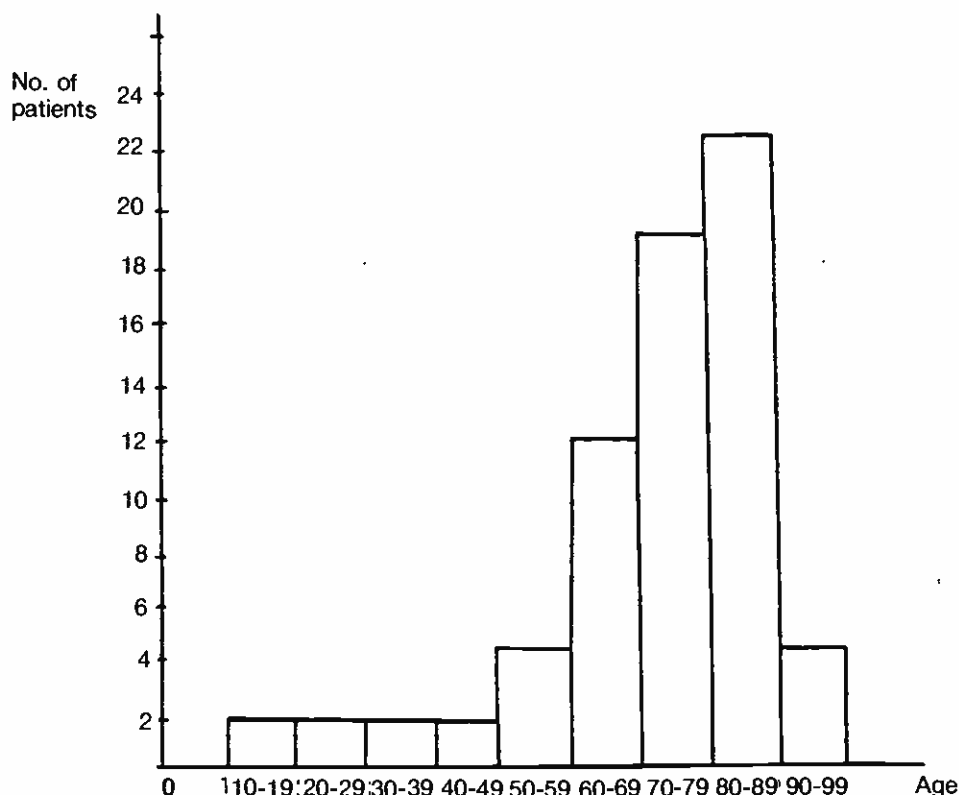


Fig. 1 Age distribution of the seventy two patients reviewed

Table II  
**ANALYSIS OF THE INCIDENCE OF  
DEEP VEIN THROMBOSIS**

	Total Number of patients	Number of patients with thrombi	% of patients with thrombi
Age Overall	72	7	9.7
10 - 19	2		
20 - 29	2		
30 - 39	2		
40 - 49	2	1	50.0
50 - 59	5		
60 - 69	12		
70 - 79	19	3	15.8
80 - 89	23		
90 - 99	5	3	60.0
Sex: Female	52	4	7.7
Male	20	3	15.0
Type of fracture			
Fracture neck of femur	38	3	7.9
Intertrochanteric fracture	32	3	9.4
Subtrochanteric fracture	2	1	50.0
(Trochanteric fractures)	(34)	(4)	(11.8)

## DISCUSSION

The overall incidence of deep vein thrombosis in this group of patients is 9.7%. This is a very low incidence compared with reports in the West, which is up to 40% to 60%. Although a large percentage of the patients studied were Chinese, it was found that the incidence was much lower than that in a study on Hong Kong Chinese (53.3%) (7). However, the pattern of deep vein thrombosis was comparable. For example, the majority of the thrombi in the injured limb were limited to the calf (84.6% Mok C K et al) (7) and in our study all the thromboses were below the knee. Also, in both studies, features of venous insufficiency were not observed in the patients being followed up. In terms of the incidence of pulmonary embolism, both studies did not have any patients with this complication. This could be explained by the observation made by McLachlin and Paterson (8), Mara and Galloway (9) and Kakkar et al (10), that when thrombosis is limited to the calf, the risk of pulmonary embolism is negligible.

In this study, it would appear that there is a higher incidence of deep vein thrombosis in the males (15%) than in the female patients (7.7%) (Table II). According to a study by Sikorski (11), women showed a higher incidence of deep vein thrombosis than men, ((56%) for women, (44%) for men) but these differences were not statistically significant. Sikorski also noted that there was an increasing tendency to develop deep vein thrombosis after operation, with increasing age. This was noticed in our patients with deep vein thrombosis whose ages fall within the brackets of 70-79 years and 90-99 years, only one patient was of 44 years. However, the sample of the younger age groups were too small to give a proper measure of incidence (eg. there were only 2 patients in the 40-49 range, and since one developed deep vein thrombosis, this would theoretically imply that 50% of this age group developed deep vein thrombosis) (Table II).

It is interesting to note that of the seven patients who developed deep vein thrombosis, 2 had anaemia. It has been found that there is a higher incidence of deep vein thrombosis in patients with anaemia (11).

Congestive cardiac failure, atrial fibrillation and

obesity were also known to cause an increased risk of deep vein thrombosis (12). Out of the seven patients afflicted, only four had pre-existing medical problems.

The incidence of deep vein thrombosis in patients with trochanteric fractures is 11.8% compared with that for femoral neck fractures 7.9%. This may be attributable to the greater severity of the injury (13). (Table II).

Studies in the West have shown that the incidence of deep vein thrombosis in the uninjured limb varied from 25-50%. In a study on Hong Kong Chinese patients, Mok C K et al found a lower incidence of 14.3% (7). In our present study we did not perform phlebographic studies on the uninjured leg. This aspect could possibly be looked into, in future prospective studies, in order to understand the pattern of deep vein thrombosis in Singapore patients better.

No prophylaxis for deep vein thrombosis was instituted, even for relatively high risk patients. For those who developed deep vein thrombosis, no treatment was instituted either. Clinically, there was no deterioration of the physical status of the group of patients with deep vein thrombosis, and no complications thereof as mentioned before. This might suggest that active treatment for Singaporean Chinese, with a relative high risk of deep vein thrombosis (related to trauma) might not be essential.

In the West, where deep vein thrombosis is common and pulmonary embolism a substantial threat, studies have shown that low dose Heparin, as a prophylaxis, causes a reduction in deep vein thromboses by 68% and a 49% decrease in pulmonary embolism (18). It has been recommended that for high risk orthopaedic patients undergoing elective hip surgery or knee reconstructions, prophylactic regimes of low dose Warfarin, dextran or adjusted dose Heparin be used. The regimes last at least 7 days or longer, if the patient remains bedridden. For patients who are not high risk, mechanical measures such as external pneumatic compression may be used. Early mobilisation and elevation of injured limbs is also recommended.

The low incidence of post-operative deep vein thrombosis in Chinese may be due to a slower and smaller fall in Antithrombin III levels in Chinese, com-

pared to Caucasians. Antithrombin III is one of the naturally occurring "plasma inhibitors" in the blood. It is a natural inhibitor of activated Factor X and therefore holds in check the hypercoagulable state which the presence of activated Factor X confers. In trauma or operations, there is an increase in Factor VII and fibrinogen levels and a slow fall of Anti-thrombin III, but most important of all is the immediate activation of Factor X by the release of Thromboplastin from damaged muscles and other tissues (12).

It has been shown that in Caucasians, a fall in antithrombin III activity occurred even after minor operations and was more marked in women taking oral contraceptives (20). In a study by Tso S C (19), a significant fall in antithrombin III levels was found only in 3 of the 4 patients who developed deep vein thrombosis.

Ascending phlebography has been considered the most complete and certain way of establishing this clinically elusive condition, but there are drawbacks (12). Besides reactions to contrast media, both allergic and chemotoxic, there is also the risk of pulmonary embolism from dislodgement of the thrombi (14) and promoting its extension (12). Phlebography is not exhaustive, because it fails to display the profunda femoris vein and its tributaries and does not always display all the calf veins. Other tests that complement phlebography are the doppler ultrasound flow detector, the 125 I-labelled fibrinogen test and 125 I-clearance value. The doppler ultrasound flow detector is most useful for the femoral and iliac venous thrombi detection.

## CONCLUSION

The racial distribution of the group of patients studied was predominantly Chinese (94%). The incidence of deep vein thrombosis was low (9.7%) comparable to the incidence in Beijing Chinese (6,15). Although the incidence did not compare with that of Hong Kong Chinese (whose incidence is closer to those in the West), the pattern and clinical course of deep vein thrombosis is remarkably similar.

The patients did remarkably well without pre-operative prophylaxis or treatment even after deep vein thrombosis was diagnosed. This suggests that prophylaxis or treatment for deep vein thrombosis (secondary to trauma in the proximal femur) in Singapore Chinese, may not be essential.

Future studies may benefit from bilateral phlebographic studies and repeat studies, together with complementary investigation like Doppler-Ultrasound flow detector, 125 I-labelled fibrinogen test and 125 I-clearance value.

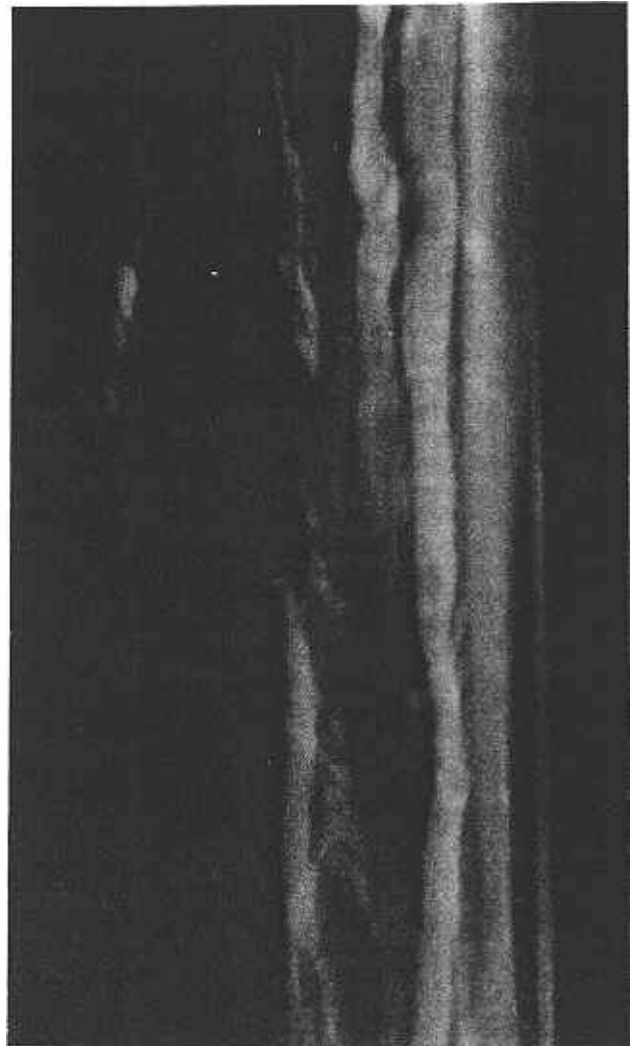


Fig 2

There were no thrombi extensions into the femoral or iliac veins.

Table III  
PATTERN AND EXTENT OF THE  
VENOUS THROMBI

Extent of Thrombi	No.
Isolated Calf vein	2
Multiple calf veins	2
Calf vein and popliteal vein	2
Incompetence of perforators	3

Table IV  
TYPE OF OPERATION AND INCIDENCE OF DVT

Type of Operation	Total no. of cases	Number with DVT	Percentag with DVT (%)
Pin and plate (MacLaughlin's or Jewetts)	34	4	11.8
Moore's or Thomson's hemiarthroplasty (uncemented)	31	2	6.5
Pin or screw fixation	7	1	14.3

## ACKNOWLEDGEMENT

The authors wish to thank Mr. Low YP and Mr See HF at Toa Payoh Hospital for allowing us to study their

patients.

We also wish to thank Miss Teo Saw Chiok and Miss Ng Gar Hoon for all their efforts.

## REFERENCES

1. Flanc C, Kakkar VV, Clarke MB: The detection of venous thrombosis of the legs using 125 I-labelled fibrinogen. *Br J Surg* 1968; 55:742.
2. Broose NL, Negus, D: Prevention of post-operation leg vein thrombosis by electrical muscle stimulation. An evaluation with 125 I-labelled fibrinogen. *Br Med J* 1970; III:615.
3. Srivastava SC: Absence of pulmonary embolism in Asians. *Br Med J* 1964; i:772
4. Tinckler LF: Absence of pulmonary embolism in Asians. *Br Med J* 1964; i:502
5. Franz RC, Kark AE, Hathorn M: Postoperative thrombosis and plasma fibrinolytic activity. *Lancet* 1961; i:195.
6. Bong SC, Chow SP: Mortality in fractures of the proximal end of femur in Hong Kong Chinese. *J West Pac Orth Assoc* 1977; 14:1.
7. Mok CK et al: The Incidence of deep vein thrombosis and clinical course of a group of Hong Kong Chinese patients following Hip Surgery for fracture of Proximal Femur. *Br J Surg* 1979; 66(9):640-2
8. McLachlin J, Paterson JC: Some basic observations on venous thrombosis and pulmonary embolism. *Surg Gynae Obstet* 1951; 93:1
9. Mavor GF, Galloway JWD: Iliofemoral venous thrombosis. Pathological considerations and surgical management. *Br J Surg* 1969; 56:45
10. Kakkar VV, Home CT, Flanc C and Clarke MB: Natural history of postoperative deep vein thrombosis. *Lancet* 1969; ii:230.
11. Sikorski JM, Hampson WG, Staddon: Natural history and aetiology of deep vein thrombosis after total Hip Replacement. *JBJS* 1981; 63B:171-7.
12. Lester Lowe: Venous Thrombosis and Embolism. *Br Ed Soc Bone and Joint Surg* 1981; 43B:155-66.
13. Field ES, Nicolaides AN, Kakkar VV, Cnellin RQ: Deep vein thrombosis in patients with fractures of the femoral neck. *Br J Surg* 1972; 59:377.
14. Culner D, Crawford JS, Gardiner JH, Wiley AM: Venous thrombosis after fractures of the upper end of the femur, *JBJS* 1970; 52:61.
15. Horn JS, Wang YC: The Mechanism, traumatic anatomy and non-operative treatment of intertrochanteric fracture of the femur. *Br J Surg* 1964; 51:574-80.
16. Seviatt S, Gallagher N G: Prevention of Venous Thrombosis and Pulmonary Embolism in Injured Patients. *Lancet* 1959; ii:981.
17. Steven J, Fardin R, Fneeark R J: Lower Extremity Thrombophlebitis in Patients with Femoral Neck Fractures. *J Trauma* 1968; 8:527.
18. Conference on Prevention of Deep Venous Thrombosis and Pulmonary embolism. *The Lancet* 1986; ii:1202-3.
19. Tso SC: Deep venous thrombosis after strokes in Chinese. *Aust NZ J Med* 1980; 10:513-4.
20. Sogar S, Nairn D, Stamatakis JD et al: Efficacy of low-dose heparin in prevention of extensive deep-vein thrombosis in patients undergoing total hip replacement. *Lancet* 1976; i:1511-4.
21. De Weese JA, Rogoff SM: Functional Ascending Phlebography of the Lower extremity by Serial Long Film Technique. Evaluation of Anatomic and Functional Detail in 62 Extremities. *Am J Roentgenol Rad Ther Nucl Med* 1959; 81:841.