



Incidence of Deep Vein Thrombosis In Elderly Indian Population Following Hip Surgeries – A Prospective Study Using Serial Duplex Ultrasound

KEYWORDS

Deep Vein Thrombosis, Orthopaedic hip surgery

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ABSTRACT

Introduction -- Hip surgery is one of the most common orthopaedic surgeries. Patients of hip surgery considered at high risk for developing DVT. The incidence of DVT in Asian patients was traditionally considered to be lower than western. However few recent studies have shown significantly higher incidence even in Asian population & it suggest use of routine thromboprophylaxis for hip surgeries. There is lack of data on the incidence of DVT in Indian population. These guide us for initiating a prospective study to determine the incidence of DVT following hip surgery.

Methods -- A prospective was conducted on 102 patients scheduled for hip surgery and met our inclusion and exclusion criterias. A duplex ultrasound on both lower limbs was done 7th to 10th days after surgery and one month after surgery. The patients were assessed clinically for any signs of deep venous thrombosis (DVT) daily and duplex ultrasound was done earlier in case of clinical suspicion of DVT irrespective of the stage of study.

Results -- Out of 102 patients recruited for study, only one patient developed DVT which accounts for overall incidence of 0.98% (~1%) at one months of postoperative period.

Conclusion -- In view of results of our study & most of previous studies we conclude that, it is not cost effective to advice thromboprophylaxis in patients undergoing hip surgery routinely in India and need of thromboprophylaxis in Indian patients should be individualized according to presence of risk factors

INTRODUCTION

Surgery around hip is a potent stimulus for thrombogenesis. As a result of immobility and hypercoagulable condition associated with operation, patients are regarded as having a high risk of developing deep vein thrombosis (DVT). The risk of DVT extend for at least 3 months after surgery, the risk is maximum at 2-5 days postoperatively. Second peak occur around 10-13th day.¹ Postoperative DVTs also occur in the contra-lateral leg after major joint surgery in approximately 25% of the patients, reflecting the systemic coagulopathy seen after surgery. The clinical assessment of these complications is unreliable and the majority of venous thromboembolic events are asymptomatic. Even for an asymptomatic DVT, the risk of pulmonary embolism (PE) is considerable.

There are only a handful of studies carried out in Asia that examined the incidence of DVT associated with proximal femur fracture and surgeries around hip. The practice of prophylactic prevention of DVT is mainly based on Western literature. In western countries postoperative DVT is a well recognized complication of major lower limb surgery, incidence ranging from 32-88%.²⁻⁵ The use of routine thromboprophylaxis has shown to decrease the incidence to 15%– 30%.^{4,6-11}

Among various modalities used for diagnosis of DVT, Colour Doppler ultrasonography has the advantage of being noninvasive, cost effective, can be repeated when required, has no side effects, and matches venography in sensitivity and specificity as far as proximal DVT is concerned.¹²

While most studies have shown that the incidence of DVT is lower in Asian patients than the Western population¹³⁻²⁰, some of the recent studies from Pacific island including

India²¹⁻²⁴ have shown significantly higher incidence of DVT in the high risk orthopaedic patients. In view of conflicting data from other countries in Asia it was necessary to have a prospective study on the incidence of DVT in high risk orthopaedic surgery patients from India.

MATERIALS AND METHODS

Study Design: Prospective, observational type of study.

Place of study: Tertiary care center (Medical College)

Duration of study: For one and half year

Sample Size: Total numbers of participants were 102 patients.

• Inclusion criteria:

1. Age 60 years or more
2. Patient scheduled for hip surgery including Total Hip replacement, surgeries for Fracture neck of femur, intertrochanteric & subtrochanteric fracture of femur.
3. Patients giving written informed consent

• Exclusion criteria

1. <60 yr of age
2. Past history of DVT
3. Preexisting DVT as shown by pre-operative color Doppler report
4. Patients taking any prophylaxis (mechanical or pharmacological) for DVT
5. History of known coagulation disorder
6. Patient taking any antiplatelet agent or anticoagulation therapy
7. Chronic renal disease
8. Pathological fractures

Methodology:

All Patients who were admitted in our hospital for hip surgery were scrutinized and reviewed. Some patients were

excluded according to exclusion criteria. Those who are meeting the inclusion criteria were explained about the study & a written consent was taken. Total 102 patients were included in the study.

A Proforma was used to collect the information of the participants including name, age, sex, address, ethnicity and previous medical history. A thorough physical examination was done for DVT including Homans sign, prominence of superficial vein, leg & ankle swelling, skin discoloration, tenderness, fever etc.

As per protocol if the patient with proximal femur fracture scheduled for hip surgery or elective total hip replacement, met the criteria for inclusion the complete evaluation of all the deep calf veins (the paired peroneal, posterior tibial and anterior tibial) and the deep thigh veins (common femoral, superficial femoral, popliteal, and proximal profunda femoral veins) were evaluated in their entirety bilaterally using duplex Sonography preoperatively.

The equipment used was the Logic 3, a linear ultrasound probe with 8 MHz frequency and a convex probe with 3.5 MHz Frequency. The examination was performed with the patient in a supine position and horizontal dorsal decubitus for the study of the femoral vein segments and in a lateral decubitus for the study of the popliteal, tibial, fibular, and calf muscular vein segments.

Following criteria as shown in Table 1 is used for diagnosis of DVT. If all the deep calf veins were not visualized satisfactorily, the findings were considered indeterminate. All evaluations were performed by experienced Radiologist.

Table 1: Criteria for Establishing the Diagnosis of DVT by Ultrasonography of the Deep Leg Veins²⁵

Lack of vein compressibility (the principal criterion)
Vein does not "wink" when gently compressed in cross-section
Failure to oppose the walls of the vein due to passive distension
Direct Visualization of Thrombus
Homogenous
Low echogenicity
Abnormal Doppler Flow Dynamics
Normal response: calf compression augments Doppler flow signal and confirms vein patency proximal and distal to Doppler
Abnormal response: flow blunted rather than augmented with calf compression

Following procedural characteristics were recorded –

- Duration of injury before surgery
- Type of surgery
- Duration of surgery (skin to skin)
- Blood loss
- Time of immobilization

As in preoperative period, assessment for postoperative DVT by duplex ultrasound scan was done on the 7th to 10th day and at 1month postoperatively. All patients ex-

amined daily for clinical signs of DVT & color Doppler was done earlier or repeated if there was any clinical suspicion of DVT.

None of the patient received any mechanical or pharmacological prophylaxis for DVT in both preoperative & postoperative periods.

Mobilization and ambulation of the patients was done according to routine protocol at our institution. Patients of total & hemiarthroplasty usually mobilized within 3 days, while ambulation of patients of DHS and PFN, usually not allowed for 4-6 weeks, though static and dynamic physiotherapy of affected limb started within 48 hours in all patients.

RESULTS & OBSERVATIONS

A. Baseline characteristics of the study population

I. Demographic Characteristics of the study population

During the study period a total of 102 participants were included in the study. The total numbers of male participants were 48 and females were 54. Mean age of our study population was 65.5 years and standard deviation was 4.39 years.

Table 2: Table showing participants in various age groups of study population

AGE GROUP	NO. OF PARTICIPANTS
60-70 yrs	89
71-80 yrs	12
>80 yrs	1
TOTAL	102

II. Physical Characteristics of the study population.

Among co-morbid conditions, 39 out of 102 patients were hypertensive. 22 out of 102 patients were diabetic. 82 patients were vegetarian and 20 patients were non vegetarian. 29 patients were smoker.

iii. Clinical parameters of the study population

➤ **Types of Hip surgery in the study population:**

Table 3: Different Types of Hip surgery in the study population

Hip surgery type	Frequency	Percent (%)
Dynamic hip screw (DHS) fixation	51	50
Hemi-arthroplasty	40	39.21
Proximal femoral nail (PFN) fixation	08	7.84
Total Hip Replacement (THR)	03	2.94

Clinical manifestation of DVT in study population.

Most common sign of DVT was limb edema or swelling followed by Homan's sign and calf tenderness.

Table 4: Clinical manifestation of DVT in the study pop-

ulation.

Clinical manifestation	Frequency	Percent
Limb edema	20	19.6%
Homans sign	12	11.7%
Calf tenderness	12	11.7%

➤ INCIDENCE OF DVT

- ❑ Out of 102 patients recruited for study, only one patient developed DVT which accounts for overall incidence of 0.98% (~1%).
- ❑ The patient who developed DVT was 65 years old female, had undergone close reduction & internal fixation with Proximal femoral nail (PFN) for fracture subtrochanteric femur. She developed calf swelling & pain at 1 month postoperative period & proximal DVT detected on duplex scan in ipsilateral leg. She had no known risk factors for DVT.
- **Injury to Surgery Interval** – Average Injury to Surgery Interval were 7 days & in patient of DVT it was 8 days.
- **Preoperative DVT**- None of the patient developed DVT preoperatively as evident from preoperative duplex scan.
- **Type of anaesthesia**– All the operation in our study was done in regional block anaesthesia so comparison could not be done with general anaesthesia.
- **Duration of surgery** – In our study average duration of surgery was 115 mins & duration of surgery in patient of DVT was 120 min.
- **Pulmonary Embolism** – No case of pulmonary thromboembolism detected in any patient.

DISCUSSION

This study provides information on incidence and risk factors for DVT in Indian population undergoing hip surgery. An accurate assessment of the incidence and the risk factors in this ethnic group will probably help clinicians in making important decisions about thromboprophylaxis in the perioperative period in Indian population.

In our study **only one** case of proximal DVT was found in ipsilateral limb out of 102 patients which accounts for an overall incidence of 0.98% (~1%). There were 54 females and 48 males in our study, the patient who developed DVT was a female, reflecting higher incidence in females, these finding is consistent with the findings of Sikorski et al and Sharma et al^{1,26}. The higher incidence of DVT in female may be due to higher incidence of peritrochanteric fractures in elderly female. However these differences are not statistically significant.

Incidence of DVT in our study is very low as compared to reports in the west, which is up to 32-88%²⁵. This incidence is also lower than few of previous studies from Pacific island including Indian studies²¹⁻²⁴. A previous study by V Jain et al¹⁴ on Indian patients, found a low incidence of DVT. Only two of their 71 patients developed DVT. The results of our study are consistent with this previously published result. This study reconfirms the belief of most of previous studies done on Indian population that incidence of DVT is very low. As incidence of DVT in Indian patients is significantly lower than the Western population, criteria for thromboprophylaxis, which are mainly based on results of western studies, cannot be applied on Indian population. There must be separate guidelines for Indian ortho-

paedic patients.

No case of distal (calf) DVT detected in our study which is contrary to established literature, which suggest that calf vein DVT is commoner than proximal DVT^{18,20,27}. The only patient, who developed DVT in our study, is proximal DVT.

Preoperative Doppler ultrasonography prevents any false positive cases, as well as forewarns the surgeon regarding the increased risk of DVT and need for prophylaxis. In our study none of the patients of preoperative DVT diagnosed, which is consistent with the findings of Jain et al & YK Chan et al^{14,28}. Despite of this it is prudent to do preoperative Doppler ultrasonography to detect any pre-existing DVT.

As the coagulation process is very complex, it is very difficult to explain the difference in incidences between our findings & those reported by western literature. The differential incidence of occurrence of a particular disease in various ethnic groups is often attributed to presence or absence of multiple acquired and genetic traits. The genetic traits that may be possible explanations for this reduced incidence of DVT in Asian population include-

➤ GENETIC TRAITS –**a) Lesser prevalence of Factor V Leiden**

Its prevalence in Europeans is 4.4% while in Asians is 0.6%. Factor V Leiden was not found in any of 1600 chromosomes from South east Asia²⁹⁻³¹. These large difference in prevalence of factor v Leiden in different ethnic groups may be a strong reason for differences of DVT incidence in various ethnic population.

b) Low prevalence of Hyperhomocysteinemia

According to Lim YK et al³³ prevalence of hyperhomocysteinemia in elderly Asian population is 52.3% which is lower than western population (69.8%). Hyperhomocysteinemia is a risk factor for DVT³¹⁻³³. These may be another possible reason for these ethnic difference of incidence of DVT.

c) Lower prevalence of Activated Protein C Resistance

Prevalence of activated protein c resistance is low in Asian population²⁹.

Acquired traits that are thought to be risk factors for development of DVT and have been found to be less prevalent in Asians include----

a) Dietary habits

Differences in dietary habits between Indian diet (more starch & fibres) and western diet (more fats) may be associated factor for differences in incidences of DVT. However no study shows a direct positive correlation between dietary habit & DVT yet. In our study 20 patients were non-vegetarian while 82 patients were vegetarian.

b) Life style and demographic profile

Differences in life style & demographic profile of various ethnic groups & nation may be another associated factor for differences in incidences of DVT.

c) Obesity

Many studies suggest obesity as an independent risk factor for DVT^{20, 27, 34}. In our study most of the patients were thin built. These may be a variable that accounts for ethnic differences, as the incidence of obesity is more in western population as compared to Indian population.

Determining the risk factors for development of DVT is important as this may help clinicians to identify the patients at risk and give them prophylaxis appropriately. There are various studies to determine the risk factors for DVT in high risk orthopaedic surgery patients in the West. Based on the findings from these studies we evaluated many factors for their role in occurrence of DVT.

Old age is considered as an independent risk factor for DVT. Borow et al³⁵ found an increasing incidence of thrombosis with greater age. In our study we included patients with age 60 yrs or more to know the incidences of DVT especially in these high risk groups. Stulberg et al²⁰, Kim et al²⁷ & Dhillon et al²¹ in their studies found no correlation with greater age. In our study the patient who developed DVT was 65 yr old. Because of very low incidence in our study it is not possible to comment upon any correlation with age, but even if we are not finding positive cases in such a high risk population then it is very difficult to consider old age as a risk factor. Mean age of our study population was 65.5 years, as we included patients of more than 60 years, similar to most of previous studies.^{14, 34, 36} Even those studies, who included all age group patients, shows more incidence in elderly population group that is around 80 years of age.^{18, 33}

Most common surgery in our series was DHS (50%) followed by hemiarthroplasty (39%), Proximal femoral nail (7.8%) and THR (3%). According to literature, incidence of DVT is more with DHS followed by hemiarthroplasty, among surgeries for proximal femur fracture.^{26, 33} Overall incidence is highest with Total knee arthroplasty followed by THR and trauma surgeries of lower limb.^{21, 23} In our study the patient developed DVT undergone PFN for fracture of subtrochanteric femur.

Evarts et al³⁷ reported a higher incidence of DVT in patients who had hypertension. In our series the patient who developed DVT was normotensive and none of the 39 hypertensive patients develop DVT. This observation is consistent with the results of Kim et al.²⁷ there for we conclude that hypertension is probably not a contributing factor.

It has been suggested that the incidence of thrombosis is lower after surgery under spinal anaesthesia as compared with general anaesthesia.³⁸⁻⁴⁰ All the operation in our study is done in regional block (spinal + epidural). So comparison could not be done with general anaesthesia in our study.

Literature suggest that accuracy of clinical manifestations in diagnosis of DVT is less than 50%.^{20-23,27,40,41} In contrary to above studies Nathan et al³⁶ and Sharma et al²⁶ showed 100% positive predictive value of clinical manifestations. In our study the patient who developed DVT showed clinical manifestation at 1month of postoperative period, while 12 patients who developed more than 2 signs & symptoms of DVT found negative on duplex scan.

Sharma et al²⁶ in their study reported significant correlation between period of postoperative immobilization more than 4 days and incidence of DVT, as 90% of their positive cases were immobilized for more than 4days, which is further supported by V Bagaria et al³⁴ and Nagi et al⁴⁰. In our study postoperative physiotherapy of all the patients done according to routine protocol of our institution. Patients of total & hemiarthroplasty usually mobilized within 3 days, while ambulation of patients of DHS and PFN, usually not allowed for 4-6 weeks, though static and dynamic physi-

otherapy of affected limb started within 48 hours. Despite of delayed mobilization of patients of DHS and PFN incidence of DVT, even in this group of patients (1 out of 59) is very low.

Similar to most of previous studies (Kim et al²⁷) we found no correlation between amount of intraoperative blood loss & incidence of DVT. In our study DVT developed in patient who undergone PFN fixation.

As per Sikorski et al¹ maximum incidence of DVT occurs in first week of surgery, same results shown by YK Chan²⁸ and Sharma et al²⁶, these may be due to presence of hypercoagulable state during perioperative period. But in our study DVT detected at 1 months post operative period.

Sedentary life style has been considered as a risk factor for DVT in many of previous studies.²⁸ We included patients of more than 60 years in our study so life style of them is usually sedentary, despite of it incidence of DVT is very low. Most of our study population belongs to low socio-economic labour class among males and housewives among females.

Borow and Goldson³⁵ showed linear relationship between length of operation and DVT. In our study average duration of surgery was 115 minutes & duration of surgery in patient who developed DVT was 120 minutes. These suggest that there is no significant relationship, which is consistent with the findings other studies.^{21,27,36,40}

None of the patient shows signs and symptoms suggestive of pulmonary embolism in our study. These reflect towards an important conclusion that rate of symptomatic pulmonary embolism is very low.

In view of results of our study & most of previous studies we conclude that, it is not cost effective to advice thromboprophylaxis in patients undergoing hip surgery routinely in India and need of thromboprophylaxis in Indian patients should be individualized according to presence of risk factors.

Major risk factors, found to be significant in various studies were postop immobilization more than 72 hours, hypertension, general anaesthesia, smoking and sedentary life style. Because of very low incidence and relatively small study size in our study, evaluation of various risk factors proposed for etiology of DVT cannot be done.

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