

## Identification of Prevalence of Deep Vein Thrombosis in High Risk Patients Using D-Dimer and Duplex Scan

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### Abstract

**Introduction:** Deep vein thrombosis (DVT) is a potentially dangerous condition that can lead to morbidity and mortality. It is often difficult to diagnose and may be lethal when allowed to progress. The true incidence of DVT is unknown and probably underestimated as many are clinically silent and present with nonspecific signs and symptoms. Though there are ample of studies about DVT in literature but very few studies are from India. We sought to study a cost effective clinical model for diagnosis and exclusion of DVT in symptomatic patients using D-dimer and duplex scan.

**Methods:** A prospective study of patients in high risk group for DVT without evidences of clinical thrombosis was carried out. Total 80 patients included in the study based on the Caprini stratification score and well are scoring system. The patients who already had a proven DVT and the patients who were receiving thromboprophylaxis were excluded. All the patients in the high and highest risk score underwent D-Dimer assay either in the post-operative period or in ICU. All these patients also underwent color duplex scan study to see for any evidence of DVT.

**Results:** In this study, we found incidence of DVT in 6 cases out of 80 high risk patients. Study design had maximum 90% abdominal cases followed by 10 % orthopedic. Total 40 (50%) cases were of malignancy and rest 50% were benign cases. None had past history of DVT or family history. Regarding illness, most of patients were suffering from periampullary carcinoma (27.5%) followed by intestinal obstruction (15%) and in stomach malignancy (10%). All DVT proved cases had Caprini score of 5 or more (highest risk group) and Wells score of  $\geq 3$  (high risk group). Regarding D dimer concerned the patient who showed DVT have D dimer value  $\geq 0.3$ mg/L. Out of DVT cases distal thrombus were seen in 66.67% patients involving popliteal veins and 33.33% proximal thrombus extension seen in iliac and common femoral vein. None developed pulmonary embolism.

**Discussion:** Thus in our setting, although many hospitalized medically-ill patients had risk factors for DVT, the absolute risk of DVT was low compared to the Caucasian population. In this study, we found 7.5% incidence of DVT in high risk patients. More studies from India are required to confirm our findings. None developed pulmonary embolism.

**Key words:** Deep venous thrombosis, High risk patients, Capirini score, Wells score, D-dimer, Duplex scan

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### Introduction

Deep vein thrombosis (DVT) is a potentially dangerous condition that can lead to preventable morbidity and mortality [1-4]. Lower extremity deep vein thrombosis has

an estimated annual incidence of approximately 5 per 10,000 in general population [2]. Typical progression of DVT starts from distal segments like below knee region but rapid progression proximally with subsequent pulmonary embolism are frequently observed in course of the disease [2,3]. About 50-60 % of untreated DVT may progress to pulmonary embolism with death rate of 25-30% [6]. Advanced age, cancer, immunosuppression, cardiovascular diseases may lead to increased mortality in DVT.

It is often difficult to diagnose and may be lethal when allowed to progress in cases with no or improper intervention. The true incidence of DVT is unknown and probably underestimated as many are clinically silent and present with nonspecific signs and symptoms. Though there are studies about DVT in the west but very few studies are from India [7]. We sought to study a cost effective clinical model for diagnosis and exclusion of DVT in symptomatic patients using D-dimer and duplex scan.

### Material & Methods

A prospective study of patients with high risk groups for DVT without evidences of clinical thrombosis was carried out in the Department of General Surgery, Sir Sunderlal Hospital, Banaras Hindu University, and Varanasi (U.P.) from July 2011 to July 2014. A written informed consent was obtained from all patients participating in the study. Patient's identification data followed by detailed history related to symptoms and their duration, presence or absence of risk factors for DVT, past history of DVT or any other vascular disease in family, comorbidity, trauma, surgery, malignancy, drug intake

including a detailed examination of the lower limbs for signs of DVT was performed.

Total 80 patients with high and highest risk were enrolled in the study based on the Caprini stratification score and Well's scoring system which was done in all patients. The patients who already had a proven DVT and those who were receiving thromboprophylaxis were excluded. All the patients in the high and highest risk score underwent D-Dimer assay either in the post-operative period after 48 hours or in ICU. D-Dimer assay was done using NycoCard D-Dimer single test reader II

The test was based on immunometric flow through principle. The cut off level was taken as 0.3 mg/L. All these patients also underwent color duplex scan study to see for any evidence of DVT. For Duplex evaluation patients were examined using Toshiba xario style ultrasound. Examination was done in supine position with the leg extended 5-8 MHZ linear or 3-5 MHZ curvilinear transducer were used for each examination depending on the degree of leg swelling and patients habitus. Venous compressibility, intraluminal echoes, venous flow characteristics and luminal color filling characteristic were evaluated. Finally it was analyzed, how many patients of higher risk group according to stratification score really developed evidence of DVT.

### Results

A prospective study of 80 high risk patients prone to develop DVT was analyzed. Study design had maximum abdominal cases 72(90%) followed by 5(6.25%) orthopaedic cases. On analysis, out of 80 high risk patients, only 6 developed DVT (Table 1).

**Table 1. Distribution of cases according to colour Doppler study.**

Colour Doppler study	No. Of Cases(80)	Percent
Normal	74	92.5
DVT Positive	6	7.5

All patients had symptom of prolonged immobilization, (Table 2) followed by malignant condition seen in 40(50%), smoking in 33(41.2%) and swelling lower limb in 22 (27.5%)

**Table 2. Distribution of cases according to symptoms of the patients.**

Symptoms	No. of Cases	Percent
Immobilization	80	100
Limb Pain	7	8.8
Swelling lower limb	22	27.5
Painful walking	7	8.8
History Of DVT	0	0
Malignancy	40	50
Family history	0	0
Smoking	33	41.2
Alcohol	30	37.5

All 6 DVT cases had immobilization, limb pain, swelling lower limb and painful walking. None of the patient had past history of DVT or family history. Regarding illness of patients (Table 3) maximum number of cases 22 (27.5%) were suffering from periampullary carcinoma followed by intestinal obstruction 12 (15%) and 8(10%) stomach tumour and like condition.

On stratifying the patients (Table 4) according to Wells scoring system of 80 cases 71 (88.8%) had intermediate risk (1-2) whereas only 9 (11.2%) cases were high risk group ( $\geq 3$ ) but in DVT group, all 6 (100%) were high risk patients.

According to Caprini scoring 74 patients were Highest risk group ( $\geq 5$ ) and 6 were in high risk categories (risk score 3-4). All DVT proved cases had Caprini score of 5 or more.

**Table 3. Distribution of cases according to disease present.**

Disease	No. of Cases	Percent
Periampullary Carcinoma	22	27.5
Intestinal Obstruction	12	15
Stomach tumour and like conditions	8	10
GI Perforation	7	8.8
Carcinoma Gallbladder	7	8.8
Colorectal Carcinoma	5	6.2
Acute cholangitis choledocholithiasis	3	3.75
Fracture shaft of femur	2	2.5
Fracture tibia Rt. Lower limb	2	2.5
Hydatid cyst/pyoperitoneum with end ileostomy	2	2.5
Fracture tibia and fibula Rt. Lower limb	1	1.25
Acute necrotizing pancreatitis	1	1.25
End ileostomy with jejuno-colic Fistula	1	1.25
Gossypiboma	1	1.25
Head injury/seizure disorder	1	1.25
Infracolic aortic aneurysm	1	1.25
Malignant melanoma foot	1	1.25
Renal cell carcinoma	1	1.25
Tropical splenomegaly	1	1.25

**Table 4. Distribution of cases according to Wells score.**

Wells Score	No. of Cases(80)	Percent
0	None	
1-2	71	88.8
$\geq 3$	9	11.2

**Table 5. Distribution of cases according to D-dimer assay.**

D-dimer mg/L	DVT Cases(6)	Normal Study(74)
<0.3	0	21
$\geq 0.3$	6	53

**Table 6. Distribution of DVT patients according to site of thrombus.**

Site of Thrombosis				No. of cases	Percent	
Proximal	Division	No. of Cases	Percent	2	33.33	
	Lt. CFV thrombus /Rt. SFV and DFV thrombus		1			16.67
	Thrombus Lt. iliac vein		1			16.67
Extension from Common iliac to Popliteal vein.				2	33.33	
Extension to Popliteal vein and Great Saphenous vein				2	33.33	

Regarding risk factors for developing DVT is concerned all patients had prolonged immobilization as risk factor followed by prolonged surgery and acute infection seen in 5 (83.33%) cases and 3(33.33%) cases respectively. All DVT patients were high and highest risk group according to wells score and Caprini score system respectively.

On D-dimer assay (Table 5), out of 74 non DVT patients 21(28.38%) had D-dimer value <0.3mg/L while 53 (71.62%) had D-dimer value of  $\geq 0.3$ mg/L. All 6 DVT cases (7.5%) were having D dimer value  $\geq 0.3$ mg/L.

Distal thrombus (Table 6) was seen in 4 (66.67%) patient involving popliteal veins and proximal in 2 cases (33.33%) extension in iliac and common femoral vein. None of the patient developed pulmonary embolism

## Discussion

It was found that despite the high proportion of risk factors for DVT, only a small proportion of high risk patients hospitalized for a medical-illness developed DVT. In western countries, the cumulative incidence of DVT among medical in-patients was found to be 10-20 per cent, and it was 10-80 per cent among critical care patients [8]. In a recent survey of hospitals from 32 countries worldwide, about 42 per cent of hospitalized medical patients were found to be at risk for venous thrombosis [9]. Jain *et al*, conducted a prospective study in post-surgical patients with total knee (26

patients) and hip arthroplasty (45 patients), and showed a very low incidence (2/71) of DVT [10]. Lee *et al.*, showed an overall incidence of confirmed DVT to be 17.46 per 10,000 admissions with 64% being non-surgical, non-trauma patients [11]. Pulmonary embolism was diagnosed in 14.9% of the study patients. In our study Wells scoring analysis revealed high risk groups (score  $\geq 3$ ) and Caprini scoring of  $\geq 9$  i.e. highest risk groups in all 6 DVT patients. All 6 DVT cases had D dimer value  $\geq 0.3$  mg/L.

As far as the incidence of DVT is concerned, most of the published studies from India, have reported a low incidence of DVT among hospitalized patients, 5 study revealed incidence  $\leq 10\%$  a few has reported incidence of  $\geq 20\%$  [12-19]. Although clinical signs and symptoms such as sudden onset dyspnea, chest pain, fever, limb swelling, tachycardia and tachypnea always have a high index of suspicion of DVT and pulmonary embolism, it is always recommended for investigations to confirm the thrombus. Wells established clinical predictions rule based on signs, symptoms and risk scores and classifying as low, moderate or high probability of DVT or PE which stands quite helpful before radiological investigations [20, 21].

According to Agarwal *et al.*, who carried a prospective study in orthopedic population found to have incidence of 60% [13].

However, all these studies were carried out on surgical or orthopaedic patients, and ours is the first attempt from India to find out the incidence of DVT in high risk patients having no thromboprophylaxis. In India maximum study has been done in orthopedic population only one done in surgical patient [12]. Presently Sharma *et al.*, did prospective study in 163 patients and found incidence of 3 % [15]. In our study we found 7.5% incidence of DVT in high risk DVT prone surgical patients. None of the patient developed pulmonary embolism. Thus in our setting, although many hospitalized medically-ill patients had risk factors for DVT, the absolute risk of DVT is low compared to the western population. The limitation of our study was that D-dimer and Doppler study was assumed to be diagnostic tests and venography which is considered gold standard for DVT could not be performed but most of the studies done on DVT assumed colour Doppler as diagnostic test. Further large studies from India are needed to confirm the findings of the present study.

### Authors' Contributions

AR and SKT drafted the manuscript and collected data. RCS, JS and AKK critically reviewed and finally drafted the manuscript.

### Ethical Consideration

This study was approved by the Institute Ethics committee of Institute of Medical Sciences, BHU, and Varanasi. The copy of approval is available with the authors.

### Conflict of Interests

The authors declare that there are no conflicts of interests.

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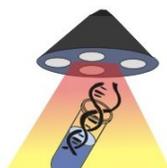
None declared

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