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Comparative Colour Doppler Study of Lower Limb Deep Venous Thrombosis in Diabetic and Non-Diabetic Patients with Review of Current Knowledge

Bhanupriya Singh[1*], Harsha Gara[1], Mridu Singh[2], Gaurav Raj[1], James Marak[1]

[1]Department of Radiodiagnosis, Dr. Ram Manohar Lohiya Institute Of Medical Sciences, Vibhuti Khand, Gomti Nagar, Lucknow, UP, India

[2]Department of Medicine, Dr. Ram Manohar Lohiya Institute Of Medical Sciences, Vibhuti Khand, Gomti Nagar, Lucknow, U.P., India

ABSTRACT

Introduction: The present study was aimed at comparing the clinical characteristics of DVT patients with and without DM. The risk of venous thromboembolism appears to be elevated in both type 1 and type 2 diabetic patients. Hyperinsulinaemia, which is often present in type 2 diabetes, has been shown to have a prothrombotic effect as well. Doppler ultrasonography serves as reliable, non-invasive and rapid investigation to detect DVT. Therefore helping in early detection of DVT in clinically suspected patients. On USG, findings in favor of DVT are non-compressible venous segment with loss of phasic flow on valsalva, shows absent colour flow if completely occlusive and lack of flow augmentation with calf squeeze and increased flow in superficial veins.

Objectives: To Assess and analyze the colour Doppler findings and to evaluate site, extent and stage of lower limb deep vein thrombosis of lower limb deep vein thrombosis in diabetic as well as non-diabetic patients.

Methods: Present observational comparative study was conducted in the Department of Radio-diagnosis of a tertiary level care.

Results: Total 36 patients were enrolled in this study of this 21 were diabetic and 15 were non-diabetic. The incidence of DVT was found to be 21% among diabetics and 15% among non-diabetics.

Conclusion: Incidence of deep vein thrombosis in diabetic and non-diabetic patients differs, however it is not statistically significant. Anatomic localization of the thrombus revealed that common iliac, external iliac, common femoral, femoral and popliteal vein involvement was more common among diabetics as compared to non-diabetics.

Key words: Diabetes mellitus, Non diabetes mellitus, Deep vein thrombosis, Venous thromboembolism

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Corresponding author: Bhanupriya Singh

e-mail✉: dr.singh.radiology@gmail.com

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INTRODUCTION

Deep vein thrombosis is a common clinical problem. Patient presents with swelling in the affected leg and a feeling of warmth in affected leg. Venous ultrasonography is recognized as an accurate and cost effective method for determining the presence of symptomatic deep vein thrombosis in lower extremities. The present study was aimed at comparing the clinical characteristics of DVT patients with and without DM. Venous thromboembolism shares many risk factors with atherosclerotic cardiovascular disease, including obesity, hypertension, dyslipidemia, smoking, and diabetes [1]. Diabetes mellitus (DM) has reached pandemic proportions across the globe and the burden is especially high in India. It is known that diabetes can contribute to the increase in cardiovascular events [2]. The risk of venous thromboembolism appears to be elevated in both type 1 and type 2 diabetic patients [3]. A 2-fold increase in the age-adjusted risk of venous thromboembolism in patients with diabetes identifies the diabetic population as being particularly vulnerable to initial venous thromboembolism and disease recurrence [4]. The majority of epidemiological studies demonstrate an increased risk of deep vein thrombosis and pulmonary embolism among diabetic patients [5–8]. Virchow proposed venous stasis, increased coagulability of the

blood, and damage to the vessel wall as three precipitants for venous thrombosis. Hyperinsulinemia, which is often present in type 2 diabetes, has been shown to have a prothrombotic effect as well. Increased thrombin generation and higher concentration of procoagulant cell-derived circulating micro particles in patients with type 2 diabetes suggest that hypercoagulability may play an important pathogenic role in the increased frequency of venous thromboembolism [9]. The increased rate of immobility and other medical comorbidities, such as heart failure [9,10], chronic lung disease [11,12], ischemic heart disease [1,3], and chronic kidney disease [13], results in a persistently elevated risk of recurrent venous thromboembolism after treatment of the initial event.

AIM AND OBJECTIVES

We compared incidence and colour Doppler findings of lower limb deep vein thrombosis in diabetic and non-diabetic patients. We also assessed and analyzed the colour Doppler findings of lower limb deep vein thrombosis in diabetic as well as non-diabetic patients. We used grey scale, colour Doppler, power Doppler to evaluate the site, extent and stage of lower limb deep vein thrombosis and to compare these colour Doppler findings in diabetic and non-diabetic patients. Special man oeuvres like compressibility, augmentation and Valsalva were used, while confirming the diagnosis of thrombosis.

MATERIAL AND METHODS

The present observational comparative study was conducted in the Department of Radio-diagnosis of a tertiary level care. All of these patients were explained the purpose of the study and an informed written consent was obtained before they were enrolled for the study. The study was approved by the Institutional Ethics Committee. USG was performed by 7- 12 MHZ probe with department ultrasonography machine on B-mode and colour Doppler mode.

RESULTS

General features: Non-compressible venous segment with loss of phasic flow on valsalva shows absent colour flow if completely occlusive and lack of flow augmentation with calf squeeze and increased flow in superficial veins.

Acute thrombus: Increased venous diameter with soft or deformable intraluminal material and have smooth surface.

Chronic post-thrombotic change: Normal or decreased venous diameter, rigid intraluminal material, irregular surface and synechiae or bands.

DISCUSSION

The present study compared the clinical spectrum of DVT patients with and without diabetes. The incidence of DVT was found to be 21% among diabetics and 15% among non-diabetics. Descriptive images and finding of diabetics are displayed in Figures 1 and 2, and for non-diabetics in Figures 3-5. The two groups were similar with respect to stage, extend and location of thrombus (Table 1).

Previous studies have demonstrated a 1.4 fold increase in the VTE risk in patients with diabetes [14-16]. The causative nature of this association remains undetermined, as majority of the studies are of observational design. A recent meta-analysis found that the association of VTE and DM was no longer significant when adjusted for co-morbid conditions [7]. Therefore, the observed association between diabetes and VTE appears to be mainly explained by diabetes-associated comorbid conditions. We found that the most common age group among DVT patients was 50 to 70 years of age and had predominantly male patients could be due to significantly high levels of homocysteine (thrombophilia marker) in males as compared to females as reported in an Indian study 14. Anatomic localization of the thrombus revealed that common iliac, external iliac, common femoral, femoral and popliteal vein involvement was more common among diabetics as compared to non-

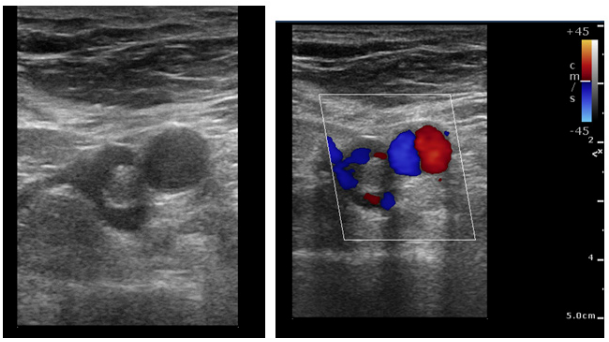

Figure 1: Transverse B-mode and color mode image showing partial, chronic thrombosis of common femoral vein, with accompanying normal common femoral artery in a diabetic patient.

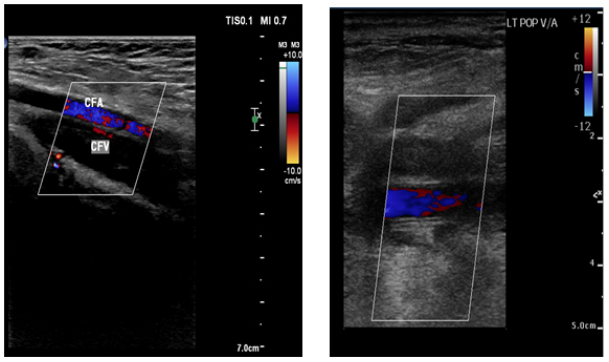

Figure 2: Longitudinal color mode image showing anechoic thrombus in common femoral vein, completely occluding it with associated increase in luminal caliber. Suggests acute complete thrombosis in a diabetic patient. Longitudinal color mode image showing no flow in popliteal vein and mildly echogenic lumen causing slightly increase in diameter of vein as compare to accompanying artery suggests sub-acute complete thrombosis in a diabetic patient.

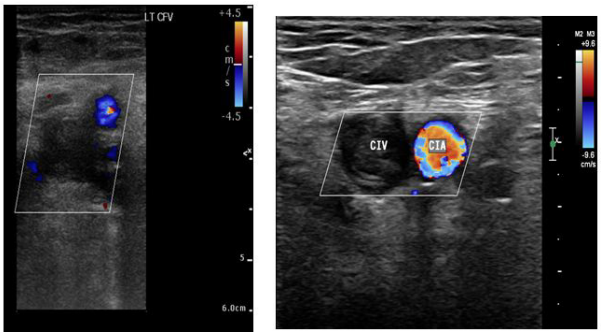

Figure 3: Transverse color mode image showing complete thrombosis of common femoral vein, accompanying common femoral artery shows normal flow in a non-diabetic patient. Transverse color mode image showing complete thrombosis of common iliac vein, accompanying common femoral artery shows normal flow in a non-diabetic patient.

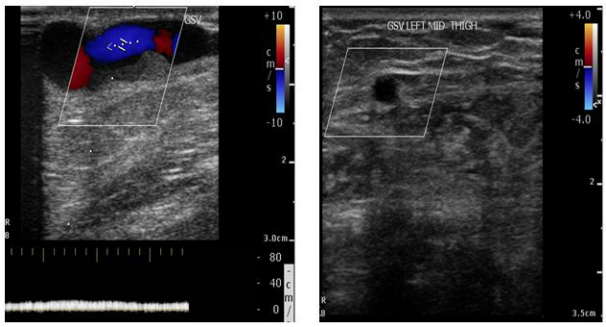

Figure 4: Longitudinal color mode image showing echogenic partially occluding thrombus of great saphenous vein in a non-diabetic patient. Transverse color mode image showing complete absent flow with anechoic lumen of great saphenous vein suggestive of completely occluding acute thrombus of great saphenous vein in a non-diabetic patient.

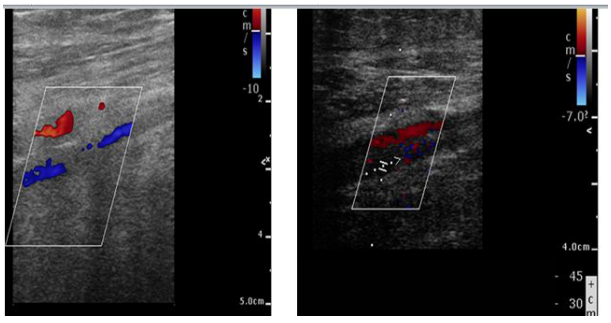

Figure 5: Longitudinal color mode image showing partial absent flow in lumen of posterior tibial vein suggestive of partial occluding thrombus in a non–diabetic patient. Longitudinal color mode image showing partial absent flow in lumen of posterior tibial vein suggestive of partial occluding thrombus in a non-diabetic patient.

diabetics (Table 2).

Great saphenous vein (superficial vein) involvement was also found to be significantly more common among diabetics as compared to non-diabetics (n = 8/21 vs 1/15; p value <0.05). Left lower limb was most commonly involved in our patients; similar findings were reported in previous studies demonstrated by Naqvi et al 15. Pain was found to be more common among non-DM patients in our study as compared to DM, similar results were reported by Piazza et al.7 Possible reason could be due to peripheral neuropathy component of DM. However

Table 1: Comparison and disease distribution of deep venous thrombosis.

Variables	Diabetes mellitus (n=21)	Non-diabetes mellitus (n=15)	p value
Age group (In years)			
≤ 30	1	0	0.88
>30 to 50	6	6	
>50 to 70	11	5	
>70	3	4	
Gender			
Females	6	4	0.99
Male	15	11	
Stage of thrombus			
Acute	6	4	0.89
Sub-acute	5	3	
Chronic	10	8	
Extent of thrombus			
Partial	7	4	0.75
Complete	14	11	
Location of thrombus			
Proximal	10	7	0.94
Distal	3	5	
Both proximal & distal	8	4	
Limbs involved			
Single right	5	5	0.18
Single left	15	9	
Bilateral	1	1	

Table 2: Distribution of patients according to the veins involved.

Veins	Diabetes mellitus (n=21)	Non-diabetes mellitus (n=15)	p value
Common ileac	10	2	<0.05
External ileac	8	1	<0.05
Common femoral	17	6	<0.05
Femoral	15	5	<0.05
Popliteal	18	9	<0.05
Posterior tibial	11	8	0.76
Anterior tibial	8	7	0.52
Peronial	4	2	0.41

Table 3: Distribution of patients according to their complications.

Complications	Diabetes mellitus (n=21)	Non-diabetes mellitus (n=15)	p value
Pain	5	12	<0.05
Edema	8	9	0.22

edema was seen similarly among all patients (Table 3). There are few limitations in our study. First, although Doppler ultrasonography is a non- invasive procedure and provides good accuracy for detecting DVT, the gold standard for detecting DVT is bilateral venography [17], which was not used in the present study. Second, the diagnosis of DVT can be affected by the level of expertise and years of experience of the sonologist. Therefore, the results of the present might not be applicable to other imaging centers. Second, data on numerous factors which might affect the incidence and severity of DVT like BMI, serum triglycerides and co-morbidites were not collected and analysed. Last, we did not analyse type-1 diabetes and type-2 diabetes separately due to small

sample size, although they can have different influences on venous thrombosis.

CONCLUSION

Incidence of deep vein thrombosis in diabetic and non-diabetic patients differs, however it is not statistically significant. Anatomic localization of the thrombus revealed that common iliac vein, common femoral, femoral vein and popliteal vein involvement was more common among diabetics as compared to non-diabetics. Distal veins like anterior tibial vein, posterior tibial vein and peroneal veins involvement were almost similar in DM and non-DM patients. There is no significant mean age difference between diabetic and non- diabetic in onset of DVT. Symptoms like pain were significant more in non- diabetic as compared to diabetic. Doppler ultrasonography serves as reliable, non-invasive and rapid investigation to detect DVT. Therefore early detecting of DVT in clinically suspected patients. Accurate anatomic description of thrombus which includes extends and location of the thrombus can help the clinician evaluate the course of thrombosis and optimize treatment.

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