Evaluation of deep vein thrombosis of lower limbs by using colour doppler ultra-sonography

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Abstract :

Background : Phlebography whichis "gold standard" of venous imaging is expensive, invasive, time consuming, painful, exposes to radiation, lacks repeatability, requires expertise to perform, interpretor reliably and associated with low but finite risk of contrast reaction and post-venographic phlebitis[1]. Colour Doppler is non invasive, repeatable, can be performed rapidly in the clinic, at patient's bedside or even at home and the results are available immediately. **Aim :** To Study the spectrum of findings on colour Doppler ultrasound in patients who presented with clinical symptoms and signs of deep venous thrombosis and to evaluate the distribution of thrombi in lower limb. **Materials & Methods :** It is prospective study. And was carried out on 60 patients with clinically suspected DVT. All suspected patients of DVT in DVVPF's Vikhe Patil Memorial Hospital were subjected to color Doppler examination using (3-12 MHz) linear array transducer. **Results:** Out of 60 cases, 47 cases showed the presence of thrombus and 13 cases were negative for thrombus.66.6% cases were males and out of those evidence of DVT was noted in 65.9% .The predominant involvement of DVT was seen in left lower limb 56.25%. Distribution of DVT wasleading in SFV, (85.1%) secondarily in popliteal vein (76.6%) and then calf veins (posterior tibial vein – 61.7%). **Conclusion :** Loss of compressibility is the most common finding in the patients of DVT. Localization & Evaluation of extent of thrombosis. Doppler examination in all the vein should be done in patients, to avoid missing the thrombus isolated to single vein.

Key words : Venous thrombosis, ultra-sonography, lower extremities, Deep Venous Thrombosis (DVT), colour doppler.

Introduction : DVT is a common clinical problem that complicates many medical and surgical disorders. Its also a most timely subject as it continues to be a elusive diagnosis. It has been demonstrated that colour doppler is as accurate as venography in the diagnosis of DVT, when used by experienced operators[2]. The time taken for examination is 15-20 minutes which is lot less than venography.

Group of patient with the high risk of developing DVT are the patients after a major surgery, trauma, prolonged immobilization such as in acute myocardial infarction, CCF, stroke and postoperative convalscence. Other risk factors to mention the few are neoplasms, pregnancy, oral contraceptive pills and hypercoaguable states[2].

Phlebography which is considered as the "gold standard" of venous imaging is expensive, invasive, time consuming, painful, exposes to radiation, lacks repeatability, requires expertise to perform and interpret reliably and associated with low but finite risk of contrast reaction and postvenographic phlebitis. This led to the development of several noninvasive techniques such as impedance plethysmography, air displacement plethysmography, thermography phlebography, iodine 125(1-125) fibrinogen scanning and Doppler ultrasonography[2].

The introduction of Doppler ultrasound technique has irrevocably altered the diagnosis and treatment of DVT. Thrombotic obstruction of the underlying vein distorts the venous flow pattern and these changes are readily detected by the Doppler instrument. There are no side effects to this technique. This technique is repeatable, non invasive, can be performed rapidly. It can be used in pregnant women, permits multiple views in

various positions of the leg and the study is safe, painless inexpensive. Venous system is evaluated for flow, phasicity, pliability and augmentation. The duplex scan can diagnose many thrombi at a stage when no major changes have occurred in the venous haemodynamics and the patient is asymptomatic or minimally symptomatic.[3]

Materials & Methods : It is prospective study. And was carried out on 60 patients with clinically suspected DVT.

All suspected patients of DVT in our tertiary care hospital were subjected to color Doppler examination using (3-12 MHz) linear array transducer.

Figure 1: Linear ray transducer

Results : A study of 60 patients with symptoms of lower extremities were included in this study. Following observation were made.

Table – 1 : Age Distribution

Age Group (in years)	Cases with suspected DVT (n = 60)		Cases shown evidence of DVT (n = 47)		Rate of evidence of DVT against suspected (%)
	No.	Percentage	No.	Percentage	
21 – 30	9	15	7	14.9	77.77
31 – 40	16	26.6	15	31.9	93.75
41 – 50	10	16.6	6	12.8	60
51 – 60	18	30	14	29.8	77.77
61 – 70	4	6.6	3	6.4	75
71 – 80	3	5	2	4.2	66.66
Total	60	100	47	100	

Age of diagnosed patients of DVT ranged from 21 to 79 yrs. 55.4% patients were older than 40 yrs of age. The mean age of cases shown to have DVT is ≈46 yrs.

Table – 2 : Sex Distribution

Sex	Cases with suspected DVT (n = 60)		Cases shown evidence of DVT (n = 47)	
	Patient no.	Per-centage	Patient no.	Per-centage
Male	40	66.6	32	80
Female	20	33.3	15	75
Total	60			

In this study Of 60 patients 66% were males and 34% were females.

Table –3 : Type of involvement in study population with evidence of DVT on Doppler ultrasonography

Age	No. of cases	% of cases
Unilateral	46	97.87
Bilateral	1	2.13
Total	**47**	**100**

This study showed unilateral involment in patients are common (97.87%)

Figure 2: Normal SFJ showing normal flow on doppler

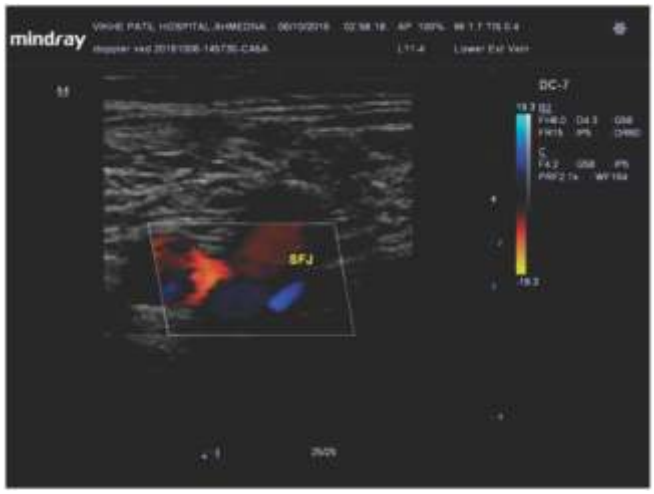


Table – 4 : Distribution of thrombi in right and left limb in study population with evidence of DVT onDopperUltrasonography

	No. of extremities Involved	Percentage (%) of extremities involved
Right lower extremity	21	43.75
Left lower extremity	27	56.25

1 case being showing bilateral involvement, total number of extremities shown evidence of thrombosis are 48.
Left lower extremity predominance was noted in our study.

Figure 3 : Normal GSV. No thrombosis noted. Compressible in its entire course.

Figure 4 : Normal venous flow in Superficial Femoral Vein.

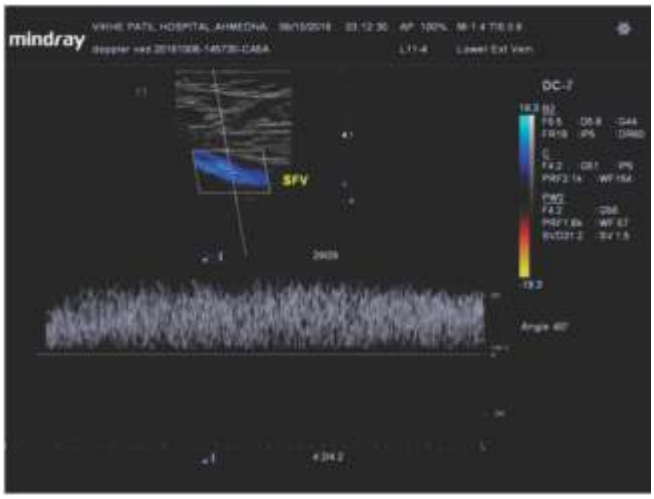
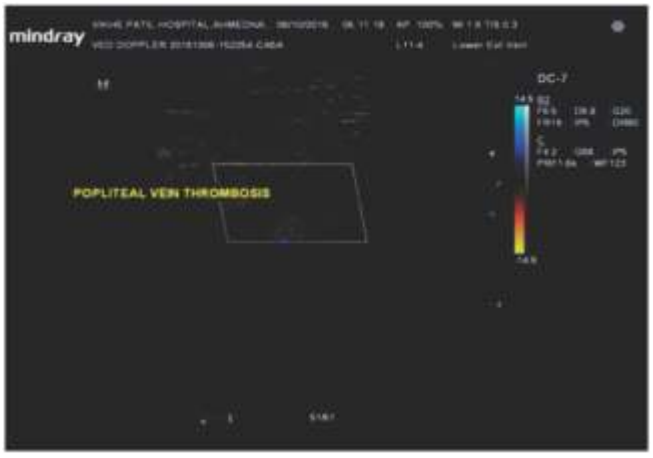


Table – 5 : Anatomic distribution of thrombi in study population with evidence of DVT on DopplerUltrasonography

	CFV	SFV	PV	PT	AT	PER	CIV	EIV	SVS
No. of cases Showing involvement	26	40	36	29	21	18	5	11	6
Percentage of cases showing involvement	55.3	85.1	76.6	61.7	44.7	39.3	10.6	23.4	12.8

leading distribution of thrombi was seen in SFV, (85.1%) secondarily in popliteal vein (76.6%) and then calf veins (posterior tibial vein – 61.7%).

Figure 5 : Thrombosed popliteal Vein. Non-compressible, not taking colour on Doppler.



Discussion : The diagnosis of deep vein thrombosis has always been difficult and problematic. The management of patients with clinical diagnosis of DVT in the lower extremity needs to identify the presence of thrombus, its nature, location and extent.

The present study was performed with the objective of assessing the role of colour Doppler USG in the diagnosis of DVT of lower extremity. It included detection and assessment of spectrum of findings of DVT by using colour Doppler ultrasonography. Our technique involves a complete survey of all major deep veins and superficial veins of the lower limb.

Amongst the total 60 cases studied for suspected DVT of lower limbs, 47cases showed the presence of thrombus. 13 patients did not show the presence of DVT even after clinical suspicion .

Age : Age of diagnosed patients of DVT ranged from 21 to 79 yrs. 55.4% patients were older than 40 yrs of age. The mean age of cases shown to have DVT is ≈46 yrs.

Sex : Majority of patients were males(66.6%) ,of which 80% showed presence of DVT. Female subjects were 33.3%, and presence of DVT was 75%.

Type of involvement : In this study, 46 cases showed the presence of DVT in the suspected limb with 1 case showing bilateral involvement. This study showed unilateral involvement in patients are common (97.87%). This correlates with the data published by Sheiman RG et al[4] in 1995 who indicated a low incidence of thrombus in contralateral extremity.

Distribution of thrombi : In 56.25% of cases with evidence of DVT on colour Doppler USG the thrombus was localised to left limb, while in 43.75% of cases, thrombosis was localised to right limb.

Localisation and extent of thrombosis : In the present study, leading distribution of thrombi was seen in SFV, (85.1%) secondarily in popliteal vein (76.6%) and then calf veins (posterior tibial vein – 61.7%). The study by Hill SL et al [5] reported involvement of iliofemoral segment in 16% , CFV in 13% , SFV in 19% ,PV in 18 % , calf veins in 24% and superficial veins in 11%.

The distribution of thrombi in present study is 55.3 % in the CFV, 85.1% in SFV, 76.6 % in the popliteal vein, 61.7% in posterior tibial vein, 44.7% in anterior tibial vein, 39.3% in peroneal vein, 10.6% in common iliac vein, 23.4 % in external iliac vein, and 12.8% in the superficial veins.

In our study, DVT isolated to single vein is uncommon. Hence Doppler examination in all the vein should be done in patients, in order to reduce examination time and also to avoid missing the thrombus isolated to single vein.

Loss of compressibility : Loss of compressibility is the most common finding in the patients of DVT. In this study all the patients who were positive for DVT shown the loss of compressibility. This is in correlation with the study by Wright DJ et al [6] in 1990 who had stated that, it is difficult to demonstrate the compressibility of the vein due to thick muscular structure as in adductor canal.

Conclusion : In cases of DVT clinical diagnosis is not always reliable due to subjectiveness of the clinician as we seen in this study. Hence a technique which is objective. Phlebography can be employed for this purpose; but it is expensive, time consuming, painful and pose a small but definite hazard of contrast reaction. Hence, non-invasive, accurate, easily repeatable and cost effective techniques like colourdoppler which are easily available are used.

In the present study evaluation of 60 patients with clinical suspicion of DVT of the lower limbs was carried out, colour Doppler USG was of immense utility in following respects:

1. Diagnosis of DVT of lower limbs in patients with symptoms suggesting it.
2. Loss of compressibility is the most common finding in the patients of DVT.
3. Accurate clot localization in cases with diagnosis of DVT of lower limbs.

4. Localization &Evaluation of extent of thrombosis. Doppler examination in all the vein should be done in patients, in order to reduce examination time and also to avoid missing the thrombus isolated to single vein.

Abbreviations

AT - Anterior Tibial

CCF - congestive cardiac failure

CFV - Commen Femoral Vein

CIV - Common iliac vein

DVT - Deep Venous Thrombosis

EIV - External iliac vein

PT - Posterior tibial

PV - Popliteal Vein

PER - Peroneal vein

SFV - Superficial Femoral Vein

SVS - Superficial venous system

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