



**A CROSS SECTIONAL STUDY TO EVALUATE THE ROLE OF COLOUR DOPPLER SONOGRAPHY IMAGING IN CLINICALLY SUSPECTED PATIENTS WITH LOWER EXTREMITY DEEP VEIN THROMBOSIS**

**Dr. Rahul Kumar\***

Junior Resident, Department of Radio-diagnosis, SRMS IMS, Bareilly.  
\*Corresponding Author

**Dr. Neeraj Prajapati**

Professor, Department of Radio-diagnosis. , SRMS IMS, Bareilly.

**Dr. Chandan Yadav**

Senior Resident, Department of Radio-diagnosis, SRMS IMS, Bareilly.

**ABSTRACT**

**AIMS & OBJECTIVES-** The aim of the study was to evaluate by duplex sonography normal appearance of deep veins of lower extremity and appearance of thrombus in clinically suspected patients of DVT.

**MATERIALS AND METHOD-** This study was conducted on Siemens Acuson X-700 machine in the department of Radiodiagnosis at SRMSIMS Bareilly in 50 patients presented with clinical suspicion of leg pain. They were evaluated by color duplex sonography in Department of Radiodiagnosis.

**RESULTS-** On color duplex sonography 42 patients were detected and confirmed for DVT .On sonography sensitivity for test was 82%.

**DISCUSSION-** The diagnosis of DVT has always been troublesome. The characteristics signs and symptoms that can be associated with DVT and the fact that many thrombi are having no symptoms make it exceedingly difficult to rely on the clinical diagnosis. The management of patients with clinical presentation of DVT in the lower extremity needs precise diagnosis of thrombus, its nature, location and extent.

**CONCLUSION-** It is conclusively accepted that Color Doppler USG is non invasive, efficient, easily, repeatable, widely available and sensitive diagnostic tool in diagnosis of lower limb DVT.

**KEYWORDS :**

**INTRODUCTION**

Deep vein thrombosis is the cause of significant morbidity and mortality. It is clotting of the blood in vein. The most common site of a deep vein thrombosis is in a deep leg vein. Complications occur when a clot embolize and cause subsequent pulmonary embolism.

Ascending venography was the reference standard for the diagnosis of DVT, but it is invasive and associated with adverse effects. New assays for d-dimer is playing a growing role. Consequently, colour duplex sonography has become the routine initial evaluation of DVT.

The majority of the thrombi in asymptomatic high-risk patients are in the calf veins and are often non-occlusive. Ultrasonography has improved the detection of DVT in high-risk patients following surgery.

The aim of the present study is to prove the sensitivity of colour duplex sonography in the evaluation of deep vein thrombosis.

**AIM AND OBJECTIVES**

- To describe the normal appearance of the deep veins of the lower extremity on color duplex sonography.
- To describe the color duplex appearance of thrombus in the deep venous system of lower extremity in clinically suspected patients and to prove the sensitivity of color doppler sonography in the evaluation of DVT

**MATERIAL AND METHODS**

The present study was conducted from November 2018 to May 2020 in the department of Radiodiagnosis.

**Study design -** Prospective study

**SAMPLE SIZE –** 50 Patients

**Study Location –** This was a tertiary care hospital based study done in the department of Radio diagnosis at SRMSIMS hospital, Bareilly, India.

**Sample size –** Consecutive 50 patients who had symptoms of DVT during study period

**Subjects and Selection method –**

The study population was draw from patient who were referred to department of Radio diagnosis in collaboration with all departments at SRMSIMS hospital, Bareilly. The research procedure following in obedience to the approved ethical committee standards of SRMSIMS Bareilly, Ethical committee (Human).

**Study tool -**

- Predesigned proforma for data collection
- Informed consent form
- Ultrasound equipment for sonography.

**INCLUSION CRITERIA-**

The patients admitted to the hospital with symptoms and signs like pain, swelling of lower limbs, shortness of breath, warmth and in duration of lower limbs, chest pain and Homan's sign (pain in the calf region on forced dorsiflexion of foot), Moses' sign ( pain with calf compression against the tibia ) etc which are suggestive of deep vein thrombosis, were subjected to color duplex sonography.

**EXCLUSION CRITERIA -**

The patients admitted to the hospital with symptoms and signs of Burger's disease, Reynaud's disease, Lymphadenopathy cellulitis, and hematoma

**RESULTS**

- A Study of 50 patients with symptoms of lower limb DVT were included in this analysis.

**Table.1-age Distribution**

AGE GROUP (in yrs)	Cases with Suspected Deep Vein Thrombosis		Cases shown evidence of Deep Vein Thrombosis		rate of evidence of DVT against suspected %
	Number	%	Number	%	
14-20	4	8.0	3	7.1	75.0
21-30	2	4.0	1	2.4	50.0
31-40	4	8.0	3	7.1	75.0
41-50	8	16.0	7	16.7	87.5
51-60	15	30.0	13	31.0	86.7
61-70	9	18.0	8	19.0	88.9

71-80	6	12.0	5	11.9	83.3
81-90	2	4.0	2	4.8	100.0
Total	50	100.0	42	100.0	84.0

Age of patients was in range of 14 to 86 years. Maximum 30.0% patients were found in age group 51-60 years accompanied by 16% in age group 41-5 yrs. The mean age of Cases with Suspected DVT was 53.9 ± 17.8 years and mean years of Cases shown evidence of DVT was 55.3 ± 17.3 year.

**Table.2- Gender Distribution**

Gender	Cases with Suspected Deep Vein Thrombosis		Cases shown evidence of Deep Vein Thrombosis	
	Number	%	Number	%
Male	25	50.0	21	50.0
Female	25	50.0	21	50.0
Total	50	100.0	42	100.0

- Out Of 50 patients 50 % were male and 50 % were females.

**Table.3- Distribution Of Cases With Complaints.**

Complaints	Cases with Suspected Deep Vein Thrombosis		Cases shown evidence of Deep Vein Thrombosis	
	Number	%	Number	%
PAIN AND SWELLING IN BOTH LL	4	8.0	0	0.0
PAIN AND SWELLING IN LEFT LL	24	48.0	23	54.8
PAIN AND SWELLING IN RIGHT LL	22	44.0	19	45.2
Total	50	100.0	42	100.0

- Maximum patients had complaint of pain & swelling in either right or left leg.

**Table 4 - Any Other Findings**

Any other findings	Number	%
SUBCUTANEOUS ODEMA	40	95.2

- Out of 50 patients 40(95.2%) had subcutaneous edema.

**Table 5 - Prior History Of Dvt**

Prior h/o DVT	Cases with Suspected Deep Vein Thrombosis		Cases shown evidence of Deep Vein Thrombosis	
	Number	%	Number	%
NO	47	94.0	39	92.9
YES	3	6.0	3	7.1
Total	50	100.0	42	100.0

- Out of 50 patients only 3(6.0%) had prior history of DVT.

**Table.6 - Predisposing Clinical Conditions**

Predisposing clinical conditions	Cases with Suspected DVT		Cases shown evidence of DVT	
	Number	%	Number	%
BEDRIDDEN	22	44.0	19	45.2
DIALYSIS	3	6.0	3	7.1
ICU/BEDRIDDE	2	4.0	1	2.4
K/C/O CKD	1	2.0	1	2.4
K/C/O DM, HTN	1	2.0	1	2.4
Not Known	21	42.0	17	40.5
Total	50	100.0	42	100.0

- According to distribution of predisposing clinical conditions BEDRIDDEN 44% was most common followed by not known 42%.

**Table.7 - Type Of Involvement In Study Population With Evidence Of Deep Vein Thrombosis On Doppler Ultrasonography.**

Type of Involvement	Number	%
BILATERAL	1	2.4

UNILATERAL	Number	%
UNILATERAL	41	97.6
Total	42	100.0

- Our study shows 41(97.6%) unilateral limb predominance.

**Table.8 - Extremity Involved**

Extremity involved	Number	%
BOTH LL	1	2.4
LEFT L.L	23	54.8
RIGHT L.L	18	42.9
Total	42	100.0

- Total cases of extremity shown evidence of thrombosis is 42. Left lower limb dominance was noted 54.8 % and right lower extremity predominance was noted 42.9 % and 1 case being showing bilateral involvement.

**Table.9 -Anatomic Distribution Of Thrombi In Study Population With Evidence Of Deep Vein Thrombosis On Doppler Ultrasonography.**

	CFV	SFV	PV	PT	AT	PER	CIV	EIV	SVS
No of cases shown involvement	33	35	32	3	3	3	5	8	13
Percent of cases shown involvement	78.6	83.3	76.2	7.1	7.1	7.1	11.9	19.0	31.0

- Leading distribution of thrombi was seen maximum (83.3%) in SFV accompanied by 78.6% CFV, 76.2% PV.

**Table.10 - Stage Of Involvement In Study Population With Evidence Of Deep Vein Thrombosis On Doppler Ultrasonography.**

Stage of involvement	Number	%
ACUTE	23	54.8
CHRONIC	19	45.2
Total	42	100.0

- In my study acute thrombosis (54.8%) prevalence was noted.

**Table.11 - Echogenicity Of Thrombus**

Echogenicity of thrombus	Number	%
ANECHOIC	13	31.0
HYPERECHOIC	23	54.8
ISOECHOIC	5	11.9
NAD	1	2.4
Total	42	100.0

- According to distribution of Echogenicity of thrombus hyperechoic was maximum 54.8 % followed by anechoic 31.0%.

**Table.12 - Pattern Of Involvement**

Pattern of involvement	Number	%
ISOLATED	1	2.4
MC	40	95.2
NO MC	1	2.4
Total	42	100.0

- Out of 50 patients 40(95.2%) of cases were seen of multiple contiguous involvement only 1(2.4%) of isolated.

**Table.13 - Any Other Condition Mimicking Dvt**

Any other condition mimicking DVT	Number	%
ATHEROSCLEROTIC CHANGE	0	0.0
MULTIPLE LYMPHNODES	9	21.4
PARTIAL THROMBOSIS	2	4.8
THROMBUS IN ARTERIAL LUMEN	1	2.4

- Multiple lymph nodes were found in 9(21.4%) of cases, partial thrombosis 2(4.8%) and thrombus in arterial lumen in 1(2.4%) of cases.

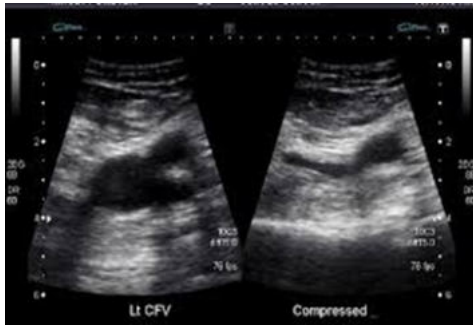


Figure-1- Normal deep veins showing compressibility on probe pressure

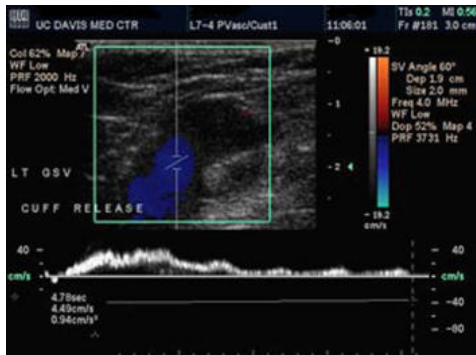


Figure-2- Normal respiratory phasicity of venous wave form

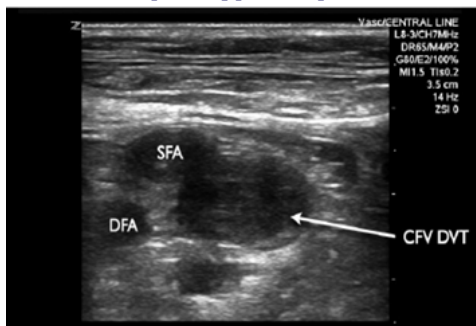


Figure-3- Anechoic thrombosis noted in CFV

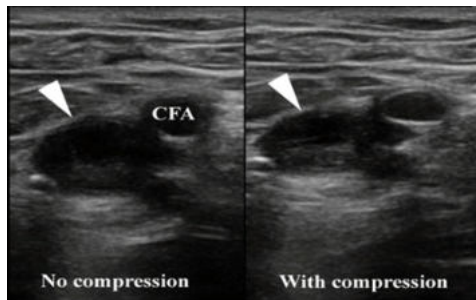


Figure-4- Image showing loss of compressibility on probe pressure

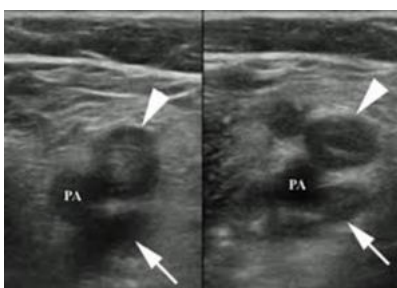


Figure-5- Image showing loss of compressibility on probe pressure and venous distension in Popliteal vein

**DISCUSSION**

The diagnostic of DVT has always been troublesome. The characteristics signs and symptoms that can be associated with DVT and the fact that many thrombi are having no symptoms, make it exceedingly difficult to rely on the clinical diagnosis. The management of patients with clinical presentation of DVT in the lower extremity needs to pinpoint the presence of thrombus, its nature, location and extent.

The current study was performed with the purpose of assessing the role of color Doppler USG in the diagnosis of deep vein thrombosis of lower extremity. It included detection and evaluation of variety of findings of DVT by using color Doppler ultrasonography. We deliberate the color flow detection in patients who presented with pain, edema or both of the lower extremities, pulmonary embolism and prior complaint of DVT. Our approach involves a complete inspection of all major deep veins and superficial veins of the lower limb.

Among the total 50 cases studied for suspected DVT of lower limbs, 42 cases showed the evidence of thrombus. In 8 patients, although there was clinical diagnosis of DVT of lower limbs, the color Doppler study shows no evidence of DVT.

The data shown by Sheiman RG et al<sup>79</sup> in 1995 and Strothman G<sup>80</sup> et al in 1995 suggest a low incidence of thrombus in opposite extremity. This supports the unneeded of examination in both sides of patients with unilateral extremity symptoms. However the inspection of both the lower extremities is advisable in patients with clinical signs or symptoms of pulmonary embolism, even though one extremity is symptomatic.

**CONCLUSION**

The clinical diagnosis of DVT is inaccurate in approximately half of the cases in which the disease is suspected. If diagnostic precision is to be improved and the appropriate therapy initiated, an equitable technique must be used to supplement the diagnosis. Although phlebography can be appoint for this objective; it is costly, time consuming, difficult and poses a small but certain hazard of contrast reaction. Because of these problems, non- invasive and semi- invasive tests for deep vein thrombosis have gained in popularity. As compared to other modalities like echo-Doppler, CECT and MR Venography, color Doppler is much cheaper, reasonably efficient and much more widely available.

It has been conclusively accepted that color Doppler USG is a noninvasive, efficient, easily repeatable, widely available and relatively sensitive in the diagnosis of lower limb DVT and also helps in providing valuable information of therapeutic importance and risk of pulmonary embolism.

**REFERENCES**

- 1) Fraser JD, Anderson DR. Deep venous thrombosis: recent advances and optimal investigation with US. Radiol 1999;211:9-24.
- 2) Hill SL, Holtzman GI. Selective use of the duplex scan in diagnosis of deep venous thrombosis. 1995;170:201-205.
- 3) Harold R, Hansen KJ. Expanded criteria for the diagnosis of deep venous thrombosis. Arch Surg 1984;119:1167-1170.
- 4) Effency DJ, Friedman MB, Gooding GAW. Iliofemoral venous thrombosis. Real time ultrasound diagnosis, normal criteria and clinical application. Radiol 1984;150:787-792.
- 5) Hull R, Hirsh J. Cost effectiveness of clinical diagnosis, venography and noninvasive testing in patients with symptomatic deep vein thrombosis. N Engl J Med 1981;304:1561-1567.
- 6) Ramchandani P, Soulen RL. Deep vein thrombosis: significant limitations of noninvasive tests. Radiology 1985;156:47-49.
- 7) Holden RW, Klatte EC. Efficacy of noninvasive modalities for the diagnosis of thrombophlebitis. Radiology 1981;141:63-66.
- 8) Dosick SM, Blakemore WS et al. The role of Doppler ultrasound in acute deep vein thrombosis. 1978;126:265-268.
- 9) Sumner DS, Lambeth A. Reliability of Doppler ultrasound in the diagnosis of acute venous thrombosis both above and below the knee. Am J Surg 1979;138:205-209.
- 10) Langsfeld M, Hershey FB. Duplex B-mode imaging for the diagnosis of deep venous thrombosis. Arch Surg 1987;122:587-591.

- 11) **Comerota AJ, Katz ML.** Venous duplex imaging : should it replace hemodynamic tests for deep venous thrombosis. *JVasc Surg* 1990;11:53-61.
- 12) **Roguin A. Christian Johann Doppler.** The man behind the effect. *The Br J Radiol* 2002;75:615-619.
- 13) **Talbot SR.** Use of real time imaging in identifying deep venous obstruction. A preliminary report. *Bruit* 1982;6:41-42.
- 14) **Killewich LA, Bedford GR, Beach KW, Strandess ED.** Diagnosis of venous thrombosis – A prospective comparing duplex scanning to contrast venography. *Circulation* 1989;79(4):811-814.
- 15) **Rose SC, Zweibel WJ, Nelson BD, Priest DL, Reading JC, Miller FJ.** Symptomatic lower extremity deep venous thrombosis : Accuracy, limitation, and role of color duplex flow imaging in diagnosis. *Radiol* 1990;175:639-644.