

Color Doppler Utility in Evaluation of Deep Vein Thrombosis Patients

Dr. Gaurangi Pawar^{1*} Dr. Deepak Patil² Dr. A. N. Kamble³

¹Research Scholar

²Research Scholar

³Associate Professor, Department of Radio Diagnosis, Jawaharlal Nehru Medical College Sawangi, Warda

Abstract – Background: Deep vein thrombosis (DVT) of both extremity limbs and pelvic veins is one of the most causes for the majority of death caused by pulmonary embolism. Most venous thrombi are asymptomatic. B-mode and color Doppler imaging is first line and non-invasive for early diagnosis of DVT to prevent complications and sequel of DVT.

Patients and methods: prospective cross sectional study of 45 patients, 33 patients male, 12 female, diagnosed clinically with DVT evaluated on Doppler and differentiated according to age thrombus as acute, sub-acute and chronic deep vein thrombosis

Results: Color Doppler flow imaging in 45 cases predominantly involving to third decade. In study, predominantly distribution of thrombus was found to be in thigh deep venous system (common femoral vein), followed by DVT below knee (popliteal vein).

Conclusion: Color Doppler is useful in evaluation of DVT in symptomatic and at risk patients and non-invasive first line method of investigation. It is helpful in evaluating the site, extent and stage of thrombus in bedside patients also. It is possible to access surrounding structures.

Keywords: duplex Doppler, Color Doppler venous examination, deep venous thrombosis, venous thromboembolism, Pulmonary embolism

INTRODUCTION

Thrombosis is the term refers to the formation of, from constituents of blood, of an abnormal mass within the vascular system. When this process occurs within the deep veins, it is referred to as deep vein thrombosis (DVT). The threat of deep venous thrombosis (DVT) and pulmonary embolism (PE) is a daily concern in intensive care unit (ICU), hospitalized and bedridden patients and is complication following major orthopaedic procedures, both emergent and elective. In bedridden patients. Venous thromboembolism is the condition after acute coronary syndrome and stroke²⁻³. Pulmonary embolism is the common cause of death.

Many medical and surgical disorders are complicated by DVT. The common signs of DVT are pain and swelling of affected venous system. It may cause structural damage to the valves of deep veins

developes into post phlebitic syndrome. Neoplasm's, pregnancy, oral contraceptive pills and hypercoaguable states are a few other risk factors of DVT

Early diagnosis of DVT is important to prevent unnecessary complications and deaths from pulmonary thromboEmbolism. In the early 1980s, B-mode sonography became the technical standard. Then color Doppler came into evolution. Colour Doppler ultrasound is a new technical development allowing simultaneous grey scale imaging and a dynamic colour flow vascular image⁵. The 'color' ability used to identify artery from vein.

In the last few years, conventional duplex scanning was method for diagnosis of thrombosis. Nowadays color Doppler scanning is most accurate, non-invasive mode of investigation for suspected DVT⁶. Venous duplex ultrasound combines two components to assess for DVT: B-mode or grey-scale imaging with

transducer compression maneuver utilizes real time imaging combined with a linear array of transmission beams to produce a two dimensional and duplex ultrasound image and Doppler evaluation consisting of color-flow Doppler imaging and spectral Doppler waveform analysis

Color Doppler can also be used to differentiate acute from chronic thrombus. It can show blocked or reduced flow of blood through narrow areas in the major arteries and also can reveal blood clots in deep vein thrombosis. And also useful evaluation of the extent of the thrombus, its age, and its attachment to the venous wall (partially or totally occlusive thrombus, attached or free floating thrombus) in both extremity, pelvic and neck deep venous system. Color Doppler technique can be performed bedside due to availability of portal ultrasound machinery and is valuable in bedridden, pregnant, amputated and immobilised patients after orthopaedic operations.

METHODS:

Source of data :-

The study was conducted in Acharya Vinoba Bhave Rural Hospital of Jawaharlal Medical College, Sawangi (meghe). The study subjects were Patients with the clinical suspicion of deep vein thrombosis

In this study, sample size of 45 patients presented with limb swelling, limb ulcers, pain and oedema irrespective of age and sex referred to radio-diagnosis department. After getting informed consent from patient and ethical clearance. Patient underwent history recording and color Doppler evaluation. The duration of study -1 year (2016-2017)

Procedure performed on USG machine (Hitachi arietas S70) equipped with a 12-18MHz real time high frequency probe

DEEP VEINS OF THE LIMB EXAMINED FOR:

1. Absent or reduced compression of deep veins on ultrasonography.
2. Loss of spontaneous flow on colour Doppler.
3. Loss of phasic variation with respiration.
4. Impaired or absent augmentation of blood flow on distal compression (distal compression will not be done in case of acute thrombus).

5. Appearance of vein and its lumen for internal static echoes, incomplete colour filling, expansion of the vein.

INCLUSION CRITERIA:

1. Clinically diagnosed patients with deep venous thrombosis.
2. Symptomatic patients of all age group (irrespective of age and sex) referred to the Radio-diagnosis department.

EXCLUSION CRITERIA:

1. Patients not willing to give written consent.
2. Patient undergoing any interventional treatment.
3. Post-operative and cast placed patients

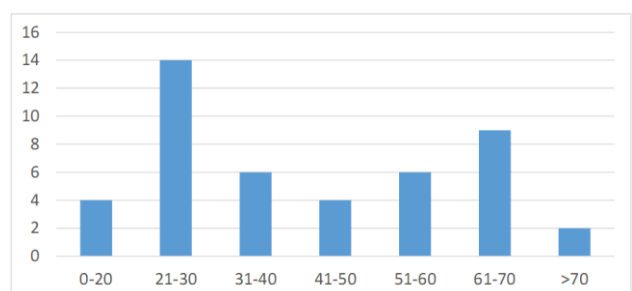
RESULT:

A prospective study was carried out on 45 patients of clinically diagnosed DVT on Venous color Doppler.

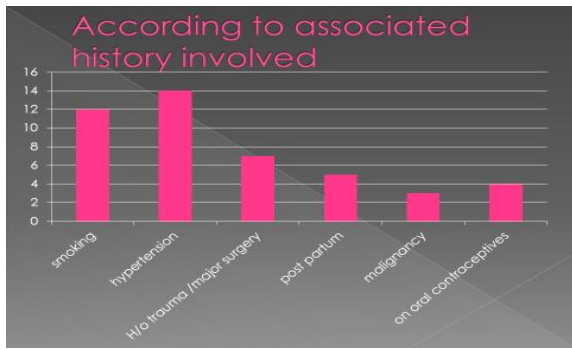
Analysis of cases of DVT done in terms of age and sex wise distribution, signs and symptoms, predisposing conditions, associated condition, anatomic distribution and stage of involvement of thrombus and pattern of involvement of veins.

Out of 45 patients of deep vein thrombosis, 33 patients affected are male and 12 are female most commonly involved are lower extremity deep veins followed by pelvic vein and least commonly involved are upper extremity and neck deep veins.

Peak age group affected is (21-30years) followed by second peak in (61-70 years)



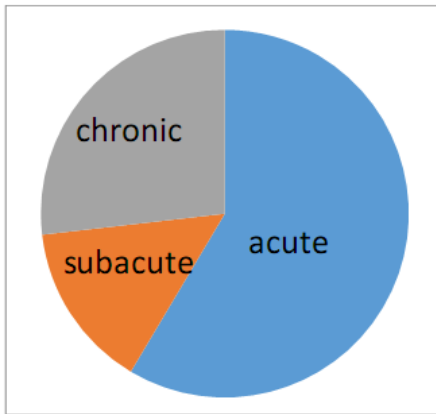
Patients with deep vein thrombosis most commonly had long standing of hypertension and history of smoking and presented with affected limb swelling, pain and ulcers over affected site



Out of 45 patients, most commonly diagnosed patients are with acute dvt followed by chronic and then with sub-acute dvt.

According to anatomical distribution

Out of 45 patients, most commonly affected deep veins are above the knee (common femoral) followed by deep veins below the knee (popliteal). Least commonly affected are deep veins of neck



Deep Vein Involved	Numbers
Inferior vena cava	8
External illiac vein	9
Common femoral/sup femoral	28
Popliteal vein	22
Anterior tibial vein	8
Posterial tibial vein	8
Axillary vein	2
Subclavian vein	2
Internal jugular vein	4

Criteria for Differentiation Acute and Chronic DVT on Ultrasound

ACUTE DVT	CHRONIC DVT
Anechoic/hypoechoic	Brightly echogenic
homogenous	heterogenous
Spongy &deformable	Rigid echotexture
Smooth borders	Irregular borders
Poorly attached/floating)	Well attached
Veins enlarged (if obstructed)	Vein contracted

According to grey scale and Color Doppler ultrasound findings

Color Doppler findings	Present	absent
Color flow	8 but reduced	33
Venous compressibility	22 but reduced	21
Complete occlusion (due to thrombus)	28	-
Incomplete occlusion (due to thrombus)	13	-

Transverse B mode Color Doppler image shows completely occlusive acute thrombus in common femoral vein. The diameter of venous lumen is increased as compared to arterial lumen and showing no spectra waveform



Figure 1

Longitudinal color Doppler and grey scale image shows normal flow in popliteal artery but absent flow in popliteal vein due to completely occlusive acute thrombus.

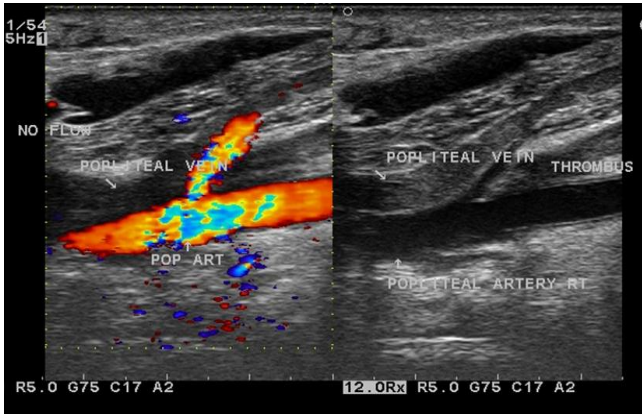


Figure 2

Transverse color Doppler image of axillary vein showing partially occlusive hypo echoic thrombus. Diameter of venous lumen is also increased.



Figure 3

Axial color Doppler image showing sub-acute thrombus in infrarenal inferior vena cava

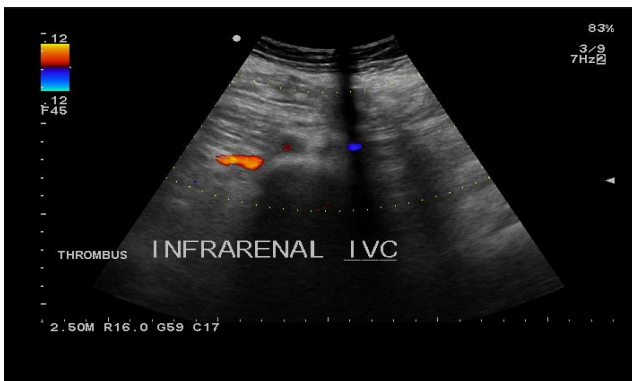


Figure 4

Longitudinal color Doppler image showing absent flow due to echogenic chronic thrombus in paired anterior tibial vein.



Figure 5

Axial color Doppler image showing absent flow in popliteal vein due to chronic thrombus. Diameter of vein is decreased as compared to artery. Thrombus is well attached to venous lumens.



Figure 6

Axial grey scale and color Doppler ultrasound image shows absent flow due to hypo echoic thrombus in great saphenous vein and common femoral vein. Diameter of veins also increased as compared artery.

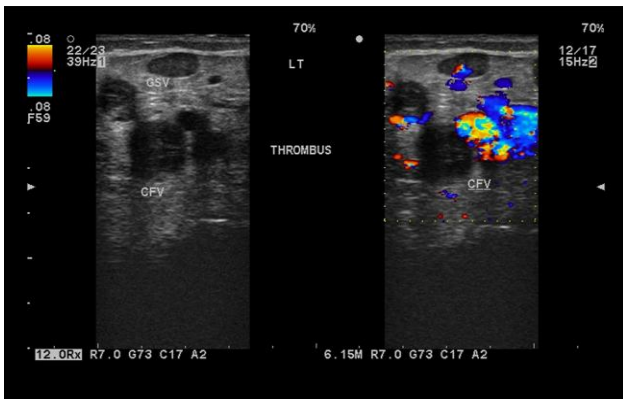


Figure 7

DISCUSSION:

As other modalities were not feasible due to being invasive and cost-effective, color Doppler ultrasound was right thought to select for diagnosis of deep venous thrombus and its nature. In our study, total of 45 cases of deep venous thrombosis were evaluated and obtained result were compared with other studies

In Mosheer et al study, popliteal vein being most common site affected and in our study deep veins of thigh (femoral veins) are most commonly involved with followed by popliteal vein.

According to O. Guneshwar et al deep vein thrombosis (DVT) in lower extremity, commonest age group between 41-50 years and there was male preponderance, in present study most commonly involved age group is between 21-30 years followed by 61-70 with maximum patients had history of smoking and elder age group gave history of long standing hypertension.

There was number of ultrasonographic findings combined with color Doppler are non-compressible veins, diameter of veins and echogenicity of thrombus varies with age of thrombus, absent color flow and spectral waveform at affected site.

Gita et. al. stated after comparing the other modalities that ultrasound is irreplaceable by advanced imaging techniques nanotechnology/biotechnology, molecular imaging and PET, CT venography and MRI.

According to present study, Color Doppler can be efficiently used for differentiation of acute, subacute and chronic DVT. It can be used in bedside emergencies and useful guide for interventional procedures i.e. thrombolysis for putting Intra-Venous filters.

CONCLUSION:

The study concludes that, Color Doppler is non-invasive and cost effective first line investigation of DVT as compared to other techniques such as ascending venography and d-dimer assay. Doppler scanning gives accurate and efficient diagnosis of venous thrombosis in addition displays alterations in adjacent structures, facilitating differential diagnosis with other conditions.

REFERENCES:

- Advanced imaging in acute and chronic deep vein thrombosis gita yashwantrao karande¹, sandeep s. hedgire², yadiel sanchez³, vinit baliyan⁴, vishala mishra⁴, suvrana ganguli⁵, anand m. prabhakar. nov 28, 2016.
- Bedside ultrasonography in deep vein thrombosis author: lars j grimm, md, mhs; chief editor: caroliner taylor, md updated: apr 20, 2015
- Colour flow duplex scanning in suspected acute deep vein thrombosis; experience with routine use n. labropoulos 1, M. Leon 1, E. Kalodiki ~, A. Ai Kutoubi 2, P. Chan ~ And A. N. Nicolaidis 1 (1995)
- Emeka Kesieme, Chinenye Kesieme, Nze Jebbin, Eshiobo Irekpita (2011). Deep vein Thrombosis: A Clinical Review, Andrew Dongol.
- G. M. Baxter, S. Mackechnie, P. (1990). Duffy clinical radiology color doppler ultrasound in deep venous thrombosis: a comparison with venography.
- Guillermo Fernandez-Canton*, A, Ignacio Lopez Vidaur A, Fernando Muñoz A, Miguel Angel Antoñana A, Fernando Uresandi B, Jose Calonge
- Lars J. Grimm, MD, MHS; Chief Editor: Caroline R. Taylor, M.D. (2015). More. Bedside Ultrasonography in Deep Vein Thrombosis.
- Mosheera Goran (2009). Deep vein thrombosis of the lower limbs in duhok: a descriptive study using doppler ultrasound.duhok med.
- O. Guneshwar Singh, R. K. Jayshree Devi, Ksh. Achouba Singh (2013). Detection of venous thrombosis among suspected vascular lesions of lower limbs by Doppler solography.
- Sanjay M. Khaladkar, Dhaval K. Thakkar, Kunal Shinde, Dolly K. Thakkar, Harshawardhan

Shrotri, Vilas M. Kulkarni (2014). Deep vein thrombosis of the lower limbs: a retrospective analysis of Doppler ultrasound findings.

Shelan Hakeem Mohammed, Dr. Salwa A. Al-Najjar (2016). Role of color flow ultrasound in detection of deep venous thrombosis.

The role of ultrasonography in thromboembolic disease management in the orthopaedic patient William J. Ciccone II, Md J. Spence Reid, Md Vincent D. Pellegrini, Jr., Md.

Corresponding Author

Dr. Gaurangi Pawar*

Research Scholar

E-Mail – gaurangi738@gmail.com