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ROLE OF COLOUR DOPPLER IN DETECTING DEEP VEIN THROMBOSIS OF LOWER EXTREMITY

Radiodiagnosis

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ABSTRACT

DVT of lower extremities is one of the most common cause for pulmonary embolism which in turn is responsible for majority of deaths. 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.

It has been demonstrated that colour Doppler is as accurate as venography (proximalDVT-99.4%,distal DVT 93.1%) in the diagnosis of DVT , when used by experienced operators.

KEYWORDS

Deep vein thrombosis (DVT), Colour Doppler, Deep Veins, Superficial Veins, Perforator Veins.

INTRODUCTION:

Development of a thrombus with in a vein may be considered functionally as an exaggeration of the normal process of haemostasis. It usually presents as pain and swelling of the affected limbs and may also cause structural damage to the valves of deep veins , which results in postphlebitic syndrome.[1] Group of patients 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 convalescence period. Other risk factors to mention a few are neoplasms, pregnancy, oral contraceptive pills and hypercoagulable states.

The introduction of Doppler ultrasound technique has irrevocably altered the diagnosis and treatment of DVT. The rationale is quite simple. Thrombotic obstruction of the underlying vein distorts the venous flow pattern and these perturbations are readily detected by the Doppler instrument.[2]

It can be used in pregnant women, permits multiple views in various positions of the leg[10] and the study is safe, painless, inexpensive.[2] Venous system is evaluated for flow, phasicity, pliability and augmentation. It is useful as a screening modality in high-risk patients to ensure prompt and early treatment. 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.[4]

The lower limb veins can be grouped into three anatomically and functionally distinct groups:

1. The deep veins
2. The superficial veins
3. The perforators

All deep veins of lower extremity accompany corresponding named arteries. Communications exist between deep and superficial venous systems through perforating veins. In normally functioning perforating veins, valves maintain flow in one direction from superficial to deep.

Clear visualization of the lower extremity veins requires adequate distention of the venous system. This can be accomplished by tilting down the feet at about 15 or 20 degreeor by examining the patient in the sitting position. The patient is instructed to breathe normally during the USG examination. The lumen of a normal vein is echo free without colour Doppler, and the interior surface of the vein wall is smooth. Five important Doppler characteristics of normal veins are spontaneous, phasic, ceases with the Valsalva maneuver, is augmented by distal compression and is unidirectional.[2]

AIMS AND OBJECTIVES:

1. To study the spectrum of findings on colour Doppler ultrasound in patients who presented with clinical symptoms and signs of deep venous thrombosis.
2. To evaluate the distribution of thrombi in proximal and distal deep veins of lower limb.

MATERIALS AND METHODS:

The present study is carried out on 40 patients with clinical suspicion of deep venous thrombosis referred to the Department of RadioDiagnosis in a period of 2 Years from October 2011 to October 2013 in the hospital attached to Alluri Sitarama Raju Academy of Medical Sciences ,Eluru.

Inclusion criteria : Clinically suspected cases of Deep venous thrombosis and patients between 21-80 years who are at increased risk of DVT were included in our study.

Exclusion criteria : Pediatric cases and neoplastic conditions were excluded.

Colour doppler ultrasonography machine : Philips Envisor CHD Type of transducer: Linear array with frequency 3.5 MHz,7.5 MHz.

RESULTS:

Age Distribution: 57.6%patients were older than 40 yrs of age. The mean age of cases suspected to have DVT being 48.7yrs and mean age of cases shown to have DVT being 46.25yrs.

Sex Distribution: Of 40 patients 28(70%) were males and 12 (30%) were females.

Distribution of cases by signs and symptoms: Edema(45.16%) was the most common presenting symptom in patients who were diagnosed as DVT ,both pain and edema in 25.81% of patients followed by pain(19.35%), pulmonary embolism (6.45%) and then asymptomatic(3.23%).

Clinical conditions for suspected DVT: In our study it was found that prolonged hospitalization(29.03%)was the most common predisposing factor, followed by post-operative (9.68%) and trauma(9.68%). However in 35.48% of patients with deep venous thrombosis no predisposing factor was found.

Type of involvement with evidence of DVT: Our study showed unilateral limb predominance (96.77%).

Distribution of thrombi in right and left limb: The total number of extremities showing evidence of thrombosis are 32. Left lower extremity predominance is noted in our study. One case showing bilateral involvement.

Anatomic distribution of thrombi: Predominant distribution of thrombi was seen in SFV, (83.87%) followed by popliteal vein (74.19%) and calf veins (posteriortibialvein-74.19%). Thus thrombus involvement is more common in proximal segments (femoro-popliteal) than in distal segments (calf veins).

Stage of involvement: In our study acute thrombosis (58.06%) predominance was noted.

Type of occlusion: Most of the occlusion seen in our study was complete type of occlusion (67.74%).

Pattern of involvement of veins: Multiple contiguous involvement predominated our study. Multiple contiguous involvement was seen in 93.55%, followed by isolated seen in 6.45%.

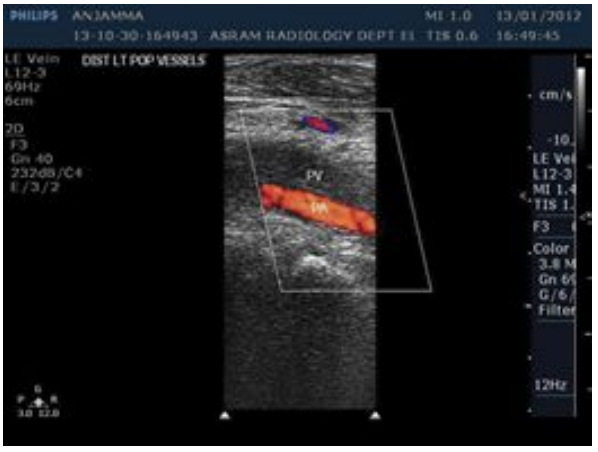


Figure1 : Longitudinal image of popliteal fossa showing popliteal vein thrombosis with evidence of absence of colour flow noted in the popliteal vein



Figure 2: Transverse image of chronic popliteal vein thrombosis, showing dilated popliteal vein with partial filling of colour suggestive of thrombosis with partial recanalization.

DISCUSSION:

Colour Doppler USG is used in accurate clot localization, characterization of thrombosis (acute or chronic), evaluation of extent of thrombosis and easy visualization of complete thrombotic occlusion.

Males(70%) contribute a major group in our study with suspected DVT showing higher incidence (74.19%) of positive Doppler study and 12 cases are females(30%), with 8 (25.81%) of them showing evidence of DVT. This correlates with the study conducted by the Hill SL et al5 in 1995 which concluded that higher incidence of DVT was seen in males.

Amongst the patients showing evidence of DVT, the common symptom suggestive of DVTwas oedema. This is in correlation with the study by Langsfeld M et al3 in 1987, who found leg swelling as the most common sign in patients diagnosed to have DVT. In contiguous segment involvement, the oedema is the common presentation due to occlusion of major venous channels.

In present study one case presented with bilateral pain and oedema showed evidence of thrombosis, which is similar to the study conducted by Colucciello SA6 where DVT never occurred in patients with bilateral symptoms.

In 77.41% of cases with evidence of DVT on colour Doppler USG, thrombus was in left limb, while 25.80% in right limb. This correlated with the venographic study of Stamatakis JD etal8 who found major thrombi occurring more frequently in left limb.

Acute thrombosis was found in 18 (58.06%) and chronic in 13 (41.94 %). This finding correlated with the study by Grosser S et al9 in 1990.

The criterion for diagnosis of acute thrombosis was increased venous diameter which was found in all 18 cases of acute thrombosis. This correlated with the study by van Gemmeren D et al10 who had found a significant correlation between age of thrombosis and the venous diameter ($P<0.001$).

Compressibility of veins was lost in all 31 cases (acute and chronic) with DVT. This is in correlation with the study by Wright DJ et al11 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.

Present study shows one case(2.5%) of acute DVT showing free floating proximal end of thrombus in comparision with Norris CS et al12 who had 5 cases(6%) showing free-floating thrombi on venography.

The colour Doppler flow imaging diagnosis based primarily on the presence of a focal void within the colour encoded blood flow or the absence of visible flow within a segment of a vessel, correlated with the study by Rose SC et al7 in 1990.

CONCLUSION:

- It has been conclusively established that colour Doppler USG is a non-invasive, accurate, easily repeatable and relatively sensitive in diagnosis of lower extremity deep vein thrombosis.
- It also helps in provides valuable information of therapeutic significance and evaluates the risk of pulmonary embolism.
- It guides in characterization of thrombosis (acute or chronic) and study of spectrum of findings in them.
- Diagnosis of non-occlusive thrombi and free floating thrombi which may have a greater potential for embolization.
- It helps in identification of collaterals.

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