

Assessment of Deep Vein Thrombosis of Lower Limb Using Color Doppler as a Diagnostic Tool.

¹Dr. Rushvik Amin, ²Dr. Sushil Kachewar, ³Dr. Dilip Lakhkar

¹Resident, Department of Radio-diagnosis DVVPPF's Medical College & Hospital, Ahmednagar – Maharashtra, India

²Professor, Department of Radio-diagnosis DVVPPF's Medical College & Hospital, Ahmednagar – Maharashtra, India

³Professor, Department of Radio-diagnosis DVVPPF's Medical College & Hospital, Ahmednagar – Maharashtra, India

Abstract: Venous thrombosis of lower limb is a prevalent condition. Many different imaging modalities were used for its diagnosis. Phlebography is considered the gold standard modality for its diagnosis. Recently, color Doppler has evolved as an easily available, repeatable, non-invasive, dynamic modality. In our study 40 patients who were clinically suspected to have thrombosis were further examined on color Doppler. Majority of the patients were male (72.5%) in the age group of 41 – 50 years (30%). Most of the patient had unilateral (94.12%) involvement in which left lower limb was predominantly involved (70.59%). Superficial femoral vein (79.41%) was more commonly involved followed by common femoral vein (67.65%) and popliteal vein (61.76%). In all the clinically suspected cases of thrombosis, color Doppler can be used as a diagnostic modality which can provide the location, acute vs chronic, complete lumen vs incomplete lumen, flow spectrum data for complete assessment which would help in appropriate timely further management.

Date of Submission: 24-10-2019

Date of Acceptance: 09-11-2019

I. Introduction

Deep vein thrombosis (DVT) of lower extremity is a condition which refers to the formation of one or more blood clot/thrombus in the lower limbs. The incidence of DVT in the general population has been estimated to be 80-100/1,00,000 annually in the western societies^[1], 4-75/1,00,000 in South-Asia^[2]. In India, the incidence of DVT is not well studied and literature survey shows scanty works in this field. Most of the literature available in India is from the orthopedic departments, overall incidence of DVT in the general population is largely unknown.

Patients usually presents with pain and swelling of the affected limb. The causes for the development of thrombosis are trauma, prolonged immobilization in conditions like myocardial infraction, Congestive Cardiac Failure, stroke, post-operative after trauma, pregnancy, oral contraceptive pills and hypercoaguable states. Clinically these patients have calf discomfort, edema, venous distension, pain on dorsiflexion of foot (Homans sign). It may lead to life threatening pulmonary embolism referred as venous thromboembolism^[3,4].

Clinical diagnosis of deep vein thrombosis is uncertain and laboratory test like D – dimer assay have high sensitivity but low specificity^[5-7]. Multiple imaging modalities are available for the evaluation. Phlebography is the gold standard modality for the assessment, however its invasive nature, radiation exposure, requirement of expertise, reliability, lower risk of development of post venographic phlebitis. Non-invasive modalities are also available to evaluate deep vein thrombosis and color Doppler is one of them. Color Doppler as a diagnostic modality is cheap, easily available, repeatable, non-invasive, dynamic, venous flow pattern can be traced with patients comfort. It does not involve ionizing radiation therefore can be used in pregnant women without adverse effects to neither mother nor fetus. Using Doppler venous thrombosis can be diagnosed at very early stages even when patient is asymptomatic.

In present study my aim was to assess deep vein thrombosis using color Doppler as a diagnostic tool.

II. Material And Methods

Study Design : Descriptive cross sectional study

Study Location : This study was performed in a tertiary care hospital at Vithalrao Vikhe Patil Foundation's memorial hospital at Ahmednagar.

Study Duration : January 2019 to June 2019

Sample Size : In our study we have included 40 patients.

Aim : To assess spectrum and distribution of deep vein thrombosis in lower limb in 40 suspected patients using color Doppler as a diagnostic tool.

Inclusion criteria:

1. Clinically suspected patients of deep vein thrombosis.
2. Patients who are at increased risk of DVT.
3. Patient who are willing to participate in the study.

Exclusion criteria:

1. Patients who are not willing to participate in the study.
2. Patient having associated neoplastic etiology.

Machine : GE LOGIQ F6 series and Mindray DC7 with high frequency linear array probe having 3.5 to 7.5 MHz frequency.

Procedural methodology :

Patient who are clinically suspected to have deep vein thrombosis are sent to the department of radio-diagnosis for evaluation of deep veins. Consent from the patient was taken for Doppler evaluation. Patients leg is slightly flexed and externally rotated Grey scale evaluation of deep venous system starting from External iliac vein, Common femoral vein into Superficial femoral vein and Deep femoral vein then patient is turned into prone position for the evaluation of popliteal vein and its tributaries common Tibioperoneal trunk, Common peroneal vein and Posterior tibial vein is done. Patient is turned to supine position for Anterior tibial vein evaluation.

III. Result

Our study included 40 patients who were clinically suspected to have deep vein thrombosis.

Table 1: Age Distribution

| Age group | Suspected cases | Percentage | Positive cases | Percentage |
|---------------|-----------------|------------|----------------|------------|
| 21 - 30 years | 6 | 15% | 5 | 15.63% |
| 31 - 40 years | 8 | 20% | 7 | 21.88% |
| 41 - 50 years | 12 | 30% | 10 | 31.25% |
| 51 - 60 years | 9 | 22.5% | 7 | 21.88% |
| 61 - 70 years | 3 | 7.5% | 2 | 6.25% |
| 71 -80 years | 2 | 5% | 1 | 3.13% |
| Total | 40 | 100% | 32 | 100% |

Maximum number of patients were in the age group of 41 – 50 years (30%) and among all the positive cases maximum cases belong to the same age group of 41 to 50 years (31.25%)

Table 2: Gender Distribution

| Age Group | Suspected Cases | Percentage | Positive Cases | Percentage |
|-----------|-----------------|------------|----------------|------------|
| Male | 29 | 72.5% | 24 | 75% |
| Female | 11 | 27.5% | 8 | 25% |
| Total | 40 | 100% | 32 | 100% |

Maximum number of patients were male (72.5%) followed by females (27.5%).

In positive cases maximum number of patients were male (75%) followed by females (25%).

Table 3: Distribution according to side

| | Number of Cases | Percentage of Cases |
|-----------------------|-----------------|---------------------|
| Unilateral lower limb | 32 | 94.12% |
| Bilateral lower limb | 2 | 5.88% |
| Total | 34 | 100% |

Maximum cases were unilateral (94.12%) followed by bilateral (5.88%)

Table 4: Right and left lower extremity distribution

| | Number of Cases | Percentage of Cases |
|------------------|-----------------|---------------------|
| Right lower limb | 10 | 29.41% |
| Left lower limb | 24 | 70.59% |
| Total | 34 | 100% |

Majority of the cases had left limb involvement (70.59%) followed by right limb (29.41%)

Table 5: Segmental distribution of deep vein thrombosis

| | CFV | SFV | PV | ATV | PTV | CPV | CIV | EIV | SVS |
|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Positive cases | 23 | 27 | 21 | 10 | 12 | 11 | 8 | 9 | 10 |
| Percentage | 67.65% | 79.41% | 61.76% | 29.41% | 35.29% | 32.35% | 23.53% | 26.47% | 29.41% |

Superficial femoral vein was most commonly involved (79.41%) followed by common femoral vein (67.65%) and popliteal vein (61.76%). Anterior tibial vein (29.41%), posterior tibial vein (35.29%), common peroneal vein (32.35%), common iliac vein (23.53%), external iliac vein (26.47%), superficial venous system (29.41%) were also involved.

Table 6: Acute vs chronic distribution

| | Number of cases | Percentage |
|---------|-----------------|------------|
| Acute | 21 | 61.76% |
| Chronic | 13 | 38.24% |
| Total | 34 | 100% |

Maximum cases were acute (61.76%) followed by chronic (38.24%).

Table 7: Complete and incomplete lumen thrombosis distribution

| | Number of cases | Percentage |
|-----------------------------|-----------------|------------|
| Complete lumen thrombosis | 20 | 58.82% |
| Incomplete lumen thrombosis | 14 | 41.18% |
| Total | 34 | 100% |

Maximum cases showed complete lumen thrombosis (58.82%) followed by incomplete lumen thrombosis (41.18%).

IV. Discussion

The study included 40 patients who were suspected to have deep vein thrombosis on clinical evaluation. Evaluated in the department of Radio-Diagnosis for deep vein thrombosis. 34 cases were positive for the deep vein thrombosis. 6 patients who did not have thrombosis, 4 had only subcutaneous edema and 2 patients had cellulitis.

Out of 40 patients majority of the patients belong to the 41 to 50 years age group (30%) and even in the positive case group majority belonged to the same age group (31.85%). These results correlate well with the study done by Khadalkar SM et al have majority belong to the fifth decade^[8].

In another study by Akhtar W et al majority of the patients belong to the 30 – 39 years of age group^[9].

In our study most patients were male (72.5%) and rest were females (27.5%). Out of all the positive cases 75% were males and 25% were females.

Khadalkar SM et al study results show 74.4% male and rest were females^[8] while Akhtar W et al 61% males and rest of 39% were females^[9].

Out of all the 34 positive cases majority of the patient had only unilateral findings.

In my study 32 patients (94.12%) had unilateral and 2 (5.88%) had both lower limb involvement.

Study performed by Colucciello SA none of the patients had bilateral thrombosis^[10] while in Akhtar W et al study observed 90% of patients had unilateral and 10% had bilateral involvement^[9]. Khadalkar SM et al 96% had unilateral with only 4% patients had bilateral lower limb involvement^[8].

Our study also supports the work of Shieman RG who published decreased incidence of contralateral lower limb thrombosis^[11].

In study conducted by Markel A et al 83% had unilateral involvement^[12].

Majority of our patients have left lower limb involvement (70.59%) in all the positive cases. Left lower limb was predominantly (82.7%) involved in a study done by Khadalkar SM et al^[8] and Akhtar W et al^[9]. Stamatakis JD et al performed venography on lower limb and observed more involvement of left lower limb in thrombosis^[13]. In study by Markel A et al majority of the patients had left limb thrombosis^[12].

Importance of identifying the location of deep vein thrombosis cannot be stressed upon. Thrombosis above the knee joint are associated with pulmonary embolism however thrombosis below the joint are more often silent with less dreadful complications. Superficial femoral vein was most commonly involved (79.41%) followed by Common femoral vein (67.65%) and Popliteal vein (61.76%).

In study performed by Khadalkar SM et al^[8] majority of the thrombosis was above knee joint with most common involvement of Superficial femoral vein (88.5%) followed by common femoral vein (73.1%) and then by popliteal vein (69.2%) (1). Study conducted by Akhtar W et al^[9] superficial femoral vein was most frequently involved (80%) followed by popliteal vein (71%) followed by common femoral vein (64%) and Markel A et al^[12] superficial femoral vein was involved in 74% followed by popliteal vein 73% followed by common femoral vein 58%.

Rose SC et al study showed 76% had thrombosis above the level of knee joint^[14].

In study by Maki DD et al isolated superficial thrombosis was seen in 22.3% and superior or inferior extension with involvement of common femoral vein or popliteal vein involvement is 77.7%^[15].

21 patients (61.76%) showed acute thrombosis and 13 patients (38.24%) chronic thrombosis. Acute thrombus is usually anechoic to hypoechoic while the chronic ones are usually hyperechoic.

20 patients (58.8%) showed complete lumen vs 14 patients (41.18%) who showed partial lumen thrombosis.

V. Conclusion

Deep vein thrombosis is very well evaluated using color Doppler as a diagnostic tool. It helps in localization of the site of the thrombosis and in differentiating between acute vs chronic thrombosis. Detection of thrombosis in clinically silent patients is also feasible and advantageous. Through early diagnosis of thrombosis prompt treatment can be provided to the patient. Follow up and monitoring of patients with DVT on treatment is also done.

References

- [1]. Agarwala S, Bhagwat AS, Modhe J. Deep vein thrombosis in Indian patients undergoing major lower limb surgery. *Indian J Surg* 2003;65:159-62.
- [2]. Chinglensana L, Rudrappa S, Anupama K, Gojendra T, Singh KK, Chandra ST. Clinical profile and management of deep vein thrombosis of lower limb. *J Med Soc.* 2013;27:10-4.
- [3]. Huisman MV, Klok FA. Diagnostic management of acute deep vein thrombosis and pulmonary embolism. *J Thromb Haemost.* 2013;11:412-22.
- [4]. Galson SK. Prevention of deep vein thrombosis and pulmonary embolism. *Public Health Rep* 2008;123:420-1
- [5]. Tovey C, Wyatt S. Diagnosis, investigation, and management of deep vein thrombosis. *BMJ* 2003;326:1180-4.
- [6]. Kelly J, Rudd A, Lewis RR, Hunt BJ. Plasma D-Dimers in the diagnosis of venous thromboembolism. *Arch Intern Med.* 2002;162:747-56.
- [7]. Tan YK, da Silva A. Digital photoplethysmography in the diagnosis of suspected lower limb DVT: is it useful? *Eur J Vasc Endovasc Surg.* 1999;18:71-9.
- [8]. Khaladkar SM, Thakkar DK, Shinde K, Shrotri H, Kulkarni VM. Deep vein thrombosis of the lower limbs: A retrospective analysis of doppler ultrasound findings. *Medical Journal of D Y Patil University.* 2014;7:612-9.

- [9]. Akhtar W, Mishra R. Color Doppler evaluation of deep vein thrombosis of lower extremity. National journal of Medical and Dental research. 2016;4:3 255-232.
- [10]. Colucciello SA. Protocols for deep vein thrombosis (DVT). A state of art review part I: Risk factors assessment, Physical Examination, Current Diagnostic Modalities. 1999
- [11]. Sheiman RG, Weintraub JL. Bilateral lower extremity US in the patient with bilateral symptoms of deep vein thrombosis: Assessment of need. Radiol. 1995; 196: 379-381.
- [12]. Markel A, Manzo RA, Bergelin RO, Strandness DE. Pattern and Distribution of Thrombi in Acute Venous Thrombosis. *Arch Surg.* 1992;127(3):305-309.
- [13]. Stamatakis JD, Kakkar VV et al. The origin of thrombi in the deep veins of the lower limb: a venography study. *The Br J Surgery.* 1978;65:449-451.
- [14]. Rose SC, Zwiebel WJ, Miller FJ. Distribution of acute lower extremity deep vein thrombosis in symptomatic & asymptomatic patients: Imaging implication. *J Ultrasound Med* 1994;13: 243-250.
- [15]. Maki DD, Kumar N, Nguyen B, et al. Distribution of thrombi in acute lower extremity deep venous thrombosis: implications for sonography and CT and MR venography. *AJR Am J Roentgenol.* 2000;175:1299-1301

Figure No. 1 : Axial section of superficial femoral vein showing partial lumen thrombosis with compression.

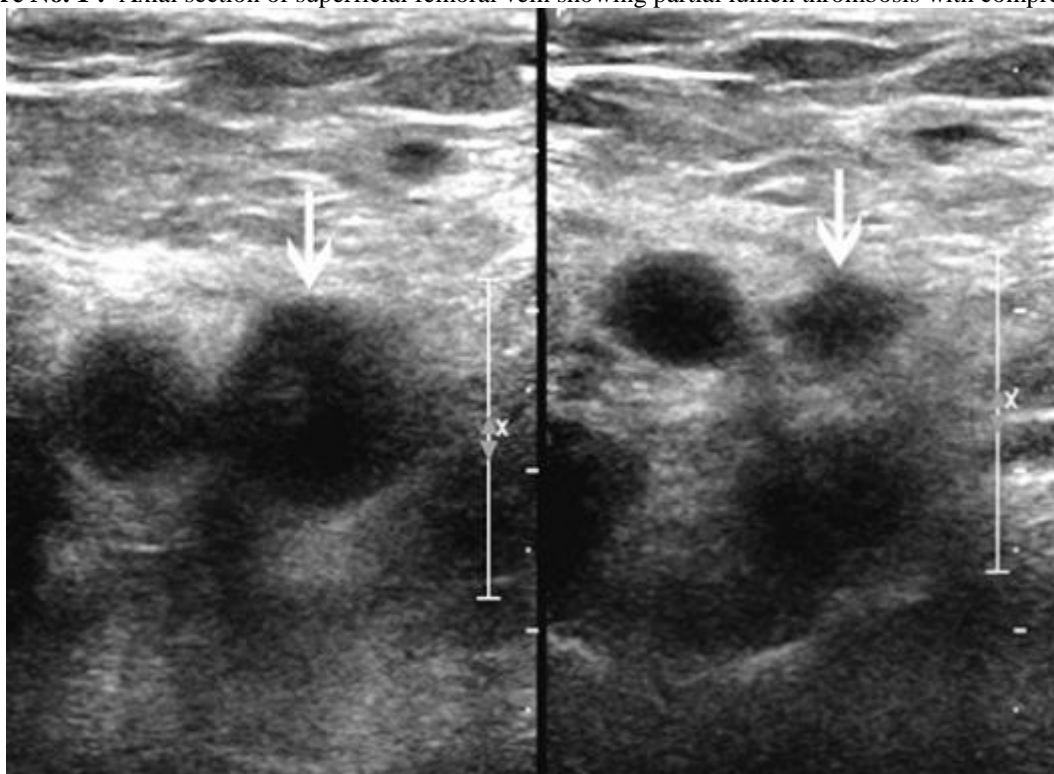


Figure No. 2: Axial section at bifurcation of common femoral artery with thrombus in common femoral vein.



Figure No. 3: Sagittal section of popliteal vein with color Doppler showing full lumen thrombosis.

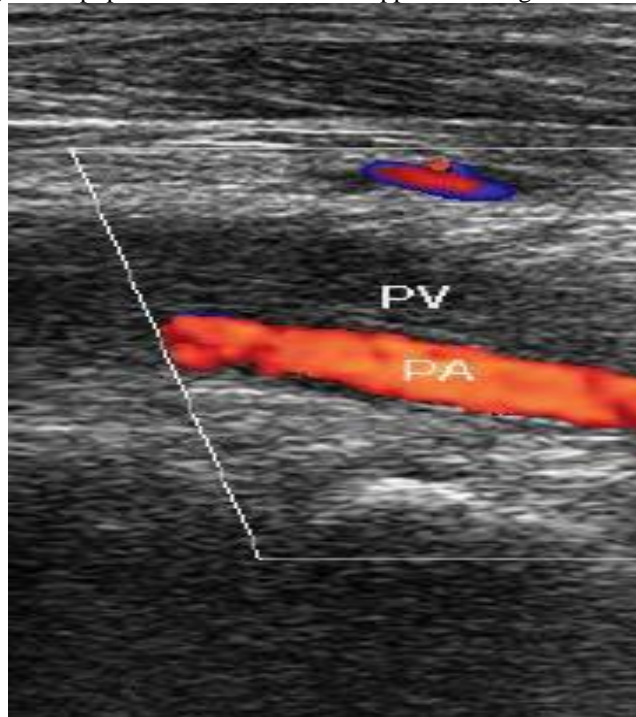


Figure No. 4: Axial section on grey and color Doppler showing thrombosis of common femoral vein.

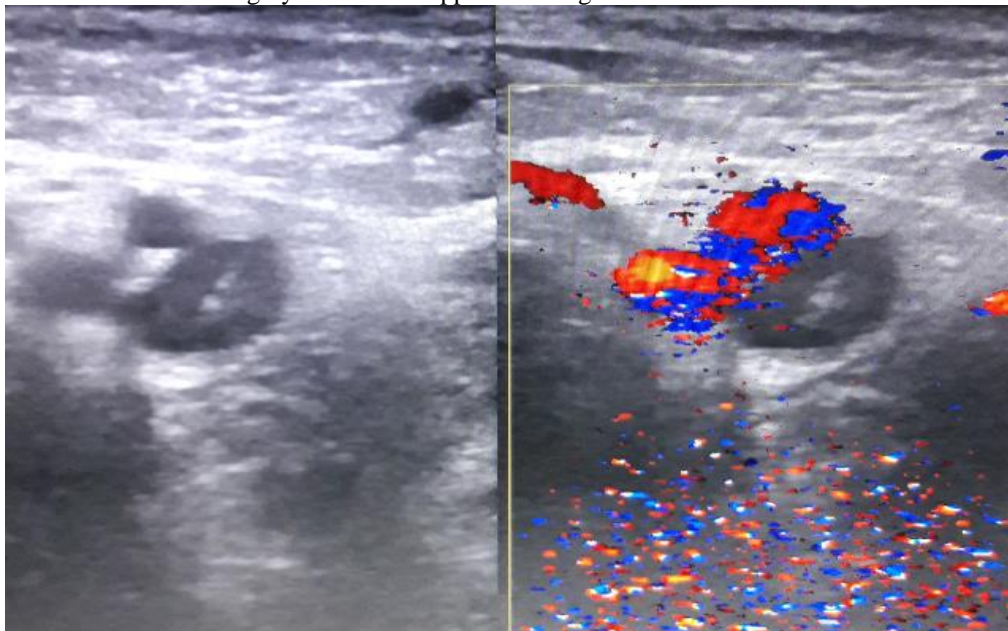


Figure No. 5: Sagittal images of superficial femoral vein on grey and color Doppler showing thrombosis.

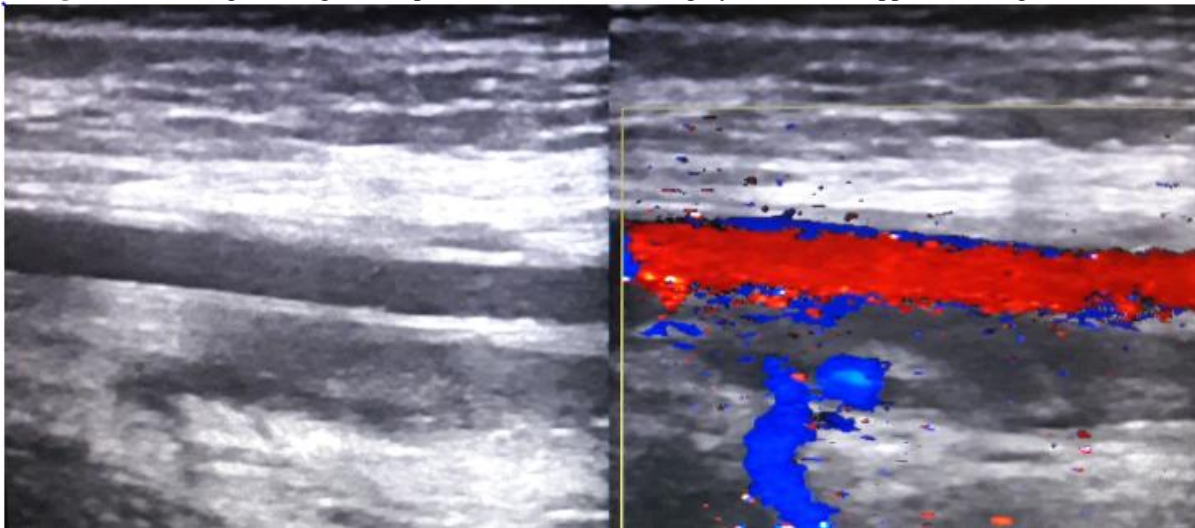
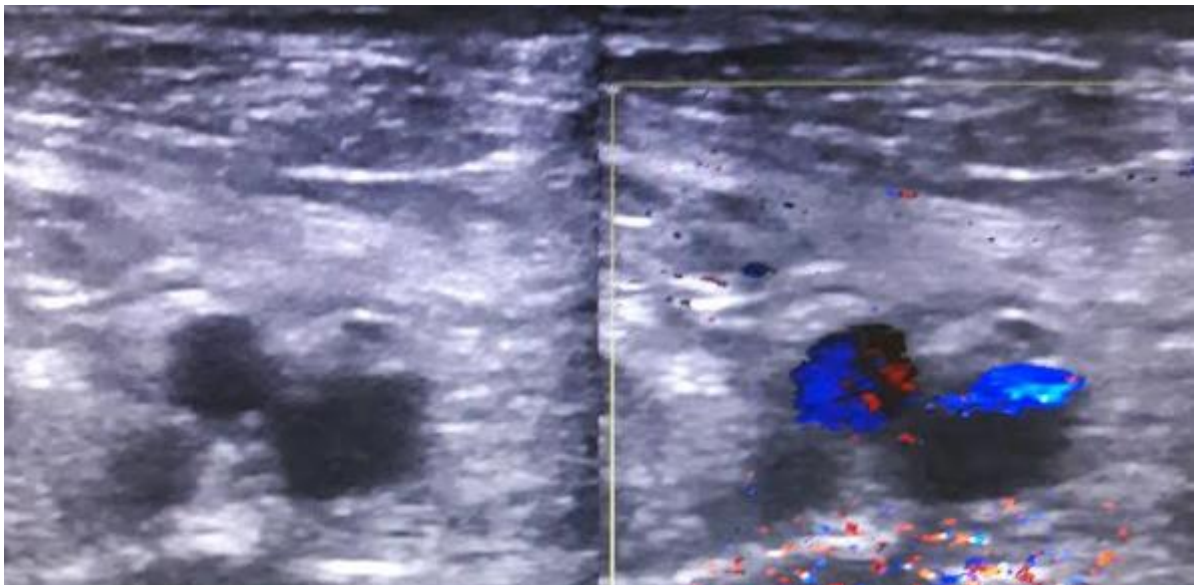


Figure No. 6: Axial images on grey and color Doppler showing thrombosis of superficial and deep femoral vein thrombosis.



1Dr. Rushvik Amin. "Assessment of Deep Vein Thrombosis of Lower Limb Using Color Doppler as a Diagnostic Tool." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 11, 2019, pp 07-13.