



ORIGINAL RESEARCH PAPER

Radiology

A STUDY ON EVALUATION OF VENOUS INSUFFICIENCY OF LOWER LIMBS BY DUPLEX SONOGRAPHY

KEY WORDS: Duplex sonography, venous insufficiency, lower limbs, varicose vein

Dr.Amit Kumar Routh*

Assistant Professor, Department of Radiology, Bhaskar Medical College and General Hospital. *Corresponding Author

Dr.Neelagiri Dheeraj

Senior Resident, Osmania Medical College.

ABSTRACT

Venous Insufficiency of the lower limbs is characterized by symptoms or signs produced by venous hypertension as a result of structural or functional abnormalities of veins. The most frequent causes of Venous Insufficiency are primary abnormalities of the venous wall and the valves and secondary changes due to previous venous thrombosis that can lead to reflux, obstruction, or both. The present study aims to evaluate the role of colour flow duplex ultrasound in clinically suspected patients of Venous Insufficiency of the lower limbs. 50 patients with symptoms and signs of lower extremity Venous Insufficiency were included in this study. Study was done to identify the cause of their symptoms and to diagnose and establish Venous Insufficiency or deep vein thrombosis or both as their symptomatic cause with Duplex ultrasound. Duplex ultrasound was effective in excluding other causes of pain and swelling, thus preventing invasive investigations and interventions and unnecessary medical therapy

INTRODUCTION:

The term Venous Insufficiency refers to the venous valvular incompetence caused by incompetence in the superficial, deep and/or perforating veins or deep vein thrombosis. Incompetence of the vein valves permits flow reversal and promotes venous hypertension in the distal segments. This form of venous dysfunction may be the result of recanalised thrombosed venous segments, pathological dilation of the vein or due to congenital absence of competent valves.¹ Venous Insufficiency of the lower limbs is characterized by symptoms or signs produced by venous hypertension as a result of structural or functional abnormalities of veins. Symptoms may include aching, heaviness, leg- tiredness, itching, cramps, burning sensation, swelling, restlessness of leg, dilatation of superficial veins, and skin changes. Signs may include telangiectasia, reticular or varicose veins, edema, and skin changes such as pigmentation, lipodermatosclerosis, eczema, and ulceration.²

The most frequent causes of Venous Insufficiency are primary abnormalities of the venous wall and the valves and secondary changes due to previous venous thrombosis that can lead to reflux, obstruction, or both. Congenital malformations are rare causes of Venous Insufficiency. Because the history and clinical examination will not always indicate the nature and extent of the underlying abnormality a number of diagnostic investigations have been developed that can elucidate whether there is calf muscle pump dysfunction and can determine the anatomic extent and functional severity of obstruction or reflux. Patients with spider veins particularly on lateral thigh area do not require ultrasound examination. However, when spider veins are on medial thigh area require ultrasound examination.²

Venous Insufficiency is associated with physical findings that are characteristic, but these findings are non-specific with respect to cause. It is due to underlying chronic Venous Insufficiency with venous hypertension. Varicose veins have a wide clinical presentation , which if recognized early can significantly reduce the morbidity of patients.

The clinical signs and symptoms of deep venous thrombosis are nonspecific³ and even though clinical examination can lead to correct diagnosis in case of varicose veins, it is important to promptly perform objective testing to confirm the diagnosis and enable the institution of safe and effective therapy⁴. Phlebography which is considered as the “gold standard” of venous imaging is expensive, invasive, time

consuming, painful, exposes the patient 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 plethysmography⁵, thermography⁶ phlebography, iodine 125 (1-125) fibrinogen scanning and doppler ultrasonography.

The introduction of doppler ultrasound technique has significantly altered the diagnosis and treatment of Venous Insufficiency. It is non-invasive, repeatable, can be performed rapidly in the clinic, at patient's bedside and the results are available immediately. It can be used in pregnant women, permits multiple views in various positions of the leg¹¹ and the study is safe, painless inexpensive.¹⁰ Venous system is evaluated for flow, phasicity, compressibility and augmentation. It is useful as a screening modality in high-risk patients to ensure prompt and early treatment.

Duplex ultrasound, with colour flow imaging, has been validated as a sensitive and specific modality for the identification of superficial and deep vein thrombosis.¹²⁻¹⁴ Valvular incompetence can be confirmed with spectral and colour Doppler. Venous Insufficiency can be localized to specific valve sites in the deep and superficial veins. Incompetent perforators can similarly be identified and mapped prior to surgery or intervention. The present study aims to evaluate the role of colour flow duplex ultrasound in clinically suspected patients of Venous Insufficiency of the lower limbs.

MATERIALS AND METHODS: 50 patients with symptoms and signs of lower extremity Venous Insufficiency were included in this study. Study was done to identify the cause of their symptoms and to diagnose and establish Venous Insufficiency or deep vein thrombosis or both as their symptomatic cause with Duplex ultrasound. This study was conducted in the Department of Radio diagnosis of BHASKAR MEDICAL COLLEGE & HOSPITAL. Study will be performed on GE LOGIQ P9 Ultrasound machine using high frequency linear transducer (7-12 MHz) and colour doppler.

Specifications of the colour doppler ultrasonography machine:

Manufacturer: GE

Model : LOGIQ P9

Transducer : High frequency linear array transducer

Frequency of transducer : 7.5 MHz

Veins of the lower limb were examined for

- Appearance of vein and its lumen for internal static echoes.
- Anatomic variants like duplication of veins
- Tortuosity and dilatation (size) of veins.
- Incompetence of valves of veins at Saphenofemoral and saphenopopliteal junction.
- Incompetence of perforators.
- Absent or reduced compression of deep veins on ultrasonography.
- Loss of spontaneous/incomplete flow on Colour Doppler.
- Loss of phasic variation with respiration.
- Impaired or absent augmentation of blood flow on distal compression.

STUDY POPULATION: All patients who are referred to the department of radiology with signs and symptoms of varicose veins and clinical suspicion of deep vein thrombosis.

SAMPLE SIZE: 50 cases shall be taken up for study to evaluate the Venous Insufficiency by Duplex sonography.

INCLUSION CRITERIA: All patients presenting with the signs and symptoms of varicose veins. clinically suspected cases of deep vein thrombosis.

EXCLUSION CRITERIA: Patients who are not willing to be part of the study.

RESULTS: A study of 50 patients clinically suspected to have Venous Insufficiency in the lower extremities were evaluated with Duplex ultrasound of the lower extremities. The following observations were made.

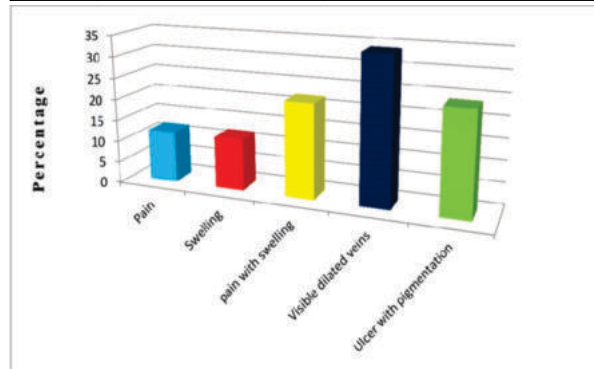
Table - 1: Age Distribution

Age group (in years)	Cases with suspected Venous Insufficiency (n = 50)	
	No.	Percentage
21-30	2	4
31-40	10	20
41-50	15	30
51-60	14	28
61-70	6	12
71-80	2	4
81-90	1	2
TOTAL	50	100

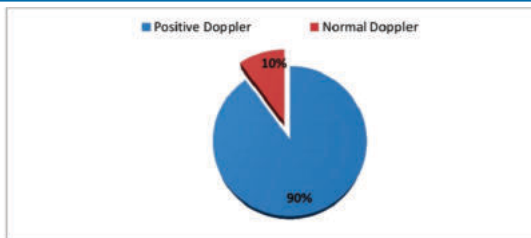
Male predominance was found in our study. Of the 50 patients 45 (90%) were males and 5 (10%) were females. We found that visible dilated veins (34%) was the most common presenting symptom, followed by ulcer with pigmentation (22%) as the second most common presenting symptom.

Table - 2: Sex Distribution

Sex	Cases with suspected Venous Insufficiency (n = 50)	
	No.	Percentage
Male	45	90
Female	05	10
Total	50	100



GRAPH 1: DISTRIBUTION OF CASES BY SYMPTOMS



GRAPH 2: DOPPLER ULTRASOUND RESULTS

Thus prolonged hospitalization - 5 (62.5%) and surgery - 2 (25%) were the most common factors in patients with DVT. Occupational/ prolonged standing were common in 31 (83.79%) and hereditary factors in 6 (20.8%) in patients with varicosities. Of the 50 cases, features of venous insufficiency on Doppler was noted in 45 cases. 5 cases had normal venous Doppler. 1 case with normal venous Doppler had an additional finding of Baker’s cyst in popliteal fossa. Out of 45 cases with, 7 (15.5%) cases were found to have DVT. Out of these 4 (8.88%) had acute DVT and 3 (6.66%) had Chronic DVT. Of the 38 patients with Varicose veins in our study, mid-calf perforator was seen in majority of cases 24 (63.1%), followed by above ankle perforator 18 (47.3%) and above knee perforator 13 (34.2%). SFJ incompetence 9 (23.6%) was more common than SPJ incompetence 8 (21.05%) in our study. Overall, the GSV varicosity 37 (97.3%) predominated over SSV varicosity 25 (65.7%) in our study. 37 (82.22%) cases with Varicose veins. Out of these, 36 (80%) had perforator incompetence and 14 had SFJ & SPJ (31.11%) Incompetence. 1 case (2.22%) had both DVT and Varicose veins.

DISCUSSION:

The peripheral veins of lower extremities are affected by a variety of disorders which can be evaluated with duplex ultrasound. DVT and Varicose veins are the most common indications for investigation of the peripheral veins. A variety of signs and symptoms that can be associated with DVT and many other causes like ruptured Baker’s cyst can mimic DVT and make it difficult to differentiate from thrombi by clinical examination alone.

The present study was performed to assess the role of duplex ultrasound in Venous Insufficiency. It included the detection of thrombus, its extent of involvement, differentiation of acute and chronic thrombi, assessment of valvular incompetence at Sapheno-femoral and Sapheno-popliteal junction, identification and marking of incompetent perforators prior to surgery, characterization of the varicosities as primary or secondary to underlying DVT, rule out the conditions which mimic DVT like ruptured Baker’s cyst, Cellulitis, Lymphedema.

Among the 50 cases examined for suspected venous pathology duplex ultrasound showed Venous Insufficiency findings in 45 cases; 5 cases showed normal findings (1 case with normal venous Doppler had an additional finding of Baker’s cyst in popliteal fossa). Thus Duplex ultrasound was effective in excluding other causes of pain and swelling, thus preventing invasive investigations and interventions and unnecessary medical therapy.

CONCLUSION:

Duplex ultrasound provides a noninvasive and reliable method for examining the venous system, particularly with respect to the diagnosis of thrombus and incompetent veins in symptomatic patients. Duplex ultrasound can be used instead of venography or varicography and may be the only examination required to define the anatomy and function in patients with varicose veins. Varicography show perforator veins which are obviously incompetent and some superficial and deep venous segments but ultrasound has the advantage that the segments of deep and superficial systems can be examined and the direction of blood flow within each segment can be demonstrated. Compared to other modalities

like CT Venography and MR venography, Colour Doppler is much cheaper, reasonably accurate and much more widely available.

REFERENCES:

1. Caso A, Zensing AWA, Wells P. Non invasive objective tests for the diagnosis of clinically suspected DVT. Hemostasis. 1995;170:86-90.
2. Harold R, Hansen KJ. Expanded criteria for the diagnosis of deep venous thrombosis. Arch Surg 1984;119:1167-1170.
3. Effency DJ, Friedman MB, Gooding GAW. Iliofemoral venous thrombosis. Real time ultrasound diagnosis, normal criteria and clinical application. Radiol 1984;150:787-792.
4. 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.
5. Ramchandani P, Soulen RL. Deep vein thrombosis : significant limitations of noninvasive tests. Radiology 1985;156:47-49.
6. Holden RW, Klatte EC. Efficacy of noninvasive modalities for the diagnosis of thrombophlebitis. Radiology 1981;141:63-66.
7. 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.
8. Langsfeld M, Hershey FB. Duplex B-mode imaging for the diagnosis of deep venous thrombosis. Arch Surg 1987;122:587-591.
9. Mattos MA, Londrey GL, Leutz DW et al: Colour flow duplex scanning for the surveillance and diagnosis of deep venous thrombosis. Journal of vascular surgery. 1992;15:366-376.
10. Kerr TM, Cranley JJ, Johnson JR, et al: Analysis of 1084 consecutive lower extremities involved with acute venous thrombosis diagnosed by duplex scanning.
11. Roguin A. Christian Johann Doppler. The man behind the effect. The Br J Radiol 2002;75:615-619.
12. Joann Lohr, Kevis James, Ravi Deshmukh. Calf vein thrombi are not a benign finding. American journal of surgery. Aug. 1995;170:86-90.