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Research Article

TO STUDY ROLE OF COLOUR FLOW DUPLEX SONOGRAPHY IN EVALUATION AND WITH CORRELATION OF CHRONIC VENOUS INSUFFICIENCY OF LOWER LIMBS IN SOUTH INDIANS

Dr. Sanjeeb Kumar Agarwal[1]*, Reena Agarwal[2]

*[1]Associate Professor of Radiology, Meenakshi Medical College hospital& Research Institute, Enathur, Kanchipuram, Tamil Nadu, India.
[2]Professor of Anatomy, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, India.

ABSTRACT

Chronic venous Insufficiency (CVI) is a commonest condition encountered in clinical practice that occurs due to venous valvular dysfunction in the superficial, deep, and/or perforating veins. The spectrum may vary from common varicose veins to more severe deep vein thrombosis and resulting local and systemic complications. Duplex ultrasonography plays vital role in understanding the spectrum of CVI. 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. The colour duplex sonography is a safe, non-invasive, accurate, easily repeatable, economical, and widely available modality in the diagnosis of venous insufficiency and excludes underlying DVT, thus helping in providing valuable insights for the treatment of the patient. Duplex ultrasound was effective in excluding other causes of pain and swelling, thus preventing invasive investigations and interventions and unnecessary medical therapy.

Keywords: Color Flow Duplex Sonography, Chronic Venous Insufficiency, Lower Limbs.

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INTRODUCTION

Chronic venous Insufficiency (CVI) is a commonest condition encountered in clinical practice that occurs due to venous valvular dysfunction in the superficial, deep, and/or perforating veins. The magnitude and impact are often under recognized due to diverse clinical presentation.[1] The spectrum may vary from common varicose veins to more severe deep vein thrombosis and resulting local and systemic complications.[2] There needs to be more credible data at the global or national level on the true burden of CVI. Large-scale epidemiological studies have reported a prevalence of varicose veins with or without edema of about 25 % and in 5% of the population with trophic skin changes that include leg ulcers.[3] It can have a significant negative effect on the quality of life (QoL) of affected patients.[4] The introduction of Doppler

Corresponding Author: **Dr. Sanjeeb Kumar Agarwal** Email: sanjeeb100@gmail.com

technology has significantly transformed the diagnosis and management of CVI. The colour flow imaging in Doppler ultrasound offers a unique advantage by enabling visualization of the deep veins in the leg, which proves to be a valuable and desirable procedure for evaluating both the superficial and deep venous systems in the lower limb. [5] The duplex ultrasound, when enhanced with color flow imaging, has been confirmed as a highly sensitive and specific method for identifying both superficial and deep vein thrombosis. In a normal vein, the lumen appears echo-free without any color on Doppler imaging. The interior surface of the vein wall is smooth, and the wall is so thin that it is not visible. [6-8] when examining veins with color Doppler, the correct approach involves first ensuring a clear visualization of the vein wall. This method helps in accurately assessing the venous system and detecting any abnormalities in blood flow patterns. [9]

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. 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, lip dermatosclerosis, eczema, and ulceration. 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 themorbidity of patients. The clinical signs and symptoms of deep venous thrombosis are nonspecific and even though clinical examination can lead to correct diagnosis in case of varicose veins [4], it is important to promptly perform objective testing to confirm the diagnosis and enable the institution of safe and effective 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 post venographic phlebitis [4]. This led to the development of several noninvasive techniques such as i mpedance plethysmography, air displacement 5 plethysmography [5], thermography 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 leg and the study is safe, painless inexpensive [10-11]. 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.

Thus, the purpose of this study was to assess patients clinically symptomatic with CVI using colour duplex ultrasound. This evaluation aims to provide valuable information to assist and to evaluate the role of colour flow duplex ultrasound in clinically suspected patients of Venous Insufficiency of the lower limbs in the subsequent management of these patients.

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 Meenakshi Medical College hospital & Research Institute and Sri Lakshmi Narayana Institute of Medical Sciences, Study will be performed on GE LOGIQ P9 Ultrasound machine using high frequency linear transducer (7-12

MHz) and colour doppler. Colour doppler ultrasonography machine 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.

All patients who are referred to the department of radiology with signs and symptoms of varicose veins and clinical suspicion of deep vein thrombosis. 50 cases shall be taken up for study to evaluate the Venous Insufficiency by Duplex Sonography. Ethical approval was obtained from the Institutional Committee prior to initiating the study. Following the inclusion and exclusion criteria, a total of 50 patients having symptoms of lower extremity were referred to the department and enrolled in the research.

Criteria for Inclusion: Patients who showed clinical signs suggestive of chronic venous disease were included, Patients of all ages and both sexes were included in the study, Patients exhibiting symptoms such as pain, swelling, dilated painful tortuous veins, and leg ulcers. Patients scheduled to undergo varicose veins surgery at Meenakshi Medical College hospital & Research Institute and Sri Lakshmi Narayana Institute of Medical Sciences.

Criteria for Exclusion: Patients with confirmed cases of deep vein thrombosis were excluded from the study, Patients with a history of recurring varicose veins, Patients suspected with arterial and lymphatic diseases of lower limbs, Pregnant women.

RESULTS AND DISCUSSION:

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. 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.

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 Bakers 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 varicosity37 (97.3%) predominated over SSV varicosity25 (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.

This study aimed to evaluate the role of color flow duplex in chronic venous insufficiency (CVI) and correlate the findings with surgical outcomes. It is particularly useful in diagnosing common abnormalities such as varicose veins, venous thrombosis, leg edema caused by venous insufficiency, and leg ulceration. [15] The study involved categorizing varicosities based on their causes, distinguishing between reflux and obstruction, and assessing valvular incompetence, alongside comparing these findings with surgical observations. 21 to 90 years. Among the 50 cases examined, the highest number of patients (80%) were between 41 and 50 years of age. In randomized trial conducted by Belcaro et al. [16] concluded that the prevalence of CVI increases with age. This is most likely due to the loss of elasticity in vessels as individuals grow older.

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 Bakers cyst, Cellultis, Lymphedema [17-19].

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 Bakers 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. Colour duplex sonography stands as a crucial, safe, and cost-effective method for evaluating venous disorders in the lower limbs. This non-invasive technique offers quick and accurate insights into the nature of venous pathology, including incompetence, venous

reflux, and the presence of varicose veins. It not only aids in determining the type and level of incompetence but also provides detailed venous mapping, guiding surgical interventions effectively.

Table – 1: Age Distribution Cases with suspected Venous Insufficiency (n = 50)

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**

Table – 2: Sex Distribution Cases with suspected Venous Insufficiency (n = 50)

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

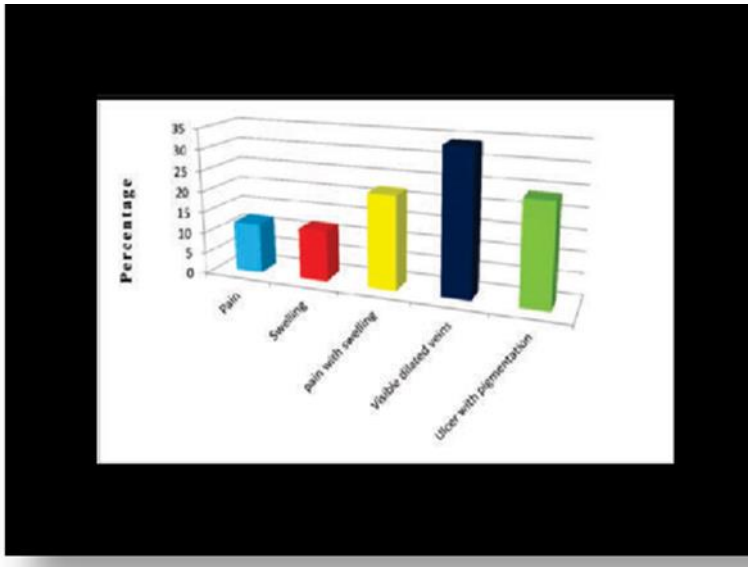

Figure 1: Distribution of cases by Symptoms

DISCUSSION

The present study highlights the efficacy of color duplex ultrasound in diagnosing chronic venous insufficiency, with accurate correlation between Doppler and surgical outcomes, emphasizing its significance in guiding appropriate interventions. Unlike other methods like contrast-enhanced CT and MRV, colour duplex sonography is not only more affordable but also widely accessible. Its ability to visualize both deep and superficial venous systems and assess blood flow direction within each segment provides understanding of the condition. This modality significantly enhances the surgeon's success rate and ultimately improves the quality of life for patients affected by lower limb venous abnormalities.

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.

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