

A Prospective Analytical Study Assessing Role of Colour Flow Duplex Ultrasound in Clinically Suspected Patients of Chronic Venous Insufficiency of the Lower Limbs

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Abstract

Aim: The aim of the present study was to evaluate the role of colour flow duplex ultrasound in clinically suspected patients of chronic venous insufficiency of the lower limbs.

Methods: The prospective study was done at department of Radiodiagnosis for the period of six months. Total 100 cases are included in study with all clinically suspected cases of venous disease of the lower limb, referred to the department of radiodiagnosis were evaluated. All patients underwent detailed colour duplex ultrasound of the lower limb venous system.

Results: The age group was wide varying from 19-80 yrs. Most common age group was 41-50 yrs (25 cases) accounting for 25% of the cases with the mean age of 46.62. 80% were male in the study. The most common side of lower to be involved was left (46 cases, 46%) as compared to right (34 cases, 34%) or bilateral (20 cases, 20%). The most common pathology in patients with chronic venous insufficiency was varicose veins (85 cases, 85%) with the remaining 7 cases suffering from deep vein thrombosis (18%). The most common site of reflux was perforator (incompetence) with 60 cases (60%) followed by mixed incompetence (both junctional and perforator) (32 cases, 32%) sapheno-femoral incompetence (3%). Most of the patients had multiple-level perforator incompetence, but the most common level was below knee medial mid 1/3rd (72 cases, 72%) and below knee medial lower 1, 3rd (68 cases, 68%). the least incompetent perforator was anterior (3 cases, 3%). All the 15 patients with deep vein thrombosis showed involvement of the proximal segment veins.

Conclusion: The study concluded that colour flow duplex sonography provides a good knowledge of the anatomy and the pathophysiology of CVI in each patient, describes the pattern of incompetence at the superficial and deep venous junction the distribution of the incompetent perforation and the prevalence of deep venous reflux, also helps in ruling out DVT.

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

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Introduction

The vast majority of patients referred for CVI duplex scan present with primary superficial varicose veins. [1] Less commonly, lower extremity venous disease is complicated by previous thrombotic events (deep or superficial) resulting in a range of problems in various venous segments including: occlusive or non-occlusive chronic thrombotic residua, venous wall fibrosis and incompetence of the affected segments. Another distinct group of patients are those representing with recurrent varicose veins following past interventions. The spectrum of clinical presentations in patients with CVI is broad, ranging from minor asymptomatic telangiectasiae and reticular veins, swelling, itching, venous eczema, symptomatic but small varicose veins,

asymptomatic but large varicose veins, post-phlebotic leg through to lipodermatosclerosis and ulceration. [2,3]

Venous return from the lower extremity to the heart must overcome gravitational forces in the upright position. In order to counter this gravitational force, biological adaptations such as muscle pump and venous valves and supportive fascial structure have evolved. However, over time, these can fail and lead to venous incompetence, a common problem affecting at least 25% of women and 15% of men. [4,5] Several treatment options including endovenous techniques and surgery are available for the venous reflux. These treatment options are largely palliative, and recurrence is common.

In 1994, at the American Venous Forum held in Maui (Hawaii, USA), the CEAP classification of venous diseases was developed, based on clinical signs (C), etiology (E), anatomical distribution (A) and pathophysiologic dysfunction (P). [6] It is considered as the standard classification and allows uniformity in report and assessment of different modalities of diagnostic and treatment. In 2004, a modification to that classification was proposed, with the aim of enhancing it. [3] In an epidemiologic study carried out in Brazil by Maffei et al [7] including patients who sought treatment at a Health Center in Botucatu (SP) for routine examinations, there was a 47.6% prevalence of varicose veins. After statistical correction, estimated prevalence for the population in the same socioeconomic level in that municipality was 35.5%, excluding cases of complaints regarding lower limbs. González-Fajardo et al [8] mention a study sponsored by the World Health Organization (WHO) in Spain, in which there was a 10.5% prevalence of lower limb venous diseases in a sample of 4,800 people aged between 30-65 years. Barros Jr [9] performed a study in pregnant patients at the prenatal care of Hospital Amparo Maternal, with the aim of analyzing prevalence of varicose disease, risk factors and symptoms during pregnancy. The study showed a high prevalence of varicose disease (72.7%), and the most prevalent risk factors were age and positive family history for varicose veins.

The aim of the present study was to evaluate the role of colour flow duplex ultrasound in clinically suspected patients of chronic venous insufficiency of the lower limbs.

Materials and Methods

The prospective study was done at department of Radiodiagnosis Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India for the period of six months. Total 100 cases are included in study with all clinically suspected cases of venous disease of the lower limb, referred to the department of radiodiagnosis were evaluated. All patients underwent detailed colour duplex ultrasound of the lower limb venous system. colour doppler studies were performed on ESAOTE 50 MY LAB VISION, SIEMENS ACUSON X300 and PHILIPS HD 15 ultrasound machines using high frequency (7-15MHZ) linear probes and low frequency (4-7 MHz) curvilinear probes wherever required.

Inclusion Criteria:

- All patients clinically suspected to have chronic venous disease
- Patients who present with swelling and ulcers of the foot and leg

- Patients of both sexes and all age groups were included in the study

Exclusion Criteria:

- All patients with suspected arterial and lymphatic diseases of the lower limb were excluded

Examination technique in lower limb doppler: Clear visualization of the lower extremity veins requires adequate distension of the venous system. Generally the venous system is examined in the supine position and the presence of incompetent perforators in the standing position with the patients putting his weight on the non-examined limb. All venous segments were examined for the characteristics of venous flow and the effects of compression. The patients were instructed to breath normally during the USG examination.

STEP-1: Femoral segment

STEP-2: Long Saphenous Vein:SFJ also examined in this step

STEP-3: Popliteal Segment

STEP-4: The Calf Veins: Anterior Tibial, Posterior Tibial And Peroneal Veins.

STEP-5: Iliac Veins all veins except the popliteal are examined with the patients in supine position. The popliteal veins are examined with the patient in the prone position and the knee slightly flexed. All veins are viewed in both transverse and longitudinal planes. The transverse plane is most useful to demonstrate the compressibility of the vein, and the longitudinal imaging for the flow pattern.

STEP-6: examination method for detecting incompetent veins: patient is examine in the standing position facing the examiner and supporting his or her weight on the contralateral extremity

The following levels of perforators will be evaluated

1. Above knee (Dodds and Hunters)
2. Below knee medial upper 1/3 rd (Boyd s)
3. Below knee medial mid 1/3 rd (Cockett's)
4. Below knee medial lower 1/3 rd (Cockett's)
5. Upper posterior
6. Lower posterior
7. Lateral
8. Anterior

Statistical Analysis

Microsoft office 2007 was used for the analysis. Descriptive statistics like mean and percentages were used for the analysis.

Results

Table 1: Demographic data

Age Group (Yrs)	No. of StudySubjects	Percentage
11 to 20	2	2
21 to 30	20	20
31 to 40	13	13
41 to 50	25	25
51 to 60	20	20
61to 70	15	15
71to 80	5	5
Sex		
Male	80	80
Female	20	20
Side		
Right	34	34
Left	46	46
Bilateral	20	20

The age group was wide varying from 19-80 yrs. Most common age group was 41-50 yrs (25 cases) accounting for 25% of the cases with the mean age of 46.62. 80% were male in the study. The most common side of lower to be involved was left (46 cases, 46%) as compared to right (34 cases, 34%) or bilateral (20 cases, 20%).

Table 2: Distribution of study subjects according to Doppler and pathology finding

Doppler findings	No of study subjects	Percentage
CVI	85	85
Bakers cyst	7	7
Cellulitis	8	8
Pathology		
Varicose veins	82	82
DVT	18	18

The most common pathology in patients with chronic venous insufficiency was varicose veins (85 cases, 85%) with the remaining 7 cases suffering from deep vein thrombosis (18%).

Table 3: Distribution of study subjects according to the site of reflex

Site	No of study subjects	Percentage
SPJ	5	5
SPI	3	3
Perforator	60	60
Combined (junctional and perforator	32	32
Total	100	100

The most common site of reflex was perforator (incompetence) with 60 cases (60%) followed by mixed incompetence (both junctional and perforator) (32 cases, 32%) sapheno-femoral incompetence (3%).

Table 4: Distribution of study subjects according to level of perforator incompetence

Level Of Perforator	No. of study subjects	Percentage
Above Knee (Dodd's and Hunter's)	10	10
Below Knee Medial Upper 1/3rd (Oyd's)	48	48
Below Knee Medial Mid 1/3rd (Cockett's)	72	72
Below Knee Medial Lower 1/3rd (Cockett's)	68	68
Posterior Leg Upper ½	34	34
Posterior Leg Lower ½	26	26
Lateral Leg	32	32
Anterior Leg	3	3

Most of the patients had multiple level perforator incompetence, but the most common level was below knee medial mid 1/3rd (72 cases, 72%) and below knee medial lower 1, 3rd (68 cases, 68%). the least incompetent perforator was anterior (3 cases, 3%).

Table 5: Anatomical distribution of thrombi in study subjects with deep vein thrombosis

Segment involved	No of study subjects	Percentage
EVI	-	-
EVI+CFV	2	13.33
EIV+THIGH(CFV+SFV)	2	13.33
Thigh (CFV+SFV)	2	13.33
EVI+THIGH UPTO KNEE	5	33.33
(CFV+SFV+PV)	4	26.66
Thigh upto knee (CFV+SFV+PV)	-	-

All the 15 patients with deep vein thrombosis showed involvement of the proximal segment veins.

Discussion

The term chronic venous insufficiency refers to the venous valvular incompetence in the superficial, deep and/or perforating veins. Incompetence of the vein valves permits reversal of flow and promotes venous hypertension in the distal segments. [10] This form of venous dysfunction may be the result of recanalization of thrombosed venous segments, pathological dilatation of the vein or due to congenital absence of competent valves. Chronic venous insufficiency of the lower limbs (CVI) is characterized by symptoms or signs produced by venous hypertension. Deep vein thrombosis can cause pain and swelling of the affected limb and it may also cause structural damage to the valves of the deep veins, which results in post phlebitis syndrome. [11] 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, it is important to promptly perform objective testing to confirm the diagnosis and enable the institution of safe and effective therapy. Ambulatory venous pressure measurements were used as a hemodynamic complement to anatomic information obtained from venography phlebography which is considered as the "gold standard" of venous imaging is expensive, time consuming, painful, exposes to radiation, lacks repeatability, requires expertise to perform and interpret reliably and associated with low but finite risk of contrast reaction and venographic phlebitis. This led to the development of several noninvasive techniques such as impedance plethysmography, air displacement plethysmography, iodine 125((1-125) fibrinogen scanning, and doppler ultrasonography. [12]

The age group was wide varying from 19-80 yrs. Most common age group was 41-50 yrs (25 cases) accounting for 25% of the cases with the mean age of 46.62. 80% were male in the study. The study done by Mirji P et al [13] included patients aged from 20 yrs to 60 yrs with only 8 female (25%) and 24 (75%) male patients. The most common side of lower to be involved was left (46 cases, 46%) as

compared to right (34 cases, 34%) or bilateral (20 cases, 20%) which was in correlation with the study done by Irodi A et al [14] who reported the most common side of involvement as left (59 limbs) when compared to right (41 limbs). The most common pathology in patients with chronic venous insufficiency was varicose veins (85 cases, 85%) with the remaining 7 cases suffering from deep vein thrombosis (18%). The most common site of reflux was perforator (incompetence) with 60 cases (60%) followed by mixed incompetence (both junctional and perforator) (32 cases, 32%) sapheno-femoral incompetence (3%). Most of the patients had multiple level perforator incompetence, but the most common level was below knee medial mid 1/3rd (72 cases, 72%) and below knee medial lower 1, 3rd (68 cases, 68%). the least incompetent perforator was anterior (3 cases, 3%). All the 15 patients with deep vein thrombosis showed involvement of the proximal segment veins. This roughly correlates with the study by Hill SL et al [15] who found 49% thrombi in the thigh or popliteal region with calf involvement. The study reported involvement of iliofemoral segment in 16% CFV in 13% SFV in 19% PV in 18% calf veins 24% and superficial veins in 11% in the present study of 50 patients, 43 of them had CVI on doppler examination.

Conclusion

The study concluded that colour flow duplex sonography provides a good knowledge of the anatomy and the pathophysiology of CVI in each patient, describes the pattern of incompetence at the superficial and deep venous junction the distribution of the incompetent perforation and the prevalence of deep venous reflux, also helps in ruling out DVT. Chronic venous insufficiency causes a great deal of morbidity in our population, however prevalence in indian population is not known. The finding of duplex sonography is important in planning the appropriate treatment, which includes surgical and non-surgical modalities. Hence colour flow duplex sonography is an accurate investigation in demonstrating the various spectrum of finding in patients with CVI, and also has a high percentage correlation with operative finding, as in the present study.

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