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ORIGINAL RESEARCH ARTICLE:

ROLE OF COLOR DOPPLER IN EVALUATION OF VARICOSE VEIN WITH EMPHASIS TO EVALUATE THE REASON BEHIND IT WHEREVER POSSIBLE.

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INTRODUCTION- Doppler ultrasound is an imaging modality widely used to evaluate venous disease of lower extrimities like varicose vein. Color Doppler and spectral study is gold standard for evaluation of varicose veins Dixon P M et al (1). Doppler ultrasound is used for confirmation of diagnosis, evaluation of severity and venous mapping to plan treatment of varicose vein. Normal veins of lower extrimities have deep, superficial and perforating venous components. By Doppler ultrasound we can evaluate all these three venous components accurately.

OBJECTIVE: To evaluate the varicose vein in the lower limb by Doppler ultrasound and find out the cause , severity of varicose vein, pattern of valvular incompetence , associated Doppler findings with skin changes and deep vein thrombosis .

METHODOLOGY: Symptomatic Patients who comes at our department for venous Doppler evaluation of lower extrimities were selected for study. All the sampled individuals comprising of males and female of different age. Different provocative measures were used for the diagnosis of venous pathologies. Compression technique, echogenic contents and Color Doppler were used for the diagnosis of deep vein thrombosis, Valsalva and distal augmentation techniques were used for chronic venous insufficiency.

RESULTS: Among 50 patients 30(60%) females and 20 (40%) males were diagnosed for different venous diseases i.e. chronic venous insufficiency and varicose veins with dilated perforators and DVT. DVT was observed in 5legs. Out of 5, 2in right leg and 3 in left leg (Right 40%, Left 60%). Chronic venous insufficiency seen in 20 (40%) and dilated incompetent perforators observed in 30 (60%) of individuals.

CONCLUSION: Doppler ultrasound is a noninvasive technique and was very effective in the assessment of lower limb peripheral veins pathology. Superficial vein incompetance is common pattern compared to deep venous system. Sephano Femoral Junction (SFJ) incompetance is the commonest pattern. Larger caliber of vein, prolonged duration of reflux, reflux in deep venous system and perforator insufficiency are significantly associated with skin changes.

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KEY WORDS: Deep Vein Thrombosis, Varicose Veins, Chronic Venous insufficiency , Incompetent Perforators .Distal augmentation ,Valsalva, Sephano femoral junction etc.

BACKGROUND - Varicose veins are dilated, tortuous veins mainly involving the superficial veins of lower limb. Depending on the presence or absence of the underlying cause, they are classified as primary and secondary .Doppler ultrasound is increasingly used in the investigations of the lower limb venous problems since last decades. It is cost effective, universally available, relatively rapid and noninvasive modality used for diagnostic imaging for varicose vein. It is therefore investigation of choice in the assessment of lower limb venous diseases. Reflux in veins due to absent or incompetent valves, occurs generally in lower limbs because of its dependant position. Venous reflux is defined as, when the retrograde flow is present for more than 0.5 second in veins. Varicose veins in long term lead to venous hypertension and skin changes; like edema, pigmentation and ulceration. This disease entity is termed as chronic venous insufficiency/disease (CVD). Chronic venous disease is very common problem affecting approximately 15% of men and 25% of women among general population as seen in Western Studies Callum M J et al (2). Varicose veins are reported more in females and in left limb. Callum M J and Irodi A et al (2, 3) .They are more prevalent in pregnancy, older patients, obesity and few occupational groups Beebe- Dimmer J L et al (4).SFJ incompetence is the main cause of varicosity, though there are multiple possible sites of reflux including sapenopopliteal junction(SPJ), deep femoral and popliteal vein reflux, and perforators incompetence Engelhorn C A et al(5). Doppler analysis is very important to locate the site of venous reflux, severity of reflux and venous anatomy which is important to plan surgical and even nonsurgical treatments like ablation .On spectral analysis, longer duration of reflux and more number of perforators may be associated with more severe outcome Stuart W P et al(6).

AIMS AND OBJECTIVES

The study was conducted with the aim was to confirm vascular patency, valvular incompetence , dilated perforators veins and perform venous mapping by venous Doppler .This study will allow us to decide which is the ideal treatment for each patient .

MATERIAL AND METHOD- STUDY DESIGN- Prospective Study.

PLACE AND DURATION – This study was conducted in Radiodiagnosis department of Super specialty hospital N.S.C.B. Medical college Jabalpur.(M.P.) from January 2020 to January 2021. METHOD- The study was conducted using Wipro G E Logiq P9 Color Doppler machine with linear probe having 5-13 MHz frequency, at the department of Radiodiagnosis in SSH .N.S.C.B. Medical college Jabalpur. With the patient lying in the supine position we were assess the deep veins from the common femoral vein (CFV) up to the poplitial vein and the bifurcation of the tibio-peroneal trunks to ensure its patency and mpetence. It is important to analyze the morphology of the spectral wave with pulsed Doppler at the level of the CFV, which should be phasic and should be modified with breathing to rule out a possible proximal obstruction in the iliac axis. This is how we will rule out that reflux in the internal saphenous vein is due to a vicariant flow. Callum M J and Mayers K A et al(2,7). The existence of reflux in the common femoral and the popliteal veins should be assessed a few centimeters above the sapheno-femoral or sapheno -popliteal junction .Next we will assess the superficial venous system with the patient standing on a platform, with his leg in abduction and external rotation, with his weight being supported by the opposite leg. It is an essential that the study is performed with a stand-up patient .Evans C J et al(8).

To confirm the presence of reflux we will use these manoeuvers:

• Valsalva manoeuver: increasing thoraco-abdominal pressure Ioannou C V et al (9)• Distal compression/relaxation maneuver Paolinelli P and Magnusson M B et al (10 ,11) by performing distal

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

compression until the flow disappears; the reflux is considered positive when upon stopping the compression the inverted flow is detected by showing a change of color and inversion of the spectral curve Hamper U M and Selfa S et al (12,13)in transversal slices and with color Doppler. Transient retrograde reflux is normal and it occurs with valvular closure. We will begin the study at the level of the sapheno-femoral junction in B-mode (Mickey Mouse sign) . At this point we should look for the possible cause of reflux, which in most cases is caused by incompetence at the level of the sapheno-femoral junction. Jung SC et al(14). Approximately 3 cm from the junction, the calibers of both saphenous veins should be measured, which in normal conditions should be less than 3-4 mm.(15) This measurement will influence the therapeutic decision and can be used as a reference for further examinations. The presence of reflux is usually associated with an increase in the diameter of the venous structure. Next we will assess possible re-entry points i.e. through perforator veins into the deep venous system or the secondary network.

Statical Analysis plan : All the records will be recorded by using structural schedule (Case Report Forms) and entered in Microsoft Excel Sheet. All the records will be rechecked for their completeness and consistencies. Non numeric entries will be coded numerically into nominal / ordinal distribution before analysis. Categorical variables was summarized in frequency and percent distribution and Chi-square or Fishers exact test will be performed as appropriate.

RESULTS: Bilateral limb involvement was seen in 34 (68%) patients and unilateral in 16 (32%) patients only i.e. total 84 limbs. Skin related changes were seen in 52 (61.9%) limbs out of total 84 limbs. Saphenofemoral junction incompetance was seen in 72(85.7%) limbs out of 84 limbs and was most common pattern of incompetance. Overall, superficial veins were involved in 78(92.8%) limbs and deep veins in 25(29.7%) limbs. Prolonged duration of varicosity(>9 year) (p=0.000), bilateral limb involvement(p=0.024), reflux in deep venous system(p=0.002), larger Greater Saphenous Vein (GSV) size(p=0.003), and perforator incompetance(p=0.002) were associated with skin changes. GSV diameter more than 7 mm was associated with reflux significantly (P=0.002).

Distribution of patients according to age-

Age in years	Number of Patients	Percentage
10-20	01	02%
21-30	10	20%
31-40	16	32%
41-50	14	28%
51-60	06	12%
61-70	03	06%
Total	50	100%

Maximum number of patient were seen at 31-40 (32%) years of age and least number of patient were at 10-20 (02%) years of age in our study.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

Distribution of patients according to sex-

	No. of patients	Percentage
Male	26	52%
Female	24	48%
Total	50	100%

Varicose vein are seen in 52% male and 48% female in our study.

Most common symptoms of varicose vein

Pain	15	30%
Swelling	13	26%
Dilated vein	12	24%
Pigmentation	07	14%
Venous ulcer	03	06%
TOTAL	50	100%

Most common symptoms are pain (30%), swelling (13%),dilated vein(24%) pigmentation (14%) and venous ulcer (3%) present in our study.

Distribution of patients according to their occupation-

Occupation	Number of patients	Percentage
Bus conductors	10	20%
Athletes	06	12%
Housewife	08	16%
Staff nurse	05	10%
Doctors	03	06%
Labourers	18	36%
TOTAL	50	100%

Maximum number of patients were labourer (36%) and minimum number of patients were doctors (06%) in our study.

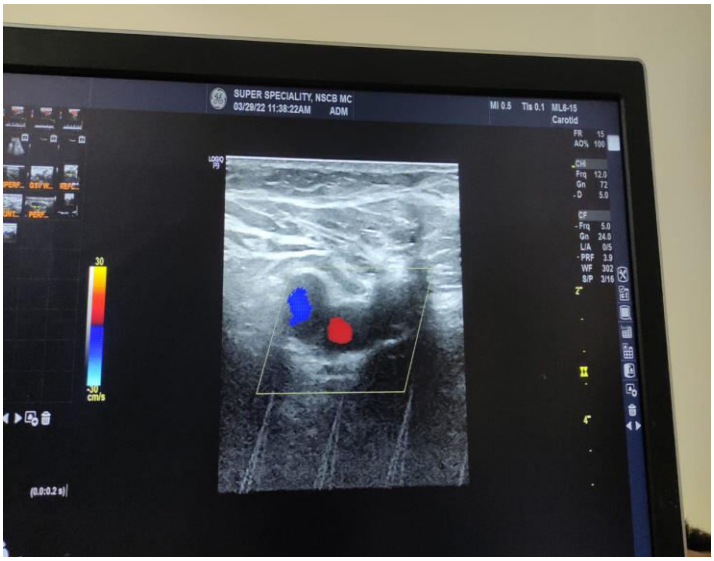
Distribution of patients according to lower limb involvement-

Limbs	Number of cases	Percentage
Rt . lower limb	06	12%
Lt. lower limb	10	20%%
Both(Rt. and Lt.) lower limb	34	68%
TOTAL	50	100%

Bilateral lower limb involvement seen in maximum number 34(68%) of patients and right lower limb involvement seen in minimum number 06(12%) of patients.

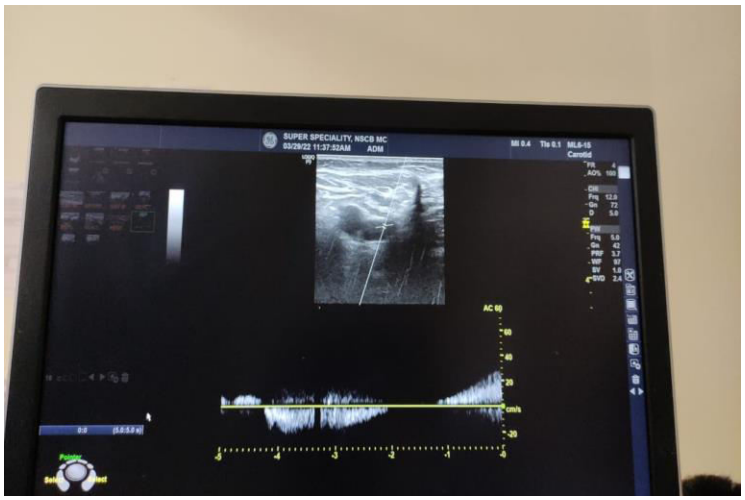
ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

Echogenic filling seen in proximal CFV and GSV

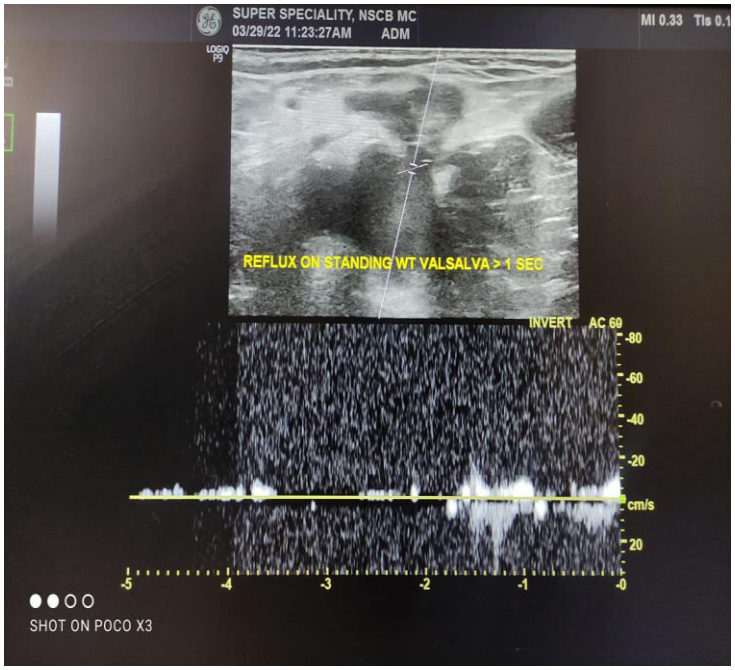


Color Doppler evaluation at SFJ.

ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022



Incompetent Sephanofemoral Junction



Reflux on standing with Valsalva > 1second s/o grade I

DISCUSSION -Because of technological advances in Ultrasound, several studies have supported Doppler ultrasound is an efficient and valuable technique for diagnosing the presence and determining the etiology of varicose veins. M.G. De Maeseneer , P. Coleridge Smith and A. Cavezzi et al (16,17,18). The deep venous system is not involved in patients with primary varicose vein. Patients with secondary varicose vein develop this condition because of damage to the deep venous system, usually caused by deep vein thrombosis W. J. Zwiebel et al (19)n. Doppler ultrasound is a non-invasive, simple and reproducible diagnostic tool that can demonstrate the cause and location of lower limb varicose vein before planning the treatment course and post-treatment follow-up. M. M. Baldt et al (20) . Incompetence of the greater or lesser saphenous vein or both has been reported to be the most common cause of lower

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limb varicose vein W.J. Zwiebel et al (21) . Our study results also demonstrated that 50% of the lower limbs with varicose veins resulted from sapheno-femoral valvular incompetence. On B-mode and color flow imaging, the dynamic motion of venous valve was well demonstrated. On spectral Doppler imaging, the direction of flow during the Valsalva's maneuver also could be assessed well . W.J. Zwiebel et al (22) . In addition to incompetence of the venous valve, incompetent perforating vein appears to have a role in the cause of lower limb varicose vein. In one series, G. W. L. Phillips et al (23) reported that perforating vein with reflux could be identified in approximately 25% of the patients with perforators <3 mm in diameter and approximately 60% of the patients with perforators >4 mm. We found that the incidence of perforating vein with reflux in perforators with diameter ≥4 mm group was more than in the diameter <4 mm group (80% vs. 61.8%). More perforating veins with reflux, regardless of size could be detected in our study.M. M. Baldt et al (20) used ascending venography and color-coded duplex sonography for detection of incompetent perforating vein and demonstrated more incompetent perforating veins were found by ascending venography. In our study, the incidence of perforating vein with reflux in the perforators with diameters ≥4 mm was high (8/10, 80%) . G.W.L. Phillips et al suggested that the difficulty in demonstrating reflux with US in all incompetent perforating veins is because of the small volume and low velocity of flow involved. This may explain, in part, why the two perforators with diameter ≥4 mm, but without reflux demonstration on Doppler ultrasound was probably incompetent. GSV diameter more than 7mm near SFJ is associated with reflux in most limbs, which was also found in our study. Bilateral leg involvement was associated with skin changes as compared to single leg involvement. This may be related to late presentation in patients with varicosity, presence of systemic problems like obesity, family history of venous disease, chronic airway disease and higher age in those patients age as independent risk factor for severe disease has also been described Scott T.E. et al (24)

Conclusion- In conclusion, Doppler Ultrasound is a safe and effective method for detection of valvular incompetence and the anatomic location of incompetent perforating vein of lower limb varicose vein before planning the treatment course. It also allows us to determine the severity of varicosity , related to the occupation of patients.

Conflict of interest – None to declare.

Acknowledgement – None to declare.

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ISSN: 0975-3583,0976-2833 VOL13,ISSUE05,2022

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