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Original Article: Role of Venous Doppler Ultrasound In Evaluation of Lower Limb Venous Pathologies in 100 Patients

KEYWORDS: Venous Doppler sonography, duplex sonography, lower extremity, phasicity, pulsatility, venous Sonography, evaluation.

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ABSTRACT *The purpose of this study is to discuss the utility of venous Doppler ultrasonography as the foundation for diagnosis of lower extremity pathologies like varicosities anddeep vein thrombosis. The effectiveness and practicality of venous ultrasonography as a stand-alone examination in the diagnosis of acute deep vein thrombosis and varicose veins is addressed.*

Venous ultrasonography has become the most widely used diagnostic modality, invasive or noninvasive, for the diagnosis and exclusion of acute deep vein thrombosis or varicose veins. Duplex ultrasound is considered to be the primary noninvasive diagnostic method for deep vein thrombosis.

(We conducted a retrospective studyon 100 patients having prior history oflower limb pain, claudication, edema and varicosities.

INTRODUCTION:

Often, the examination is obtained to evaluate the cause of swelling of an extremity. In addition to deep venous thrombosis, there are other causes for swelling. As part of the examination, pulsed-wave Doppler sonography of the veins should be performed. This can be done with augmentation, in which the extremity is squeezed distally and the vein is insonated proximally using pulsed-wave Doppler sonography. A rapid change in the venous waveform provides indirect evidence of patency of the vein between those two points.

Pulsed-wave doppler sonography in a proximal vein in the extremity is also performed to evaluate the waveform for the presence of respiratory phasicity or cardiac pulsatility. If a normal waveform is obtained in the common femoral vein, the proximal iliac veins and inferior vena cava are patent. If a normal waveform is obtained from these veins but a nonphasic or nonpulsatile (flat) waveform is obtained more distally, a venous occlusion between the points of insonation should be investigated.

There is tremendous variability in the appearance of normal venous waveforms between individuals because of differences in depth and rate of respiration, right heart function, tricuspid regurgitation, intravascular volume, body habitus, and other physiologic differences. In addition, for a given individual, the amplitude of the waveform decreases as the distance from the heart increases. To obtain an internal standard, the contralateral extremity can often be used.

An abnormal waveform present in one of the lower extremities should prompt pulsed-wave Doppler sonography of the veins of the contralateral lower extremity for comparison. If it is determined that the waveforms lack phasicity or pulsatility in one extremity, the ipsilateral iliac vein should be further evaluated by additional imaging for compression or obstruction. An abnormal waveform present in both lower extremities should prompt evaluation of both iliac veins and the inferior vena cava. There has been a report of venous occlusion of an iliac vein because of lymphadenopathy that was discovered due to lack of a normal waveform. However, abnormalities of the abdomen and pelvis have not been as well recognized as abnormalities of the thorax. There is much pathology in the thorax, abdomen, and pelvis that can be discovered from identifying abnormal waveforms in the veins of the extremities.

METHODS: The study consisted of 100 cases which were referred to the Department of Radiodiagnosis and Imaging, Bharati Hospital.

A detailed history of the patient's symptoms was taken. All patients with symptoms related to the lower limb were subjected to lower limb venous doppler study on a high end Philips iU 22 and HD 11 ultrasound systems and real-time images of the common femoral, deep femoral, femoral and popliteal veins were obtained before and after compression. Color and pulsed-wave Doppler sonography also was performed. If an abnormal pulsed-wave Doppler waveform was present, real time images and doppler sonograms of the iliac veins and inferior vena cava were obtained. If available, previous CT scans were reviewed. CT was also performed if needed. Pulsed wave doppler was used in conjunction with duplex ultrasonography which increased the sensitivity in the detection of the lower limb venous pathologies. A waveform obtained by pulsed-wave Doppler sonography was interpreted as normal if cardiac pulsatility or respiratory phasicity was shown. A waveform was interpreted as abnormal if there was a flat or nearly flat waveform. If there was any uncertainty about the appearance of the waveform, pulsed-wave doppler sonography of the contralateral extremity was performed to provide comparison with a normal waveform. All

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waveforms were interpreted with the patient breathing normally. In all cases, the interpreter of the duplex venous examination was unaware of the results of any previous imaging examinations at the time of the interpretation.

DISCUSSION :

Swelling of an extremity may be a sign of peripheral deep venous thrombosis but may occasionally be caused by more proximal venous obstruction. Duplex venous sonography of the extremities is a commonly performed procedure to evaluate for this possibility. As a part of this examination, pulsed-wave Doppler sonography is used to evaluate for augmentation that provides evidence of venous patency between the levels that the extremity is squeezed and the point of insonation.

Venous ultrasonography has become the most widely used diagnostic modality, invasive or non invasive and is indicated mainly for the study of two pathologies: venous thrombosis and venous insufficiency. Duplex ultrasound is considered to be the primary non invasive diagnostic method for DVT [1].

It allows the examiner to evaluate the gross anatomy of the superficial and deep venous networks as well as the blood flow direction, which is crucial in determining vein pathology. It has become the reference standard used in the assessment of the condition and hemodynamics of the veins of the lower limbs [2]. The normal physiological blood flow is anterograde, flowing from the periphery towards the heart, so that the evidence of an opposite, retrograde flow might indicate a pathology. The presence of a reflux is likewise of note; a reflux when not isolated in a vein (as simply retrograde), means that the blood flow is bi-directional where once the flow had been only anterograde [3].

Color flow venous duplex scanning of the proximal and distal veins is the current standard for routine clinical assessment of possible lower extremity DVT [4]. Other invasive and noninvasive tests also are occasionally indicated in the assessment of possible DVT in clinical settings where venous duplex scanning is technically inadequate or cannot provide appropriate information.

Duplex sonography can effectively diagnose any of the acute or chronic disease processes that affect extremity veins. Most commonly, duplex sonography is used when acute deep venous thrombosis is suspected [5]. Evaluation of chronic venous pathology is a less common but nevertheless important function of this technique.

It is immensely useful because of the noninvasive nature of the study, the portability of the machine, and the rapidity with which results may be obtained.

Duplex evaluation of superficial venous thrombosis, especially occurring in the greater saphenous vein, is important for two reasons. First, although the clinical examination is useful in establishing the diagnosis, it is not reliable in identifying the extent of the thrombus [6]. Particularly in the proximal thigh, thrombus often extends beyond the apparent area of involvement. Duplex sonography documents the proximal extent and can be used to monitor progression.

Duplex sonography of extremities with superficial venous thrombosis is also useful to identify concomitant but clinically silent DVT.

In conclusion, peripheral venous duplex sonography is commonly performed to evaluate the cause of swelling of an extremity. Venous insufficiency and peripheral deep venous thrombosis are frequently the cause.

IMAGES

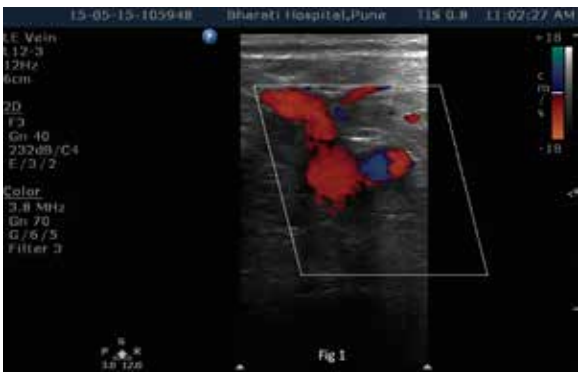

Fig. 1. Normal common femoral and great saphenous vein. The femoral vein is located medial to the common femoral vein.

Fig.: 2. Normal femoral vein. The femoral vein is positioned below the superficial femoral artery, with adequate color filling

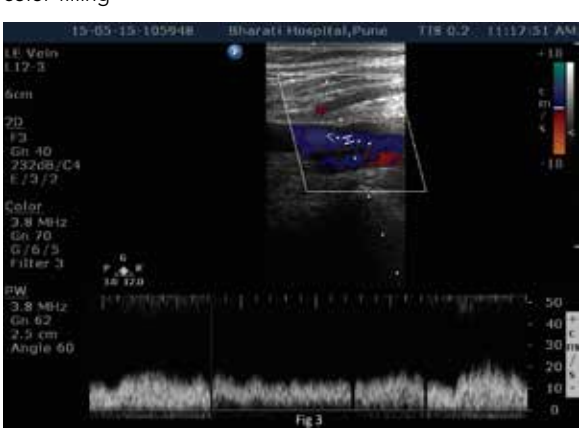

Fig.: 3. Normal respiratory phasicity is present in the spectral evaluation of the femoral vein.

RESULTS/OBSERVATION:

Out of 100 symptomatic patients 35 patients were suffering from venous insufficiency and 22 showed acute and chronic deep vein thrombosis.

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Clinical relevance/ Application

Doppler is extremely useful modality for evaluationa and diagnosis of lower limb venous pathologies. It gives valuable information to the referribg surgeons for planning the line of treatment in terms of consevative management or surgery. Doppler is not only a diagnostic tool but also heps in therapeutic interventions.

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