

Proper Preparations for the Ultrasonographic Evaluation of Varicose Veins of the Lower Extremities – The 2023 Korean Society for Phlebology Clinical Practice Guidelines

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In the diagnosis of varicose veins, duplex ultrasound scanning is recommended as the diagnostic test of choice. Both superficial and deep veins must be tested accurately and consistently in a standardized manner. Ultrasonography, while effective, is highly dependent on the examiner and requires standardization. To ensure reliable results, it is crucial to obtain high-quality images of superficial veins using a high-frequency linear array transducer during ultrasound examinations of the lower extremities. Image optimization techniques should be employed to minimize artificial images and enhance diagnostic quality. When conducting ultrasound examinations of the lower extremities, specifically for varicose veins, performing the venous reflux test in a standing position is essential. This positioning allows for testing under conditions more similar to physiological ones, ensuring a more accurate assessment of pathological reflux influence. (Ann Phlebology 2023;21:60-62)

Key Words: Varicose vein, Ultrasound, Reflux, Diagnosis, Guideline

Introduction

For patients suspected of chronic venous disease, duplex ultrasound scanning is a primary diagnostic examination to evaluate abnormalities in both superficial veins and deep vein systems. Given that venous reflux can occur in both legs, the examination should encompass both legs, even if the issue appears localized to one side. The assessment for chronic venous insufficiency involves the use of duplex ultrasound, employing a high-frequency linear array transducer with a range of 4~14 MHz to obtain high-quality images of both superficial and deep veins. To prevent false positive and false negative results, the patient should be tested in a standing position. If standing is not feasible for the patient, the examination can be conducted in the reverse Trendelenburg position. This review will delve into the standardized diagnostic test of choice for varicose veins, the selection of appropriate probes, techniques for image optimization, and considerations for the examination posture.

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Key Question 1. What tests should be performed on patients with suspected varicose veins?

1-1. A duplex ultrasound examination is performed to diagnose varicose veins

A duplex ultrasound is recommended as the initial

diagnostic test for all patients suspected of chronic venous disease (1,2). Recognized for its safety, non-invasiveness, cost-effectiveness, and reliability, duplex ultrasound has long been considered an accurate method for evaluating venous failure (3). In 2011, the Society for Vascular Surgery (SVS) and the American Venous Forum (AVF) introduced the first evidence-based guidelines, strongly advocating for the use of duplex ultrasound in patients with chronic venous disease (1A Strong recommendation, high-quality evidence) (4). The 2023 revised guidelines from the Society for Vascular Surgery, American Venous Forum, and American Vein and Lymphatic Society continue to emphasize the strong recommendation (grade 1, strong) for the implementation of duplex ultrasound as a diagnostic test for venous reflux (5). This reaffirms the enduring recognition of duplex ultrasound as a reliable and highly recommended method for diagnosing chronic venous disease.

Key Question 2. What are the appropriate probes and settings when examining varicose veins with ultrasound?

2-1. It is recommended to use a vascular linear probe to obtain an accurate standard image

A study by Labropoulos et al. (6), which is the cornerstone of the study on the diagnosis of deep vein and superficial venous valve dysfunction, was measured with vascular linear probes (4~7 MHz), and all studies related to the diagnosis of varicose veins used linear probes with frequencies between 4~14 MHz (1,4,7-10). Until reliable research results are accumulated to measure lower limb venous insufficiency by transducers for other purposes, measurements by vascular linear transducers, the main position of the current academic world, are reasonable. Therefore, the diagnosis is based on reflux measured using a 4~14 MHz vascular linear probe that meets this criterion, and surgical treatment is also determined based on the results.

2-2. Inspection is performed under a setting with minimal spectral broadening, blooming artifacts, mirror images, noise, artifacts, false positives, and false negatives

Similar to other imaging tests, Doppler ultrasound may

introduce artifacts due to the physical properties of the device or the anatomical structure of the human body. For instance, inadequate gain settings in spectral Doppler ultrasound may result in the loss of essential information, while excessively strong gain settings can deform the waveform, leading to artifacts such as spectral broadening, mirror images, and spikes caused by noise. These artifacts have the potential to compromise the objectivity of diagnosis. Hence, the fundamental principle of the duplex ultrasound test is to minimize background noise, aiming to exclude false positives induced by artifacts (11-13). This approach is crucial for maintaining the accuracy and reliability of the diagnostic process.

2-3. The test should be performed in a standing position of the patient. However, if a standing position is not possible, it can be measured in a sitting or reverse trendelenburg position

When diagnosing valvular insufficiency in the lower extremities using ultrasound, measurements should ideally be conducted in a standing position. This is because the standing position better illustrates the physiological effects of gravity, particularly in the presence of pathological reflux (1,6-8,14,15). Measuring in a supine position should be avoided, as it is prone to yielding false positive and false negative results (16-18). However, in cases where the patient is unable to stand, alternative positions such as sitting or the 'reverse Trendelenburg' position (greater than 45 degrees from the horizontal) can be considered for the ultrasound measurement (7). This allows for a more accurate assessment in situations where standing is not feasible.

Conclusion

Ultrasound serves as the primary diagnostic test of choice for patients with chronic venous vein diseases in the lower extremities, offering a safe, non-invasive, inexpensive, and reliable method. Given the subjective nature of the diagnosis, there is a need to establish clear standards for diagnosing varicose veins and to standardize the technique. To obtain accurate standard images, the use of vascular linear probes is recommended, and ultrasound optimization is essential to eliminate false positives caused by artifacts, which could otherwise impact the objectivity of the diagnosis. Performing duplex ultrasound of the lower

extremities in chronic venous diseases is ideally conducted in a standing position. However, if a standing position is not possible for the patient, alternative positions such as sitting or the examination in a reverse Trendelenburg position can be considered. This adaptability ensures a thorough and flexible approach to diagnosis based on the patient's condition.

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