



Duplex Ultrasound Imaging Of Lower Extremity Veins in Chronic Venous Disease, Exclusive of Deep Venous Thrombosis: Guidelines for Performance and Interpretation of Studies

These American College of Phlebology guidelines for lower extremity ultrasound venous imaging describe minimum standards for imaging protocols and reporting as well as qualifications for those individuals performing and interpreting these studies. The accuracy of the non-invasive venous study depends on the knowledge, skill and experience of the technologist or physician performing the studies, and the knowledge, skill and experience of the physician interpreting the studies.

The ultrasound investigation in patients with chronic venous disease (CVD) is very different from examinations to rule out deep vein thrombosis. Most examinations for CVD are for diagnosis and planning for treatment of venous insufficiency. The information gathered by the duplex investigation has a significant impact on what type of treatment will be most appropriate and therefore recommended. Failure to identify and treat all sources of reflux may result in outright treatment failure. Duplex ultrasound is essential to the performance of endovenous ablative procedures including endovenous laser, radiofrequency occlusion, and ultrasound-guided sclerotherapy. The examination may be used for outcome assessment after treatment.

Indications for Duplex Doppler Ultrasound Studies in Chronic Venous Disorders:

Duplex ultrasound imaging is the most commonly used investigation to evaluate the venous system prior to management of chronic venous disorders (CVD) of the lower extremities. After a focused history and a physical examination, a request should be made for a duplex ultrasound exam. Duplex ultrasonographic imaging is indicated in patients seeking treatment for primary or recurrent venous insufficiency (varicose veins) and in patients with lower extremity symptoms or signs suggestive of venous disorders.

The duplex ultrasound examination in CVD patients should demonstrate both venous anatomy and function. The following facts should be determined during the standing examination:

1. The location, competency and diameter of the saphenous junctions.
2. The distal extent of reflux in the saphenous veins in the thighs and legs. Recording the saphenous diameter at the mid-thigh and at the knee is desirable.
3. The location of incompetent perforating veins as measured from the floor.

4. Other named and unnamed veins that show reflux or are varicose should be noted.
5. The source of venous hypertension in varices if not from the veins described above.
6. Saphenous veins that are absent, totally occluded, hypoplastic or atretic should be noted.
7. The state of the deep venous system, including valvular competence and evidence of current or previous venous thrombosis.

Qualification to perform and/or interpret duplex ultrasound imaging does not constitute qualification to perform endovenous ablation procedures. Additional training in those techniques is mandatory.

Equipment

Use of appropriate duplex instrumentation, which uses both B-mode imaging and real time Doppler ultrasound, is required. A color duplex ultrasound instrument is recommended. Imaging probes of 7-15 MHz are appropriate for obtaining good quality images of the venous system of the legs. Doppler frequencies of at least 3 MHz and hardcopy documentation of the examination are recommended. Static images must be archived.

Patient Positioning

Evaluation of the superficial system is best performed on the non-weight bearing extremity with the patient standing. The supine position is inappropriate for detection of reflux and measurement of vein diameters.

Examination of calf veins may be performed with the patient in either the sitting or standing position. For examination of the tibial and calf vessels, the patient may need to be tilted or the leg dangled over the side of the examination table.

Evaluation of the deep venous system of the thigh may be carried out with the patient supine or in a reverse Trendelenburg position. The flexed leg may be externally rotated for better access to the deep venous circulation. Access to the popliteal vein or posterior calf veins may be performed by way of a posterior approach with the patient in a lateral decubitus position.

Reporting of Results

The report should clearly state the reason for the ultrasound examination. A diagrammatic representation of the findings is highly desirable. A textual report is required. The report should include information about the location of sources of venous reflux, status of the saphenous junctions, function of the saphenous veins and the deep venous system. Inclusion of selected images from the study is recommended. A video recording does not usually form part of the report.

Qualifications

The appropriate use and interpretation of non-invasive venous studies requires knowledge of venous anatomy, physiology, hemodynamics, and the clinical manifestations of venous disease. In addition, knowledge of ultrasound physics, indications for testing, criteria for diagnosis of venous reflux and thrombosis, technical limitations of the study and an understanding of the skills necessary to perform the studies.

Suggested minimum qualifications for the physician performing and/or interpreting studies include the following, which relate chiefly to interpretation of examinations:

- A. Hold an active medical license.
- B. Clinical experience in phlebology or related vascular specialty.
- C. Training and understanding of venous anatomy, physiology and hemodynamics, ultrasound physics and

instrumentation. Evidence of training in residency, fellowship, or postgraduate CME course work that includes these items is required. This should include: supervised experience in an approved training program in which non-invasive venous studies are an integral part of the experience with a minimum of 50 cases. Or, in the absence of the formal training during residency or fellowship, the physician should have experience with at least 100 documented cases.

- D. CME with specific reference to venous disease including imaging should be maintained at a minimum of 15 credit hours every 3 years.
- E. Continuing experience is important to maintaining competence; a minimum of 100 examinations per year is recommended to maintain a physician's interpretation skills.
- F. Regular interaction with a sonographer, if applicable, to ensure continuous quality control and improvement is desirable.

The clinical experience and training above relate primarily to interpretation of studies. Additional skills training by the physician in

performing the examinations is required. The physician should perform a minimum of 100 examinations per year in order to maintain performance skills.

Suggested minimum qualifications for the sonographer performing studies include the following:

- A. Training in venous anatomy, physiology, hemodynamics, ultrasound physics and instrumentation. Evidence of formal training in a supervised setting and continuing CME course work, which includes these principles, is required.
- B. Qualification to perform these studies is best demonstrated by certification or eligibility for certification by a nationally recognized certifying body, such as the Registered Vascular Technologist (RVT) credential offered by American Registry of Diagnostic Medical Sonographers (ARDMS) or the Registered Vascular Specialist (RVS) credential offered by Cardiovascular Credentialing International (CCI).
- C. CME minimum requirements should be 30 hours every 3 years.

References

The American College of Phlebology guidelines are largely based on the International Union of Phlebology's Consensus Documents on Duplex Ultrasound Investigation of Veins in Chronic Venous Disease of the Lower Limbs. These consensus documents, as well as other materials reviewed in forming the ACP guidelines included but were not limited to:

1. Cavezzi et al. Duplex Ultrasound Investigation of the Veins in Chronic Venous Disease of the Lower Limbs - UIP Consensus Document. Part II Basic Principles. *Eur J Vasc Endovasc Surg* 2006;31:288-99.
2. Coleridge-Smith et al. Duplex Ultrasound Investigation of the Veins in Chronic Venous Disease of the Lower Limbs - UIP Consensus Document. Part I Anatomy. *Eur J Vasc Endovasc Surg* 2006;31:83-92.
3. MedPAC recommendations of imaging services, statement of executive director March 2005
4. ACC/ACP/SCAI/SVMB/SVS Clinical Competence Statement on Vascular Medicine and Catheter-Based Peripheral Vascular Interventions - *J Am Coll Cardiol* 2004;44(4):941-57.
5. ACR practice guideline for performing and interpreting diagnostic ultrasound examinations, as revised and amended 2000, effective January 2001
6. Suggested Minimum Qualification for Physicians Interpreting Noninvasive Vascular Diagnostic Studies, Society of Vascular Technology, March 1996
7. Foldes, M et al: Standing Versus Supine Positioning in Venous Reflux Evaluation: *J Vasc Tech* 1991;15(6):321-24.
8. Registered Physician in Vascular Interpretation examination requirements
9. Clinical Privilege White Paper, the Credentialing Resource Center, Marblehead Mass

Disclaimer

Adherence to these guidelines will not ensure successful performance. Furthermore these guidelines should not be deemed inclusive of all proper methods of treatment or exclusive of other protocols reasonably directed to obtain the same results. The physician and patient must make the ultimate judgment regarding the propriety of any performance and interpretation of studies in light of all the circumstances presented by the individual patient.

These guidelines reflect the best available data at the time it was prepared; the results of future research or technology may require alteration of the minimum standards and reporting as set forth in this guideline.