



## **VASCULAR TECHNOLOGY PROFESSIONAL PERFORMANCE GUIDELINES**

---

# Lower Extremity Venous Duplex Evaluation

This Guideline was prepared by the Professional Guidelines Subcommittee of the Society for Vascular Ultrasound (SVU) as a template to aid the vascular technologist/sonographer and other interested parties. It implies a consensus of those substantially concerned with its scope and provisions. This SVU Guideline may be revised or withdrawn at any time. The procedures of SVU require that action be taken to reaffirm, revise, or withdraw this Guideline no later than three years from the date of publication. Suggestions for improvement of this Guideline are welcome and should be sent to the Executive Director of the Society for Vascular Ultrasound. No part of this Guideline may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

Sponsored and published by:  
Society for Vascular Ultrasound  
4601 Presidents Drive, Suite 260  
Lanham, MD 20706-4831  
Tel.: 301-459-7550  
Fax: 301-459-5651  
E-mail: [svuinfo@svunet.org](mailto:svuinfo@svunet.org)  
Internet: [www.svunet.org](http://www.svunet.org)

Copyright © by the Society for Vascular Ultrasound, 2014  
ALL RIGHTS RESERVED. PRINTED IN THE UNITED STATES OF AMERICA.

# Lower Extremity Venous Duplex Evaluation

## (For Deep/Superficial Vein Thrombosis)

### PURPOSE

Duplex imaging of the lower extremity veins is performed to assess the deep and superficial venous system of the lower extremity (groin to ankle level) to determine the presence or absence of deep or superficial vein thrombosis.

### APPROPRIATE INDICATIONS

Common indications for the performance of lower extremity venous duplex imaging include, but are not limited to:

- Swelling
- Pain
- Tenderness
- Documentation of a source for pulmonary embolism (PE)
- Palpable cord
- Status post venous interventional procedure
- Symptoms of pulmonary embolism
- Shortness of Breath with known lower extremity venous thrombosis
- New lower extremity pain while on anticoagulation
- Before terminating anticoagulation therapy

### CONTRAINDICATIONS AND LIMITATIONS

Contraindications for lower extremity venous duplex imaging are unlikely; however, some limitations exist and may include the following:

- Obesity
- Casts, dressings, open wounds, etc, can limit visualization
- Patients with severe edema/swelling
- Limited patient mobility

### PATIENT COMMUNICATION

The technologist/sonographer/examiner should:

- Introduce self to the patient and explain why the evaluation is being performed and indicate how much time the exam will take.
- Explain the procedure, taking into consideration the age and mental status of the patient, and that the necessity for each portion of the evaluation is clearly understood.
- Respond to questions and concerns about any aspect of the Lower Extremity Venous Evaluation
- Educate patients about risk factors for and symptoms of deep and/or superficial venous thrombosis.
- Refer specific diagnostic, treatment or prognostic questions to the patient's physician.

## **PATIENT ASSESSMENT**

Patient assessment must be performed before the exam. This includes assessment of the patient's ability to tolerate the procedure and an evaluation of any contraindications to the procedure.

The technologist/sonographer/examiner should:

Obtain a complete, pertinent history by interview of the patient or their representative and review the patient's medical record, when available. A pertinent history includes:

- Relevant risk factors including previous DVT/SVT
- Lower extremity trauma
- Extremity immobilization
- Recent major surgery
- Prolonged bed rest
- History of cancer
- Family history of DVT
- Pregnancy
- Congestive heart failure (CHF) or other similar cardiac history
- Current medications and/or therapies
- Results of other relevant diagnostic procedures

Complete a limited or focused physical exam, including observation and localization of any signs or symptoms of peripheral venous disease:

- Swelling
- Pain/tenderness
- Palpable cord
- Discoloration
- Varicosities
- Ulceration
- Shortness of breath

## **PATIENT POSITIONING**

The optimal for viewing the veins of the lower extremity is:

- Supine position with the head of the bed elevated
- Reverse Trendelenburg
- Leg being examined, externally rotated .
- Alternately, the lateral decubitus or prone position may be utilized to visualize the popliteal vein, peroneal and proximal posterior tibial veins, small saphenous vein and soleal veins.
- To aid in normalizing abnormal common femoral vein signals, positioning the patient slightly to the side opposite the examination side may assist with normalizing the Doppler waveform signal.

## **INSTRUMENTATION**

Use appropriate duplex instrumentation with appropriate frequencies for the vessels being examined.

- Typically a linear 5-7 MHz transducer
- Superficial structures may require higher frequency
- Deeper structures or edematous tissue may require a lower frequency transducer
- Iliocaval imaging will require lower frequency 2-5 MHz curvilinear or phased array transducers.

This includes display of both two-dimensional structure and motion in real-time and Doppler ultrasonic signal documentation with:

- Spectral analysis with or without color Doppler imaging
- Videotape, film or digital storage of static images and/or cineloop. Adding cineloop to laboratory protocol provides documentation of normal or abnormal compression at each of the segments.

## EXAM PROTOCOL

Throughout each examination the technologist/sonographer/examiner should:

- Observe the sonographic characteristics of the normal and abnormal tissues, structures, and blood flow to allow necessary adjustments to optimize exam quality
- Assess and monitor the patient's physical and mental status, allowing modifications to the procedure plan according to the patient's clinical status
- Analyze sonographic findings to ensure that sufficient data is provided to the physician to direct patient management and render a final diagnosis

Follow a standard imaging protocol per department specific/facility specific anatomic algorithm. A complete venous duplex evaluation incorporates B mode and spectral Doppler with or without color flow Doppler analysis.

- Studies may be unilateral with the use of an appropriate algorithm. However, it is required to compare the common femoral spectral waveform from the contralateral limb, in this event.
- Transverse transducer compressions (when anatomically possible and not contraindicated) should be performed every 2 cm to ensure entire vein is assessed.
- Representative images are obtained per lab protocol

Interrogation and documentation of **compression** of the following vessels is the minimum requirement:

- Bilateral common femoral veins
- Sapheno-femoral junction
- Great Saphenous Vein
- Proximal Deep Femoral Vein
- Proximal femoral vein (FV)
- Mid FV
- Distal FV
- Popliteal vein
- Posterior tibial veins
- Peroneal veins
- The following are included if indicated or required by the facility specific-protocol:  
Inferior vena cava, common iliac, external iliac, great saphenous, small saphenous, proximal deep femoral, gastrocnemius, soleal, anterior tibial or perforating veins.

**Spectral Doppler** waveform assessment is performed in the sagittal plane. It is not required to angle correct unless measuring velocities. If angle correction is utilized, 45-60 degree angles must be maintained and aligned with the vessel wall.

To accurately assess venous waveform profiles, venous flow is characterized according to:

- Spontaneity
- Phasicity
- Augmented venous flow with proximal or distal augmentation
- Pulsatility

SVU Protocol requires interrogation of the following vessels:

- Right and left common femoral veins
- Deep Femoral Vein
- Femoral vein
- Popliteal Vein
- Great Saphenous Vein
- Peroneal and Posterior Tibial Veins in transverse view with color Doppler of distal augmentation

IAC Standards may require less documentation.

When pathology (thrombus or intraluminal echoes) is present:

- B-Mode image should demonstrate the degree of compressibility
- Differentiate between partially or totally non-compressible segments
- Appearance, presence of intraluminal echoes, brightly echogenic or hypoechoic thrombi
- Location and extent
- Differentiate between unattached proximal tips and attached thrombi.
- Note dilatation/contraction of vein to assist in describing characteristics of aging the thrombus
- Measure size of any abnormal structures in length, width and AP diameters

## **REVIEW OF THE DIAGNOSTIC EXAM FINDINGS**

The technologist/sonographer/examiner should:

- Review data acquired during the Lower Extremity Venous Duplex Evaluation to ensure that a complete and comprehensive evaluation has been performed and documented.
- Explain and document any exceptions to the routine Lower Extremity Venous Duplex Evaluation protocol (i.e., study omissions or revisions).
- Determine any change in follow-up studies, review previous exam documentation so that the current evaluation can document any change in status; and, to duplicate prior imaging and Doppler parameters. The examination protocol may need to be modified to address current physical needs.
- Record all technical findings required to complete the final diagnosis on a worksheet or other appropriate methods i.e., computer software, so that the findings can be classified according to the laboratory diagnostic criteria [these criteria may be based on published or internally validated data (see appendix with criteria)]
- Document the exam date, clinical indication(s), technologist performing the evaluation and exam summary in a laboratory logbook or other appropriate method, i.e. computer software.

## **PRESENTATION OF EXAM FINDINGS**

The technologist/sonographer/examiner should:

- Provide preliminary results when necessary as provided for by internal guidelines based on the Lower Extremity Venous Duplex Evaluation findings.
- Present record of diagnostic images, data, explanations, and technical worksheet to the interpreting physician for use in interpretation.
- Interpreting physician's name, date of exam, date of interpretation, and an appropriate indication must appear on the final report.
- Alert vascular laboratory Medical Director or appropriate health care provider when immediate medical attention is indicated based on the departmental guideline/policies and procedures.

## **EXAM TIME RECOMMENDATIONS**

High quality, accurate results are fundamental elements of the lower extremity venous evaluation. A combination of indirect and direct exam components is the foundation for maximizing exam quality and accuracy. Total recommended time allotment is 75 minutes (for bilateral examination).

- Indirect exam components include pre-exam activities: obtaining previous exam data; initiating exam worksheet and paperwork; equipment and exam room preparation; patient assessment and positioning; patient communication; post-exam activities: exam room cleanup; compiling, reviewing and processing exam data for preliminary and/or formal interpretation and, patient charge and billing activities. Recommended time allotment is 15 minutes.
- Direct exam components includes equipment optimization and the actual hands-on, examination process Recommended time allotment is 40-60 minutes (for bilateral examination).

## **REFERENCES**

- Talbot, S.R., Oliver, M. Duplex Imaging of the Lower Extremity Venous System, Diagnostic Medical Sonography, The Vascular System, Lippincott Williams and Wilkins, 209-230, 2013
- IAC Standards and Guidelines for Vascular Testing Accreditation (updated 1/2013) Section 4B: Peripheral Venous Testing p 42-48
- Gornik, H.L., Gerhard-Herman, M.D., Misra, S., Mohler, E.R., Zierler, R.E., ACCF/ACR/AIUM/ASE/IAC/SCAI/SCVS/SIR/SVM/SVS/SVU 2013 Appropriate Use Criteria for Peripheral Vascular Ultrasound and Physiological Testing Part II: Testing for Venous Disease and Evaluation of Hemodialysis Access