



## **VASCULAR TECHNOLOGY PROFESSIONAL PERFORMANCE GUIDELINES**

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# Lower Extremity Venous Duplex Evaluation

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# Lower Extremity Venous Duplex Evaluation (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
- Limb pain
- Tenderness
- Documentation of a source for pulmonary embolism (PE)
- Palpable cord
- Pallor (Phlegmasia alba dolens)
- Cyanosis (Phlegmasia cerulean dolens)
- 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 may include the following:

- Obesity
- Recent surgery in the region of exam, the presence of casts, surgical staples/dressings, open wounds, hematoma
- Patients with severe edema/swelling
- Involuntary movement or inability to remain still during examination
- Patients with limited mobility
- Studies done at bedside may be limited due to patient access and room dimensions.

## **PATIENT COMMUNICATION**

Prior to beginning the exam, the sonographer or examiner should:

- Introduce self and explain why the examination is being performed and indicate how much time the examination will take.
- Verify the patient's name and date of birth or utilize facility specific patient identifiers.
- Explain the procedure, taking into consideration the age and mental status of the patient and ensuring that the necessity for each portion of the evaluation is clearly understood.
- Respond to questions and concerns about any aspect of the evaluation.
- Educate the patient about risk factors for and symptoms of deep and superficial vein thrombosis.
- Refer specific diagnostic, treatment or prognosis questions to the patient's physician.

## **PATIENT ASSESSMENT**

A 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 sonographer or examiner should obtain a complete, pertinent history by interview of the patient or their representative and a review of the patient's medical record, when available.

A pertinent history includes:

- Relevant risk factors including previous deep venous thrombosis (DVT) or superficial venous thrombosis (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 (including central venous or femoral catheters)
- Results of other relevant diagnostic procedures
- Verify that the requested procedure correlates with patient's clinical presentation.

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

- Pregnancy
- Swelling
- Pain/tenderness

- Palpable cord
- Discoloration
- Varicosities
- Ulceration
- Shortness of breath

## **PATIENT POSITIONING**

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

- Patient in supine position with the head slightly elevated for comfort
- Reverse Trendelenburg position with the leg being examined, externally rotated.
- Lateral decubitus or prone position may be utilized to visualize the popliteal, peroneal, proximal posterior tibial, small saphenous 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 curved linear or phased array transducers.
- Display of two-dimensional structure and motion in real-time
  - Doppler ultrasonic signal documentation
  - Spectral analysis with color and/or power Doppler imaging
- Digital storage capabilities of ultrasound images

## **EXAM PROTOCOL**

Throughout each examination, the sonographer or examiner should:

- Observe sonographic characteristics of normal and abnormal tissues, structures, and blood flow, allowing 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 color and/or power Doppler imaging.

- 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 veins is the minimum requirement:

- Common femoral
- Saphenofemoral junction
- Proximal femoral
- Mid femoral
- Distal femoral
- Popliteal
- Posterior tibial
- Peroneal

The following veins are included if indicated or required by the facility specific-protocol:

- Inferior vena cava
- Common iliac
- External iliac
- Proximal deep femoral
- Great saphenous
- Small saphenous
- Gastrocnemius
- Soleal
- Anterior tibial
- Perforator

**Spectral Doppler waveforms** are required from the following veins:

- Right and left common femoral
- Femoral
- Popliteal

Additional waveforms are included if indicated or if required by the facility specific-protocol:

- Deep femoral
- Great saphenous
- Posterior tibial
- Peroneal

Spectral Doppler waveforms should accurately demonstrate the venous flow characteristics:

- Spontaneity

- Phasicity
- Flow augmentation with distal compression
- Pulsatility

When pathology (thrombus or intraluminal echoes) is present:

- B-mode image should demonstrate the degree of compressibility to differentiate between partially or totally non-compressible segments
- Document the location, extent and echogenicity of thrombus
- Differentiate between unattached proximal thrombus (i.e., free-floating tails of thrombus) and attached thrombus
- Note dilatation/contraction of vein to assist in describing characteristics of aging the thrombus
- Include diameter measurements of any other abnormal structures (e.g., fluid collection, mass)

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

The sonographer or 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 and limitations to the protocol (i.e., study omissions or revisions).
- To determine any change in follow-up studies, review previous exam documentation to document any change in status; and/or duplicate prior imaging and Doppler parameters.
- Record the technical findings required to complete the final diagnosis on a worksheet or other appropriate method (e.g., computer software), so that the findings can be classified according to the laboratory diagnostic criteria
- Document the exam date, clinical indications, sonographer performing the evaluation, and exam summary in the patient's medical record.

## **PRESENTATION OF EXAM FINDINGS**

The sonographer or 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 duplex evaluation. A combination of indirect and direct exam components is the foundation for maximizing exam quality and accuracy.

- 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 and processing exam data for preliminary and/or formal interpretation, and exam billing activities.
- Direct exam components include:
  - Equipment optimization and the actual hands-on, examination process.

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