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VASCULAR TECHNOLOGY PROFESSIONAL PERFORMANCE GUIDELINES

Lower Extremity Vein Mapping

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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

Internet: www.svunet.org

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PURPOSE

Lower extremity vein mapping is performed to assess the venous system for thrombosis and determine the suitability of veins that may be used for dialysis access grafts, carotid artery bypass grafts, peripheral artery bypass grafts and coronary artery bypass grafts.

APPROPRIATE INDICATIONS

Indications for the performance of lower extremity vein mapping include, but are not limited to:

- To assess the availability of veins used for peripheral vascular and/or coronary artery bypass graft in the lower extremity
- To ensure that there is no evidence of superficial or deep venous thrombosis

CONTRAINDICATIONS AND LIMITATIONS

Contraindications for lower extremity vein mapping are unlikely; however, some limitations exist and may include the following:

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

PATIENT COMMUNICATION

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

- Introduce themselves, 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 understood.
- Respond to questions and concerns about any aspect of the evaluation.
- Educate the patient about risk factors for and symptoms of deep/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 an 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:

- Proposed surgery for the patient
- Relevant risk factors including previous venous thrombosis
- Lower extremity trauma
- Previous vein harvesting or stripping
- History of venous ulcers
- Current medications and/or therapies
- Results of other relevant diagnostic procedures
- Verify that the requested procedure correlates with the patient's clinical presentation.

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

- Edema
- Varicosities
- Palpable cord
- Discoloration (including feet and digits)
- Ulceration

PATIENT POSITIONING

The optimal positioning for viewing the veins in the lower extremity for venous mapping includes the following:

- The patient's leg should be outwardly rotated in a comfortable position.
- Use reverse Trendelenburg/dependent position to promote dilatation of the lower extremity veins.
- The lateral decubitus or prone position may be utilized to visualize the popliteal vein, peroneal and proximal posterior tibial veins, small saphenous vein and calf veins.
- The room should be warm and limbs covered until imaged to reduce vasoconstriction.

INSTRUMENTATION

Utilize the appropriate duplex instrumentation with the appropriate frequencies for the vessels being examined:

- Typically, a linear 5-7 MHz transducer
 - Superficial structures may require a higher frequency transducer.
 - Deeper structures or edematous tissue may require a lower frequency transducer.
 - Ilio-caval imaging requires a lower frequency, 2-5 MHz curvilinear or phased array transducer.
- 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 of static images and/or cineloop is required

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

Sonographers should follow a standard imaging protocol per facility-specific anatomic algorithm. A complete venous duplex evaluation incorporates B-mode and spectral Doppler with color and/or power Doppler imaging

Transverse grayscale images with and without transducer compressions must include evaluation of the superficial vein to be used for bypass conduit, and a deep vein evaluation, these include the:

- Common femoral veins
- Saphenofemoral junction
- Mid femoral vein
- Popliteal vein
- Tibial and peroneal veins (if indicated)
- Great saphenous vein (GSV)
- Small saphenous vein (SSV)
- Abnormalities require additional images when present
 - The location, severity and characteristics of thrombus should be documented in transverse and longitudinal planes
- If requested, map the course of the vein(s) using indelible marker

Diameter measurements are indicated by the planned procedure type, but typically include transverse measurements of the:

- GSV in proximal, mid and distal thigh/knee; proximal, mid and distal calf
- SSV in proximal, mid and distal calf (when needed/requested)
- Femoral vein in proximal, mid and distal thigh (when needed/requested)

Spectral Doppler waveforms for assessing venous patency of the lower extremity and showing variations with respiration and/or flow augmentation should include the:

- Common femoral veins
- Popliteal vein
- Additional sites may be necessary when indicated by the planned procedure type:

- Lower extremity dialysis access mapping requires a limited evaluation and diameter measurements of the common femoral and superficial femoral arteries
- Venous Doppler waveforms are characterized according to:
 - Spontaneity
 - Phasicity
 - Augmented venous flow with proximal or distal augmentation
 - Pulsatility

REVIEW OF THE DIAGNOSTIC EXAM FINDINGS

The sonographer or examiner should:

- Review data acquired during the lower extremity vein mapping exam to ensure that a complete and comprehensive evaluation has been performed and documented.
- Explain and document any exceptions to the protocol (i.e., study omissions or revisions).
- Determine any change in follow-up studies by reviewing previous exam documentation. 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 vein mapping 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 the vascular laboratory medical director or appropriate healthcare 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 vein mapping examination. 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, and 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
- While study times may vary depending on testing protocols, patient condition, and clinical complexity of the evaluation being performed, these are the times necessary to provide a quality diagnostic evaluation. Listed are the recommended examination times for performing each CPT related to this guideline, which were derived from the direct time inputs from the Resource Based Relative Value Scale (RBRVS).
 - 93970 70 minutes
 - 93971 45 minutes

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