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VASCULARTechnology PROFESSIONAL PERFORMANCE GUIDELINES

Upper Extremity Venous Duplex Evaluation

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Sponsored and published by:
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PURPOSE

Duplex imaging of the upper extremity veins is performed to assess the deep and superficial venous system of the upper extremity (neck to distal forearm level) to determine the presence or absence of deep or superficial vein thrombosis.

APPROPRIATE INDICATIONS

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

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

CONTRAINDICATIONS AND LIMITATIONS

Contraindications for upper extremity venous duplex imaging 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, hematoma
- Patients with severe edema/swelling
- Central venous line or dialysis access catheter
- Visualization of the entire length of the subclavian vein is hampered by the clavicle
- Involuntary movement or inability to remain still during examination
- 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 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 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)
- Upper extremity trauma
- Extremity immobilization
- Recent major surgery
- Prolonged bed rest
- History of cancer
- Family history of DVT
- Pregnancy
- IV drug abuse
- Congestive heart failure (CHF) or other similar cardiac history
- Current medications and/or therapies (including central venous or subclavian 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
- Discoloration (including hands and digits)
- Ulceration
- Shortness of breath
- Cyanosis if superior vena cava is affected

PATIENT POSITIONING

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

- Patient in supine position (flat) if possible to assess the internal jugular and subclavian veins with the head turned opposite to the side being imaged.
- The head can be either flat or slightly elevated for patient comfort for the remainder of the exam.
- Externally rotate the arm being examined and reposition as necessary for best access to distal arm veins.

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
 - Subclavian imaging may require lower frequency 2-5 MHz curved linear or phased array transducers for larger patients.
- 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 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 subclavian vein 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 the entire vein is assessed.
- When compressions are difficult to attain due to bony prominences, request the patient to inhale or sniff to observe appropriate venous responses.
- Representative images are obtained per lab protocol.

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

- Internal jugular vein
- Subclavian vein
- Axillary vein
- Brachial vein
- Basilic vein
- Cephalic vein

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

- Proximal subclavian vein
- Innominate (brachiocephalic) vein
- Radial veins
- Ulnar veins

Spectral Doppler and long axis B-mode and/or color Doppler images should include the following:

- Internal jugular vein
- Subclavian vein (bilateral)
- Axillary vein

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

- Jugular- subclavian junction
- Innominate (brachiocephalic) vein
- Brachial veins
- Radial veins
- Ulnar veins
- Basilic vein
- Cephalic vein

Spectral Doppler waveforms should accurately demonstrate the venous flow characteristics:

- Spontaneity
- Phasicity
- Flow augmentation with distal compression
- Pulsatility

When suspected 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 of the thrombus
- Include diameter measurements of any other abnormal structures (e.g., fluid collection, mass, etc.)

REVIEW OF THE DIAGNOSTIC EXAM FINDINGS

The sonographer or examiner should:

- Review data acquired during the upper extremity venous duplex ultrasound exam 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 upper 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 the 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 upper extremity venous duplex 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, 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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