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VASCULAR TECHNOLOGY PROFESSIONAL PERFORMANCE GUIDELINES

Lower Extremity Venous Duplex Evaluation

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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.

COMMON 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

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

GUIDELINE 1: PATIENT COMMUNICATIONS AND POSITIONING

The technologist/sonographer/examiner should:

- 1.1 Introduce self to the patient and explain why the evaluation is being performed and indicate how much time the examination will take.
- 1.2 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.
- 1.3 Respond to questions and concerns about any aspect of the Lower Extremity Venous Evaluation.
- 1.4 Educate patients about risk factors for, and symptoms of, deep and superficial vein thrombosis.
- 1.5 Refer specific diagnostic, treatment or prognostic questions to the patient's physician.

GUIDELINE 2: PATIENT ASSESSMENT

Patient assessment must be performed before the evaluation. 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:

- 2.1 Obtain a complete, pertinent history by interview of the patient or patient's representative and review of the patient's medical record, when available. A pertinent history includes:
 - a. Relevant risk factors for lower extremity peripheral venous disease: previous deep vein and/or superficial vein thrombosis (DVT/SVT), lower extremity trauma, immobilization of extremity, recent major surgery, prolonged bed rest, history of cancer, family history of DVT, pregnancy, congestive heart failure (CHF) or other similar cardiac problems.
 - b. Current medications or therapies
 - c. Results of other relevant diagnostic procedures.
- 2.2 Complete a limited or focused physical exam, which includes observation and localization of the presence of any signs or symptoms of peripheral venous disease: swelling, pain, tenderness, palpable cord, discoloration, varicosities, ulceration and SOB.
- 2.3 When directed, perform adjunctive procedures: lower extremity limb diameter measurements; palpation of pedal pulses.
- 2.4 Verify that the requested procedure correlates with the patient's clinical presentation.

GUIDELINE 3: EXAMINATION GUIDELINES

Throughout each exam, sonographic characteristics of normal and abnormal tissues, structures, and blood flow are continually observed. This will allow necessary adjustments to optimize exam quality. The patient's physical and mental status are assessed and monitored during the examination. Modifications may be made to the procedure plan according to changes in the patient's clinical status. Also, sonographic findings are analyzed throughout the course of the examination to ensure that sufficient data is provided to the physician to direct patient management and render a final diagnosis.

The examination is performed with the patient in the supine position and the head of the bed elevated approximately 12 inches with the leg externally rotated slightly. This is the position of choice for viewing the common femoral vein (CFV), femoral vein (FV), deep femoral vein, (DFV), great saphenous vein (GSV), popliteal vein, and posterior tibial veins, (PTV). Reverse Trendelenburg may be used as an alternate position. The patient may be turned prone or to the lateral decubitus position to view the popliteal vein, peroneal and proximal posterior tibial veins, small saphenous vein and soleal veins. Positioning the patient slightly to the opposite side which is being evaluated, when pregnant or if abnormal CFV signals are present may normalize the side in question.

- 3.1 Use appropriate duplex instrumentation with appropriate frequencies for the vessels being examined. This includes display of both two-dimensional structure and motion in real-time and Doppler ultrasonic signal documentation with:
 - a. Spectral analysis with or without color Doppler imaging
 - b. 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 included in Guideline 3. In addition, cineloop can display each area of suspected DVT.
- 3.2 Follow a standard exam protocol. Studies may be unilateral with the use of an appropriate algorithm, it however, is required to compare the common femoral spectral waveform from the contralateral limb, in this event. A complete venous duplex evaluation incorporates both B-mode and color Doppler imaging along with Doppler spectral analysis.

The common femoral, deep femoral (origin), femoral, popliteal, posterior tibial, peroneal, and great saphenous veins should be interrogated in their entirety. In select cases, and when indicated, the small saphenous, gastrocnemius branches, soleal, anterior tibial and perforating veins are examined.

- a. Transverse transducer compressions (when anatomically possible and not contraindicated) must be performed every 2 cms or less and representative images are obtained per lab protocol. Typically at the proximal CFV, saphenofemoral junction, proximal femoral vein, mid or distal femoral vein, popliteal and at the mid/distal PTV. Compression/non-compression of the Peroneal veins should be documented at the mid/distal calf as well.
- b. When pathology (thrombus or intraluminal echoes) is present, compressibility, appearance, location, and extent should be documented. The B-Mode image should demonstrate the degree of compressibility, presence of intraluminal echoes, and dilation to assist in describing characteristic of aging the thrombus. The technologist should differentiate between brightly echogenic or hypoechoic thrombi, partially or totally non-compressible segments, and between unattached proximal tips and attached thrombi.
- c. Spectral and/or color Doppler are used to further support the diagnosis and to document spectral waveform profiles. A representative Doppler spectral waveform should be obtained from the same levels as noted above (3.1) for documentation of compression: i.e.: common femoral, femoral, popliteal segments. The posterior tibial and peroneal veins are evaluated for flow using color Doppler, preferable on a transverse view. Doppler spectral analysis is performed in the sagittal plane, with an appropriate vessel angle. It is not required to angle correct, however, if angle correction is utilized, it must be at 60 degrees or less and aligned with the vessel wall. To accurately assess venous waveform profiles, flow is characterized according to its spontaneity, phasicity, and the presence of brisk augmented venous flow with proximal or distal augmentation. It is helpful to open the sample volume gate to match vessel

size for venous exams to “capture” maximum flow. To ensure complete interrogation, spectral waveforms are performed while utilizing proximal or distal compression of the limb to demonstrate augmentation.

- d. With unilateral evaluations, a contralateral Doppler spectral waveform from the common femoral vein just above the saphenofemoral junction must be documented.
- e. Incidental findings, such as Baker’s Cyst, seroma, hematoma, lymph node, mass, etc. must be reported. Characterization of such findings should include measurements of size and/or presence of blood flow.

GUIDELINE 4: REVIEW OF THE DIAGNOSTIC EXAM FINDINGS

The technologist/sonographer/examiner should:

- 4.1 Review data acquired during the Lower Extremity Venous Duplex Evaluation to ensure that a complete and comprehensive evaluation has been performed and documented.
- 4.2 Explain and document any exceptions to the routine Lower Extremity Venous Duplex Evaluation protocol (i.e., study omissions or revisions).
- 4.3 To 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.
- 4.4 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)]
- 4.5 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.

GUIDELINE 5: PRESENTATION OF EXAM FINDINGS

The technologist/sonographer/examiner should:

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

GUIDELINE 6: 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).

- 6.1 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 (Guideline 1); patient communication (Guideline 2); post-exam activities: exam room cleanup; compiling, reviewing and processing exam data for preliminary and/or formal interpretation (Guidelines 4-5); and, patient charge and billing activities. Recommended time allotment is 15 minutes.
- 6.2 Direct exam components includes equipment optimization and the actual hands-on, examination process (Guideline 3). Recommended time allotment is 40-60 minutes (for bilateral examination).

GUIDELINE 7: CONTINUING PROFESSIONAL EDUCATION

Certification is considered the standard of practice in vascular technology. It demonstrates an individual's competence to perform vascular technology at the entry level. After achieving certification from either ARDMS (RVT credential) or CCI (RVS credential), or ARRT (RT-VT), the individual must keep current with:

- Advances in diagnosis and treatment of venous disease.
- Changes in Lower Extremity Venous Duplex Evaluation protocols or published laboratory diagnostic criteria.
- Advances in ultrasound technology used for the Lower Extremity Venous Duplex Evaluation.
- Advances in other technology used for the Lower Extremity Venous Duplex Evaluation.

APPENDIX

It is recommended that published or internally generated diagnostic criteria should be validated for each ultrasound system used. When validating ultrasound diagnostic criteria, it is important to realize that equipment, operator and interpretation variability is inherent to this process.

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