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VASCULAR TECHNOLOGY PROFESSIONAL PERFORMANCE GUIDELINES

Upper Extremity Arterial Duplex Evaluation

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Upper Extremity Arterial Duplex Evaluation

PURPOSE

Duplex ultrasonography of the upper extremity arteries is performed to provide an overview of the location, extent and severity of vascular disease. The ultrasound evaluation can be performed from the subclavian artery to the wrist to facilitate clinical management decisions.

COMMON INDICATIONS

Some of the common indications for performance of upper extremity arterial duplex imaging include:

- Evaluation or follow-up of patients with exercise related/induced pain, ischemic rest pain, and/or arterial ulceration
- Assessment of patients with documented arterial disease
- Pre-procedure assessment for planning of intervention
- Follow-up to determine technical adequacy of surgical intervention, i.e., post angioplasty and/or stent placement
- Follow-up of bypass grafts to detect intrinsic stenoses or progression of disease, which may threaten graft patency
- Evaluation of aneurysm, pseudoaneurysm and arterial-venous fistula
- Evaluation of arterial trauma

CONTRAINDICATIONS AND LIMITATIONS

Contraindications for upper extremity arterial duplex are few; however, some limitations exist and may include the following:

- Presence of ulcers, casts, or bandages
- Obesity
- IV or catheters that limit access to or visualization of arterial structures
- Patients' inability to cooperate with or tolerate the examination
- Bedside evaluations where access to the patient is limited by equipment and room size

GUIDELINE 1: PATIENT COMMUNICATION AND POSITIONING

- 1.1 Introduces self and explains why the Upper Extremity Arterial Duplex Examination is being performed and indicates how long it will take.
- 1.2 Explains the procedure to the patient, taking care to ensure that the patient understands the necessity for each aspect of the evaluation.
- 1.3 Responds to questions and concerns about any aspect of the examination.
- 1.4 Educates patients about risk factors and symptoms of Peripheral Vascular Disease (PVD).
- 1.5 Educates patients regarding exercise program benefit.
- 1.6 Refers specific diagnostic, treatment or prognosis questions to the patient's physician.
- 1.7 Patient should be supine with the heart at approximately the same level of the extremities.

GUIDELINE 2: PATIENT ASSESSMENT

Patient assessment must be performed before Upper Extremity Arterial Duplex Imaging. This includes assessment of the patient's ability to tolerate the procedure and an evaluation of any contraindications to the procedure.

- 2.1 Obtain a complete, pertinent history by interview and/or review of the patient's medical record. A pertinent history includes:
 - a. Current medical status, especially regarding arterial stenoses
 - b. Presence of any signs or symptoms of peripheral vascular disease: claudication, rest pain, ulceration, gangrene, ischemia, hair loss, coolness, pallor, dependent rubor
 - c. Relevant risk factors for peripheral vascular disease: diabetes; hypertension; age, smoking, obesity, cerebrovascular disease; coronary artery disease; hyperlipidemia; family history of cerebrovascular, coronary artery, peripheral vascular disease, diabetes or hypertension;
 - d. Laboratory values
 - e. Current medications or therapies
 - f. Results of other vascular studies
 - g. Results of prior vascular interventions
- 2.2 Completes a limited or focused physical exam, which includes palpation of pulses at all levels, auscultation for carotid and subclavian bruits and document trophic changes.

GUIDELINE 3: EXAMINATION GUIDELINES

Bilateral blood pressures are taken and documented. Diagnostic criteria for the duplex examination must include application of published criteria or internally generated criteria. All diagnostic criteria must be internally validated.

In general, physiologic testing, including PVR, segmental blood pressures, and segmental CW Doppler waveforms, is performed to determine the presence, location, and severity of arterial insufficiency in the upper extremity. When abnormal or equivocal physiologic findings are encountered, or when necessary to answer

the clinical questions posed, gray scale imaging may be used to identify and follow the selected vessel segments and to note the presence or absence of any disease process within the vessel lumen. Doppler spectral analysis is used to quantify disease severity and should, in general, include assessment for presence or absence of flow and, when flow is present, evaluation of peak systolic velocity, end diastolic velocity, and waveform analysis [e.g., systolic upstroke/acceleration, pulsatility, spectral broadening, turbulence and flow direction] as needed. At a minimum, spectral analysis should be obtained in all vessel segments as well as proximal, throughout and distal to any region where flow disturbances are identified. All spectral derived velocity information is obtained with an appropriate Doppler angle of insonation • 60 degrees.

- 3.1 The patient's physical and mental status is assessed and monitored during the examination, with modifications made to the procedure plan according to changes in the patient's clinical status during the procedure. Also, 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.
- 3.2 Uses appropriate duplex instrumentation (with Doppler frequencies typically in the range of 3.5 - 10 MHz), which includes real time display of both two-dimensional structure and motion and Doppler ultrasonic signal documentation with:
 - a. velocity spectral analysis (with or without color Doppler imaging)
 - b. hardcopy capabilities (It is recommended that both video and static images are acquired.)
 - c. Color Doppler imaging should be performed as per ICAVL standards
- 3.3 Follows a standard exam protocol for each segment evaluated. This will require multiple acoustic windows and patient positioning techniques. The subclavian, axillary, brachial, radial and ulnar arteries should all be interrogated in their entirety, if a complete duplex evaluation is deemed necessary.
- 3.4 All of the vessels interrogated should have spectral Doppler waveforms recorded with a minimum velocity measurement for peak systolic velocity.
- 3.5 Interrogation sites of the larger arteries, bypass grafts, fistulas, stents should include proximal, mid and distal segments at a minimum.
- 3.6 If any disease site is identified: pre-stenosis, at stenosis and post stenosis Doppler spectral velocity waveforms and measurements should be taken.
- 3.7 Evaluates the patient's physical and mental status prior to discharge.

GUIDELINE 4: REVIEW OF THE DIAGNOSTIC ULTRASOUND EXAM FINDINGS

- 4.1 Reviews data acquired during the Upper Extremity Arterial Duplex Examination to ensure that a complete and comprehensive evaluation has been performed and documented.
- 4.2 Explains and documents any exceptions to the routine Upper Extremity Arterial Duplex Examination protocol (i.e., study omissions or revisions).
- 4.3 Records all technical findings required to complete the final interpretation on a worksheet so that the measurements can be classified according to the laboratory diagnostic criteria (these criteria may be based on either published or internally generated data but must be internally validated regardless of the source).(see appendix)
- 4.4 Completes required laboratory documentation of the study.

- 4.5 Alerts medical director or other responsible physician when immediate medical attention is indicated, based on the Upper Extremity Arterial Duplex Examination findings.

GUIDELINE 5: PRESENTATION OF EXAM FINDINGS

- 5.1 Provides preliminary results as provided for by internal policy based on upper extremity examination findings.
- 5.2 Presents record of diagnostic images, velocity spectral data, explanations for suboptimal exams, and technical worksheet to the interpreting physician for use in rendering a diagnosis and for archival purposes.
- 5.3 Alert vascular laboratory medical director or appropriate health care provider when immediate medical attention is indicated.

GUIDELINE 6: EXAM TIME RECOMMENDATIONS

High quality and accurate results are fundamental elements of the upper extremity arterial duplex examination. A combination of direct and indirect exam components is the foundation for maximizing exam quality and accuracy.

- 6.1 Indirect exam components include pre-exam procedures: obtaining previous exam data, completing pre-exam paperwork, exam room and equipment preparation; patient assessment, history, and positioning (Guideline 1 & 2); and post exam procedures: clean up; compiling, processing, and reviewing data for preliminary and/or formal interpretation (Guidelines 3 and 4); patient communication (Guideline 2); exam charge and billing activities. Recommended time is 30-40 minutes.
- 6.2 Direct exam components include equipment optimization, patient positioning throughout the exam, and the actual hands-on examination process. (Guideline 3) Recommended time is 45-90 minutes.

GUIDELINE 7: CONTINUING PROFESSIONAL EDUCATION

Certification is considered the standard of practice in vascular technology. It measures an individual's competence to perform vascular technology at the entry level. After achieving certification, all Registered Vascular Technologists must keep current with:

- 7.1 Advances in diagnosis and treatment of peripheral vascular disease (PVD)
- 7.2 Changes in Upper Extremity Arterial Duplex Examination protocols or published laboratory diagnostic criteria
- 7.3 Advances in ultrasound technology used for the Upper Extremity Arterial Duplex Examination
- 7.4 Advances in other technology used for the Upper Extremity Arterial Duplex Examination

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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