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**VASCULAR TECHNOLOGY  
PROFESSIONAL PERFORMANCE GUIDELINES**

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# Radial Artery Assessment for Coronary Artery Bypass

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# Radial Artery Assessment for Coronary Artery Bypass

## PURPOSE

Radial artery evaluations are performed to assess patency and suitability of the radial artery for use as a conduit for coronary artery bypass. The evaluation also includes the assessment of digital perfusion.

## COMMON INDICATIONS

Patients requiring coronary artery bypass grafts may have radial artery assessments performed depending mainly on the preference of conduit desired by the cardiothoracic surgeon.

## CONTRAINDICATIONS AND LIMITATIONS

Contraindications for radial artery assessment are few; however, some limitations exist and may include the following:

- This exam maybe limited by the presence of calcific medial walls in the radial and/or ulnar arteries.
- This exam may be limited by the presence of open wounds and casts.

## GUIDELINE 1: PATIENT COMMUNICATION AND POSITIONING

- 1.1 Introduce self and explain why the Radial Artery Assessment 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 Radial Artery Assessment.
- 1.4 Assessment should be performed with the patient supine or in the sitting position with the arms relaxed at the side.

## GUIDELINE 2: PATIENT ASSESSMENT

Patient assessment must be performed before the Radial Artery Assessment is performed. 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 of the patient or patient's representative and review of the patient's medical records whenever possible. A pertinent history includes:
  - a. Current medical status
  - b. Previous surgeries or invasive procedures involving the affected arm.
  - c. Current medications or therapies
  - d. Recent or past surgery on the affected extremity (including any surgeries involving the vascular system), prior cannulation of the radial artery, any prior trauma to the extremity, and any symptoms suggestive of digital ischemia. Verify that the requested procedure(s) 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 must be observed so that scanning technique can be adjusted as necessary to optimize image quality and spectral waveform characteristics. The patient's physical and mental status is assessed and monitored during the examination, and modifications are made to the procedure plan according to changes in the patient's clinical condition during the procedure. 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.

### **INSTRUMENTATION:**

- 3.1 Use appropriate duplex instrumentation, which 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. Imaging carrier frequency of at least 10.0 MHz
  - c. Doppler carrier frequency of at least 5.0 MHz
  - d. Hard copy, film or digital storage capabilities
- 3.2 Follow a standard exam protocol for radial artery assessment. Studies are usually unilateral, studying the non-dominant arm whenever possible. Occasionally the study will be bilateral if the non-dominant arm does not have an adequate conduit or digital perfusion or if the referring physician requests a bilateral evaluation.
  - The standard exam includes B-mode images, utilizing transverse and sagittal views of the entire course of the radial and ulnar arteries.
  - Evidence of plaque formation within the lumen of the artery, wall thickening or the presence of calcification is documented.
  - Proximal, mid and distal vessel diameters are recorded in the transverse plane for the radial and ulnar arteries.
- 3.3 Spectral Doppler is used to document hemodynamics of each vessel.
  - Doppler spectral analysis is performed in the sagittal plane.
  - All Doppler samples must be performed at an angle of 60 degrees or less with respect to the direction of blood flow, and Doppler cursor alignment is recommended parallel to the vessel walls.
  - Spectral waveforms are routinely obtained from both the proximal and distal regions of both the radial and ulnar arteries. Measurements include peak systolic velocity (PSV). Any abnormalities should be documented.
- 3.4 Anatomic variants of the radial and ulnar arteries should be documented. Usually, the forearm portion of these vessels is the region of the surgeon's interest.
- 3.5 In addition to the duplex ultrasound portion of the radial artery assessment, a measurement of digital perfusion must be obtained. Multiple techniques may be utilized for this portion of the examination. Ideally, the technique should involve the global assessment of digital perfusion, which can be accomplished rapidly and simply with plethysmographic waveforms. Either photoplethysmography (PPG) or pulse volume recordings (PVR) can be used.
- 3.6 Radial artery dependency of the hand should be assessed with each exam to avoid post operative ischemia if the radial artery is harvested.
  - Each digit should have a PPG waveform recorded at rest and during radial and ulnar artery compression.
  - The radial /ulnar arteries can be compressed simultaneously, distally near the level of the wrist thus obliterating the flow to the finger (flat line per PPG).
  - With release of the ulnar artery while maintaining compression of the radial artery, evaluate the digital waveform for a change in amplitude compared to the resting sample previously obtained.
  - Repeat this maneuver with release of the radial artery and maintaining compression of the ulnar artery.

- With release of one vessel at a time while monitoring the digital waveform you can determine which vessel is supplying the major circulation to the hand.

If the digital waveform is attenuated >50% of the resting waveform with compression of the radial artery, there is a good chance the hand could be symptomatic with harvesting.

#### **GUIDELINE 4: REVIEW OF THE DIAGNOSTIC EXAM FINDINGS**

- 4.1 Review data acquired during the Radial Artery Assessment to ensure that a complete and comprehensive evaluation has been performed and documented.
- 4.2 Explain and document any exceptions to the routine Radial Artery Assessment protocol (i.e., study limitations, omissions or revisions).
- 4.3 Record all technical findings required to complete the final diagnosis on a worksheet, or logbook or other form, so that the findings can be classified according to the laboratory's diagnostic criteria based on published or internally validated data.
- 4.4 Document the exam date, clinical indication(s), technologist performing the exam and exam summary in a vascular laboratory log book, or other appropriate method, i.e., computer software.
- 4.5 Alert health care provider when immediate medical attention is indicated based on the Radial Artery Assessment findings.

#### **GUIDELINE 5: PRESENTATION OF EXAM FINDINGS**

- 5.1 Provide preliminary results when necessary as provided for by internal guidelines.
- 5.2 Present record of diagnostic images, data, explanations, and technical worksheet to the interpreting physician for use in rendering a diagnosis and for archival purposes.
- 5.3 Alert vascular 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 radial artery assessment examination. A combination of indirect and direct 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 preparatory activities; patient assessment and positioning (Guidelines 1 & 2) and, **post-exam procedures**: cleanup; compiling, processing, reviewing exam data for preliminary and/or formal interpretation (Guidelines 4 and 5); exam 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 of 20 - 30 minutes provided the procedure is unilateral. Bilateral procedures may require approximately 45 minutes.

## **GUIDELINE7: 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), the individual must keep current with:

- 7.1 Advances in diagnosis and treatment of radial artery disease.
- 7.2 Changes in radial artery protocols or published laboratory diagnostic criteria.
- 7.3 Advances in ultrasound technology used for the radial artery evaluation.

## **APPENDIX**

It is recommended that published or internally generated data 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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