

## **Upper Extremity Arterial Doppler Examinations**

**Purpose:** Arterial Doppler examinations utilize Doppler waveform and segmental pressures to evaluate the location, extent, and severity of peripheral vascular disease.

**Physiologic** exams utilize a continuous wave Doppler probe and a zero-crossing recorder. Segmental systolic blood pressure measurements together with segmental Doppler or Plethysmography waveforms are performed to localize and characterize peripheral arterial disease.

### **Common Indications:**

- Claudication
- Rest pain
- Decreased or absent pulses, including blood pressure differential of >20mmHg between arms.
- Non-healing wounds or ulcers
- Peripheral vascular disease
- Pre-gangrenous or black digits, cyanosis
- Follow up of known stenosis
- Post-op or post-intervention
- Pre-operative assessment for healing potential, creation of dialysis access.
- Abnormal vertebral waveforms
- Bruit
- Cold sensitivity
- Raynaud's syndrome/phenomenon
- Thoracic Outlet Symptoms

### **Contraindications and Limitations:**

- Patients with casts or bandages
- Patients with acute clot or venous thrombosis in the upper extremities should not be cuffed
- Any site of trauma, surgery, ulceration, or graft placement should not be cuffed
- Calcified vessels which may falsely elevate blood pressures (typically encountered in patients with diabetes or end-stage renal disease)
- Patients who are unable to cooperate due to mental status changes (dementia, Alzheimer's, etc.) and involuntary movement
- Patients prohibited on ipsilateral side of a mastectomy or dialysis AVG/AVF.

## **UPPER EXTREMITY ARTERIAL PHYSIOLOGIS DOPPLER EXAM**

### **Exam Protocol:**

- Verifying the settings of the equipment being used. Settings should be:
  - Baseline at 10
  - Amplitude at 20
  - Any change in calibration should be documented on the waveform(s) where the size is changed.
- Appropriately wrap 10-12cm blood pressure cuffs snugly on the limb.
- \*\*\*Using the Doppler probe, (8MHz or 4MHz for obese patients or deep vessels)
  - Record the waveforms at 25mm/sec chart speed
  - Use 45-60° angle to the skin with enough pressure to keep contact, but not so much that the probe compresses the artery.

- Inflate the cuff to 20-30 mmHg above the last audible arterial signal.
  - Slowly deflate the cuff pressure. Record the pressure as soon as the first audible arterial signal returns. Use caution – the Doppler pulse must continue after hearing the first pulse to assure there is an actual pulse and not motion artifact.
- **Obtain and store segmental Doppler waveforms and pressures** from the following:
    - Radial Artery (RA)
    - Ulnar Artery (UA)
    - Brachial Artery (BRA)
  - Repeat from \*\*\* for contralateral arm.
  - If needed: When either side is abnormal or there is a difference in the systolic blood pressures of > 20 mmHg and/or the waveforms are not triphasic, this can indicate a subclavian artery stenosis. The following representative Doppler waveforms need to be added, bilaterally:
    - Subclavian (SUBCA)
    - Axillary Artery (AXILA)

**Once exam is completed,**

- Verify that required images are stored
- Thank patient for coming, allow him/her to re-dress if needed/escort them out of testing area
- Complete the remainder of the encounter by following the “*Post Processing Procedures.*”

**Plethysmography PPG-Fingers: (performed in conjunction with UEA)**

**Exam Protocol:**

- Perform Upper Extremity Arterial Doppler (UEA) per protocol.
- \*\*\* Place digital cuff at the base of the thumb encompassing at least 75% of the circumference. (Digital cuff -1.6, 1.9, or 2.5cm)
- Record the baseline flow pattern by placing the PPG sensor on the pad of the digit. This allows us to see the waveform pattern clearly. Use either double sided tape, Velcro strap or metal clip provided with the Parks Flo-Lab to secure the sensor to the finger.
  - Sweep speed 10mm
  - Amplitude 100 OR **size that BEST documents the waveform.** Amplitude should be consistent for all digits.
- Inflate the digital cuff while recording the waveform at 10mm/sec speed until flow ceases. As you deflate the cuff, watch for the return of flow pattern. When the flow returns, this is the systolic blood pressure for the finger.
- Record pressure.
  - Repeat process for remaining digits on this hand/ or proceed with contralateral fingers as necessary \*\*\*.

**NOTE:** Patient motion can affect the PPG waveform. Therefore, the patient needs to remain as still as possible during the exam. Document any reasons a waveform or pressure cannot be obtained.

**Once exam is completed,**

- Verify that required images are stored
- Thank patient for coming, allow him/her to re-dress if needed/escort them out of testing area
- Complete the remainder of the encounter by following the “*Upper Arterial Post Processing Procedures.*”