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## **VASCULAR TECHNOLOGY PROFESSIONAL PERFORMANCE GUIDELINES**

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# Abdominal Aortoiliac Duplex Evaluation

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Society for Vascular Ultrasound  
4601 Presidents Drive, Suite 260  
Lanham, MD 20706-4831  
Tel.: 301-459-7550  
Fax: 301-459-5651  
E-mail: [svuinfo@svunet.org](mailto:svuinfo@svunet.org)  
Internet: [www.svunet.org](http://www.svunet.org)

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# Abdominal Aortoiliac Duplex Evaluation

## PURPOSE

Evaluation of aortoiliac disease and its effect on blood flow dynamics, using duplex ultrasound technology.

## COMMON INDICATIONS

Common indications for performance of this examination include, but are not limited to:

- Pulsatile abdominal mass
- The presence of an aneurysm at another anatomical location, (i.e.; iliac, common femoral, or popliteal arteries)
- A history of hypertension with family history of abdominal aortic aneurysm (AAA) and age >50 years.
- Surveillance of known abdominal aortic or iliac artery aneurysm for increase in size
- Screening approved with the Medicare SAAAVE Act. See published CMS documentation regarding guidelines for testing
- Aortic coarctation
- Back pain
- Evidence of distal emboli
- Evidence of lower extremity inflow (aortoiliac) arterial disease (i.e.: absent CFA pulse &/or buttock claudication that interferes with patients life style or ischemic rest pain, or following lower extremity physiological studies that indicate inflow disease (per lab protocol)
- Surveillance of arterial vascular intervention/reconstruction
- Abdominal and/or groin bruit

## CONTRAINDICATIONS AND LIMITATIONS

Contraindications for duplex evaluation of the abdominal aorta are few; however, limitations do exist and may include the following:

- Large firm abdomen
- Significant amount of overlying bowel gas
- Open abdominal wounds, fresh sutures/staples, peritoneal dialysis catheters
- Pregnant patients in their 2nd and 3rd trimesters may be difficult to evaluate due to poor acoustic window. Caution should be used in this case by decreasing the duration of the exam and output power to avoid possible bioeffects.

## PATIENT PREPARATION

Exams may be successful without having the patient fast, although if scheduled ahead of time, the patient should fast overnight to minimize bowel gas; however bowel prep is usually not necessary. The patient should not chew gum or smoke the morning of the exam as this may increase swallowing of air. Consideration is advised when scheduling patients who need to eat, such as the diabetic patient. Early morning appointments would be beneficial in any case.

## **GUIDELINE 1: PATIENT COMMUNICATIONS AND POSITIONING**

### **The technologist/sonographer/examiner should:**

- 1.1 Explain to the patient why examination of the aortoiliac is being performed and indicate how long the exam will take.
- 1.2 Explain the procedure to the patient, taking care to ensure that the patient understands the necessity for each aspect of the evaluation.
- 1.3 Respond to patient's questions and concerns about the aortoiliac examination.
- 1.4 Educate patient about risk factors for, and symptoms of, abdominal aortic aneurysm (AAA) or atherosclerotic disease and signs and symptoms associated with reduced blood flow to the lower extremities and endovascular graft dysfunction, when appropriate.
- 1.5 Refer specific diagnostic treatment or questions related to prognosis to the patient's physician.
- 1.6 Make sure the exam is performed with the patient lying supine with the head slightly elevated to a level of comfort. The lateral decubitus position may be useful when supine acoustic windows prove inadequate or in individuals with a large abdominal girth.

## **GUIDELINE 2: PATIENT ASSESSMENT AND PHYSICAL EXAMINATION**

Patient assessment is performed prior to the abdominal duplex evaluation. It includes assessment of the patient's ability to tolerate the procedure, determination of potential contra-indications to the procedure, and physical assessment as indicated below.

### **The technologist/sonographer/examiner should:**

- 2.1 Obtain a 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. Review of available previous studies to make comparisons to the current study and document changes in status. The examination protocol may need to be modified to address previous findings and current physical needs.
  - b. Current medical status
  - c. Prior vascular/cardiovascular history & surgeries
  - d. Current, pertinent medications or therapies
  - e. Review of vascular related risk factors; presence of aneurysmal or atherosclerotic disease; hypertension; hypercholesterolemia; peripheral vascular disease; family history of aneurysmal disease, advanced age; smoking
  - f. Review of symptoms for aortoiliac disease; aneurysmal vs. occlusive disease, back pain, increased pulsation of abdomen, groin, or popliteal fossa; signs/symptoms of distal emboli, buttock/thigh claudication.
- 2.2 Obtain pre-operative as well as post-operative ankle/brachial indices (ABI's) for documentation to determine outflow status as indicated by the physician and/or laboratory protocol.
- 2.3 Verify that the requested procedure(s) correlates with the patient's clinical presentation.

## GUIDELINE 3A – 3C: 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 throughout the examination, with modifications made to the procedure plan according to changes in the patient's clinical status during the procedure. Also, sonographic findings are analyzed throughout the course of the examination to ensure that sufficient data is provided to the interpreting physician to direct patient management and render a final diagnosis.

### The technologist/sonographer/examiner should:

- Use appropriate duplex instrumentation, which includes real time two-dimensional
- B-Mode imaging and Doppler spectral analysis of flow dynamics.
- Color and power Doppler imaging may compliment the examination.
- Set imaging carrier frequency between 2.0 and 4.0 MHz as needed for penetration
- Set Doppler carrier frequency of 2.0 to 4.0 MHz as needed for penetration
- Minimum hardcopy capabilities should include color static images or electronic color hardcopy storage. Electronic video clip storage or videotape should be available.

## 3A: ABDOMINAL AORTIC ANEURYSM EVALUATION

### The technologist/sonographer/examiner should:

- 3.1A Follow a standard exam protocol for abdominal aortic aneurysm evaluation.
- 3.2A Examine the native aorta with 2-D sonography beginning at the diaphragm and progressing through the iliac arteries bilaterally to the groin.
  - a. Document aortic (suprarenal, juxtarenal and infrarenal) and iliac artery diameters by measuring outer wall to outer wall at region of greatest dilation. Diameter measurements are taken on anterior/posterior approach in transverse orientations at peak systole.
  - b. Examine the length of the iliac artery bilaterally and documents any abnormalities.
  - c. Identify the internal iliac arteries and measure size, if possible.
- 3.3A Use color duplex to demonstrate the lumen and to confirm patency of the abdominal aorta and iliac segments.
  - a. Document the presence of thrombus, residual lumen, dissection, flaps, pseudoaneurysms, wall defects, stenoses and/or occlusion.
- 3.4A Document /confirm stenoses by recording spectral waveforms maintaining <60 degrees from the aorta, common and external iliac vessels. Additionally, if identified, record spectral waveforms from the internal iliac vessel. The angle cursor should be adjusted parallel to the vessel walls. Document sites of pathology, using angle corrected PW Doppler.

**General Considerations:** Color and spectral Doppler are required for the assessment of the aorta and its branches. Color and/or power Doppler is necessary for identification of accessory renal arteries, inferior mesenteric and lumbar arteries. Additionally, color is useful in differentiating vascular from nonvascular structures and provides greater definition of the residual vessel lumen; enhances sensitivity in detecting low velocity flow states and allows the ability to readily visualize direction of flow.

### 3B: ENDOVASCULAR AORTOILIAC STENT GRAFT EVALUATION

**The technologist/sonographer/examiner should:**

- 3.1B Follow a standard exam protocol for each endovascular stent graft evaluation.
- 3.2B Use B-Mode gray scale imaging to:
  - a. Evaluate and document the location and position of the stent fixation sites (proximal and distal stent limbs) to evaluate stent for apposition to the wall and/or endoleak.
  - b. Record the maximum cross sectional aneurysm diameter (s) to assess for aneurysm enlargement.
  - c. Examine the residual aneurysmal sac for areas of echolucency or motion/pulsation in the excluded lumen that may represent endoleak.
- 3.3B Use Doppler to
  - a. Record color Doppler of renal and visceral arteries to demonstrate patency, stenosis or occlusion
  - b. Obtain cross section color image of the aneurysm sac demonstrating color filling of stent graft limbs to demonstrate patency
  - c. Record PW spectral waveforms from the body of the graft and each limb of the stent graft and for any twisting, kinking, or deformity of the graft
  - d. Use color and spectral Doppler to assess the attachment/fixation sites with attention to the detection of any flow outside the lumen of the graft
  - e. Any complications following endograft placement (i.e. stenosis, occlusion, hematoma, arteriovenous fistula, intimal flaps, dissection or pseudoaneurysm, at access sites) should be thoroughly documented.
  - f. When intervention (PTA with or without stent) has occurred for occlusion disease, the length of treated are should be carefully assessed, particularly if stent(s) have been placed. The stent should be evaluated for alignment, full deployment and relationship to the to the vessel wall. The Doppler cursor should be carefully walked throughout the entire length of the stent(s).
  - g. Examine the aneurysm sac throughout in both sagittal and transverse planes to detect flow that may represent endoleak. Special attention should be directed to hypoechoic areas and the absence of flow confirmed by Doppler
  - h. Record color Doppler image of patent aneurysm sac branches (i.e. lumbar, inferior mesenteric artery, internal iliac artery) and document flow direction
  - i. Record PW spectral waveforms from any region of extra graft flow detected within the aneurysmal sac and from aortic side-branches (document direction of flow and the source of flow and characteristics of the waveform (low resistance, high resistance or to-fro).

**General Considerations:** Color Doppler imaging must be completed using the most sensitive settings to detect slow aneurysmal sac flows. Color flow imaging is a useful component to aortoiliac ultrasound as it assists with vessel localization and aids in following these vessels. They are often deep and tortuous as they travel within the pelvis. Color is necessary for identification of accessory renal arteries and the inferior mesenteric artery.

### 3C: ABDOMINAL AORTOILIAC DUPLEX EVALUATION FOR OCCLUSIVE DISEASE

**The technologist/sonographer/examiner should:**

- 3.1C Follow a standard exam protocol for evaluation of the abdominal aortoiliac occlusive disease.
- 3.2C Use B-Mode gray scale imaging to examine the native aorta with 2-D ultrasound from the level of the diaphragm through the length of the aorta and progressing through the length of the iliac arteries bilaterally to the groin to:
  - a. Document aortic and iliac artery diameters by measuring outer wall to outer wall in normal proximal and

- distal arterial segments, when any area of dilation is seen.
  - b. Document the presence, extent & surface characteristics of plaque, dissection and thrombus
  - c. Examine the length of the iliac artery bilaterally and document any anatomic or pathologic abnormalities
- 3.3C Use color and pulsed wave Doppler information to:
- a. Document patency of the aorta and its branches
  - b. Record representative images confirming patency, residual lumen and wall defects
  - c. Confirm abnormalities including but not limited to the presence of plaque, thrombus, dissections, flaps, pseudoaneurysms, true aneurysms, wall defects, stenoses and/or occlusion
  - d. Record pulse wave velocity proximal to, at site of and distal to region of stenoses using Doppler angle of 60 degrees or less and parallel to vessel wall
  - e. Document branch artery anatomy (celiac, SMA, IMA, renals) and patency of hypogastries.
  - f. Document branch artery anatomy (celiac, SMA, IMA, renal) and patency of the hypogastric arteries

**General Considerations:** Color and spectral Doppler are required for the assessment of the aorta and its branches. Color is necessary for identification of accessory renal arteries, inferior mesenteric, and lumbar arteries. Additionally, color is useful in differentiating vascular from nonvascular structures; provides greater definition of the residual lumen; enhances sensitivity in detecting low-velocity flow states and allows the ability to readily visualize direction of flow.

## GUIDELINE 4: REVIEW OF THE DIAGNOSTIC EXAM FINDINGS

### The technologist/sonographer/examiner should:

- 4.1 Review data acquired during the examination to ensure that a complete and comprehensive evaluation has been performed and documented.
- 4.2 Explain to the patient and document any exceptions to the routine examination protocol (i.e., study limitations, omissions or revisions).
- 4.3 Record all technical findings required to complete the final diagnosis on a worksheet so the measurements can be classified according to the laboratory diagnostic criteria (these criteria may be based on published or internally validated data) (see references).
- 4.4 Document the exam date, clinical indication(s), technologist performing the exam and a summary of the exam results in a vascular laboratory log.
- 4.5 When indicated alert the medical director and/or referring physician that study data warrant immediate medical attention.

## GUIDELINE 5: PRESENTATION OF FINDINGS

### The technologist/sonographer/examiner should:

- 5.1 Provide preliminary results when necessary as determined by individual department guidelines.
- 5.2 Present record of diagnostic images, spectral data, explanations, and technical worksheet to the interpreting physician for use in rendering a diagnosis and for archival purposes.

## GUIDELINE 6: EXAM TIME RECOMMENDATIONS

High quality and accurate results are fundamental elements of the aortic 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: review of previous exam data; completion of pre-

exam paperwork; exam room and equipment preparation; patient assessment, patient preparation and positioning (Standard 1); and post-exam procedures i.e.; cleanup; review exam data for preliminary and/or formal interpretation (Standards 4 and 5); patient communication (Standard 6); exam charge and billing activities. Recommended allotment is 15 – 24 minutes.

- 6.2 Direct exam components include equipment optimization and the actual hands-on time. (Standard 2 or 3). Recommended time allotment is 45 - 60 minutes.

## **GUIDELINE 7: CONTINUING PROFESSIONAL EDUCATION**

The RVT (ARDMS) credential, the RVS (CCI) credential, or the RT-V (AART) credential are considered the standard of practice in vascular technology. All Vascular Technologists must remain current with:

- 7.1 Advances in diagnosis and treatment of abdominal aortic and iliac occlusive disease.
- 7.2 Changes in abdominal aortic and iliac evaluation protocols and published laboratory diagnostic criteria.
- 7.3 Advances in ultrasound technology used for the assessment of abdominal aortic disease.
- 7.4 Advances in other technology used for the assessment of abdominal aortic occlusive disease.

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