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**VASCULAR TECHNOLOGY
PROFESSIONAL PERFORMANCE GUIDELINES**

Mesenteric/Splanchnic Artery Duplex Imaging

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Mesenteric/Splanchnic Artery Duplex Imaging

PURPOSE

Duplex imaging of the mesenteric arteries is performed to determine the absence or presence, type, location, extent and severity of stenosis, aneurysm, or other disease of the mesenteric arteries.

COMMON INDICATIONS

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

- Abdominal pain and cramping associated with eating
- Persistent diarrhea
- Significant unexplained weight loss
- Abdominal bruits
- Unexplained gastrointestinal symptoms
- Postoperative evaluation of a vascular reconstruction or endovascular procedure
- Suspected aneurysm of mesenteric, hepatic, and/or splenic arteries
- Suspected celiac artery compression syndrome (Median Arcuate Ligament Compression?)
- Suspected vascular insufficiency of the intestine

CONTRAINDICATIONS AND LIMITATIONS

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

- fresh surgical incisions
- drains
- rapid breathing
- bowel gas
- body habitus
- patient positioning
- patient cooperation.

PATIENT PREPARATION

The patient should fast overnight to minimize bowel gas, however a 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. Studies should be done early in the day to minimize bowel gas.

GUIDELINE 1: PATIENT COMMUNICATIONS AND POSITIONING

The technologist/sonographer/examiner should:

- 1.1 Explain why the Mesenteric Artery Duplex Examination is being performed and indicate how long it 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 questions and concerns about any aspect of the examination.
- 1.4 Educate patients about risk factors for and symptoms of mesenteric artery disease.
- 1.5 Inform patients about necessary life style changes due to vascular disease.
- 1.6 Refer specific diagnostic, treatment or prognosis questions to the patient's physician
- 1.7 The exam is usually performed with the patient in a supine position

GUIDELINE 2: PATIENT ASSESSMENT

Patient assessment must be performed before Mesenteric Artery Duplex Evaluation. This includes assessment of the patient's ability to tolerate the procedure and an evaluation of any contra-indications 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. A pertinent history includes:
 - a. Current medical status, especially regarding arterial disease.
 - b. Presence of any signs or symptoms of peripheral vascular disease, cervical, abdominal or lower extremity bruit
 - c. Relevant risk factors for peripheral vascular disease: diabetes; hypertension; cerebrovascular disease; coronary artery disease; family history of cerebrovascular, coronary artery, or peripheral vascular disease; family history of diabetes or hypertension; age; smoking, obesity
 - d. History of other related diseases such as fibromuscular dysplasia,
 - e. Laboratory values
 - f. Current medications or therapies
 - g. Results of other vascular studies.
- 2.2 Complete a limited or focused physical exam, which includes palpation of femoral pulses, auscultation for abdominal bruit, observance of patient noting any surgical or traumatic scars or incisions, etc

GUIDELINE 3: EXAMINATION GUIDELINES

Diagnostic criteria must include application of published criteria or internally generated criteria. All diagnostic criteria must be internally validated. In general, gray scale imaging is 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 evaluation is used to quantify disease severity and should include assessment for presence or absence of flow and, when flow is present, evaluation of peak systolic velocity, end diastolic velocity, and waveform analysis. At a minimum, spectral analysis should be obtained in all vessel segments and proximal, throughout and distal to any flow disturbance identified. All spectral derived velocity information is obtained with a documented Doppler insonation angle of <60 degrees.

Based on the published data, the following cautions are included:

- Standardized angle of incidence is important
 - The same angle of incidence should be used for both mesenteric artery and aorta velocity measurements
 - Caution should be exercised when comparing estimated velocities of the same location from two different angles of insonation.
- 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 Use appropriate duplex instrumentation (with Doppler frequencies typically in the range of 2.0 – 5.0 MHz), which includes real time 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. hardcopy capabilities (It is recommended that both video and static images are acquired.)
 - c. Color Doppler, while useful, is optional.
 - 3.3 This exam is generally performed with a minimum preparation of fasting after 8 p.m. the evening prior to the examination except for water in order to minimize bowel gas. If the physician feels that this is an acute problem, the patient can be studied without fasting. It should be noted that if the patient has eaten within 6 hours of the study, standard velocity criteria for determining stenosis do not apply and although patency of the SMA can be determined, embolus to the SMA branches cannot be ruled out. Abdominal exams generally require various acoustic windows and patient positions in order to optimize the data available from a patient. These vary from patient to patient depending upon anatomy, body habitus, prior surgery, and the presence and location of bowel gas.
 - 3.4 The mesenteric arteries should be identified and evaluated for color flow changes that would indicate an actual flow change, change in residual lumen, and particularly, the presence of imaged plaque.
 - 3.5 A spectral waveform should be taken at an appropriate (60 degrees or less) Doppler angle of the adjacent aorta, at the origin of the celiac axis, hepatic artery, splenic artery and proximal, mid, and distal SMA, measuring the peak and end diastolic velocity of the celiac and SMA. When appropriate, evaluation of the inferior mesenteric artery (IMA) should be performed; the presence of a prominent IMA may indicate significant compromise of the celiac axis and/or SMA flow. Additionally, a real time spectral trace of the sample volume moving through any suspected stenosis is obtained.
 - 3.6 The aorta is identified and may be followed from the level of the diaphragm through its bifurcation into the right and left iliacs in both a transverse and sagittal plane. The image is noted for arterial wall dimension, presence of plaque, significant luminal narrowing, and color flow changes.
 - 3.7 Evaluate the patient's physical and mental status prior to discharge.

GUIDELINE 4: REVIEW OF THE DIAGNOSTIC EXAM FINDINGS

The technologist/sonographer/examiner should:

- 4.1 Review data acquired during the Mesenteric Artery Duplex Examination to ensure that a complete and comprehensive evaluation has been performed and documented.
- 4.2 Explain and document any exceptions to the routine Mesenteric Artery Duplex Examination protocol (i.e., study omissions or revisions)
- 4.3 Record all technical findings required to complete the final diagnosis on a worksheet so that the measurements can be classified according to the laboratory diagnostic criteria (these criteria may be based on published or internally generated data but must be internally validated regardless of the source)
- 4.4 Document study results in a laboratory logbook where performance of the exam, interpretation of exam results, and final diagnosis are recorded.
- 4.5 Alert the medical director or other responsible physician when immediate medical attention is indicated, based on the Mesenteric Artery Duplex Examination findings and local protocols.

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 mesenteric artery examination findings.
- 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.

GUIDELINE 6: EXAM TIME RECOMMENDATIONS

High quality and accurate results are fundamental elements of the mesenteric artery 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); and post exam procedures: clean up; compiling, processing, and reviewing data for preliminary and/or formal interpretation (Guidelines 3 and 4); patient communication (Guideline 5); exam charge and billing activities. Recommended time allotment is 30-35 minutes.
- 6.2 Direct exam components include equipment optimization, patient positioning throughout the exam, and the actual hands examination process. (Guideline 2) Recommended time allotment is 45-60 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) and/or mesenteric artery disease treatment.
- 7.2 Mesenteric Artery Duplex Examination protocols or published laboratory diagnostic criteria.
- 7.3 Advances in other duplex and/or other technology used for the Mesenteric Artery Exam.

REFERENCES

1. Blackburn, D.: Color duplex imaging of the mesenteric and renal arteries. *J Vasc Technol* 15:139-43, 1991.
2. Bowersox JC, Zwolak RM, Walsh DB et al.: Duplex Ultrasonography in the diagnosis of celiac and mesenteric artery occlusive disease. *J Vasc Surg* 14:780-788, 1991.
3. LaBombard FE, Musson A, Bowersox JC, Zwolak RM: Hepatic artery duplex as an adjunct in the evaluation of chronic mesenteric ischemia. *J Vasc Technol* 16L 7-11, 1992.
4. Moneta GI, Cummings C, Caster J, et al: Duplex ultrasound demonstration of postprandial mesenteric hyperemia in splanchnic circulation collateral vessels. *J Vasc Technol* 15: 37-39, 1991.
5. Moneta GI, Yeager RA, Dalmon R, et al: Duplex ultrasound criteria for diagnosis of splanchnic artery stenosis or occlusion. *J Vasc Surg* 14: 519, 1991.
6. Rizzo RJ, Sandager GP, Astleford P, et al: Mesenteric flow velocity variations as a function of angle of insonation. *J Vasc Surg* 11: 688-94, 1990.
7. Sandager GP, Flinn WR.: Duplex evaluation of the mesenteric circulation. *J Vasc Technol* 19 (5-6): 303-308, 1995.
8. Zwolak R, Fillingner M, Walsh D, et al: Mesenteric and celiac duplex scanning: a validation study. *J Vasc Surg* 1998;27:1078-88.