MESENTERIC DOPPLER:
OBJECTIVES

- Define and describe the clinical presentations of mesenteric ischemia
- Provide sonographic technique and protocol information
- Discuss interpretation criteria
- Discuss common pitfalls
- Describe new technology
- Review good practice tips

MESENTERIC ARTERIES

- Celiac Artery
- Superior Mesenteric Artery (SMA)
  - Intersocietal Accreditation Commission (IAC)
    - Aorta adjacent to visceral vessel origins
    - Celiac artery origin
    - Common hepatic artery
    - SMA origin and proximal segment
    - IMA
  - The Society for Vascular Ultrasound (SVU)
    - Splenic artery
    - Mid and distal SMA
    - Documentation of SMV and IMV patency
- Artery of Riolan

MESENTERIC ARTERIES

- Arterial stenosis or occlusion
- Venous thrombosis
- Nonocclusive disease (low flow states, hypotension, shock)

MESENTERIC ARTERIES

- Acute Mesenteric Ischemia (AMI)
  - Severe abdominal pain
  - N/V
  - Diarrhea
  - Surgical emergency
- Chronic Mesenteric Ischemia (CMI)
  - Postprandial pain
  - Nonspecific abdominal pain
  - Weight loss
  - Bloating

MESENTERIC ARTERIES

<table>
<thead>
<tr>
<th>Acute Measuring Ischemia (AMI)</th>
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<td>Severe abdominal pain</td>
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<td>Surgical emergency</td>
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<th>Chronic Measuring Ischemia (CMI)</th>
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<td>Postprandial pain</td>
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PROTOCOL

Inter-societal Accreditation Commission (IAC)

- Aorta adjacent to visceral vessel origins
- Celiac artery origin
- Common hepatic artery
- SMA origin and proximal segment
- IMA

The Society for Vascular Ultrasound (SVU)

- Splenic artery
- Mid and distal SMA
- Documentation of SMV and IMV patency
**TECHNIQUE**
- Patient preparation fasting at least 6-8 hrs.
- Low-frequency transducers (2-5 MHz) optimized for body habitus

**PROTOCOL AORTA**
- Sagittal long axis of aorta at celiac artery origin
- Obtain angle corrected waveform
- Measure PSV

**PROTOCOL CELIAC ARTERY**
- Transverse "seagull sign"
- Turn sagittal to obtain the longest axis
- Obtain angle corrected waveform
- Measure PSV during expiration
- Measure PSV during deep inspiration (R/O MALS)
- Measure PSV 1-2 cm from origin during quiet breathing

**PROTOCOL SMA**
- Obtain sagittal SMA
- Obtain angle corrected waveform
- Measure PSV/EDV at SMA origin
- Measure PSV/EDV 1 cm from origin
- Measure PSV/EDV 2 cm from origin

**PROTOCOL IMA**
- Identify aortic bifurcation and ascend proximally up the isthmal aorta for 1-3 cm
- Obtain angle corrected spectral waveform
- Measure PSV/EDV
**INTERPRETATION CRITERIA**

<table>
<thead>
<tr>
<th>Vessel</th>
<th>Post Prandial NORMAL Response</th>
</tr>
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</table>
| SMA    | More diastolic flow  
Increased PSV  
Less pulsatility |
| Celiac | No change  
Hepatic artery  
Increased pulsatility  
Portal vein  
Increased flow |

**INTERPRETATION CRITERIA DIRECT SIGNS**

<table>
<thead>
<tr>
<th>Celiac (faster)</th>
<th>SMA (faster)</th>
<th>SMA</th>
<th>Aorta Ratio</th>
</tr>
</thead>
</table>
| ≥2.5 cm/s indicates  
>70% diameter stenosis  
Increased EDV (>45 cm/s) also a criteria | ≥2.5 cm/s indicates  
>70% diameter stenosis  
Increased EDV (>45 cm/s) also a criteria | No good criteria  
Celiac: Aorta 3.5  
SMA: Aorta 3.5  
(widely quoted) |

**INTERPRETATION CRITERIA INDIRECT SIGNS**

- Parvus tardus  
- Turbulence  
- Flow reversal  
- Hepatic artery indication of celiac occlusion

**INTERPRETATION CRITERIA**

- Aliasing  
- Bruit

**INTERPRETATION CRITERIA**

<table>
<thead>
<tr>
<th>SMA</th>
<th>Celiac</th>
</tr>
</thead>
</table>
| Sensitivity: 87-90%  
Specificity: 91-96% | Sensitivity: 87-93%  
Specificity: 80-100% |
PITFALLS

- **Patient limitations**/Post procedural states
- **Anatomic variants**
  - Stented vessels higher velocities in stented vessels compared to native
  - Aortic and mesenteric arteries should have similar velocities
  - Aortic stenosis may result in increased velocities and parasternal wall motion
  - Angiography may cause elevated velocities
  - Diaphragm: Most often involve the SMA, and are commonly concomitant of aortic dissections
- **Median Arcuate Ligament Compression Syndrome (MALS)**

Common Variants:
1. Replaced right hepatic artery originates from SMA
2. Replaced common hepatic artery originated from SMA
3. Common hepatic artery originating from aorta
4. Common origin of the celiac and SMA

MALS

- **Transient compression of the celiac artery by the median arcuate ligament of the diaphragm**
- Occurs during exhalation relieved with inspiration

NEW HORIZONS

Application: Vascular Perfusion Status
Diagnosis: Complex Distal Endoleak

NEW HORIZONS
NEW HORIZONS

GOOD PRACTICE TIPS

- Fasting state
- Scan all major arteries (celiac, SMA, IMA) and veins (SVP, IMA)
- "HSTP" technique: high-stenosis turbulence, poststenotic stenosis
- Acquire PSV with angle correction from the longest arm of vessel

<table>
<thead>
<tr>
<th>Pathology</th>
<th>Color</th>
<th>Doppler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stenosis &gt; 50%</td>
<td>High velocity flow, aliasing, color bruit</td>
<td>High velocity flow, poststenotic turbulence</td>
</tr>
<tr>
<td>Occlusion</td>
<td>No color flow at origin</td>
<td>Absent flow signals</td>
</tr>
<tr>
<td>MALS</td>
<td>Increased color velocity during exhalation</td>
<td>Increased velocity in RS inhalation and decreased with exhalation</td>
</tr>
</tbody>
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REFERENCES