Imaging Approaches to Mesenteric Ischemia

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Mesenteric Ischemia

- Acute type (90%)
  - Arterial embolism
  - Arterial thrombosis
  - Nonocclusive form
    - Low flow state
    - Vasospasm
  - Venous occlusion
- Chronic type (10%)

Acute Mesenteric Ischemia

- Increasing incident
- Nonspecific clinical presentation
- Majority from arterial embolism
- 60% mortality
- Early intervention critical
  - Vasodilator (Papaverine)
  - Thrombolysis, thrombectomy, angioplasty, stenting
  - Infarct bowel resection, revascularization

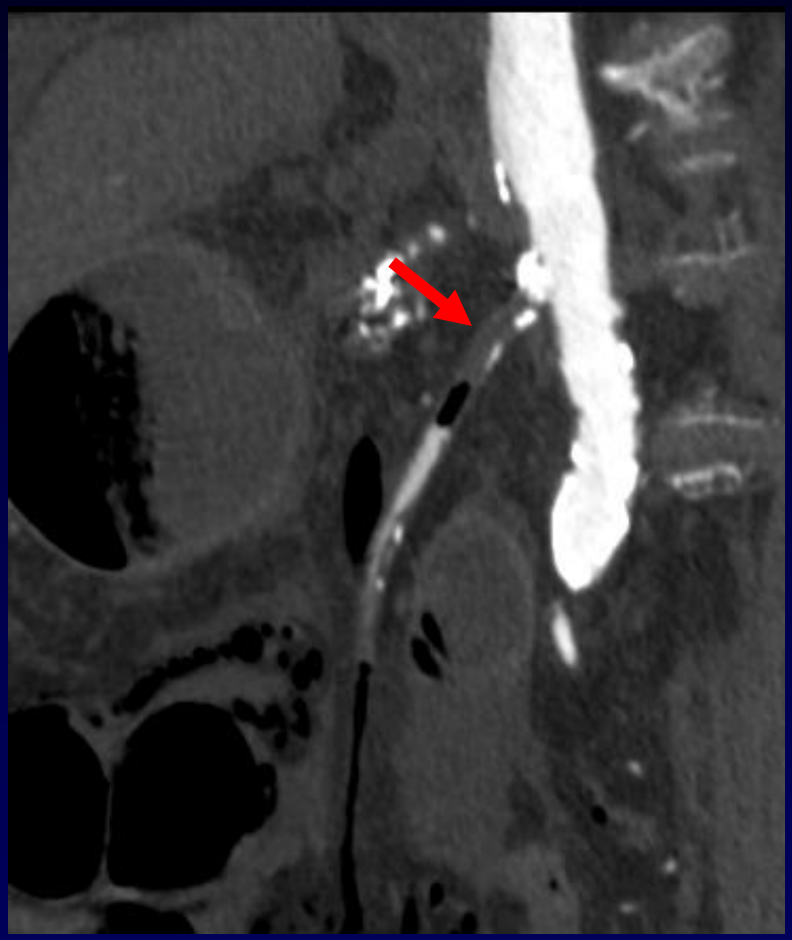
Chronic Mesenteric Ischemia

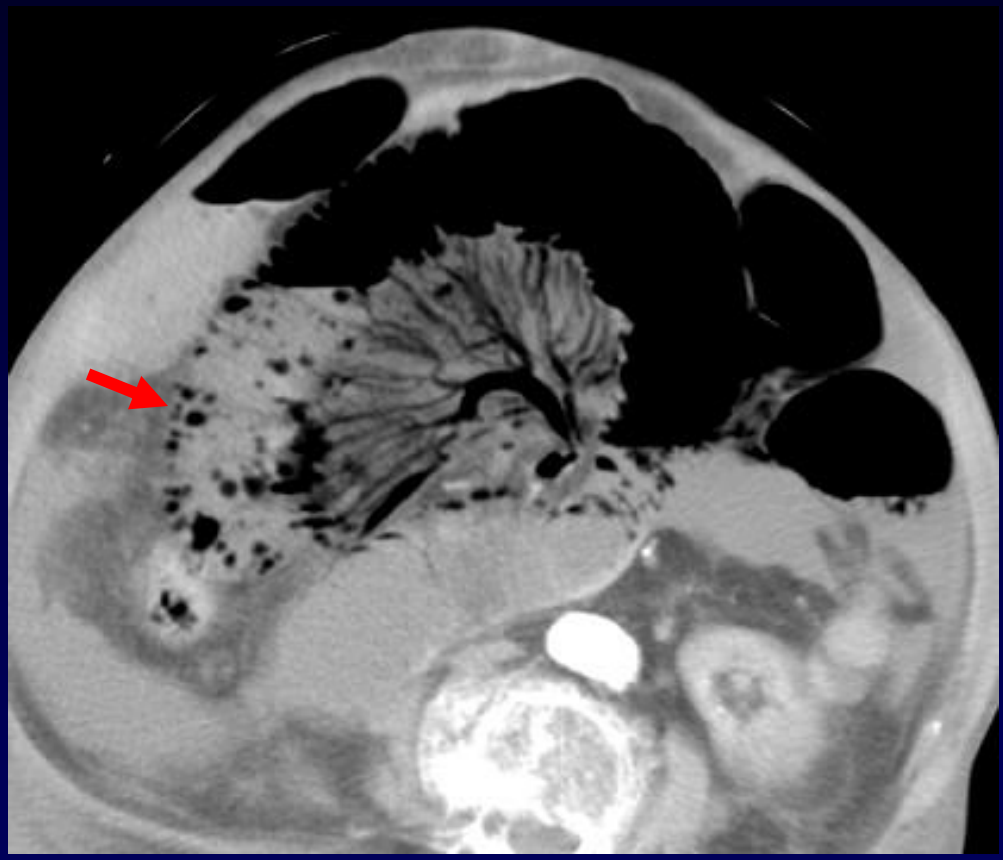
- Atherosclerosis (95%)
- Proximal vessel stenoses
- Two or more vessels involved
- Collateral arteries
- Clinical triad
  - Bowel angina
  - Food aversion
  - Weight loss
- Treatment: revascularization, stenting

Diagnostic Test

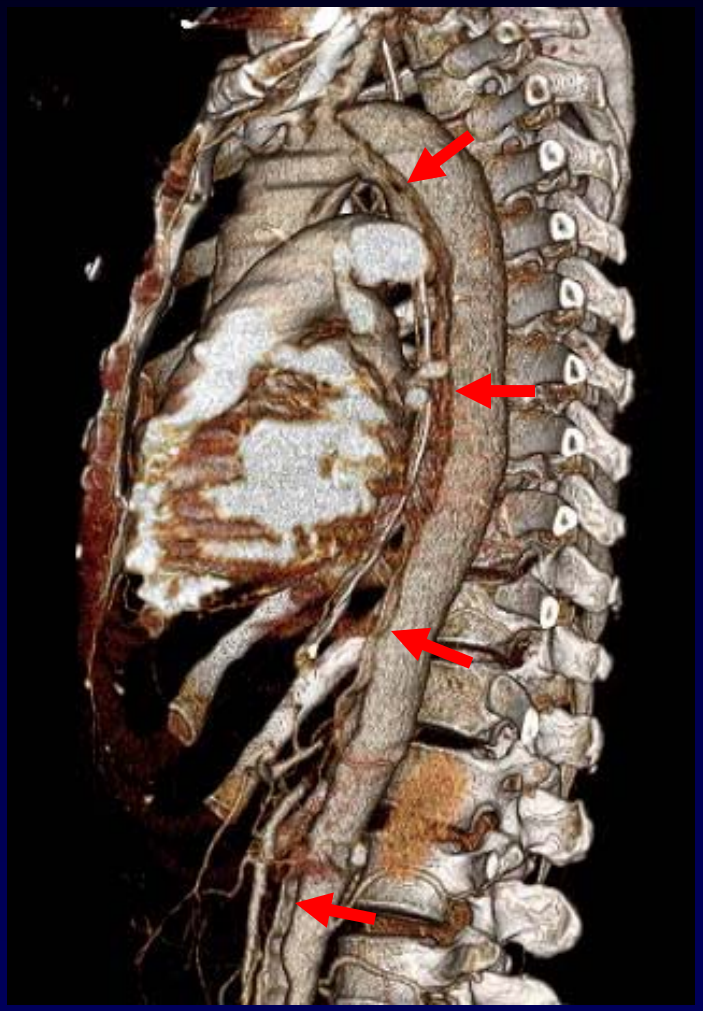
- Acute Mesenteric Ischemia
  - CT Angiography
  - Catheter Angiography + Vasodilator Tx
- Chronic Mesenteric Ischemia
  - CTA and MRA
  - Physiologic Challenge Test

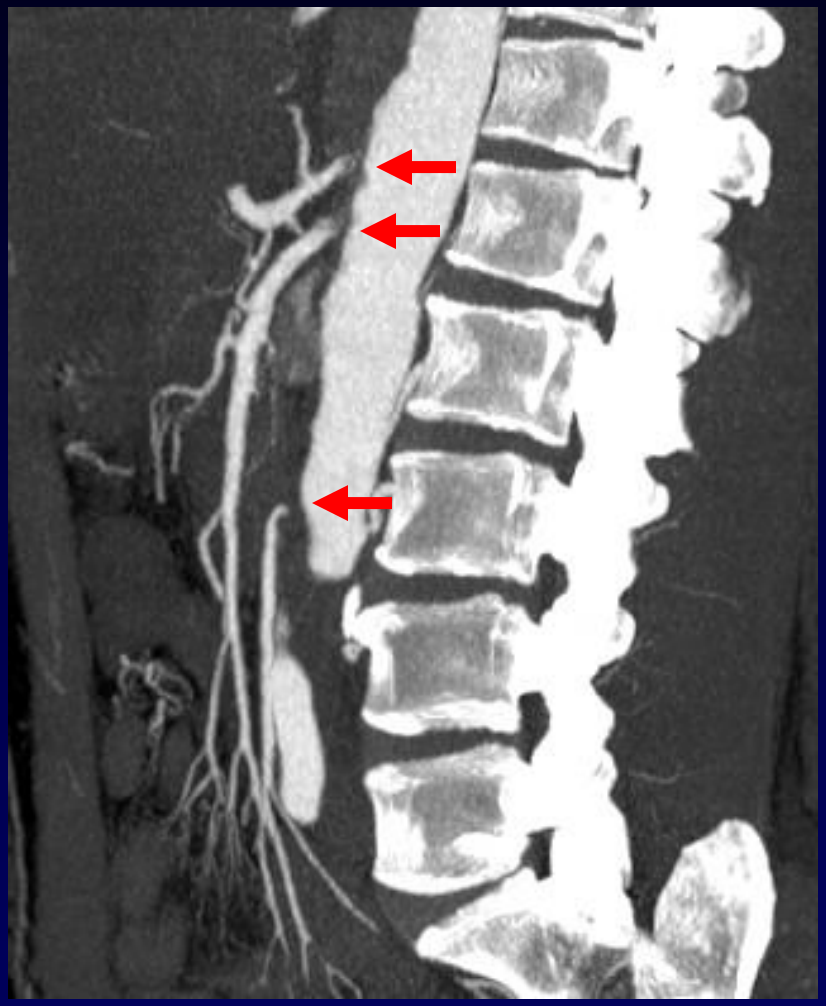
Acute SMA Thrombosis



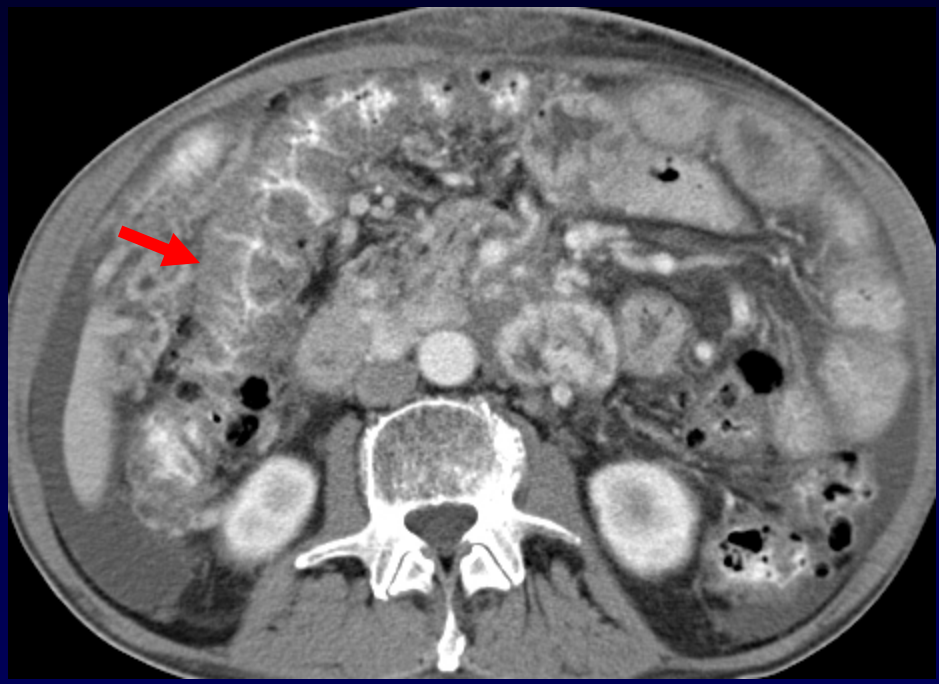


Acute Aortic Dissection





Acute SMV Thrombosis



CT Diagnosis in AMI

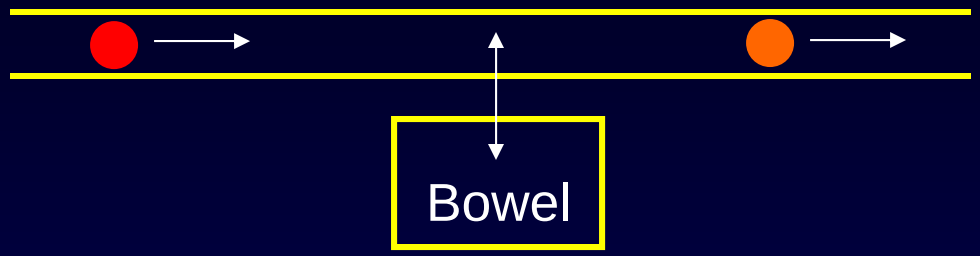
- Menke J. Diagnostic Accuracy of Multidetector CT in Acute Mesenteric Ischemia: Systematic Review and Meta-Analysis. RSNA 2010.
- 1996 – 2009
- 6 studies:3 prospective, 3 retrospective
- Pooled sensitivity: 93%
- Pooled specificity: 96%

Diagnostic Test

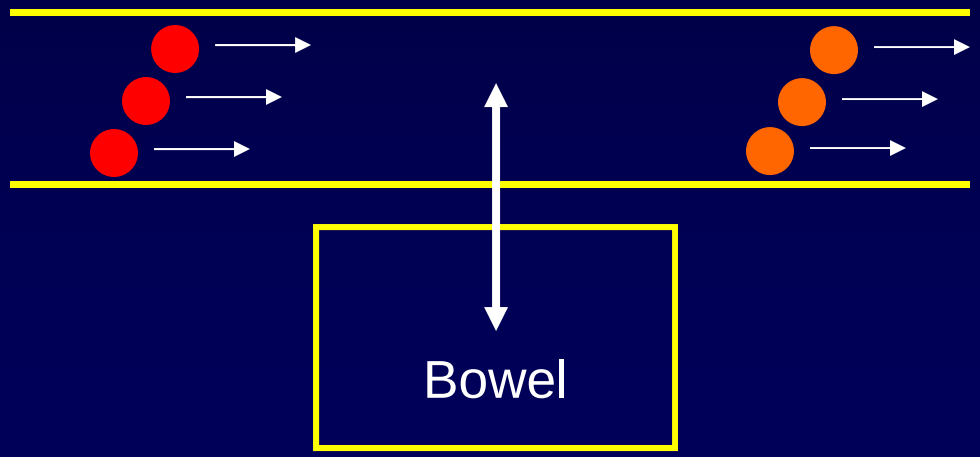
- Acute Mesenteric Ischemia
  - CT Angiography
  - Catheter Angiography + Vasodilator Tx
- Chronic Mesenteric Ischemia
  - CTA and MRA
  - Physiologic Challenge Test

Normal Response

Fasting State

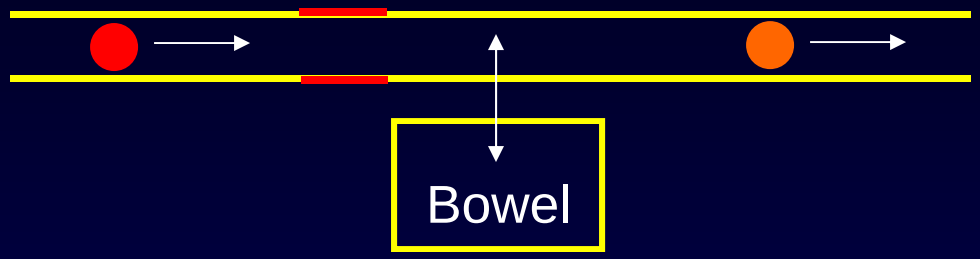


Fed State

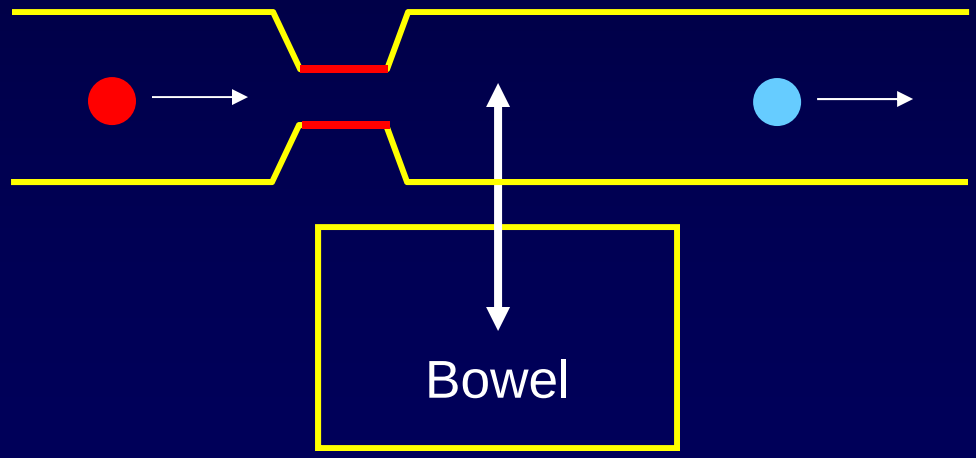


Ischemic Response

Fasting State

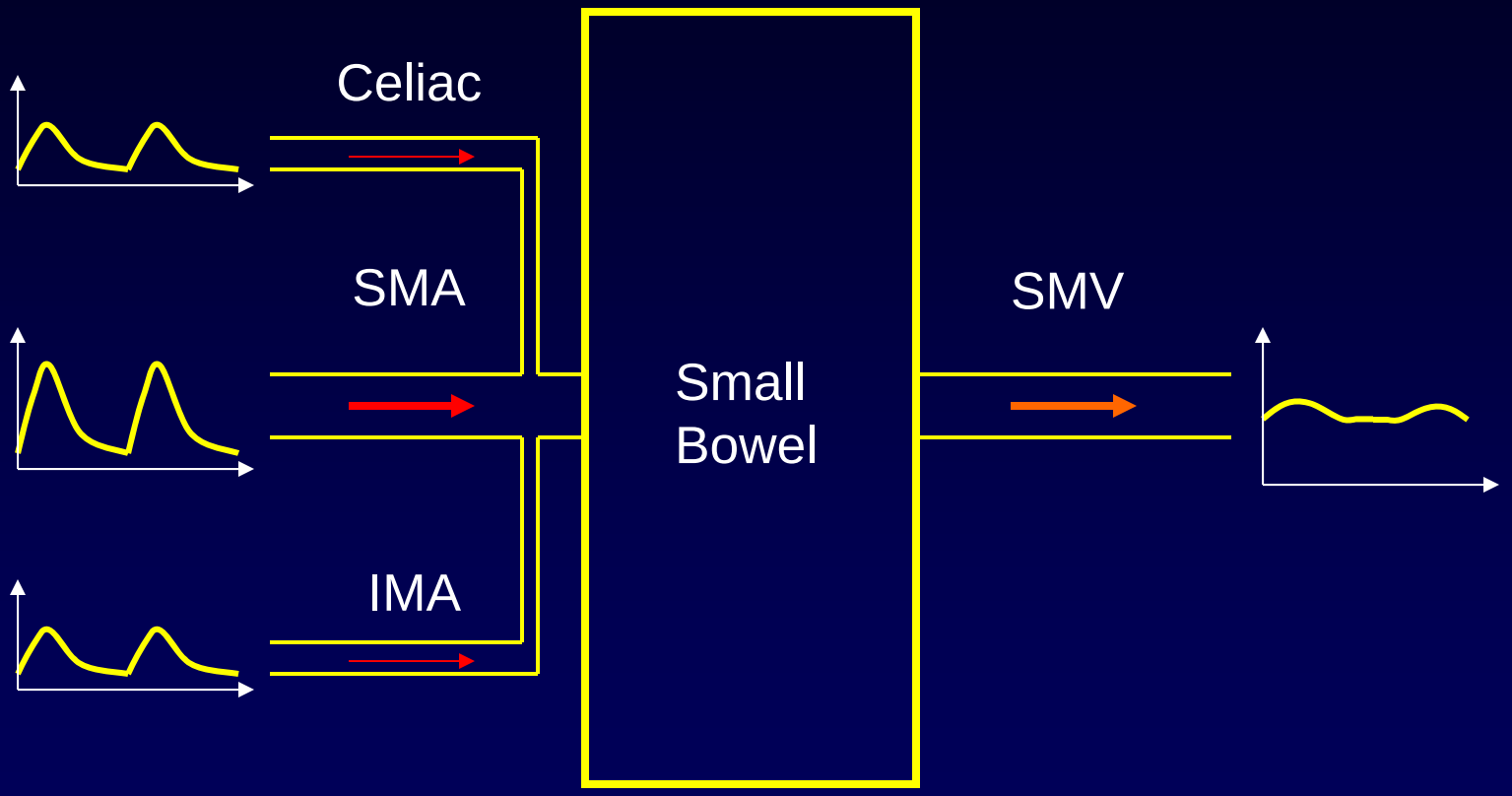


Fed State



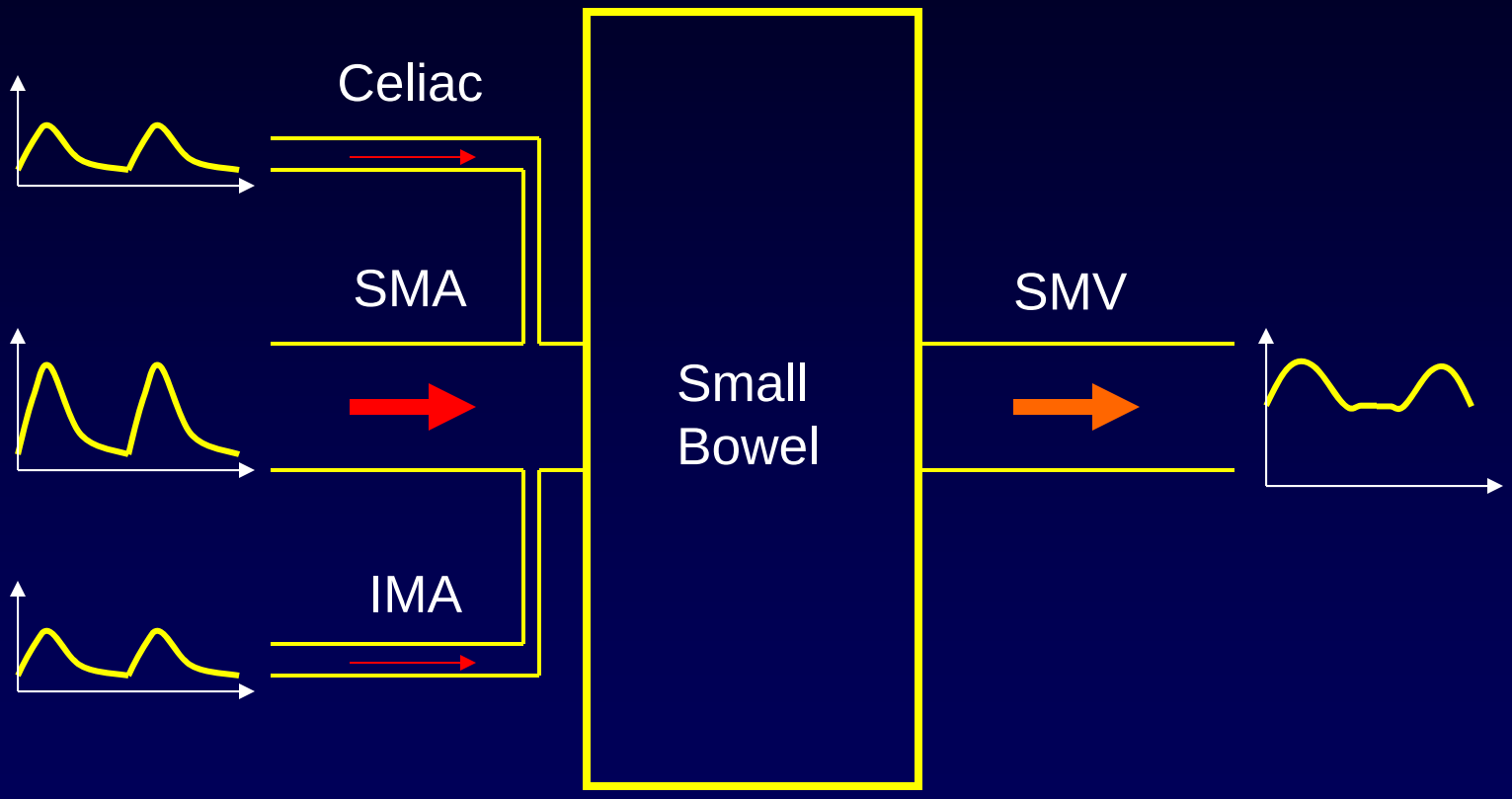
Normal Flow Pathway

Fasting State

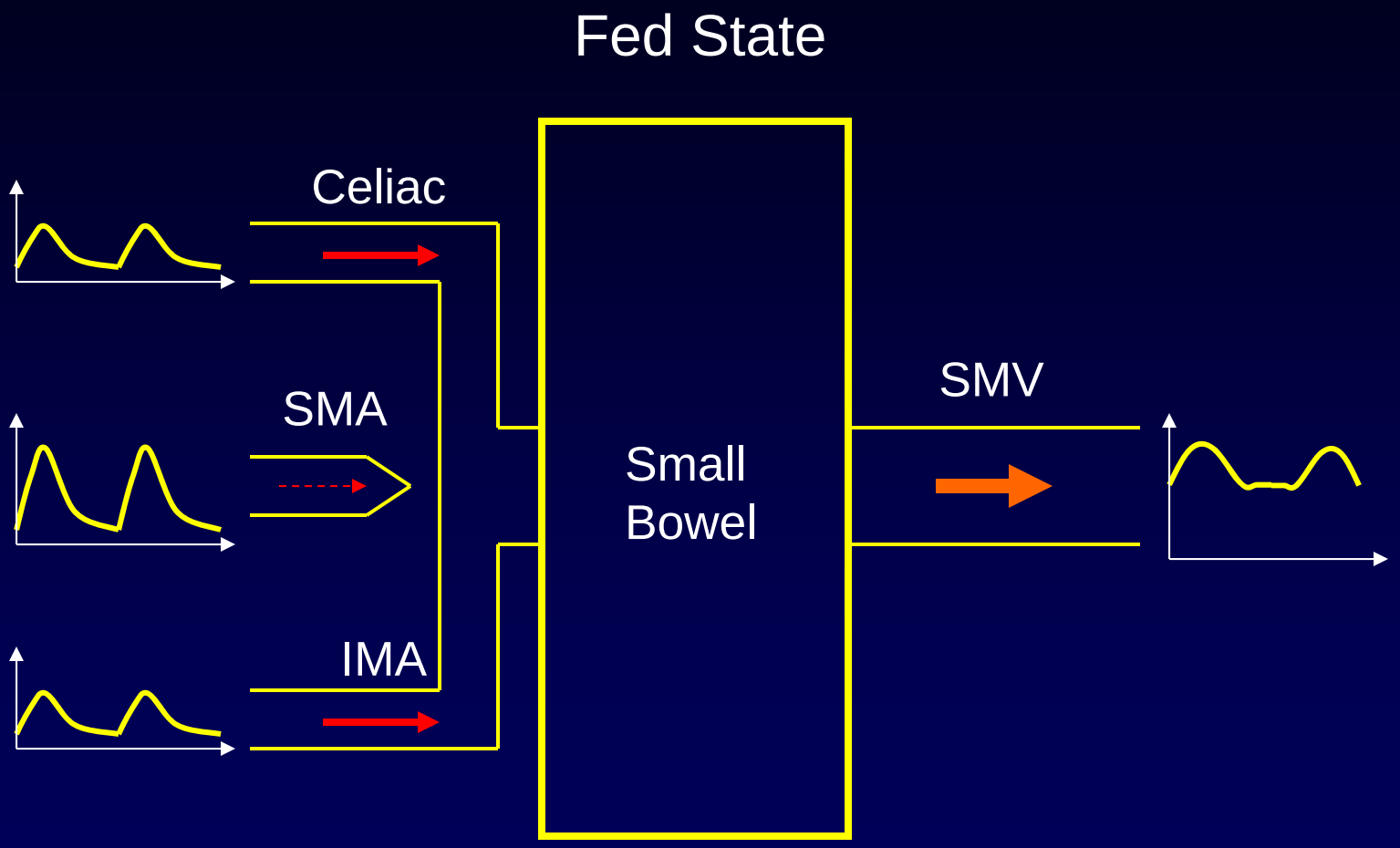


Normal Flow Pathway

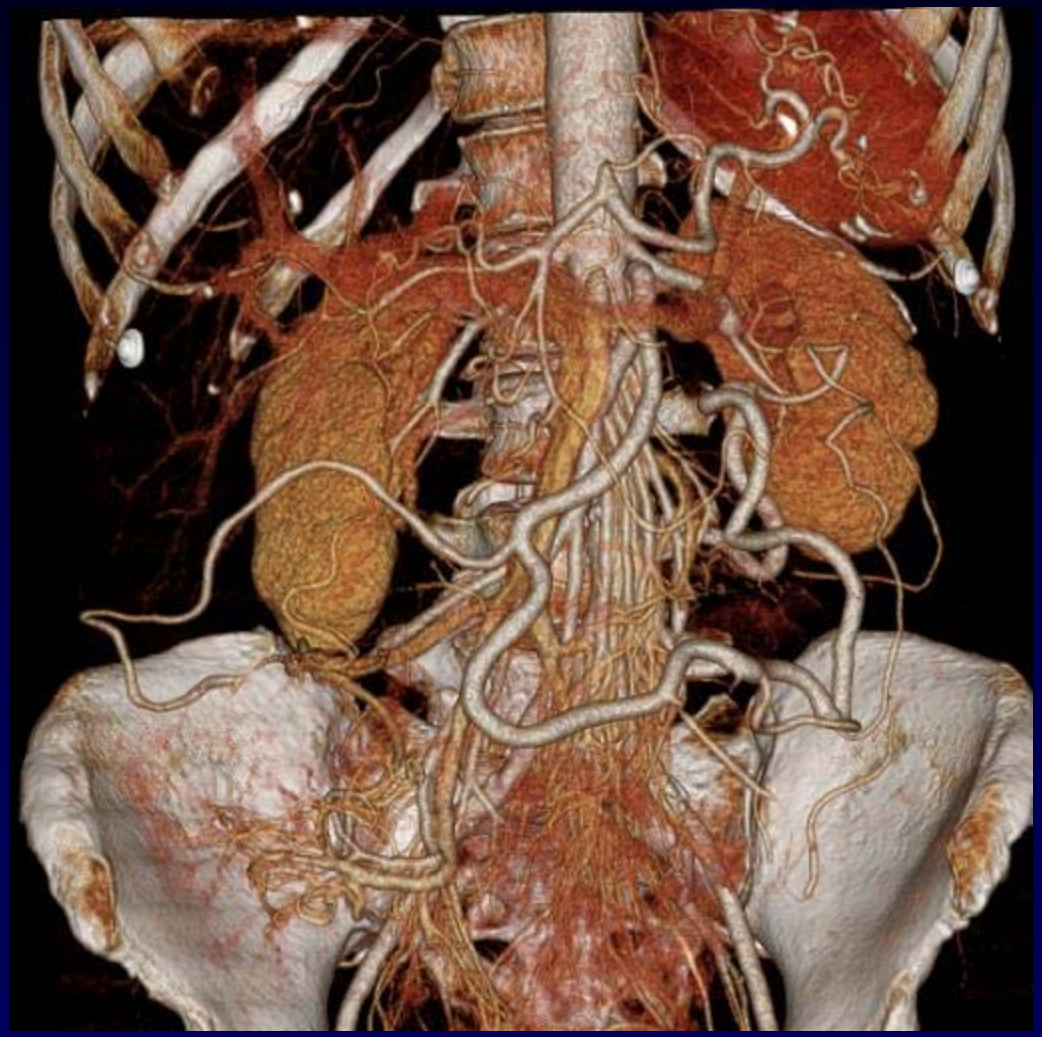
Fed State



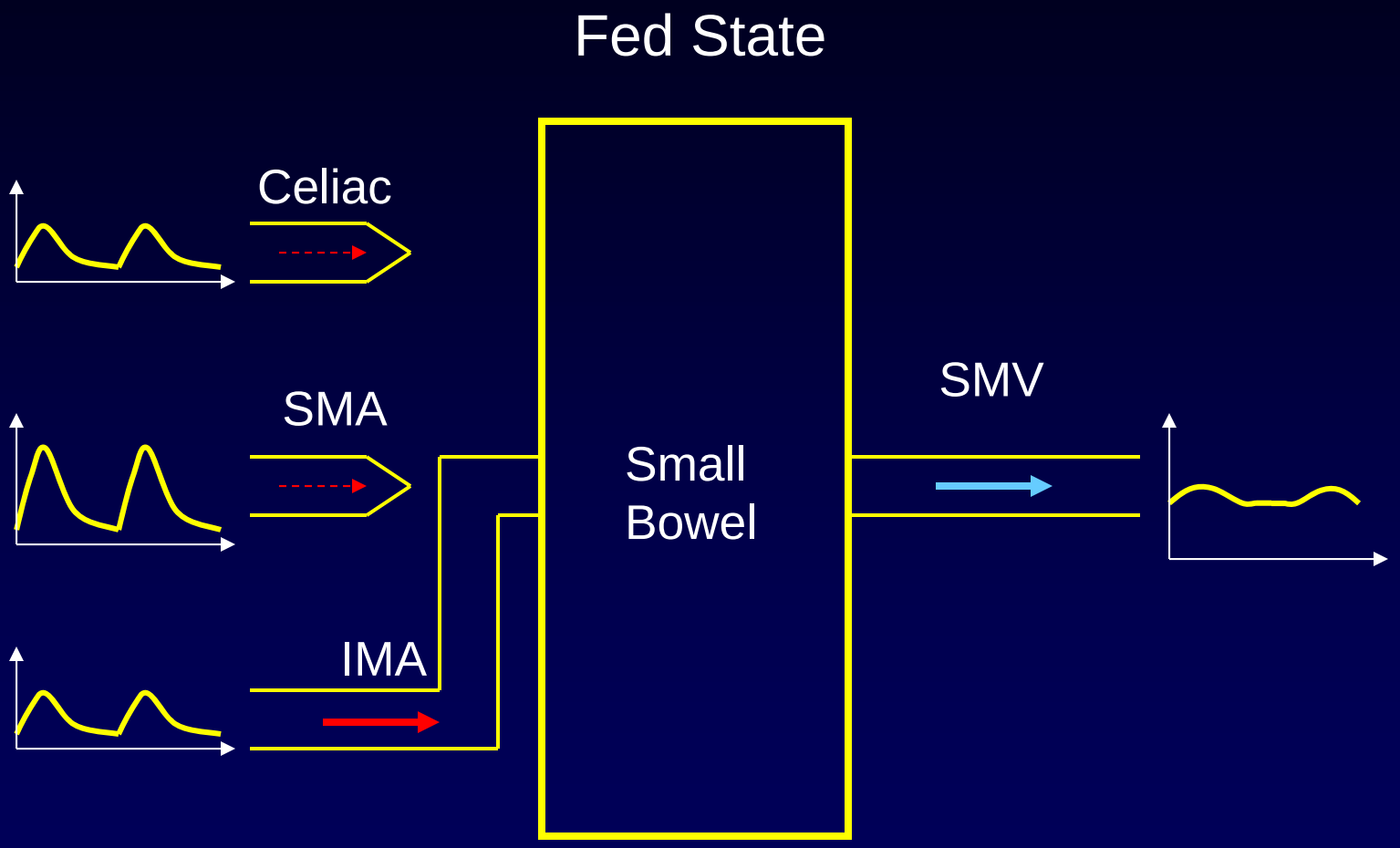
Compensated SMA Stenosis



Mesenteric Collateral Arteries



Chronic Mesenteric Ischemia



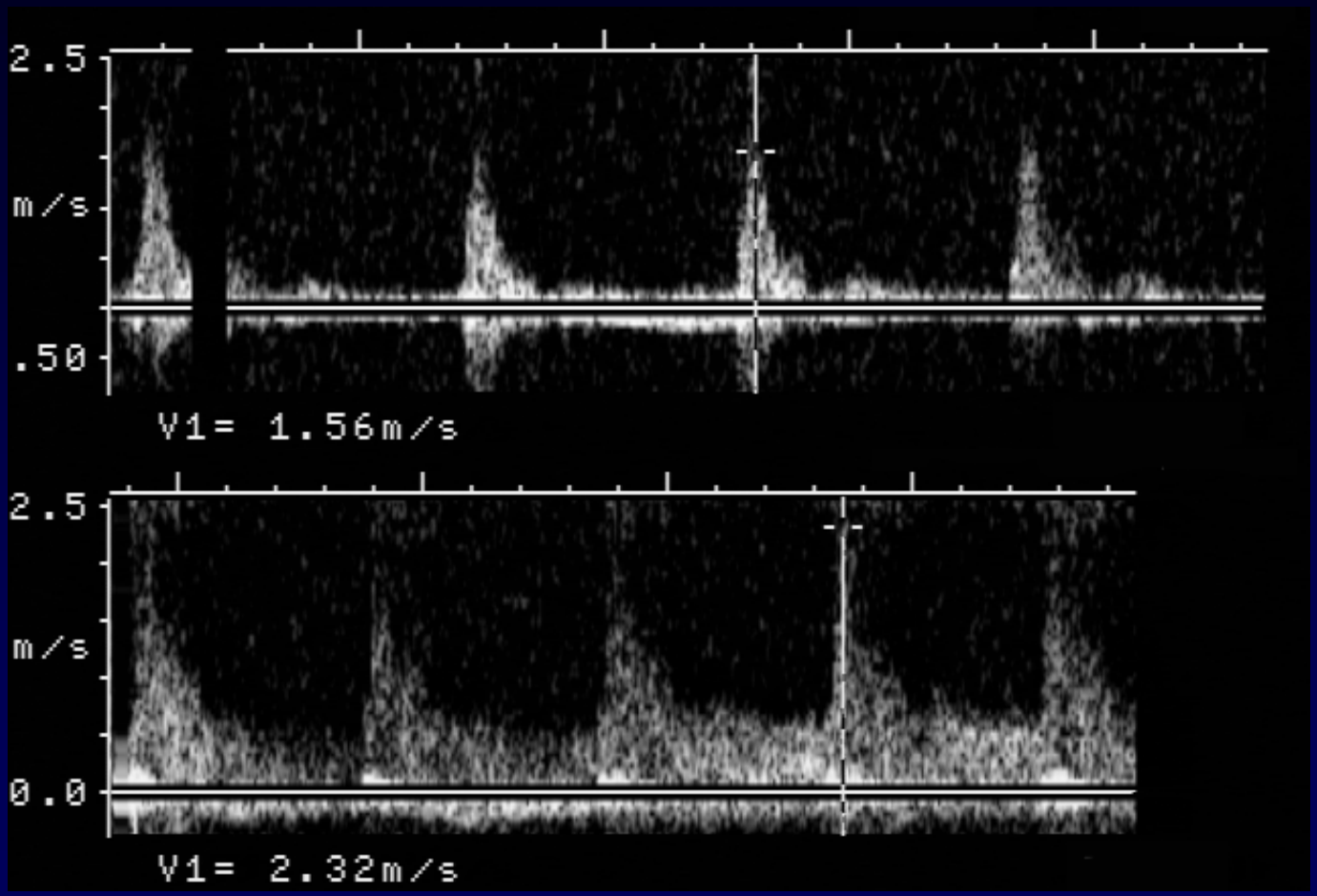
Perfusion Measurement

- Velocity
  - Doppler ultrasound at
    - SMA
    - SMV
- Flow
  - MRI phase contrast at
    - SMA
    - SMV

Doppler US of SMA

Before Meal

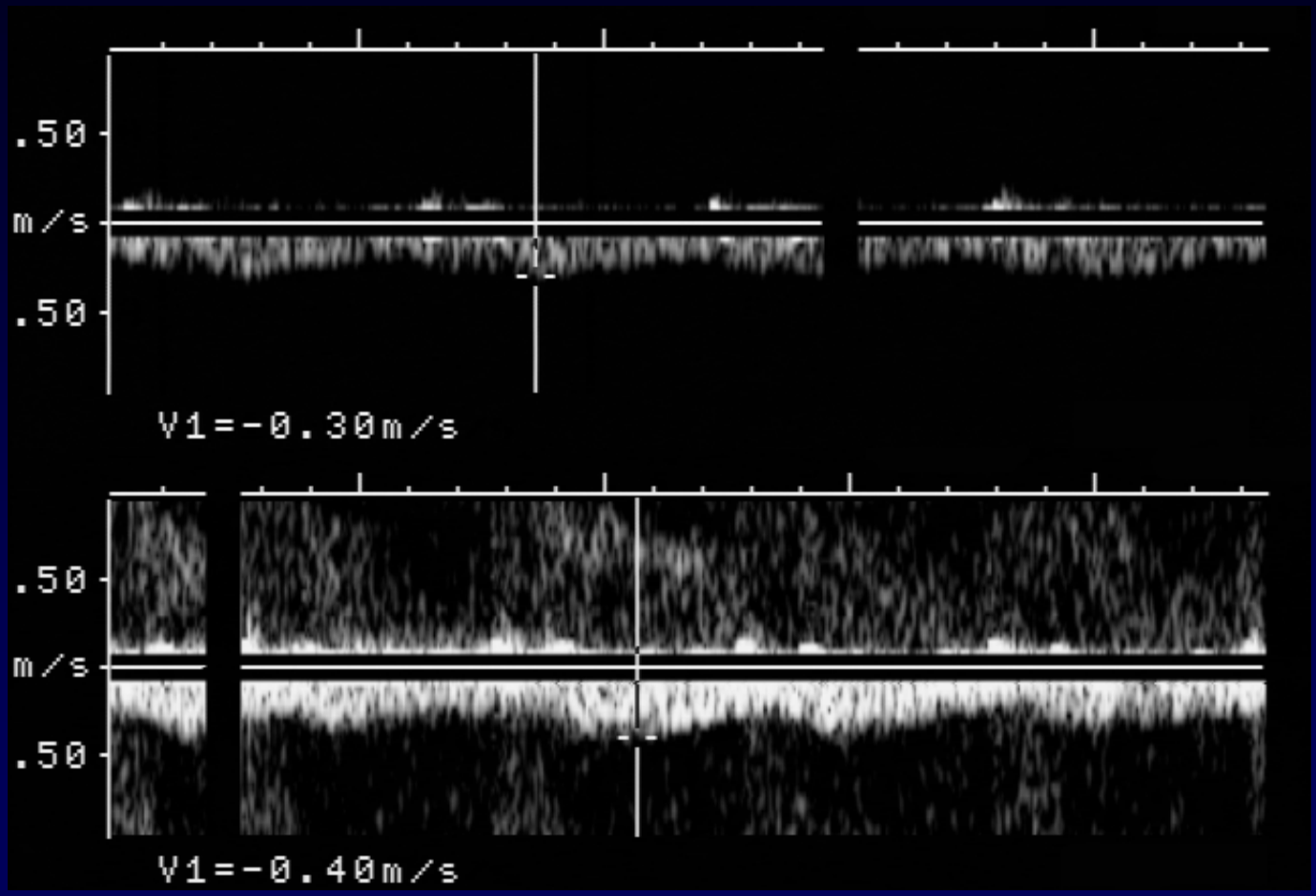
After Meal



Doppler US of SMV

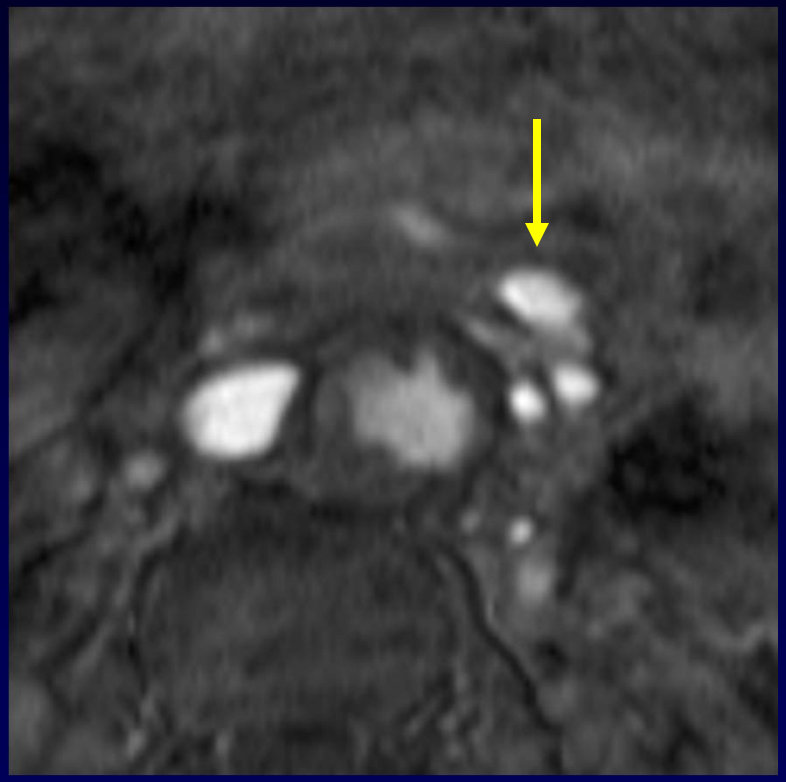
Before Meal

After Meal

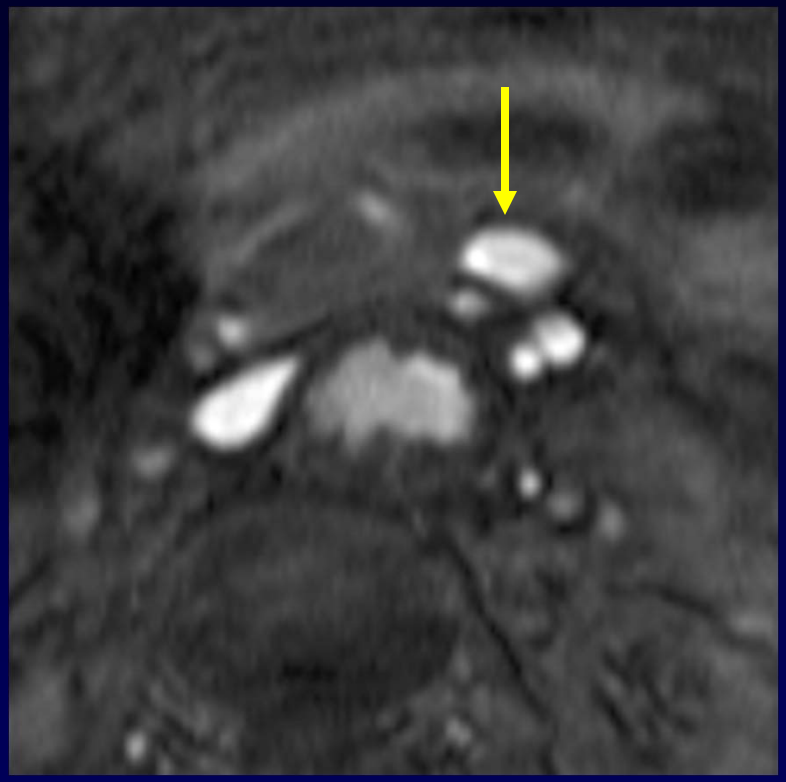


Flow Area

Venous flow increases by increase in cross-sectional area.



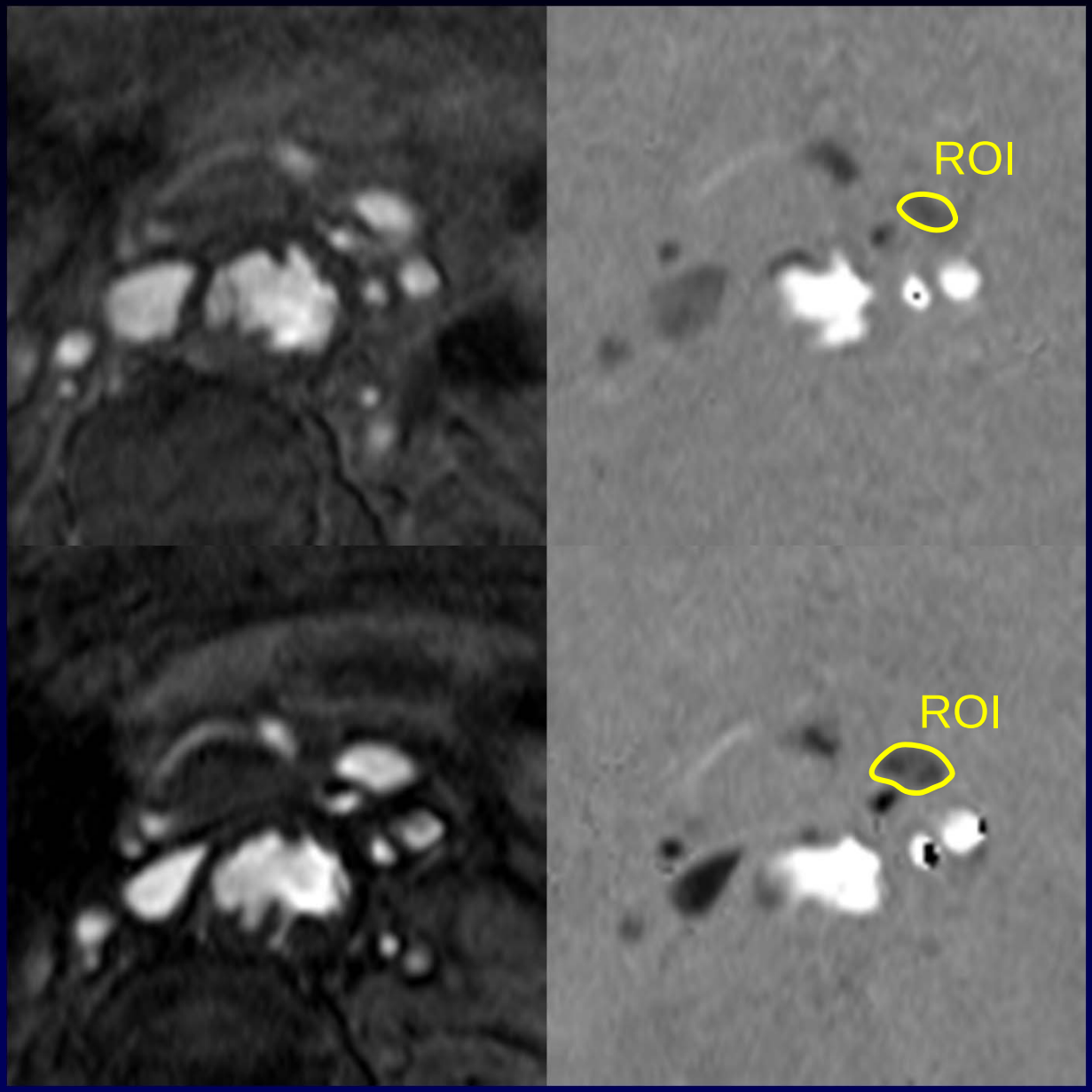
Pre-meal



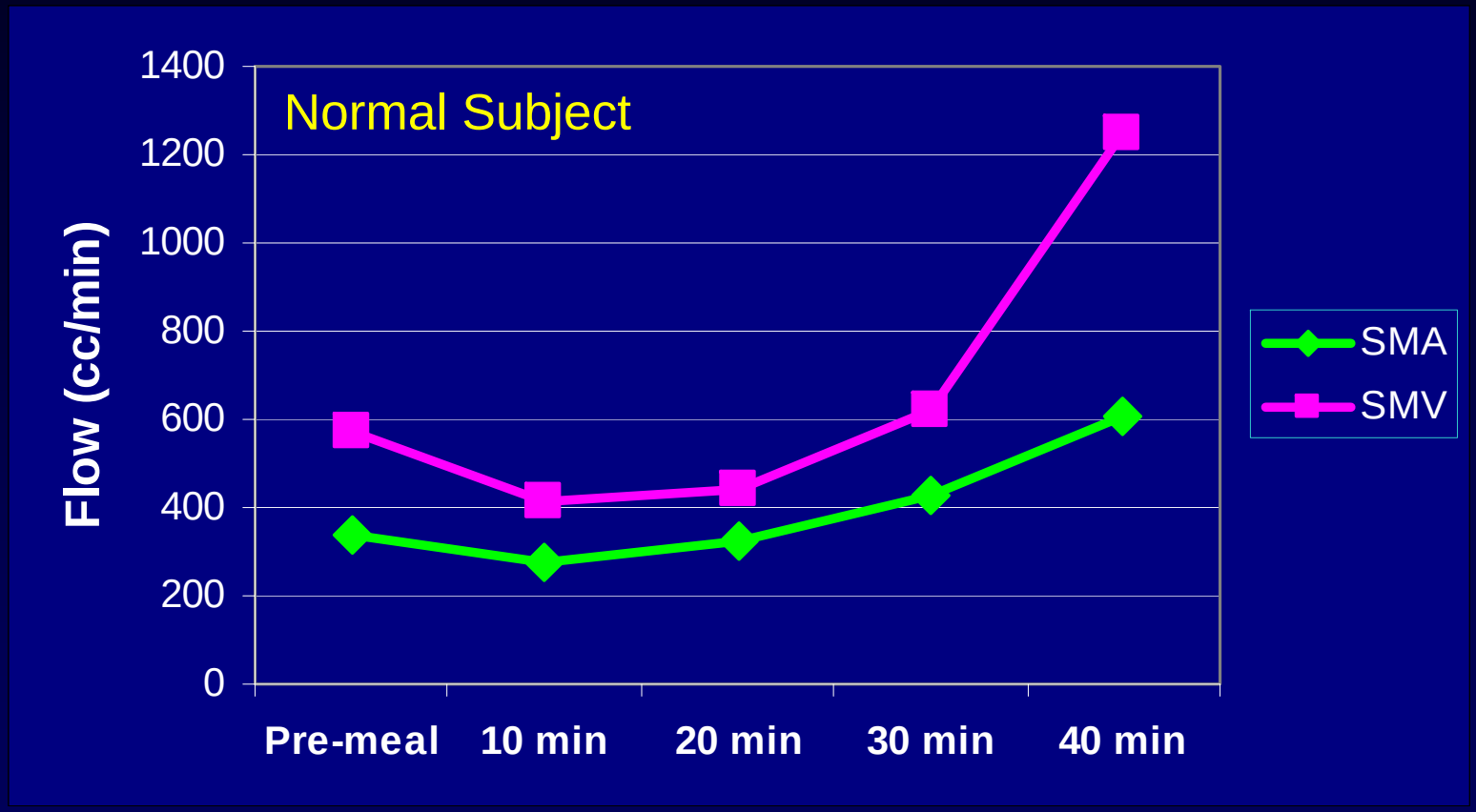
Post-meal

Perfusion Measurement

- Velocity
  - Doppler ultrasound at
    - SMA
    - SMV
- Flow
  - MRI phase contrast at
    - SMA
    - SMV


ROI
ROI

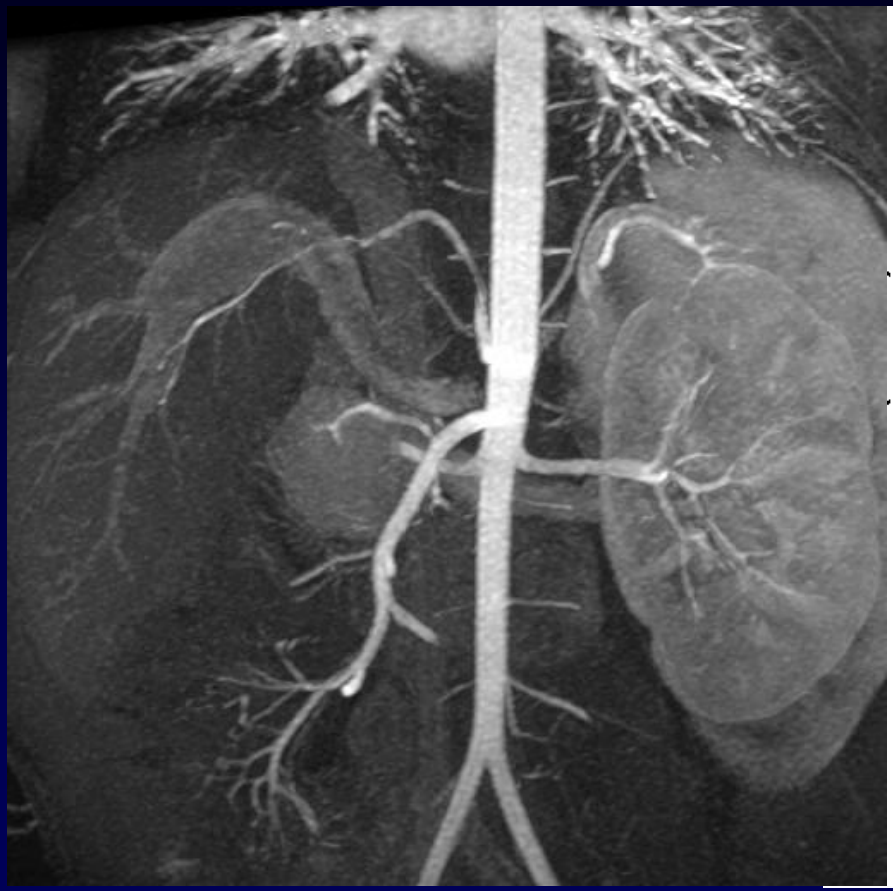
Pre and Postprandial Flow

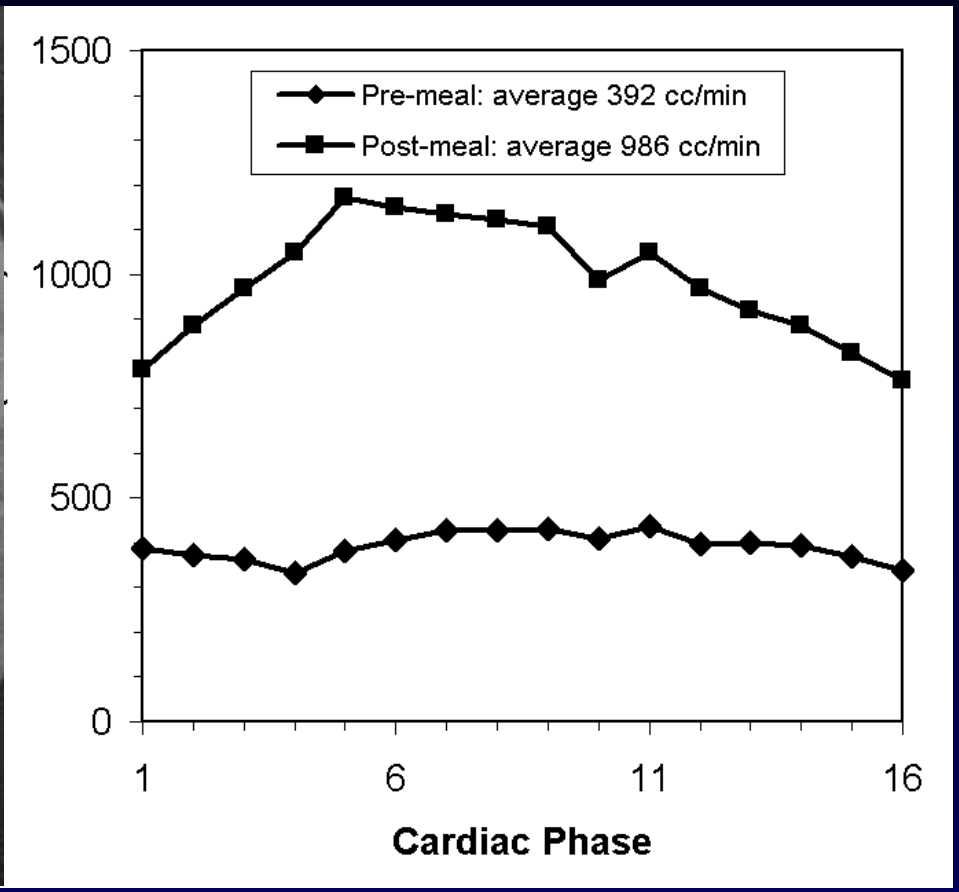


Mesenteric Ischemia Protocol

- Fasting > 6 hrs
- Localize SMV
- Pre-meal PC
- 260 cal diet supplement
- CE MRA
- 30 min post meal
- Localize SMV
- Post-meal PC
- Flow Quantification

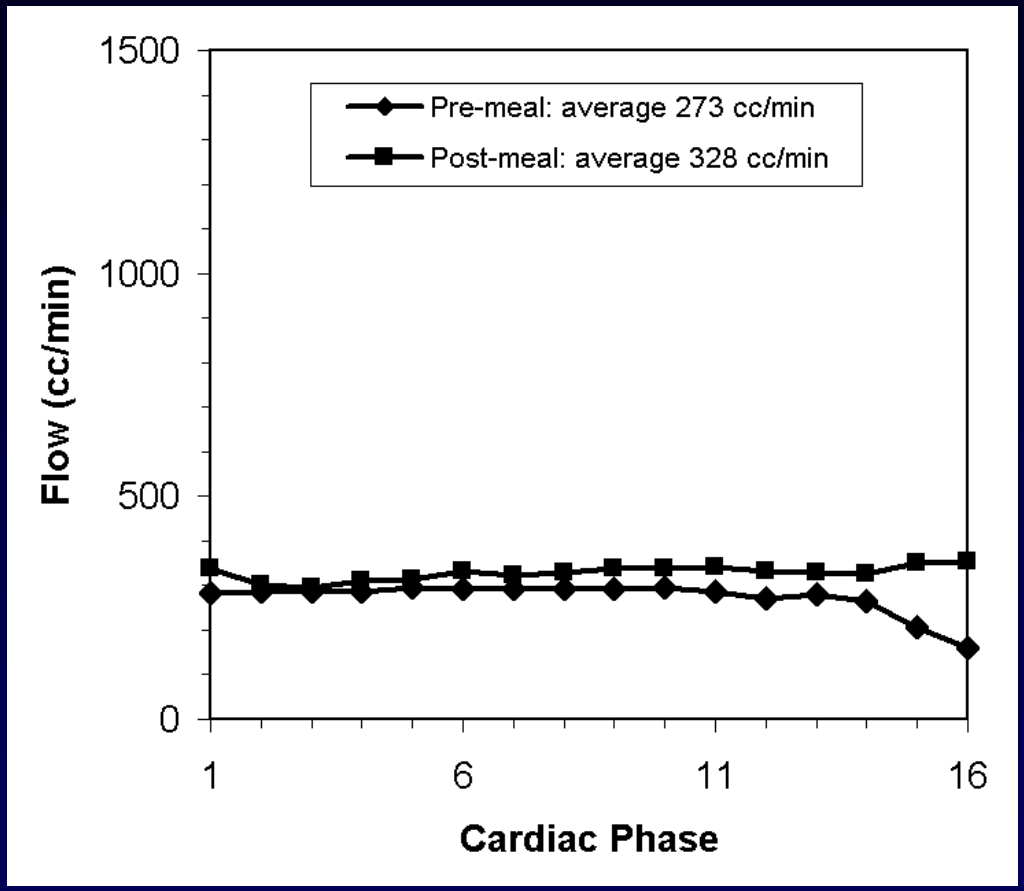
Normal Study





> 50% increase in
post-meal SMV flow

Chronic Mesenteric Ischemia



< 50% increase in
post-meal SMV flow

Limitations

- CE MRA is limited to proximal stenosis in the mesenteric arteries.
- Physiologic challenge is not sensitive to small segmental ischemia.
- Problems with inadequate fasting, poor GI motility, abnormal endocrine response.
- Physiologic challenge is not appropriate for acute mesenteric ischemia.