Management of Acute Mesenteric Ischemia

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Exploratory Laparotomy

- Necrotic 95 cm segment of mid - ileum
- Non-palpable superior mesenteric artery
- Patchy necrosis proximal jejunum
- Two small bowel resections
- GI continuity restored

Pathology Results

- Small bowel with ischemic, transmural necrosis with arterial thrombosis and serositis
- Histologically viable margins


Contrast: CONTRAST
Gantry: 0°
FoV: 350 mm
Slice: 2 mm
Couch: 158.1
Pos: FFS
1/2
F: B


Contrast: CONTRAST
Gantry: 0°
FoV: 350 mm
Slice: 2 mm
Couch: 182.1
Pos: FFS
1/2
F: B

Management of Acute Mesenteric Ischemia (AMI)

- Epidemiology
- Etiology
- Diagnosis
- Treatment

Acute Mesenteric Ischemia

"Occlusion of the mesenteric vessels is regarded as one of those conditions of which the diagnosis is impossible, the prognosis hopeless, and the treatment almost useless." - Dr. Cokkinis, 1921

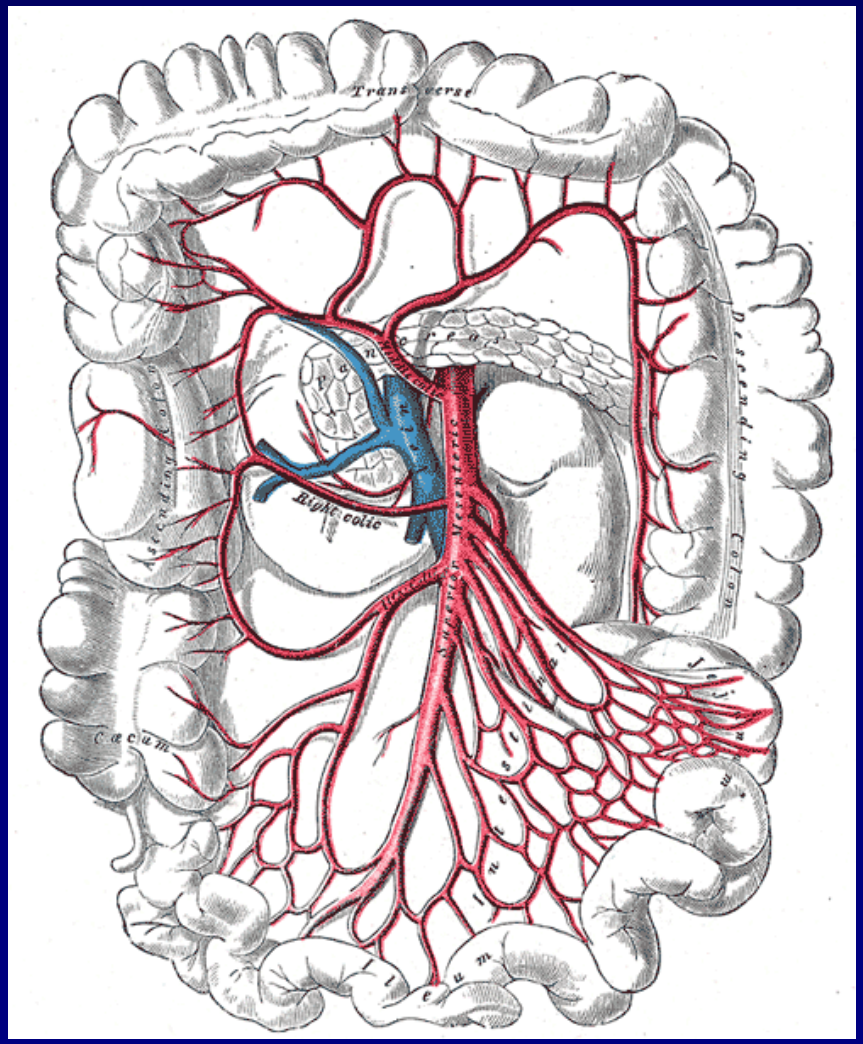
- Blood flow reduction of the mesenteric vessels causing intestinal ischemia

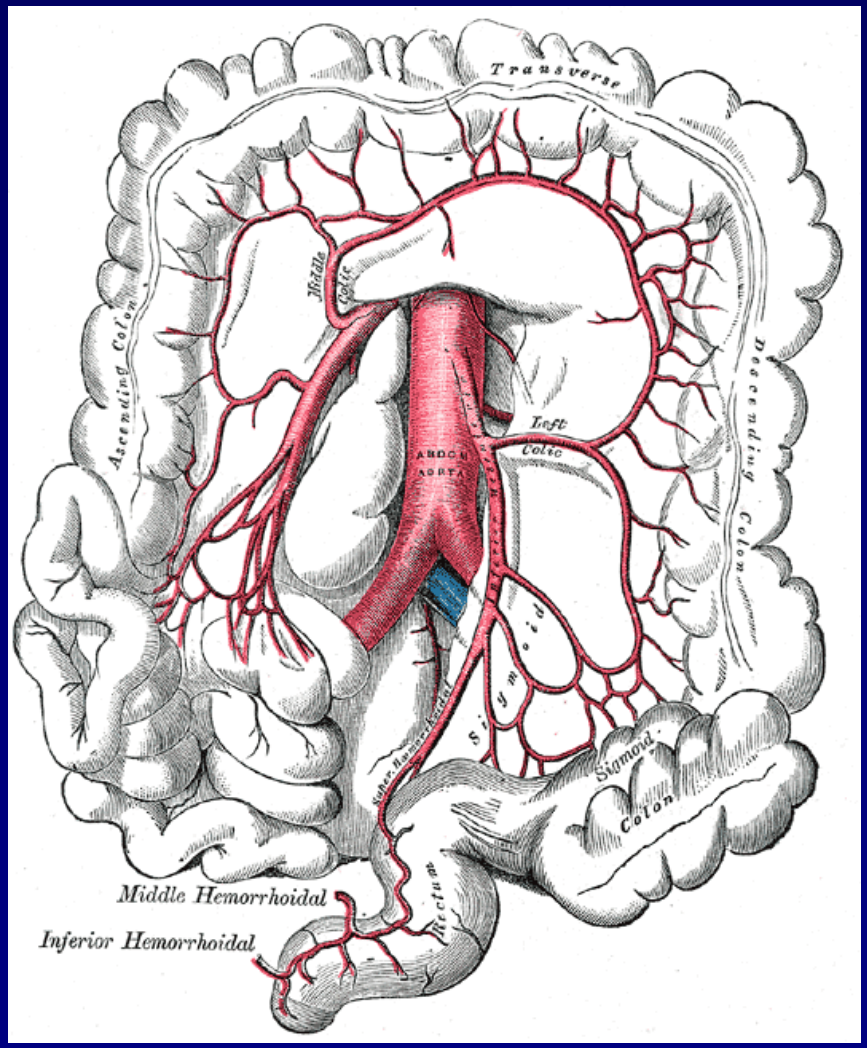
Acute Mesenteric Ischemia

- **Incidence: 1 – 2 per 1,000 admissions**
- **Mortalities: 60 - 80%**
- **Median age: 60 - 70 years old**
- **3 : 1 female predominance**

Wyers MCl. *Semin Vasc Surg* 2010; 23:9-20.

Anatomical Considerations





Etiology

- Arterial Embolism
- Arterial Thrombosis
- Venous Thrombosis
- Non – Occlusive Mesenteric Ischemia

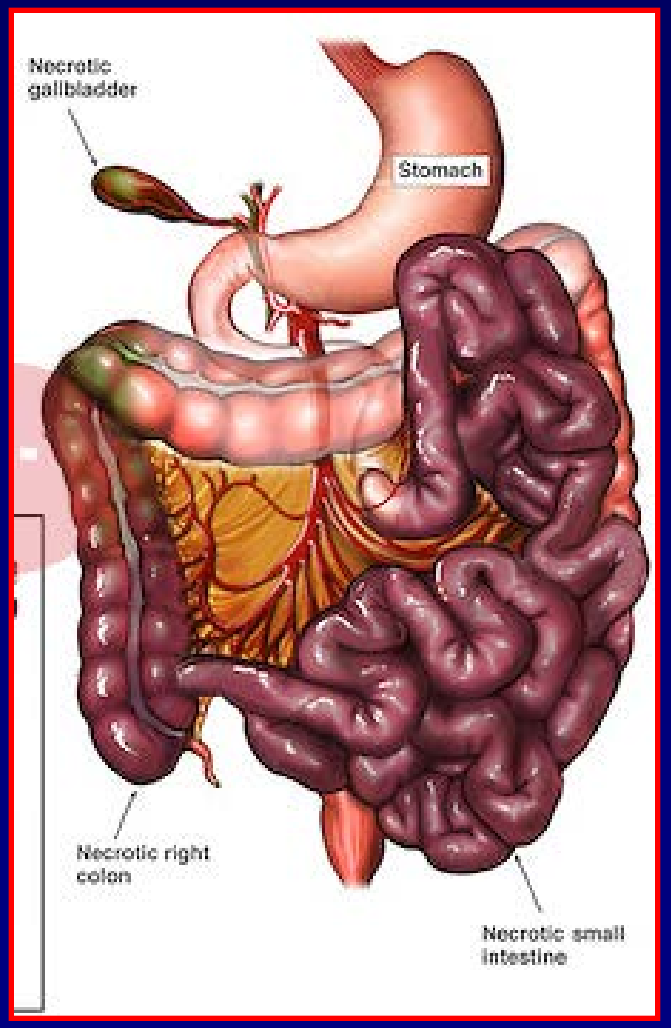
Mesenteric Arterial Embolism

- 40 – 50% of AMI
- SMA common site
- Majority lodge 3 – 10 cm distal to SMA origin
- Spares proximal jejunum and ascending colon

Risk Factors
Atrial tachyarrhythmia
Low ejection fraction
Recent myocardial ischemia
Ventricular aneurysms

Mesenteric Arterial Thrombosis

- 15 – 20% of AMI
- Atherosclerotic stenosis & thrombosis
- Collateralization ➔ insidious onset
- SMA origin occluded



Mesenteric Venous Thrombosis

- 5% of ischemia due to obstructed venous outflow
- 75% have inherited thrombotic disorder
- 78% 5-yr survival

Risk Factors
Hypercoagulable states & malignancy
Portal hypertension
Abdominal infections
Blunt abdominal trauma
Pancreatitis
Splenectomy

Orr DW et al. *Clin Gastroeneterol Hepatol*, 2007;5:80.

Non – Occlusive Mesenteric Ischemia (NOMI)

- 20 – 30% of AMI
- Due to splanchnic hypoperfusion & vasoconstriction
- Atherosclerotic patients
- 70% mortality

Risk Factors
Low ejection fraction states
Sepsis
Liver / renal disease
Vasopressive drugs
Cocaine

Presentation

- *"pain out of proportion to examination"*
- **Absent in 20 – 25%**
- **Embolism – rapid onset**
- **Peritonitis is late sign**

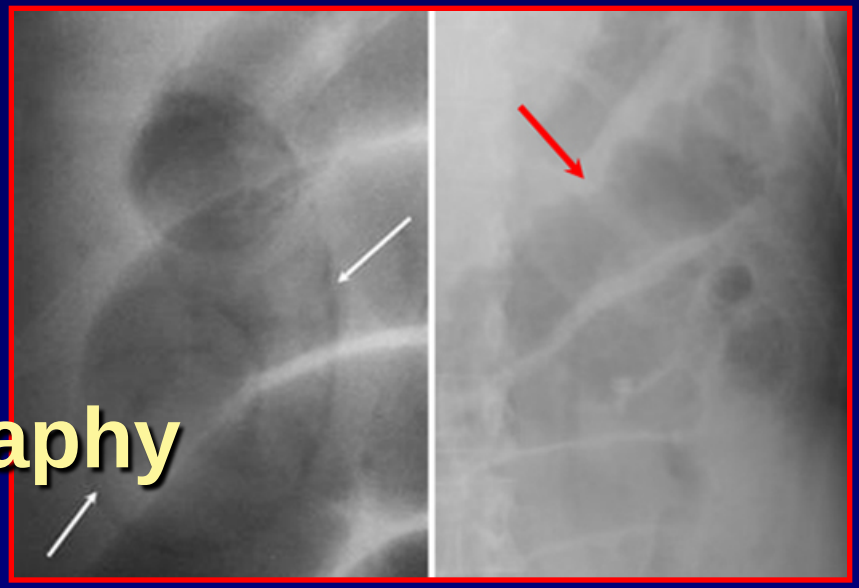
Differential
Pancreatitis
Cholecystitis
Appendicitis
Diverticulitis
Bowel obstruction

Laboratory Evaluation

- Non-specific, but bolsters suspicion
  - Marked leukocystosis
  - Lactic acidosis
  - Hemoconcentration

Traditional Imaging

- Abdominal X-Ray
  - 25% normal
- Mesenteric angiography
  - Gold standard study
  - Intra-arterial vasodilators, thrombolysis angioplasty and/or stenting

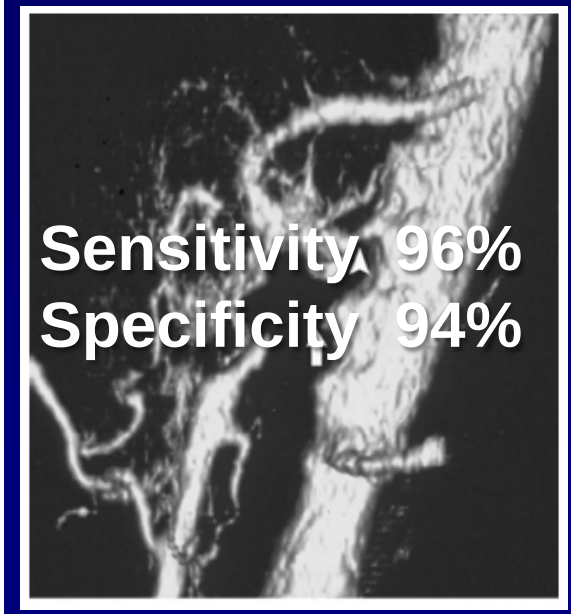


CT Angiography

TABLE 1
Analysis of CT Findings

CT Finding	Patients with AMI (n = 26)	Control Group (n = 36)	Sensitivity (%)	Specificity (%)
Pneumatosis intestinalis	11	0	42	100
SMA or combined celiac and IMA occlusion*	5	0	19	100
Arterial embolism	3	0	12	100
SMA or portal venous gas	3	0	12	100
Focal lack of bowel wall enhancement	11	1	42	97
Free intraperitoneal air	5	2	19	94
Superior mesenteric or portal venous thrombosis	4	2	15	94
Solid organ infarction	4	2	15	94
Bowel obstruction	3	2	12	94
Bowel dilatation	17	6	65	83
Mucosal enhancement	12	7	46	81
Bowel wall thickening	22	10	85	72
Mesenteric stranding	23	14	88	61
Ascites	19	24	73	33

* Patients with both celiac and IMA occlusion also had evidence of distal disease in the SMA distribution.



Kirkpatrick ID, et al. *Radiology* 2003; 229: 91-98.

Other Diagnostics

- MR Angiography
  - Evolving non-invasive modality
  - Avoids contrast allergy & toxicity
  - Limited to proximal celiac & SMA
- Diagnostic Laparoscopy
  - Fluorescein with UV light

Initial Management

- Fluid resuscitation
- Invasive monitoring
- Broad – spectrum antibiotics
- Heparin anti-coagulation therapy
- Dobutamine or dopamine, if needed

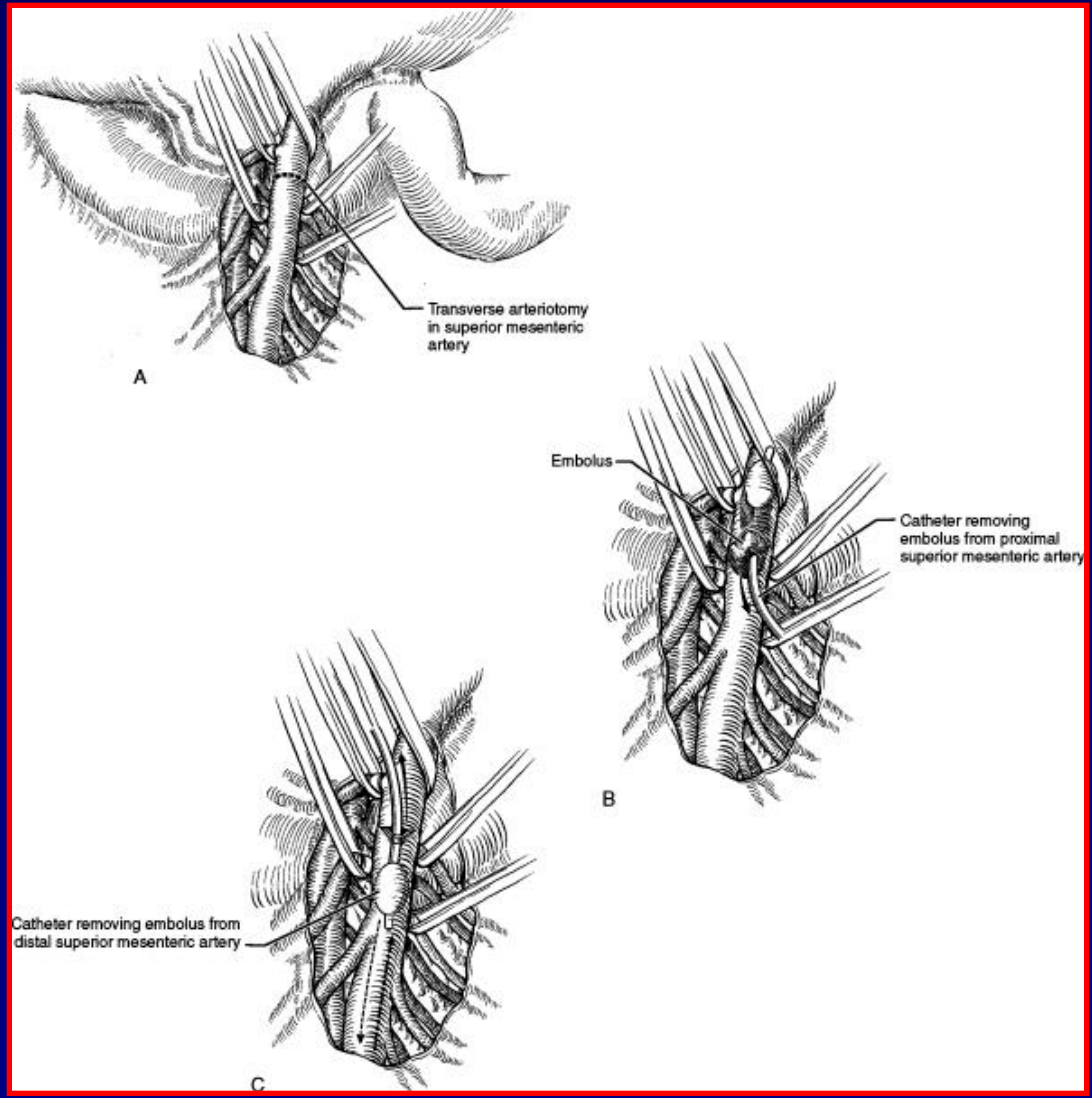
Surgical Management

- Surgical exploration required
- Bowel appearance deceiving
- Restore intestinal blood flow before bowel resection
- Revascularization held in only a few patients in extremis & bowel necrosis

Surgical Management

- SMA Embolectomy
- SMA Bypass
- Retrograde Open Mesenteric Stent (ROMS)

SMA Embolectomy

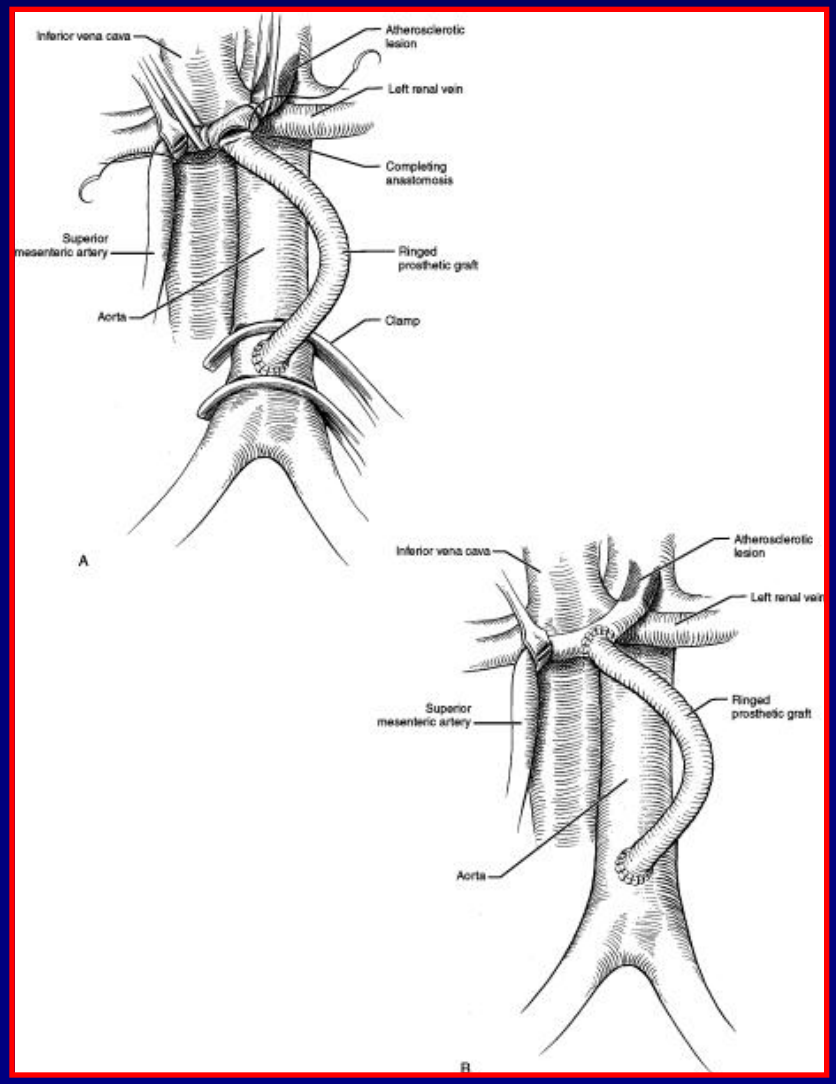


- Transverse or longitudinal arteriotomy
- Passage of embolectomy catheter
- Closure / patch

SMA Bypass

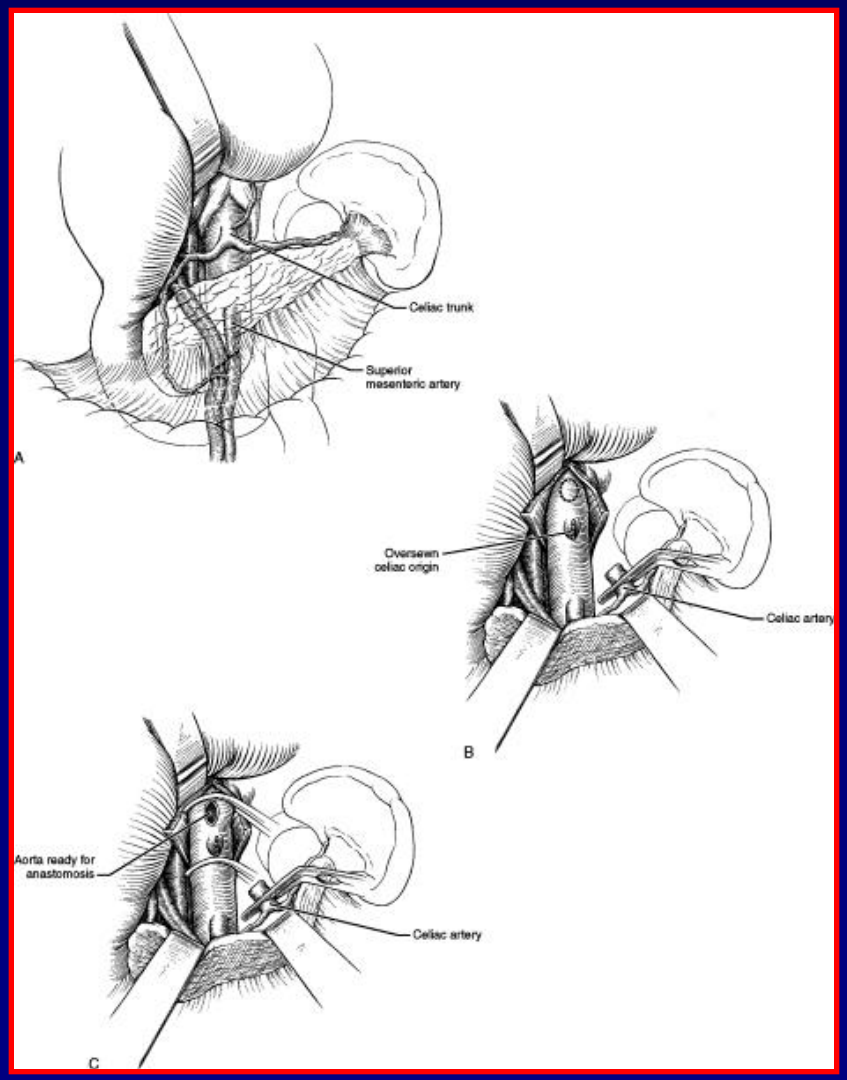
- Retrograde Aortosuperior Mesenteric Bypass
- Anterograde Aortomesenteric Bypass
- Ileomesenteric Bypass

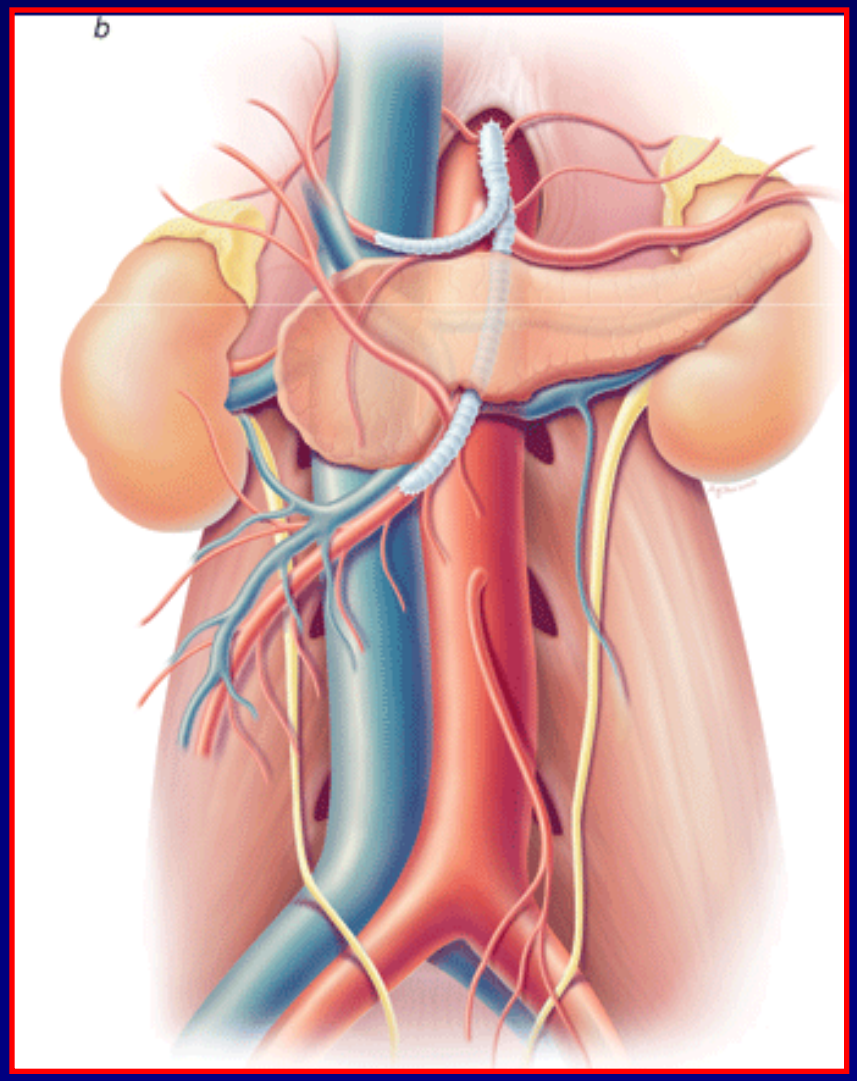
Retrograde Bypass



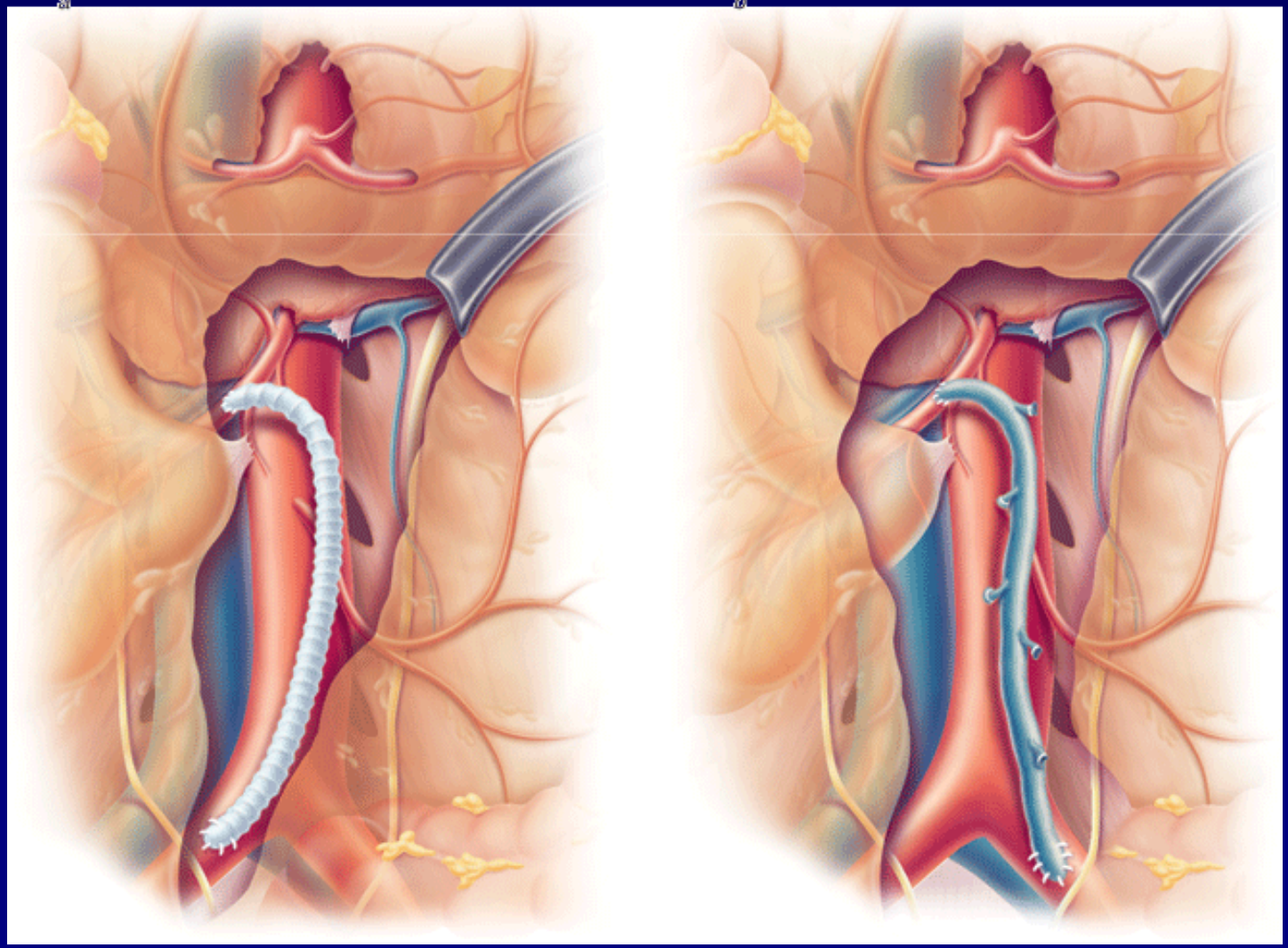
- Avoids aortic clamping
- Similar survival compared to anterograde bypass

Anterograde Bypass

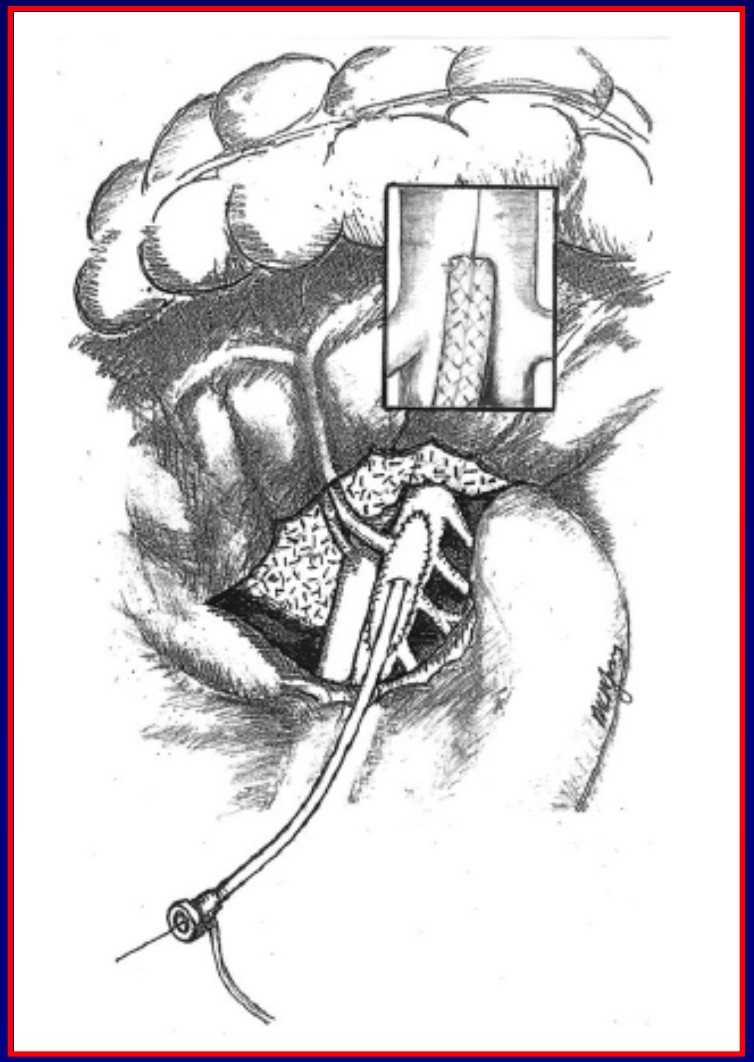




Ileomesenteric Bypass



Hybrid Procedure: ROMS



- Local SMA thrombo-endarterectomy
- Patch angioplasty for retrograde cannulation

Wyers MCl. *Semin Vasc Surg* 2010; 23:9-20.

A comparison of endovascular revascularization with traditional therapy for the treatment of acute mesenteric ischemia

Zachary M. Arthurs, MD, Jessica Titus, MD, Mohsen Bannazadeh, MD, Matthew J. Eagleton, MD, Sunita Srivastava, MD, Timur P. Sarac, MD, and Daniel G. Clair, MD, *Cleveland, Ohio*

- **Endovascular therapy preferred, 81%**
- **Successful endovascular tx in 87%**
- **69% endovascular tx required laparotomy**
- **Much less bowel resected with successful endovascular tx (52 cm vs. 160 cm, $p<0.05$)**
- **Improved mortality (36 vs 50%)**

Bowel Viability

- 20 - 30 minutes of reperfusion time
- Intraoperative assessment
- Absence of pulsatile signal on antimesenteric border implies non-viability
- Mandatory return to OR protects patient from ongoing bowel necrosis

Wright and Hobson. *Am J Surg*, 1975;129:642-645.

Summary

- Early diagnosis & treatment of AMI is essential to improve survival rate
- Second-look operation to resect marginally viable segments is integral aspect of post-op care
- Improving outcomes with evolving hybrid endovascular interventions

Annual incidence of acute mesenteric ischemia per hospital admissions is:

A. 1 in 50,000

B. 1 in 100,000

C. 1 in 150,000

D. 1 in 200,000

The dominant site of mesenteric embolic disease is:

A. Celiac artery

B. Superior mesenteric artery

C. Inferior mesenteric artery

D. Right middle colic artery

The following bypasses aid in revascularizing the SMA except:

A. Axillary-mesenteric bypass

B. Retrograde aortosuperior mesenteric bypass

C. Antegrade aortomesenteric bypass

D. Ileomesenteric bypass

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