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 jejenum
- Two small bowel resections
- GI continuity restored
Pathology Results

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

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

<table>
<thead>
<tr>
<th>Risk Factors</th>
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</thead>
<tbody>
<tr>
<td>Atrial tachyarrhythmia</td>
</tr>
<tr>
<td>Low ejection fraction</td>
</tr>
<tr>
<td>Recent myocardial ischemia</td>
</tr>
<tr>
<td>Ventricular aneurysms</td>
</tr>
</tbody>
</table>
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

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

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

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

- Local SMA thromboendarterectomy
- Patch angioplasty for retrograde cannulation

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

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

B. 1 in 100,000
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

A. Axillary-mesenteric bypass
References

- Hunter GC. Mesenteric Ischemia. Atlast of General Surgical Techniques, 1st Ed, Saunders 2010