Ischemic Colitis: An Update

Madhulika G. Varma, MD
Associate Professor
Chief, Colorectal Surgery
University of California, San Francisco

Ischemic Colitis

- Ischemic colitis (IC) represents greater than 50% of all intestinal ischemia
- First described in 1963
- IC most often affects the elderly
  - 90% of cases in patients over 60 years old

Boley et al Surg Gyn Obst 1963
Binns et al Gut 1978
Disclosures

• Honoraria
  – Applied Medical
  – Covidien

Pathophysiology

• Intestinal blood flow is inadequate to meet the metabolic demands of a region of the colon
• IC can be occlusive or non-occlusive
  – is almost always non-occlusive “low flow”
• Compromised blood flow may be secondary to changes in systemic circulation or local mesenteric vasculature
Pathophysiology

• Most cases involve watershed areas
  – Often at Left Colon
  – Aberrant anatomy will change which area it is

• The rectum is usually spared
  – Dual blood supply
    • Inferior mesenteric artery
    • Internal iliac branches

Blood Supply of the Colon

- Watershed
- Vasa Recta
- Marginal artery of Drummond
- Middle and inferior hemorrhoidal branches from internal iliacs
- Missing or incomplete in 3% of the population
- Inferior mesenteric Artery
## Risk Factors and Etiology

### Occlusive
- Micro-vascular disease
  - Diabetes
  - Rheumatoid arthritis
  - Vasculitis
  - Amyloidosis
  - Radiation injury
- Hypo-perfusion
  - CHF
  - Transient hypotension
  - Strenuous physical activities
  - Shock
    - Hypovolemia
    - Septic
    - Cardiac
- Aortic Surgery
  - 2-3%

### Non-Occlusive
- Major vascular occlusion
  - Mesenteric arterial thrombosis/embolus
  - Mesenteric venous occlusion
  - Clotting disorders
    - Protein C/S deficiency
    - Anti-thrombin III deficiency
    - Factor V Leiden
    - Sickle cell disease
    - Anti-phospholipid syndrome
- Mechanical Obstruction
  - Tumor
  - Adhesions
  - Volvulus
  - Hernia
  - Diverticulitis
  - Prolapse
- Trauma

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## Medications associated with IC

- Antibiotics
- Appetite suppressants
  - phentermine
- Chemotherapeutics
  - vinca alkyloids
- Decongestants
  - pseudoephedrine
- Cardiac glucosides
  - Digitalis
- Diuretics
- Ergot alkaloids
- Hormonal therapies
  - Estrogen
  - Danazol
- Statins
- Immunosuppressives
- Laxatives
- Nonsteroidal anti-inflammatory drugs
- Psychotrophic medications
- Serotonin agonist/antagonist
- vasopressors
- Illicit drugs
  - Cocaine
Distribution of Disease

- Left colon is involved in 75% of cases
- Splenic flexure 25%
- Isolated right colon ischemia
  - 10%-26%
  - More common in patients with shock
  - Patients tend to have:
    - Abdominal pain without bloody diarrhea
    - More severe colitis
    - 5 times more likely to need surgery
    - Associated with worse outcome
      - 2 fold increase in mortality
      - May be related to SMA occlusion and associated small bowel ischemia

Flobert et al Am J Gastro 2000

Classification of Ischemic Colitis

<table>
<thead>
<tr>
<th>Gangrenous 15-20%</th>
<th>Complete loss of arterial flow causes bowel wall infarction and gangrene, which can progress to perforation, peritonitis, and death.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Gangrenous 80-85%</td>
<td></td>
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<tr>
<td>Transient 50%</td>
<td>Transient, reversible impairment of the arterial supply, with accompanying reperfusion injury.</td>
</tr>
<tr>
<td></td>
<td>Leads to partial mucosal sloughing that heals by mucosal regeneration in a few days.</td>
</tr>
<tr>
<td>Strictureing 10%</td>
<td>Gross impairment of the arterial supply, leading to hemorrhagic infarction of the mucosa.</td>
</tr>
<tr>
<td>Chronic 20%</td>
<td>Heals by fibrosis, and can lead to stenosis</td>
</tr>
<tr>
<td></td>
<td>Can lead to chronic segmental colitis</td>
</tr>
</tbody>
</table>
Clinical Presentation

- No signs and symptoms are specific:
  - Acute onset crampy abdominal pain
  - Strong urge to defecate
  - Bright red or maroon diarrhea
  - Profuse bleeding (can suggest another dx)
  - Anorexia, nausea, or vomiting
  - Elevated white blood cell count
  - Dilation of the colon

- In fulminant cases, symptoms and signs can progress rapidly
  - Peritonitis
  - Metabolic acidosis
  - Signs of shock

Factors Associated with Worse Prognosis

- Increased age
- Absence of hematochezia
- Tachycardia
- Peritonitis
- Anemia
- Hyponatremia
- Colonic stenosis

Anon et al World J Gastro 2006
Diagnostic Strategy

• There are no specific laboratory markers of intestinal ischemia
  – Lactate, LDH, CPK, amylase, alkaline phosphatase, etc.

• Need high index of suspicion
  – Based on history and co-morbidities
  – Physical exam

• Rule out other etiologies of colitis/inflammation
  – Infectious colitis
  – Pseudomembranous colitis
  – Diverticulitis
  – Colon carcinoma

Differential Considerations

• Characteristics of colonic ischemia
  – Segmental distribution of the disease, infrequent rectal involvement
  – High rate of spontaneous recovery, low rate of recurrence
  – Lack of adequate response to usual inflammatory bowel disease therapy
  – Frequent progression to fibrotic stenosis with delayed obstruction

• Always consider the diagnosis of ischemic colitis whenever contemplating the diagnosis of inflammatory bowel disease in an elderly patient
Differential Diagnosis

<table>
<thead>
<tr>
<th></th>
<th>Clinical</th>
<th>Radiologic/Endoscopic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulcerative colitis</td>
<td>Bloody diarrhea</td>
<td>Extends proximally from rectum; fine mucosal ulceration</td>
</tr>
<tr>
<td>Crohn’s colitis</td>
<td>Perianal lesions common; frank bleeding less frequent than in ulcerative colitis</td>
<td>Segmental disease; rectal sparing; strictures, fissures, ulcers, fistulas; small bowel involvement</td>
</tr>
<tr>
<td>Infectious colitis</td>
<td>+ stool cultures or C-dif toxin</td>
<td>Diffuse colon wall thickening or toxic dilitation</td>
</tr>
<tr>
<td>Ischemic colitis</td>
<td>Older age groups; vascular disease; sudden onset, often painful</td>
<td>Splenic flexure; “thumb printing”; rectal involvement rare</td>
</tr>
</tbody>
</table>

Imaging

Abdominal plain films

- Thumbprinting
  - submucosal hemorrhage and edema
- Air filled bowel loops
  - Ileus
- Mural thickening
- Pneumatosis
- Portal venous air
- Free intra abdominal air
Imaging

Barium Enema

- Thumbprinting
- Ulcers
- Ridges
- Edema
- Strictures
- Eccentric mural deformity

Barium enema rarely used now
- Contraindicated if gangrenous ischemic colitis because of the risk of perforation
- Endoscopy may be more difficult after barium enema

Imaging

Computed Tomography (CT)

- Often the initial test
- Non- transmural IC
  - Mural thickening
  - Thumbprinting
  - Pericolonic fat stranding
  - Peritoneal fluid
  - Double halo or target sign
    - Submucosal edema/hemorrhage
    - Lack of bowel wall enhancement
    - Mesenteric vessel occlusion
- Transmural IC
  - Pneumatosis
  - Portal venous air
  - Free intra abdominal air
Target Sign

Pneumatosis and Portal Venous Air
Imaging

Angiography

• Not typically part of initial evaluation
• A treatable occlusive lesion is rarely found

• Consider angiography if:
  – Isolated right sided involvement
  – Suggestion of SMA thrombosis

Colonoscopy

• Frequently used to diagnose IC
  – Allows for visualization and biopsy
  – Except for overt gangrene, neither visual findings nor histology is specific
  – Do not bowel prep patients
  – Serial studies may be necessary
  – In IC there is often rapid resolution in 1-2 days
    • Differs from inflammatory bowel disease
Colonoscopy

- Colonoscopic findings are suggestive but are not diagnostic
  - Bulging folds from submucosal hemorrhage
  - Ulcerations
  - Friability
  - Mucosal necrosis
  - Segmental distribution
  - Rectal sparing

- Sigmoidoscopy has a negative predictive value of more than 94% and a diagnostic accuracy of 92%

Assadian et al. Vascular 2008

Marked Erythema and Exudate
Mucosal Edema, Exudates, and Ulcerations

Severe IC with Pneumatosis Intestinalis
Colonoscopy

- If chronic IC other findings may include:
  - Strictures
  - Mucosal atrophy
  - Granularity

Management

- Depends on clinical severity
- Most cases are transient and resolve spontaneously
- Supportive care adequate for mild disease
  - NPO
  - Broad spectrum antibiotics
  - TPN if prolonged NPO
  - Optimize cardiac function and oxygen delivery
  - Serial abdominal exams
Management

• For more severe cases:
  – Avoid vasopressors if possible
  – Check other medications and discontinue those associated with colonic ischemia
  – Avoid steroids
  – Aggressively treat low blood-flow states with volume
  – Most cases of non-occlusive ischemic colitis resolve in 2 to 4 weeks and do not recur

Indications for Surgery

• Acute Ischemia
  – Pneumoperitoneum
  – Significant gangrenous IC on endoscopy
  – Clinical deterioration despite conservative measures
    • Peritonitis
    • Sepsis without other source
    • Persistent fever or leukocytes
  – Persistent diarrhea, rectal bleeding or protein-losing colopathy for more than 14 days
Surgery

• Goal is to remove all affected bowel with normal bowel at the margins
  – Open the specimen to assess for ischemia or necrosis at the margin
• External appearance of the bowel may be normal at laparotomy, mucosa first area to be affected
• Extent of resection should be guided by the preoperative studies

Intraoperative Assessment

• Doppler
  – On the anti-mesenteric border
• Fluorescein
  – 500mg of IV intra-operatively to evaluate colon viability with a woods lamp
  – Look for uniform, patchy or absent illumination

Indications for Surgery

- Study of acute ischemia:
  - 33% had chronic renal failure
  - 57% were receiving vasoactive drugs
  - 56% had atherosclerosis
- 33% had an acute abdomen
  - 51% of those died
- 54% were treated non-operatively initially
  - 24% subsequently required surgery
- For those undergoing surgery there was a 41% perioperative mortality
- The overall mortality rate was 29%

Scharf et al Surgery 2003

Indications for Surgery

- Chronic Ischemia
  - Chronic segmental colitis with recurrent sepsis
  - Symptomatic colonic strictures
  - Suspicion of neoplasia
IC after Heart Surgery

3,724 pts with cardiac surgery
• 11 patients developed IC
• Patients with GI complications had a lower ejection fraction
  – 45.1 vs. 49.7%, p < 0.01
• Urgent cardiac operation
  – 3.49 times more likely to develop GI complications
• Mortality for pts with IC is 18%

<table>
<thead>
<tr>
<th>GI complication</th>
<th>Number of patients treated/number of deaths (mortality rate, %)</th>
<th>Overall disease mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>medical group</td>
<td>laparotomy group</td>
</tr>
<tr>
<td>Ectopic def. (n = 11)</td>
<td>3/1 (33)</td>
<td>8/1 (12.5)</td>
</tr>
</tbody>
</table>

Risk Factors for Postoperative Mortality

• 85 pts undergoing surgery for IC
• 50% had subtotal or total colectomy
• 80% had stoma formation

Neither type of colectomy nor stoma formation was significant in this prospective data base study

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<tr>
<th>Risk factor</th>
<th>Multivariate relative risk (95% CI)</th>
<th>P value</th>
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<tr>
<td>Ejection fraction*</td>
<td>1.35 (0.95-1.05)</td>
<td>0.10</td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Urgent</td>
<td>3.38 (1.38-7.26)</td>
<td>0.002</td>
</tr>
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</table>

*Decreased ejection fraction by 10%.

ASA(II,III) vs. (IV,V)

OR  95% CI     P value
0.13  0.02-.5  0.006

Nonemergent surgery

OR  95% CI     P value
0.2  0.06-.87  0.04

EBL >1000cc vs. <300cc

OR  95% CI     P value
7.2  1.9-36.8  0.01

Vassiliou et al Cardiology 2008
Antolovic et al Langenbeck Arch Surg 2008
Conclusion

• IC has diverse etiologies and presentation
• Consider chronic IC in elderly patients with colitis
• Right sided IC is associated with worse outcome
• Surgical resection is needed in a minority of cases but is associated with high mortality
• Operative planning based on both preoperative studies and intra-operative findings
• Normal serosa can been seen at operation for IC