Small bowel obstruction and mesenteric ischemia in a 91 year-old woman

Shantanu Gaur, HMS III
Gillian Lieberman, M.D.
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Our patient: history and physical exam

2 hours of 10/10 dull, diffuse abdominal pain, worse in her left lower quadrant (LLQ), with severe nausea. Moved bowels immediately after dinner; “spitting up” and has not moved flatus since then. Denies fevers, chills, vomiting, diarrhea.

Diverticulosis (last colonoscopy 04/2005), sigmoid resection for diverticulitis, hysterectomy (unknown dates)

T = 97.9; P = 68; BP = 112/58; RR = 20; O2sat = 99
In distress, writhing in bed. Lower midline and para-median scars noted. Abdomen is diffusely distended, tender to palpation in the LLQ, and tympanic to percussion.

WBC = 14.2; lactate = 2.1
Our patient: differential diagnosis for LLQ abdominal pain

<table>
<thead>
<tr>
<th>Category</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular</td>
<td><strong>Mesenteric ischemia</strong>, abdominal aortic aneurysm, <strong>ischemic colitis</strong>, rectus sheath hematoma</td>
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<tr>
<td>Infectious</td>
<td>Abscess (s/p surgery), Recurrent diverticulitis, mesenteric adenitis, pyelonephritis, pancreatitis, appendicitis, cholecystitis</td>
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<td>Neoplastic</td>
<td>Intra- or extra-luminal tumor</td>
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<td>Drugs/toxins</td>
<td>C. diff colitis</td>
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<tr>
<td>Iatrogenic</td>
<td><strong>Adhesions s/p abdominal surgery</strong></td>
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<tr>
<td>Congenital</td>
<td>Unlikely</td>
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<tr>
<td>Anatomic</td>
<td><strong>Small bowel obstruction</strong>, strangulated hernia, renal colic, bladder rupture</td>
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<tr>
<td>Trauma</td>
<td>Traumatic fall with subsequent hematoma/hemorrhage</td>
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<tr>
<td>Endocrine</td>
<td>Adrenal crisis, hypocalcemia</td>
</tr>
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Paucity of gas in the LLQ. Otherwise, normal gas pattern with no evidence of dilated loops or pneumoperitoneum. Incidental left lower lobe atelectasis.
Our patient: dilated small bowel loops and air-fluid levels on CTA abdomen/pelvis

Dilated loops of fluid-filled small bowel with multiple air fluid levels.
Our patient: transition point on CTA abdomen/pelvis

A transition point clearly demarcates dilated and collapsed small bowel.
Our patient: fat stranding and mesenteric congestion on CTA abdomen/pelvis.

Fat stranding and prominent vessels suggest inflammation and mesenteric congestion.

Our patient: axial CTA abdomen/pelvis.
Our patient: dilated loops of small bowel on coronal reconstruction of CTA abdomen/pelvis

Dilated loops of small bowel seen in coronal reconstruction correlate to paucity of gas seen in supine abdominal radiograph.
Our patient: patent SMA on coronal reconstruction of superior mesenteric artery (SMA)

The superior mesenteric artery appears widely patent without thrombus. A nasogastric tube had been placed in the emergency room.

Our patient: CTA coronal reconstruction of SMA.
Small bowel obstruction: relevant anatomy


Drake et al. Gray’s Anatomy for Students. 2005. Fig. 4.96.
Small bowel obstruction: epidemiology

- 20% Percentage of adult general surgery admissions for abdominal pain with a final diagnosis of mechanical SBO.
- 70% Percentage of cases of small bowel obstruction caused by adhesions.
- 93% Percentage of patients who undergo transperitoneal surgery who will develop post-operative adhesions.
- $1.3Bn Financial impact of direct patient care owing to adhesion-related disorders annually in the US.

Bevan, 1984; Menzies and Ellis, 1990; Attard and MacLean 2005.
Small bowel obstruction: etiology

**Extrinsic**

Adhesions, adjacent mass, hernia, volvulus, intussusception

**Intramural**

*Benign*: adenoma, leiomyoma, lipoma, Crohn’s disease

*Malignant*: primary adenocarcinoma, lymphoma, metastasis

**Intraluminal**

Foreign body
Gallstone
Bezoar
Wormball
Fecal impaction

Small bowel obstruction: regional differences

High
Frequent vomiting.
No distention. Intermittent
pain but not classic
crescendo type.

Middle
Moderate vomiting.
Moderate distention. Intermittent
pain (crescendo, colicky)
with free intervals.

Low
Vomiting late, feculent.
Marked distention. Variable
pain; may not be classic
crescendo type.

Source: Gerard M. Doherty; CURRENT Diagnosis & Treatment: Surgery, 13th Edition;
http://www.accessmedicine.com
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Small bowel obstruction: classification

- **Partial**: No identifiable transition point that demonstrates distal, collapsed bowel. Patient continues to pass flatus and stool.
- **Complete**: Transition point clearly separates proximal, dilated bowel from distal, collapsed bowel.
- **Simple**: Blood supply to obstructed bowel remains intact.
- **Strangulated**: Blood supply compromised, with signs of bowel ischemia.
Small bowel obstruction: treatment algorithm

Adhesive small bowel obstruction

Signs and symptoms of strangulation and intestinal ischemia? Yes → Operating room for exploration

No

Partial bowel obstruction

Signs and symptoms of intestinal ischemia? Yes → Operating room for exploration

No

Continue conservative management
Duration dependent on etiology and surgeon choice

Complete bowel obstruction

Signs and symptoms of intestinal ischemia? Yes → Improving after 24 hours of conservative management?

No → Operating room for exploration

Yes → Continue management close monitoring

NPO
IVF
NG tube if needed
Serial abdominal exam

NPO
IVF
NG tube
Frequent, serial abdominal exam

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Small bowel obstruction: imaging algorithm

Patient with acute abdominal pain, distention, nausea, vomiting and constipation

PLAIN ABDOMINAL RADIOGRAPHY

Complete or high grade partial SBO
- Surgical management
- Sonography*
  - MDCT: start at the end!
  1. Confirm the diagnosis
  2. Characterize the severity of the obstruction
  3. Identify the transition point
  4. Identify the cause of the obstruction
  5. Look for complications
- Useful primarily when CT is unavailable

Normal, equivocal, low-grade partial SBO
- Cross sectional imaging
- Small-bowel follow-through or Enteroclysis/CT enteroclysis
- Management
  - Conservative
  - Surgical

Silva et al. 2009
Small bowel obstruction: plain abdominal radiography

Reliability

- Diagnostic: 50-60%
- Equivocal: 20-30%
- Nonspecific: 10-20%

Findings of high-grade SBO

- Dilated loops of bowel >3cm in diameter or exceeding 50% of the caliber of the largest visible loop of colon
- > 3 air-fluid levels
- Air-fluid levels wider than 3cm
- Bowel wall thickening >3mm

Without the clinical signs of ischemia (fever, tachycardia, leukocytosis, focal abdominal pain), however, surgical intervention is usually not indicated.

Silva et al. 2009
Companion patient 1: upright abdominal radiograph

Common findings of SBO on abdominal radiograph include multiple air-fluid levels (arrows), thickened bowel walls (not seen), and dilated loops of small bowel (asterisk).
Small bowel obstruction: abdominal CT

Reliability

- Sensitivity: 90-96%
- Specificity: 96%
- PPV: 95%

Questions answered by CT

- Is the small bowel obstructed?
- What is the severity of the obstruction?
- Where is the transition point?
- Is the SBO strangulated?

Data applies mostly to high-grade SBO. Low-grade SBO may be more of a “blind spot” for CT.
Is the small bowel obstructed?

CT criteria for an SBO is **dilated small bowel** (> 3cm) proximal to normal caliber or collapsed distal loops (arrows).
What is the severity of the obstruction?

A complete obstruction is one that does not permit contrast from passing into distal small bowel (arrowhead). This patient had an intussusception (star). Note the air fluid levels in the proximal bowel (arrows).
Companion patient 4: small bowel feces sign on CT abdomen/pelvis

What is the severity of the obstruction?

A small bowel feces sign (asterisk) is often indicative of long-standing, high-grade obstruction but has low overall prevalence. This patient had an SBO secondary to a post-operative adhesion (arrow).
Companion patient 5: transition point on CT abdomen/pelvis

The **transition point** (arrow) marks a caliber change (>50% in high-grade obstruction) from **dilated** (s) to **collapsed** (c) small bowel.
Companion patient 6: strangulated SBO on CT abdomen/pelvis

Obstruction accompanied by intestinal ischemia is known as **strangulation**. Findings of ischemia include gas in the intrahepatic portal veins (left, black arrow) and pneumatosis coli (right, white arrows).

Companion patient: axial CT abdomen/pelvis.
Our patient: follow-up

• Open laparotomy with LOA.
• Few adhesions found on initial inspection of the abdominal wall.
• Adhesion noted in LLQ emerging from adjacent loop of small bowel that had strangulated the adjacent mesentery.
• Bowel appeared ischemic and hemorrhagic.
• 40cm small bowel resected with primary anastomosis.
• 6 day uneventful post-operative hospital course; discharged home
Our patient: hemorrhage on histopathology
Our patient: mesenteric congestion on histopathology

Courtesy of Brijal Dave, M.D.
Even without signs of ischemia or necrosis on CT, a high-grade small bowel obstruction coupled with *clinical* signs of ischemia should be aggressively treated.

Small bowel obstructions can evolve over the course of hours. Initial abdominal plain films may not demonstrate an underlying obstruction.

Mesenteric ischemia and small bowel obstruction can present simultaneously, as in this case, if the obstruction also compresses the mesentery.
Acknowledgements

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References


