Challenging Acute Abdominal CT Cases
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Case 1 - History
- 42-year-old woman with bilateral lower quadrant abdominal pain.
- CT of the abdomen and pelvis was performed.

Disclosure
- I have no relevant disclosures for this presentation…
- … other than to disclose that imaging of the acute abdomen and pelvis continues to challenge me, 25 years into my career

Case 1, question 1
- The best diagnosis in this patient is:
  A. Cecal volvulus
  B. Sigmoid volvulus
  C. Ileocolic intussusception
  D. Malrotation with midgut volvulus
Case 1, question 2
- In approximately what percentage of cases of this entity is the affected bowel in the right lower quadrant, as opposed to elsewhere?
  - A. 25%
  - B. 40%
  - C. 50%
  - D. 75%

Case 1, question 3
- The most appropriate next step in management of this patient is:
  - A. Obtain delayed CT images
  - B. Perform an imaging-guided air enema
  - C. Optical colonoscopic therapy
  - D. Surgical treatment

Diagnosis: Cecal volvulus (confirmed at surgery)
- Sigmoid volvulus is more common than cecal volvulus
- Patients tend to be younger; may or may not have known pre-existent motility disorder
- Plain films may show the classic “coffee-bean appearance” - dilated, inverted U-shaped formation – but plain films are equivocal in 1/3 or more cases; the distal colon is usually decompressed
- Surprisingly few CT reports – some of the largest series include only 10 and 11 cases (Dabrousse E et al. Emerg Radiol 2007; Rosenblatt JM et al. Radiology 2010)

Cecal volvulus
- Need to recognize CT findings – may be first test performed or may follow equivocal plain films (Moure CJ et al. AJR 2001; Rosenblatt JM et al., Dabrousse E et al.): obstruction, torsion of colon around mesocolon with “whirl sign”
- Tapered narrowing of efferent & afferent loops; “coffee-bean” appearance may be seen
- Additional more recent signs: x-marks-the-spot sign, the split wall sign

Cecal volvulus
- The cecum is usually markedly dilated, although it may not be obvious that the dilated portion of bowel is the cecum
- Multi-planar CT reformations are helpful
- Bascule – distended cecum is folded on itself – controversial entity
- Treatment is surgery (unlike in selected cases of sigmoid volvulus, where initial reduction can be attempted at colonoscopy) (Vogel JD et al. Dis Colon Rectum 2016; Perot L et al. J Visc Surg 2016)
Case 2 - History

- 56-year-old man with diffuse left-sided abdominal pain.
- CT of the abdomen and pelvis was performed.

Case 2, question 1

- The **best** CT diagnosis in this patient is:
  
  A. Epiploic appendagitis
  
  B. Small bowel diverticulitis
  
  C. Appendicitis and malrotation
  
  D. Meckel's diverticulitis

Case 2, question 2

- The next step for management of this patient should be:
  
  A. Conservative management
  
  B. Capsular endoscopy
  
  C. Imaging with a nuclear medicine examination
  
  D. Surgical treatment

Case 2, question 3

- A hernia containing an incarcerated Meckel's diverticulum is termed a hernia of:
  
  A. Amyand
  
  B. DeGarengeot
  
  C. Littre
  
  D. Nuck
Diagnosis: Meckel's diverticulitis (confirmed at surgery)
- Meckel's diverticulum – from incomplete closure of the omphalomesenteric duct, contains all 3 intestinal layers, and is found along antimesenteric side of the ileum
- Diverticulitis: from obstruction, peptic ulceration of ectopic gastric mucosa, or torsion
- May simulate appendicitis clinically and on CT – but separate from appendix and not contiguous with cecal base

Meckel's diverticulitis
- A calcified lith is unusual (10% of 84 cases of Meckel's diverticuli in AFIP series (Pantongrag-Brown et al. AJR 1996))
- CT findings in 11 patients (Bennett GL et al. AJR 2004): blind-ending pouch of variable size (short axis 1.5 to 6 cm, long axis 2 to 7 cm) and mural thickness:
  - contained air, fluid, or particulate material, but not oral contrast; mural enhancement with IV contrast; inflammation of adjacent fat

Meckel's diverticulitis
- NYU series, continued:
  - usually located near the midline, but may be in the RLQ, and variable location relative to the terminal ileum (superior or inferior)
  - normal appendix found in 7, SBO in 5 patients

Case 3 - History
- 21-year-old woman with increasing left upper quadrant pain and nausea presented to the emergency department several hours following a motor vehicle collision.
- Initial and follow-up CT examinations were performed, as well as follow-up MR.
- The initial CT is shown.
Case 1, question 1
- The main injury demonstrated on CT is to the:
  A. Duodenal-jejunal junction
  B. Posterior stomach
  C. Pancreas
  D. Spleen

Case 3, question 2
- Based on the CT images, this patient should be managed:
  A. Conservatively
  B. Endoscopically
  C. Surgically
  D. Cannot be determined based on the CT findings alone

Case 3, question 3
- In the setting of trauma, what does the presence of fluid on CT, between the posterior aspect of the pancreas and the anterior aspect of the splenic vein, indicate?
  A. A very high likelihood of a pancreatic injury requiring surgery
  B. A high likelihood of pancreatic injury
  C. A transected main pancreatic duct
  D. It is a non-specific finding

Pancreatic fracture
- The patient underwent multiple imaging examinations, but was successfully managed non-operatively.

Pancreatic trauma
- Typically due to blunt trauma: MVC, bicycle injury (typically fall onto handlebars), and child abuse
- Usually in association with other injuries
- Acute pancreatitis and pseudocysts are the most common complications
- Initial evaluation is with CT; supplement with MR/MRCP (with secretin), and with ERCP (and EUS) as needed
Pancreatic trauma

- If > 50% of the pancreatic thickness is traversed, there is usually associated main pancreatic ductal injury (Reich S et al. Emerg Radiol 2016)

Pancreatic trauma

- Some controversy regarding best management (Girard E et al. J Visc Surg 2016)
- Recent guidelines suggest pancreatic resection for AAST injury grades III and IV, conservative for grades I and II, no consensus on grade V (Ho VP et al. J Trauma Acute Care Surg 2016)
- Others recommend conservative management if at all possible, especially in children (Mora et al. J Am Coll Surg 2016)
- An isolated injury to the pancreas alone, even if substantial, had a much more benign course than if combined with other significant injuries (Siboni S et al. J Trauma Acute Care Surg 2016)

Case 4 - History

- 65-year-old man with acute right abdominal pain.
- CT of the abdomen and pelvis was performed.

Case 4, question 1

- Based on the CT findings, the most likely diagnosis is:
  - A. Cecal diverticulitis
  - B. Ileal diverticulitis
  - C. Appendiceal diverticulitis
  - D. Crohn disease with fistulas
Case 4, question 2

- The most appropriate management for this patient is:
  - A. Conservative management
  - B. Capsular endoscopy
  - C. Interventional radiology consultation
  - D. Emergent surgery

Case 4, question 3

- Place these entities in order of frequency, from most common to least common: duodenal, jejunal, and ileal diverticulitis:
  - A. duodenal, jejunal, ileal
  - B. jejunal, duodenal, ileal
  - C. duodenal, ileal, jejunal
  - D. ileal, duodenal, jejunal

Small bowel diverticulitis

- Excluding Meckel's diverticula, these are acquired pseudodiverticula, probably secondary to intestinal dyskinesia, usually in older patients (Hines J et al. Emerg Radiol 2013)
- SB diverticulitis is almost never clinically suspected
- The diagnosis is established based on the CT findings

Small bowel diverticulitis

- Duodenal – solitary collection of fluid/gas/food/oral contrast
- **-** when inflamed, need to distinguish from a duodenal ulcer/perforation (not always possible, when proximal)
- Jejunal – solitary or multiple
- **-** usually a relatively large, inflamed diverticulum

Small bowel diverticulitis

- □ 67-year-old woman with free air due to perforated jejunal diverticulitis

Small bowel diverticulitis
Small bowel diverticulitis

- Ileum – multiple, small - present with acute or recurrent RLQ pain
- Almost always have concurrent colonic diverticulosis if there is ileal diverticulosis or diverticulitis
- CT findings: diverticula/diverticulosis, wall thickening, increased enhancement, & inflammatory changes
- Complications: abscess, free air, & enterolith/SBO (Garnet Dj et al. Br J Radiol 2011)
- Difficult to know how to manage given the limited literature, but similar to colonic diverticulitis, can initially manage conservatively if no major complications (Horesh N et al. J Laparoendosc Adv Surg Tech A 2016)

Case 5 - History

- 71-year-old woman with left greater than right lower abdominal pain. Additional history is withheld.
- Contrast-enhanced CT of the abdomen and pelvis was performed.
Case 5, question 1
- Which ONE of the following statements regarding this patient’s CT findings, combined with the provided history, is correct?
  A. The findings are not diagnostic of a specific entity
  B. The patient definitively needs emergency surgery
  C. Ischemia is the most likely diagnosis
  D. There is a primary small bowel obstruction

Case 5, question 2
- On questioning the emergency department physician, it was revealed that the patient was on both an anticoagulant and an angiotensin-converting enzyme (ACE) inhibitor. Also, the extensive regional edema was out of proportion to the patient’s pain, and the serum lactate level was normal. What should be done next?
  A. Conservative management
  B. Endoscopic management
  C. Interventional radiology management
  D. Surgical management

Further considerations
- Two main diagnostic considerations are intramural hematoma of the small bowel related to the anticoagulation, versus small bowel angioedema related to the ACE inhibitor.
- If this information was known prior to CT, an initial non-contrast CT would have been very helpful to discriminate between these two.
- If possible both medications should be stopped, and bowel rest initiated, in an attempt to avoid surgery for the resultant bowel obstruction.

Further considerations
- The patient’s hemoglobin and hematocrit had decreased, establishing the diagnosis of intramural small bowel hematoma.
- The patient was successfully managed conservatively.

Intramural SB hematoma
- Intramural (usually submucosal) small bowel hemorrhage (ISBH): relatively rare, but likely under-diagnosed
- Related to anticoagulation or underlying bleeding disorder in adults; also secondary to primary ischemia or due to closed loop obstruction, as well as aortoenteric fistula, vasculitis, & other iatrogenic causes
- Correct diagnosis is often unsuspected & delayed
- Vague, subacute symptoms are common – may be asymptomatic with decrease in hematocrit only; GI bleeding in 50% or fewer

Intramural SB hematoma
  - Hyperdense SB wall thickening, homogeneous and symmetric
  - Usually duodenum/proximal jejunum, usually single site
  - Average length variable
Intramural SB hematoma

- Hemorrhage in the bowel wall may not be appreciated if only IV-contrast enhanced images are obtained
- Hemorrhage complicating ischemia/complicated SBO is likely under-diagnosed
- Focal ISBH complicating SBO indicated complicating ischemia in one series (in 19/45 patients) – 100% specific, 56% sensitive
- Most accurate MDCT sign for ischemia: decreased small bowel wall enhancement – sensitivity in this series: 78%, specificity: 98% (Geffroy Y et al Radiology 2014)

Case 6 - History

- 47-year-old woman with a recent episode of pancreatitis, on pain medications, now with new pelvic pain and increase in her serum white blood cell count.
- CT of the abdomen and pelvis was performed.
Case 6, question 1

- The most likely diagnosis in this patient, which explains the new signs/symptoms and the CT findings, is:
  - A. Necrotizing pancreatitis
  - B. Perforated gastroduodenal ulcer
  - C. Complicated stercoral ulcer
  - D. Complicated colonic diverticulitis

Case 6, question 2

- The next best step for patient management is:
  - A. Conservative management
  - B. Endoscopic management
  - C. Interventional management
  - D. Surgical management

Rectal perforation related to constipation & a stercoral ulcer

- Stercoral ulcer is secondary to inspissated/impacted stool causing pressure necrosis on the colonic wall
- Usually in elderly patients with chronic constipation
- In this patient, the findings were likely related to pain medications/opioids given for the necrotizing pancreatitis
Stercoral ulcer

- Rectum & distal sigmoid are affected, usually along the antimesenteric margin (Baltazar G et al. Am Surg 2012)
- Frequency is unknown, but has been identified in a small percentage of autopsies of individuals from chronic care facilities

Stercoral ulcer

- Harder stool, relatively poor blood supply, and higher intraluminal pressure help explain its location
- Complications include bleeding and perforation
- Very few reports of the CT findings in complicated stercoral ulcer
- Series of 13 patients (Salsonov M et al. JCAT 2014): CT findings included constipation & pericolonic fat stranding in all, as well as mucosal sloughing, mesenteric hyperemia, & extraluminal gas
  - 5 patients had septic shock, & 6 died

Stercoral ulcer

- Optical colonoscopy: irregular, geographic ulcer conforms to the contour of impacted stool
- Treat hemorrhage colonoscopically, and perforation with surgery

Case 7 – History

- 54-year-old man with severe abdominal pain which started in the early AM on the day of the subsequent CT examination.
- He had a history of HIV, but had an undetectable viral load.
- He admitted to heavy cocaine use on the day prior to the CT examination. He also had both upper and lower gastrointestinal hemorrhage. He denied any other potential relevant history, i.e. trauma.
- A CT examination of the abdomen and pelvis was performed, with IV contrast only.
Case 7, question 1
- What is the most likely etiology for the CT findings?
  - A. Perforated distal colonic diverticulitis
  - B. Complicated inflammatory bowel disease
  - C. Cocaine-related vasculitis
  - D. Traumatic perforation

Case 7, question 2
- Hint: “when the history and the imaging are discrepant, get a new historian.”
- What do you think the correct diagnosis is now?
  - A. Perforated distal colonic diverticulitis
  - B. Complicated inflammatory bowel disease
  - C. Cocaine-related vasculitis
  - D. Traumatic perforation

Distal sigmoid/proximal rectal perforation from a foreign body
- A 7 cm tear in this region was identified at emergency surgery.
- The patient had initially denied any trauma.
- On further questioning, the patient confessed to inserting an object into his rectum.

Thank you for your attention!