The EM Educator Series: Abdominal Pain that won’t go away...Gastric/Bowel Perforation
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Case 1: A 35-year-old male with no past medical history presents with mid epigastric pain for 2 weeks. He has no relief after three rounds of opioid medication, with significant tenderness to palpation. Upright chest x-ray reveals free air in the abdomen.

Case 2: A 44-year-old female with no past medical history presents with severe abdominal pain and involuntary guarding on exam.

Questions for Learners:
1. What’s your approach to abdominal pain, and what is your differential?
2. Who is at risk for gastric or bowel perforation, and how can it present?
3. Do analgesics mask exam findings?
4. What is the utility, and limitations of, obtaining an upright chest x-ray or acute abdominal series?
5. What antibiotics should you consider in the patient with perforation?
6. If imaging is delayed or not obtainable, when should you call the surgeon? If perforation is suspected, should you wait for imaging to discuss the case with the surgeon?

Suggested Resources:
- Articles
  - EM Basic
  - Radiopaedia
  - WikEM
- Journal Articles
  - EM Clinics of NA – EBM Approach to Abdominal Pain
  - EM Clinics of NA – Approach to Epigastric Pain
Answers for Learners:

1. What’s your approach to abdominal pain, and what is your differential?

The most common approach to the diagnosis of abdominal pain focuses on the location of the pain, with a separate grouping for causes of diffuse abdominal pain.

### Table 1: Differential Diagnosis of abdominal pain by location

<table>
<thead>
<tr>
<th>Right Upper Quadrant</th>
<th>Left Upper Quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biliary colic</td>
<td>Gastric ulcer</td>
</tr>
<tr>
<td>Cholangitis</td>
<td>Gastritis</td>
</tr>
<tr>
<td>Cholecystitis</td>
<td>Herpes Zoster</td>
</tr>
<tr>
<td>Fitz-Hugh-Curtis Syndrome</td>
<td>Myocardial ischemia</td>
</tr>
<tr>
<td>Hepatitis</td>
<td>Pancreatitis</td>
</tr>
<tr>
<td>Hepatic abscess</td>
<td>Pneumonia (LLL)</td>
</tr>
<tr>
<td>Hepatic congestion</td>
<td>Pulmonary embolism</td>
</tr>
<tr>
<td>Herpes zoster</td>
<td>Splenic rupture/distension</td>
</tr>
<tr>
<td>Mesenteric ischemia</td>
<td>Pyelonephritis/nephrolithias</td>
</tr>
<tr>
<td>Perforated duodenal ulcer</td>
<td></td>
</tr>
<tr>
<td>Pneumonia (RLL)</td>
<td></td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td></td>
</tr>
<tr>
<td>Pyelonephritis/nephrolithias</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Right Lower Quadrant</th>
<th>Left Lower Quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic aneurysm</td>
<td>Aortic aneurysm</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>Diverticulitis</td>
</tr>
<tr>
<td>Crohn disease</td>
<td>Ectopic pregnancy</td>
</tr>
<tr>
<td>Diverticulitis</td>
<td>Endometriosis</td>
</tr>
<tr>
<td>Ectopic pregnancy</td>
<td>Epiploic appendagitis</td>
</tr>
<tr>
<td>Endometriosis</td>
<td>Herpes zoster</td>
</tr>
<tr>
<td>Epiploic appendagitis</td>
<td>Inguinal hernia</td>
</tr>
<tr>
<td>Herpes zoster</td>
<td>Ischemic colitis</td>
</tr>
<tr>
<td>Inguinal hernia</td>
<td>Meckel diverticulum</td>
</tr>
<tr>
<td>Ischemic colitis</td>
<td>Mittelschmerz</td>
</tr>
<tr>
<td>Meckel diverticulum</td>
<td>Ovarian cyst</td>
</tr>
<tr>
<td>Mittelschmerz</td>
<td>Ovarian torsion</td>
</tr>
</tbody>
</table>
• Ovarian cyst
• Ovarian torsion
• Pelvic inflammatory disease
• Psoas abscess
• Regional enteritis
• Testicular torsion
• Ureteral calculi

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• Psoas abscess
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2. Who is at risk for gastric or bowel perforation, and how can it present?

Causes:
- Peptic ulcer disease
- Malignancy
- Diverticulitis
- Appendicitis
- Bowel obstruction
- Diabetic gastric paresis
- Diabetic ketoacidosis
- Familial Mediterranean Fever
- Gastroenteritis
- Heavy metal poisoning
- Hereditary angioedema
- Abdominal trauma (penetrating > blunt)

- Bowel obstruction
- Foreign body ingestion
- Necrotizing enterocolitis (premature infants)
- Iatrogenic (i.e., endoscopy)

History
- Abdominal pain, abdominal distention / rigidity
  - Occasionally focal if regionally confined (less common)
- Nausea, vomiting, fever, and anorexia often present

Physical exam
- Perforation with peritonitis
  - Abdominal tenderness, distention

Table 2: Differential Diagnosis for diffuse abdominal pain

<table>
<thead>
<tr>
<th>Aortic aneurysm</th>
<th>Malaria</th>
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<tbody>
<tr>
<td>Aortic dissection</td>
<td>Mesenteric ischemia</td>
</tr>
<tr>
<td>Appendicitis (early)</td>
<td>Metabolic disorder</td>
</tr>
<tr>
<td>Bowel obstruction</td>
<td>Narcotic withdrawal</td>
</tr>
<tr>
<td>Diabetic gastric paresis</td>
<td>Pancreatitis</td>
</tr>
<tr>
<td>Diabetic ketoacidosis</td>
<td>Perforated bowel</td>
</tr>
<tr>
<td>Familial Mediterranean Fever</td>
<td>Peritonitis</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>Sickle cell crisis</td>
</tr>
<tr>
<td>Heavy metal poisoning</td>
<td>Volvulus</td>
</tr>
<tr>
<td>Hereditary angioedema</td>
<td></td>
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</tbody>
</table>
3. Do analgesics mask exam findings?

The traditional teaching of withholding pain medication in patients with acute abdominal pain stems from a time when medicine was without modern diagnostic techniques and when the intravenous titration of opiates was not routinely practiced. Early and appropriate pain relief for patients with acute abdominal pain is humane, does not adversely affect diagnostic acumen or clinical decision making, and should be considered part of the initial management of every such patient.

4. What is the utility, and limitations of, obtaining an upright chest x-ray or acute abdominal series?

Easily available in all emergency departments, but sensitivity can be low and x-ray can be delayed based on your department needs.

5. What antibiotics should you consider in the patient with perforation?

Start as soon as possible; ideally within the first hour

- Community-acquired:
  - Therapy should target enteric gram-negative aerobic and facultative bacilli, obligate anaerobic bacilli, and enteric gram-positive streptococci
  - Adult regimen (see TABLE 1):
    - Mild to moderate severity community acquired GI perforation:
      - Single agent: Cefoxitin, ertapenem, moxifloxacin, tigecycline, or ticarcillin/clavulanic acid
      - Combination therapy:
        - Cefazolin, cefuroxime, ceftriaxone, cefotaxime, ciprofloxacin, or levofloxacin -AND-
        - Metronidazole
    - High risk/severity community acquired GI perforation:
      - Single agent: Imipenem-cilastatin, meropenem, doripenem, or piperacillin/tazobactam
      - Combination therapy: Cefepime, ceftazidime, ciprofloxacin, or levofloxacin -AND-
        - Metronidazole
  - Pediatric regimen: (for dosage, see TABLE 1)
    - Community acquired GI perforation:
      - Single agent: Ertapenem, meropenem, imipenem-cilastatin, ticarcillin/clavulanate, and piperacillin/tazobactam
      - Combination therapy:
        - Ceftriaxone, cefotaxime, cefepime, or ceftazidime, each in combination with metronidazole
        - Gentamicin or tobramycin, each in combination with metronidazole or clindamycin, and with or without ampicillin
• Iatrogenic/hospital-associated perforation: Therapy should be driven by local microbiologic results.
  o Drug-resistant bacteria regimen (common in hospital-associated perforation):
    ▪ <20% Resistant *Pseudomonas aeruginosa*, ESBL-producing *Enterobacteriaceae*, *Acinetobacter*, or other MDR GNB:
      ▪ Single agent: Carbapenem, piperacillin-tazobactam
      ▪ Ceftazidime or cefepime, each in combination with metronidazole
    ▪ ESBL-producing *Enterobacteriaceae*: Carbapenem, piperacillin/tazobactam, or aminoglycoside
    ▪ *P. aeruginosa* >20% resistant to ceftazidime: Carbapenem, piperacillin/tazobactam, or aminoglycoside
    ▪ MRSA: Vancomycin only
  • Fungal infection: Antifungal therapy for patients with severe community-acquired or health care-associated infection is recommended if candida is grown from intra-abdominal cultures *(fluconazole; echinocandins for triazole-resistant species)*

6. If imaging is delayed or not obtainable, when should you call the surgeon? If perforation is suspected, should you wait for imaging to discuss the case with the surgeon?

Perforations need to go to the OR emergently / urgently. If you are at all concerned about your patient’s exam (ie peritonitis or an acute abdomen), do not hesitate to let them know and have them come evaluate the patient.