Ultrasound in the Acute Abdomen

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September 15, 2022
Why Ultrasound?

- CT is increasingly replacing US for evaluation of acute abdominal pain
  - Fast
  - Fewer artifacts (gas, bone, obesity limit US)
  - Not operator-dependent
Why Ultrasound?

- US has specific advantages:
  - No ionizing radiation
    - Pediatric or pregnant patients
  - Dynamic
    - Fetal movements, peristalsis, blood flow
    - Can see effects of respiration, Valsalva, gravity, compression
  - Portability
  - Affordability
US Technique

- Graded compression
  - Fat and bowel are displaced or compressed
  - Reduces artifact from bowel gas, decreases distance from transducer to target of interest (including appendix)

- Entire abdomen examined
  - Gallbladder, pancreas, kidney, aorta, stomach, small/large bowel, appendix, uterus, ovaries
  - Bowel examined with “mowing the lawn” technique
Appendicitis

• Normal appendix
  – Small (<7 mm)
  – Easily compressible
  – Concentrically layered
  – Mobile
  – Blind-ending
  – May contain air or fecal material, rarely fluid
  – Doppler: little or no vascular signal
  – No hyperechoic, inflamed periappendiceal fat
Appendicitis

• Inflamed appendix
  – Non-compressible, tender
  – Fixed in position
  – Enlarged (average 9 mm)
  – Hypervascular
  – 30% contain fecoliths
  – Loss of layered contour, surrounding adynamic ileus or large free fluid suggests perforation (though nonspecific)
  – Periappendiceal fat is enlarged, hyperechoic, less compressible
Appendicitis
Appendicitis

• Pitfalls
  – False positive
    • Normal appendix can be >7 mm, particularly in setting of lymphoid hyperplasia, fecal impaction, cecal carcinoma (luminal obstruction resulting in mucus accumulation)
  – False negative
    • Generalized peritonitis may limit graded compression
    • Air-filled dilated bowel or appendix may obscure view
    • Rarely, inflamed appendix can be <7 mm
Appendicitis
Crohn’s Disease

• Characteristically affects terminal ileum and may be mistaken for appendicitis

• On US:
  – Non-compressible wall thickening of terminal ileum
  – Decreased peristalsis
  – Inflamed, hyperechoic fat
    • Echolucent streaks within hyperechoic tissue indicate liponecrotic tracts (fistula)
  – Abscess formation
Crohn’s Disease
Infectious Ileocolitis/Ileocecalitis

• Bacterial infection of terminal ileum and colon
  – Most common: *Campylobacter*, *Salmonella*, *Yersinia*
  – Causes diarrhea, abdominal pain

• Ileocecalitis: variant where infection is limited to ileocecal area, often by same bacteria
  – Symptoms: acute RLQ pain, mild/absent diarrhea
    • May mimic appendicitis
Infectious Ileocolitis/Ileoceccitis

- US:
  - Diffuse thickening of mucosa and submucosa of terminal ileum and cecum
  - Normal appendix
  - Often enlarged lymph nodes
- Positive stool cultures
Infectious Ileocolitis/Ileoceceitis
Infectious Ileocolitis/Ileoceccitis
Infectious Ileocolitis/Ileocecticis

Yersina Enterocolitica  Campylobacter  Salmonella
Mesenteric Lymphadenitis

- Inflammation and enlargement of mesenteric lymph nodes
- Likely viral
- Mostly in children
- Enlarged, hypervascular mesenteric nodes
Cecal Carcinoma

• Can cause acute abdominal pain due to:
  – Small bowel obstruction
  – Involvement and inflammation of appendix
  – Tumor perforation

• US:
  – Irregular, asymmetric, solid mass
  – Hypoechoic
  – Vascular
Sigmoid diverticulitis

- Often clinical diagnosis (LLQ pain, fever, leukocytosis)
- US:
  - Normal sigmoid can have variable appearance
    - Empty or filled with feces, contracted or relaxed
  - Diverticulosis:
    - Muscularis layer is markedly thickened
    - Fecolith-containing diverticula appear as reflective, rounded structures with acoustic shadowing peripheral to colon
Sigmoid diverticulosis
Sigmoid Diverticulitis

• Stages of diverticulitis:
  – Stage 0: Neck of diverticulum becomes obstructed. Surrounding inflamed fat represents mesentery/omentum walling-off imminent perforation
  – Stage 1: Small paracolic abscess. Fecolith usually disintegrates or evacuates toward colonic lumen
  – Stage R (residual): inflammatory changes may persist
Sigmoid Diverticulitis
Sigmoid Diverticulitis

- Free perforation without sealing off is less common
  - May result in peritonitis
- Even larger abscesses tend to drain into colon
  - Evacuation into bladder, vagina, or skin may cause fistula

9/20/2022
Perforated Peptic Ulcer

• More sensitive: upright CXR or CT
  – Unless small volume air
• In cases of severe abdominal pain, US may be obtained without CXR
• US:
  – Asymmetric thickening of duodenal wall
  – Air extending from duodenal lumen
  – Left lateral decubitus position best visualizes air between liver and abdominal wall
Perforated Peptic Ulcer
Other Etiologies to Consider

- Trauma
- Ruptured abdominal aortic aneurysm
- Renal pathology
  - Nephrolithiasis
  - Pyelonephritis
- Pancreatitis
- Cholecystitis
- Bowel pathology
  - Hernia
  - Obstruction
  - Epiploic appendagitis
- Many more!
Thank you!


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