Quick! Somebody Call a Doctor (Radiologist)!
Diagnosing RUQ Pain in an ED Patient

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Objectives

• Review the radiologic work-up and findings of an ED patient with RUQ/epigastric pain.
• Discuss the different imaging modalities available for diagnosing this patient’s disease.
• Review some typical radiologic findings of this patient’s disease.
Let’s Meet Our Patient

• LG, a former alcoholic, is a 48 yo man who presents to the BIDMC ED complaining of severe RUQ and epigastric pain that is radiating to his back. He has had this pain for the last several hours. No n/v/d.
Send in the Med Students
After further questioning…

- **PMH:** dilated thoracic aorta
  - PUD
  - colonoscopy (polyp removal) 2 days ago
  - pyelonephritis
- **Meds:** prilosec, percocet
- **Allergies:** NKDA
- **FH:** non-contributory
- **SH:** former alcoholic (age 18-35)
Differential Diagnoses

- Aortic dissection
- Right-sided pneumonia
- Acute cholecystitis
- Acute pancreatitis
- Chronic pancreatitis
- Appendicitis
- Acute hepatitis
- PUD
- Perforated viscus
- Right kidney disease
- Subhepatic abscess
Initial Imaging Studies for LG

• Plain Films:
  - Chest PA and Lateral
  - Abdomen Supine and Upright
Results

PA

Lateral

(widened mediastinum)

(images courtesy BIDMC)
Results (cont.)

Normal Abdominal Plain Films

Erect Supine

(images courtesy BIDMC)
Next Imaging Studies for LG

- Plain Films
- Ultrasound
- CT with and w/o contrast
Results

- slight gallbladder wall thickening
- 1 cm gallstone in gallbladder neck
- No pericholecystic fluid
- No gallbladder dilatation
- No sonographic Murphy’s

“cholelithiasis with slight wall thickening”
Results

CT w/ contrast

Mild dilatation of thoracic aorta (4.3 x 4.6 cm)

Low attenuation mass (malignancy?)

(images courtesy BIDMC)
What imaging study was performed next?

- Plain Films
- CT
- US
- MRI
Results

The area called into question on the CT scan represents focal fat.

T1 In Phase: Water shows increased signal intensity, while fat shows decreased signal intensity.

T1 Out of Phase: Water shows decreased signal intensity, while fat shows increased signal intensity.
Results (cont.)

- Gallstone
- No wall thickening
- No pericholecystic fluid

T1 w/Contrast, Fat Suppressed

(image courtesy BIDMC)
Significant Findings So Far...

- Gallstone
- Slight gallbladder wall thickening
What imaging study was performed next?

- Plain Films
- CT and Ultrasound
- MRI
- **DISIDA Scan** - peripheral injection of 99Tc-labeled di-isopropyl iminodiacetic acid, which is taken up by hepatocytes, then excreted in the bile duct system. Images are taken once per minute. Look for non-filling of the gallbladder.
Results

- DISIDA Scan shows non-filling of the gallbladder, consistent w/cholecystitis.
- Activity is noted within the small bowel at 10 minutes.

(images courtesy BIDMC)
Results (cont.)

- Post-morphine images show non-filling of the gallbladder, consistent w/cholecystitis.
To the OR

- LG had a lap cholecystectomy
- Pathology revealed a diagnosis of chronic cholecystitis.
- LG has not had episodes of RUQ pain since.

http://erl.pathology.iupui.edu/C604query.cfm?Table=Hepatobiliary

(Not LG’s gallbladder)
Let’s look at some more typical findings ...
More Typical Radiologic Findings of Cholecystitis

- **Plain Films**: only 15% of gallstones are visible on plain films.

More Typical Radiologic Findings of Cholecystitis

- Plain Films also allow you to detect:
  - gallbladder wall calcification
  - “milk of calcium”: biliary sludge formed from precipitated calcium carbonate crystals (or calcium bilirubinate)

http://www.uhrad.com/ctarc/ct186.htm
• **Ultrasound**: Test of choice if suspicious of cholecystitis.

• Look for:
  - sonographic Murphy’s
  - gallstones
  - gb wall thickening (> 4-5 mm)
  - pericholecystic fluid (hypoechoic halo)
  - dilatation of gb

• **CT** - Not the modality of choice, but very useful. You can detect:
  - pericholecystic fluid
  - gb wall thickening
  - gallstones
  - complications
    - emphysema
    - gangrene
    - perforation
    - liver abscess

http://www.vh.org/Providers/TeachingFiles/RCW2/121296/121296.html
More Typical Radiologic Findings (cont.)

- **HIDA/DISIDA Scan**
  - useful when the diagnosis is unclear after US
- **Sensitivity and specificity of 95% for detecting cholecystitis.**
- **Look for:**
  - non-filling of gallbladder
  - rim sign (pericholecystic hepatic activity)

(images courtesy BIDMC)
More Typical Radiologic Findings (cont.)

- **MRCP:**
  - can be used to visualize intrahepatic/extrahepatic bile ducts, and pancreatic ducts
  - heavily T2-weighted MRI (no contrast needed)

- Excellent for detecting duct obstruction and can be used to detect cholecystitis:
  - *Sensitivity 100%* for detection of stones in cystic duct (US 14%)
  - *Sensitivity 69%* for detection of gb wall thickening (US 96%).

Summary

- Reviewed an example of diagnostic imaging for RUQ pain
- Reviewed the different imaging modalities that are available for diagnosing cholecystitis
- Reviewed the typical radiologic findings for cholecystitis
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