Hepatobiliary Ultrasound
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Objectives
• Discuss the goals of point-of-care biliary ultrasound
• Review the hepatobiliary anatomy
• Explore strategies for image (window) acquisition
• Develop recognition of pathology on acquired images
• Discuss integration of point-of-care hepatobiliary ultrasound into your practice

Why?
• Best initial screening imaging modality for undifferentiated cases of vague abdominal pain
• Bedside
• Fast
• No radiation
• No contrast

Why?
• US has the highest sensitivity for gallstones
• HIDA has a reported higher sensitivity for detecting acute cholecystitis in older studies, but more recently some studies suggest that US may be equal
• CT limited by the fact that it misses as high as 25% of gallstones
• Also high levels of radiation
• ERCP helpful in further evaluation of dilated ducts but has risks of pancreatitis
What can we evaluate?

- Gallstones and Biliary Colic
- Cholecystitis
- Choledocholithiasis
- Ascites

Gallstones and Biliary Colic

- Approximately 1/3 of abdominal pain seen in the emergency department
- Risk factors (4 F’s) are common in younger patients but in older patients presentations are not as classic
- Some studies suggest that midepigastric pain is as common as RUQ pain in gallbladder disease

Gallstones and Biliary Colic

- Sensitivity/specificity of acquiring and interpreting hepatobiliary ultrasound has been shown to be similar for trained emergency physicians and imaging specialists (techs and radiologists)
- The main advantage is increased efficiency and decreased time to diagnosis/disposition
- You also know the clinical picture
- Have to be careful not to attribute atypical abdominal pain to gallstones!

Acute Cholecystitis

- Ultrasound is sensitive even in studies where two thirds of the emergency physicians had no formal training in ultrasound (Ralls, et al.)
- 99% of patients with acute cholecystitis have stones
- A constellation of stones and a positive Murphy’s has a PPV of 92%
- Combination of gallstones and gallbladder wall thickening had a PPV of 95.2%
Acute Cholecystitis

- The diagnosis of acute cholecystitis cannot be made by any constellation of physical examination or lab findings
- Imaging modalities should be utilized if the diagnosis is considered because patients can have acute cholecystitis without exam or lab findings

Biliary Duct Dilatation & Obstruction

- Evaluate the ducts to help determine if obstruction is the cause
- US is not specific because obstruction can be from stones, tumors, or other causes
- Important to determine if these patients have signs of cholangitis (fever, leukocytosis, etc)
- Further eval with ERCP, CT, surgery

Sepsis Abdominal Sources

- Early goal directed therapy in patients with sepsis is known to decrease mortality
- 25% of elderly patients with abdominal sepsis have acute cholecystitis
- Elderly tend to present atypically
- Prompt detection of cholecystitis as a source of sepsis can expedite care and decrease mortality

Ascites

- Detection of ascites can help clue you into what may be causing abdominal pain
- Ascites with fever and/or elevated WBC and peritoneal signs should prompt consideration of SBP
- Use the FAST exam
Hepatic Abnormalities

- Cancers, abscesses, hepatomegaly, metastases
- Can all be evaluated by ultrasound but diagnosis is more difficult and more advanced
- Often picked up incidentally by experienced sonographers
- More advanced

So let’s get to the point!

- How do we scan?

Anatomy

Scanning

- Probe choice
- Curvilinear medium frequency probe is most commonly sufficient
- If you have trouble getting through ribs or have a patient with a large body habitus you can try a low frequency probe (cardiac) for better penetration
Tricks of the Trade

- Patient positioning
  - Recumbent position is okay but usually visualization is difficult due to ribs in the way
  - Usually easiest in the left lateral decubitus position with arm up
- Other strategies:
  - Deep breath
  - Sit the patient up

Gallbladder Scanning

Ultrasound Views of the Gallbladder
Several Approaches!
Same View!

Tricks of the Trade

- Only move your probe or the patient in one dimension
  - Cephalad-Caudal
  - Left-Right
  - Clockwise-Counterclockwise
  - Inspiration-Expiration
- Move your probe slowly in addition to only moving in one dimension

Gallbladder Scanning

Left lateral decubitus position is usually easiest
Gallbladder Scanning
If you have trouble start with a familiar view and move up.

So, let’s get to the point!
- The goal is to answer yes or no questions.
- Stones?
- Duct dilated?
- Wall thickened?
- Sonographic Murphy’s?
- Pericholecystic fluid?
- Ascites?

Gallbladder Scanning
Longitudinal vs Transverse

Gallstones - Yes or No?
- Usually appear as echogenic discrete structures that cast a shadow
- If you see stones you should roll the patient to make sure they move
- If they don’t move they may be impacted in the gallbladder neck or they could be calcified polyps
- Evaluate the neck closely
- Large and small stones can both cause problems
Gallstones

- **Wall Echo Sign** - gallbladder filled with stones causing a shadow without clear visualization of the gallbladder itself

Common Bile Duct Dilated?
Yes or No

- Follow the gallbladder down to the neck
- Once you find the neck then look for the portal vein which appears as a bright echogenic walled large vessel
- Here you will find your portal triad (portal vein, hepatic artery, common bile duct)

Biliary Obstruction

- The common bile duct should measure $\leq 6$ mm for patients up to 60 years of age
- add 1 mm for every 10 years greater than age 60
- Dilated common bile duct only indicates obstruction but does not determine the cause
- Stones, masses, etc.
• If you find the portal vein in the longitudinal view you can see the common bile duct sitting right above it.

• If you turn your probe 90 degrees you will see the portal triad in the transverse view.

• Classic “Mickey Mouse” sign

• Once you find the common bile duct, put color doppler on to determine which structure is which.

• Is this dilated?
Wall Thickened?
Yes or No
• You should only measure the anterior wall of the gallbladder
• Measurement of the posterior wall can result in a false positive due to reverberation artifact
• A normal wall measurement is ≤4mm (some sources say 3mm)
• The transverse view is the most accurate for wall measurement

Wall Thickened?
Yes or No
Dist A 0.63
Dist 0.55

Wall Thickness
• Increased wall thickness can be indicative of acute cholecystitis but can also occur in other conditions such as:
  • pancreatitis
  • ascites
  • alcoholic hepatitis
  • chronic cholecystitis
  • Not pathognomonic!

Sonographic Murphy’s
• Maximal tenderness elicited by pressure from the ultrasound probe over the gallbladder
• Can you reproduce the pain?
Pericholecystic Fluid

- Very specific for acute cholecystitis

Sonographic Signs

- No single sonographic sign is sensitive enough to make the diagnosis of acute cholecystitis
- A small percentage of patients may present with no sonographic evidence of disease
- These patients may need further evaluation with HIDA
- As patients have more sonographic findings the likelihood increases

Normal Variant

Phyrigian Cap

Take Home

- Focus on answering the yes or no questions
- Start with the easy stuff first and work toward the more difficult
- Remember the tricks of the trade to help you
Questions?