Abdominal ultrasound: Non-traumatic acute abdomen
Contents

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• Normal anatomy
• Emergency conditions
  ▫ Liver abscess
  ▫ Acute cholecystitis
  ▫ Bile duct obstruction
  ▫ KUB stones and hydronephrosis
Technique of examination

A Inspiration and expiration
B Inspiration and expiration
C Inspiration and expiration
Liver
Cross sectional imaging
Cross sectional imaging
Longitudinal imaging
Intercostal approach
Liver abscess

- **Pyogenic liver abscess**
  - Frankly purulent: cystic, with the fluid ranging from echo free to highly echogenic
  - Early suppuration: solid with altered echogenicity, usually hypoechoic
  - Gas-producing: echogenic foci with a posterior reverberation artifact
  - Fluid-fluid interfaces, internal septations, debris
  - Wall: well defined, irregular, thick
Liver abscess

- Amebic liver abscess
  - Round or oval-shaped lesion
  - Absence of a prominent abscess wall
  - Hypoechochogenicity
  - Fine low-level internal echoes
  - Posterior enhancement
  - Contiguity with the diaphragm
Gallbladder
Subcostal oblique view
Left posterior oblique view
Normal gallbladder

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>location</td>
<td>Inferior to interlobar fissure</td>
</tr>
<tr>
<td>size</td>
<td>&lt; 4 cm transverse</td>
</tr>
<tr>
<td></td>
<td>&lt; 10 cm longitudinal</td>
</tr>
<tr>
<td>Wall thickness</td>
<td>&lt; 3 mm</td>
</tr>
<tr>
<td>lumen</td>
<td>anechoic</td>
</tr>
</tbody>
</table>
Gallstones

• A mobile, echogenic structure with acoustic shadowing in the lumen of the gallbladder
Impacted gallstone

- A gallbladder completely filled with stones
- Wall-echo-shadow (WES) complex
  - 1\textsuperscript{st} line: GB wall
  - 2\textsuperscript{nd} line: bright echo of the stone
  - 3\textsuperscript{rd} line: acoustic shadowing
Gallbladder polyps
Acute cholecystitis

- Gallstones
- Gallbladder wall thickening > 3 mm
- Gallbladder enlargement > 4x10 cm
- Positive sonographic Murphy’s sign
- Pericholycystic fluid
Advanced acute cholecystitis

- Irregular striated intramural sonolucencies
- Pericholecystic fluid
- Sloughed mucosal membranes
- Focal wall bulge
- Wall ulceration
- Wall disruption
Emphysematous cholecystitis

- Tend to occur in elderly men, caused by ischemia, more often in diabetics, and is often not associated with gallstones
- Very bright reflections from a non-dependent portion of the GB wall
- Dirty acoustic shadow or ring-down artifact
Biliary trees
Anatomy of bile ducts

• **Extrahepatic portion:** Central Rt and Lt ducts, common bile duct
  ▫ **Proximal duct:** run anterior to the Rt and main PV and Rt HA
  ▫ **Mid duct:** run posterior to the duodenum
  ▫ **Distal duct:** enter the head of the pancreas and travel along the most posterior aspect of the pancreatic head
Techniques

- Changes in patient position
  - Supine
  - Left lateral decubitus
  - Left posterior oblique
- Choice of sonographic window
  - Subcostal view: portahepatis and proximal CBD
  - PV is a landmark for the mid CBD.
  - Epigastric view: distal CBD in the pancreatic head
- Use of compression sonography
  - Collapse the superficial bowel and displace the bowel gas
- Detailed assessment of the distal CBD
  - Focus on the pancreatic head in the transverse plane
CBD and gallbladder
Biliary obstruction

- Bile duct obstruction: bile duct dilatation proximal to the level of obstruction
- The mid segment of CBD dilates first in the setting of obstruction.
  - 7 mm or greater in inner diameter
  - Mid-duct > 7mm may be normal in elderly patients and post cholecystectomy.
- Proximal duct: >4 mm
Criteria for dilated IHDs

- Larger than 2 mm in diameter
- More than 40% of diameter of adjacent PV
- Increased through transmission
- Irregular, tortuous walls
- Stellate configuration centrally
- Lack of Doppler signal
Causes of bile duct obstruction

- Choledocholithiasis: stones
- Infection
- Parasite
- Cholangiocarcinoma
- Gallbladder carcinoma
- Pancreatic adenocarcinoma
Choledocholithiasis

- Hyperechoic intraductal structures with posterior acoustic shadowing
- 20% of cases: no acoustic shadow
- Most stones are located in the distal duct.
Ascariasis

- A tube of parallel echogenic lines within the bile ducts
- Movement of the worm during the scan
- Multiple worms: resembling spaghetti
Pitfalls

- Blood clot, papillary tumors, biliary sludge
  - no posterior acoustic shadowing
- Surgical clips
  - short linear, high degree of echogenic foci with shadowing
  - lack of bile duct dilatation
  - absence of the gallbladder
- Aerobilia
  - bright, echogenic linear structure with posterior “dirty” shadowing and reverberation (ring down) artifact
Aerobilia
Kidneys

- Right adrenal vein
- Renal veins
- Right gonadal vein
- Left inferior adrenal vessels
- Left gonadal vein
- Superior mesenteric artery
- Gonadal arteries
- Inferior mesenteric artery
Normal renal length: 8.4 – 13.1 cm
KUB stone

• A common finding on US
• Located in the collecting system of the kidney.
• Most stones: hyperechoic structures with distal acoustic shadowing
• The stone can sometimes be identified in the dilated ureter, but this is unusual as the retroperitoneum is frequently obscured by overlying bowel.
Renal stones
Left distal UC
Bladder calculus
Obstructive uropathy

- US plays a prominent role as one of the first-line investigations in patients with flank pain, renal colic or micturition disorders.

- In the vast majority of cases, urinary tract obstruction causes dilatation of the collecting system proximal to the site of obstruction.
Hydronephrosis
Left RC with mild hydrenephrosis
Moderate hydronephrosis
Severe hydronephrosis
Pyonephrosis

- High fever and flank pain
- Low level echoes within the dilated PCS may represent pus.
- Sometimes, the urine may appear anechoic, despite being infected.
- The clinical history should help differentiate pyo- from simple hydrenephrosis.
Thank you for your attention