ABDOMINAL ULTRASOUND

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PREPARATION

- Patient position:
  - Supine
  - Left Lateral Decubitus

- Ultrasound transducer selection:
  - Curvilinear
  - Phased array

- Presets:
  - Abdominal
  - Penetration
  - Harmonics
ULTRASONIC BASICS

Cardinal Transducer Manipulation/Movement
(Sliding, Tilting, Rotating, and Rocking)
LIVER ULTRASOUND

Segmental Anatomy

- Segmental anatomy is based on the distribution of the portal veins.
- Hepatic veins divide the liver longitudinally into four sections. Each of these sections is further divided transversely by an imaginary plane through the right and left portal veins.

- Segment I: Caudate lobe
- Segment II: Left lateral superior
- Segment III: Left lateral inferior
- Segment IVa: Left medial superior
- Segment IVb: Left medial inferior
- Segment V: Right anterior inferior
- Segment VI: Right posterior inferior
- Segment VII: Right posterior superior
- Segment VIII: Right anterior superior

The right lobe is supplied by the right portal vein. The left lobe is supplied by the left portal vein. The caudate lobe receives branches from both the right and left portal veins.

Anterior View

Inferior View
LIVER ULTRASOUND

- Assess: Size, Texture, Echogenicity
LIVER SIZE

- Cranio-caudal length
  - <16cm
- Left hepatic tip
  - Sharp vs. Blunted
LIVER ECHOGENICITY
LIVER CONTOUR/TEXTURE
LEFT LIVER LANDMARKS - SAGGITAL

- Proximal Aorta
- Upper IVC
- Caudate lobe
- Ligamentum Venosum
LEFT LIVER LANDMARKS - TRANSVERSE

- Left hepatic vein
  - lateral/medial
- Left portal vein
  - superior/inferior
RIGHT LIVER LANDMARKS- SAGITTAL
RIGHT LIVER LANDMARKS- TRANSVERSE
LIVER VASCULATURE
LIVER VASCULATURE: PORTAL VEIN

Portal vein hypertension

Hepatofugal flow

Cavernous Transformation
LIVER PATHOLOGY
Liver Echogenicity

Increased
- Fatty infiltration

Cirrhosis
- Coarsened/ heterogenous echotexture
- Lobar redistribution (EtOH)- early
- Small liver with nodular contours – chronic

Decreased
- Acute hepatitis
  - Starry sky
LIVER PATHOLOGY
Liver Mass

Hypoechoic
- Single
  - Simple/avascular
    - Cyst
  - Complex
- Multiple
  - DDx:
    1. Lymphoma
    2. Micro abscesses (target lesions)
    3. Mets

Hyperechoic to heterogeneous
- 1. HCC
- 2. Hepatic adenoma
- 3. Focal nodular hyperplasia
- 4. Hemangioma

Vascularity
- No
  - Hematoma
- Yes
  - Abscess/met
ASCITES
Ascites

• Location:
  • Dependent portion: hepatorenal recess (Morison pouch) and cul-de-sac
  • Simple anechoic - transudative ascites, urine and bile
  • Echogenic Particles
  • Septation
  • Debris

Exudative ascites, hemorrhage, pus,
Malignant ascites, spilled GI contents

• Mass - tumor vs abscess
  • vascular flow - internal vs peripheral
GALLBLADDER ULTRASOUND
GALLBLADDER
CHOLELITHIASIS: WALL-ECHO-SHADOW
GALLBLADDER: SONOGRAPHIC MURPHY'S SIGN

Must have the gallbladder in view on the screen when pushing down
GALLBLADDER: ACUTE CHOLECYSTITIS

- Checklist:
  - Gallbladder wall thickening: >4mm
  - Pericholecystic fluid
  - Positive Murphy’s sign
GALLBLADDER PATHOLOGY CONT.
COMMON BILE DUCT

- <6mm in AP diameter for patients under 60 years old
  - Add 1mm per decade after 60
BILIARY TREE PATHOLOGY
Pancreas
Pancreas

**Increased**
- Fatty infiltration

**Chronic pancreatitis**
- Atrophic and fibrotic
- Calcification
- Ductal dilation

**Decreased**
- Acute pancreatitis
  - ill-define margins
  - Gallstone
  - Dilated biliary tree
  - Fluid accumulation
  - Collection
ACUTE VS. CHRONIC PANCREATITIS
PANCREATIC HEAD MASS

• A dilated pancreatic duct is suspicious for mass in the pancreatic head
  • >4mm at head
SPLEEN ULTRASOUND

- Knuckles to bed
- Splenomegaly
  - >14cm
Spleen

• Normal anatomy
  • Homogenous with smooth borders
  • Size: length < 14cm and thickness < 6 cm

• Common Pathology
  • Complex cyst lesion $\rightarrow$ Abscess or hematoma
  • Multiple hypoechoic lesions $\rightarrow$ lymphoma, micro-abscesses, and metastases
  • Hypoechoic and anechoic subscapular lesion $\rightarrow$ infract
SPLEEN PATHOLOGY
RENAL ULTRASOUND: Normal Anatomy
RENAL ULTRASOUND: NORMAL VARIANTS
Renal Cysts:
Non-obstructing renal calculi
Renal masses
• Obstruction
  • Key hydronephrosis (confirm with color Doppler)
    • DDx: peri-pelvic cysts, multiple simple cysts in the renal sinus and extra-renal pelvis
    • When filled with echogenic debris- pyonephrosis
  • Asymmetrically elevated RI of acurate artery
HYDRONEPHROSIS
• **Pyelonephritis**
  
  • Heterogenous appearing of the parenchyma and decrease blood flow on doppler
What is the diagnosis?
- Diffuse renal Parenchymal Disease
  - Increase echogenicity
Adrenal
Common adrenal pathology

- Isoechoic
  - Hyperplasia-
    - Infectious/mets/
    - Lymphoma
  - Adrenal adenoma

- Calcification
  - Adrenal hemorrhage
  - Tumor
  - Wolman disease

- Heterogenous
  - Pheochromocytoma
  - Adrenal myelolipoma

- Hyperechoic
  - Adrenal hemorrhage
APPENDICITIS

• Findings in Acute Appendicitis:
  • Outer diameter greater than 6-7 mm
  • Non-compressible
  • Lack of peristalsis
  • Target Sign
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