Focused Ultrasound in Biliary Disease

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Objectives

- Role of focused biliary ultrasound
- Anatomy
- Scanning method / live demonstration
Aims

- Demonstrate abnormalities in gallbladder
  - Gallstones
  - Signs of cholecystitis

- Demonstrate abnormalities in bile ducts
  - Dilatation
  - Gallstones

- Identify ascites

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Indications

- RUQ pain ? Biliary colic
- Jaundice ? Obstructive
- ? Ascites
Liver anatomy

- Lobes
- Ligaments
- Segments
- Venous system
- Portal system
- Gallbladder
- Biliary duct system

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Liver anatomy - lobes

4 lobes: Right, Left, Caudate, Quadrate
Liver anatomy - ligaments

Ligaments hyperechoic - linear

- Falciform – separates right and left, surrounds left main portal vein, known as ligamentum teres on inferio-anterior surface of liver

- Ligamentum venosum – separates caudate lobe
Liver anatomy - segments

- Divided into 8 segments
- Numbered clockwise
- Divisions by portal and hepatic vein
  - Right lobe
    - Anterior
    - Posterior
  - Left lobe
    - Medial
    - Lateral

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Liver anatomy - vascular
Liver anatomy - venous

- 3 main veins: left, middle and right
- Normally right hepatic vein drains directly into IVC
- Middle and left have a common trunk
- No fibrous sheath therefore less reflective

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Liver anatomy – venous

Anterior segment of right lobe
Middle hepatic vein
Left hepatic vein
Diaphragm
Inferior vena cava
Diaphragm
Right hepatic vein

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Liver anatomy - venous

- Medial segment of left lobe
- Lateral segment of left lobe
- Anterior segment of right lobe
- Diaphragm
- Inferior vena cava

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Liver anatomy – portal system

- Splenic vein, SMV and IMV join to form portal vein
- Enters at porta hepatis
- Divides into right and left branches
- Surrounded by hyperechoic fibrous walls of portal tracts
- Portal tracts contain branch of portal vein, hepatic artery and biliary duct

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IVC and portal vein - longitudinal
Summary

- Ligaments – reflective (hyperechoic) linear

- Veins – less reflective (hypoechoic) surround

- Portal veins – reflective sheath (hyperechoic)
Liver anatomy - GB

- Anechoic
- Pear shaped
- GB fossa – posterior inferior right lobe
- Fossa closely related to Main Lobar Fissure (MLF)
- MLF – thin hyperechoic line from portal vein to neck of GB
- Variable size
Liver anatomy - GB

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Liver anatomy – biliary ducts

- Right and left hepatic ducts combine to form CHD
- CHD and cystic duct combine to form CBD
- CBD joins to duodenum
Liver anatomy – CBD relationship

At porta hepatis

- Gallbladder
- Common bile duct
- Hepatic artery
- Portal
Liver anatomy
– CBD relationships

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Liver anatomy
– CBD relationships

Common bile duct  Hepatic artery

Portal

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Liver anatomy - CBD

- Internal diameter
  < 6mm

- Measure in longitudinal section
Transverse epigastrium

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Method for hepatobiliary scanning - principles

- Two planes
  - Sagittal / longitudinal
  - Transverse

- Two patient positions
  - Supine
  - Left lateral
  - Sitting
  - Standing

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1. Find the gallbladder

- Start in epigastrium
- Subcostal
- Probe in sagittal plane
- Marker towards head / right shoulder
2. Long axis gallbladder

- Move laterally to midclavicular line
- Rotate probe to scan GB in longest axis
- Scan GB from right to left by tilting probe

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3. Short axis gallbladder

- Rotate 90° counterclockwise to scan in the transverse plane

- Identify:
  - Neck
  - Body
  - Fundus

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If struggling to find GB

- Try intercostal approach
- Deep breathes
- Left posterior oblique position
GB images

- GB long axis

- GB short axis
  - Neck
  - Body
  - Fundus

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Gallbladder

- Contour of GB
- Internal architecture
- Pericholecystic space
- GB wall thickness (< 3mm), measure anterior wall
- Ultrasound Murphy’s sign

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Gallstones

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Gallstones
Gallbladder pitfalls

- Not to be confused with other anechoic rings
  - portal vein
  - IVC
  - fluid filled duodenum
GB sludge

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GB – duodenal gas
4. Common duct - transverse

- Neck of GB
- Main lobar fissure
- Portal triad

- Mickey mouse – CBD is right ear
5. Common duct - longitudinal

- Identify
  - Portal vein
  - Hepatic artery

- Measure longitudinal CBD

- Normal CBD < 6mm

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**CBD - doppler**

- Doppler helps to distinguish CBD and hepatic artery

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6. Ascites

- RUQ
- Pelvis

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Ascites - RUQ

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Questions?
Summary

- Ligaments – linear hyperechoic
- Veins – hypoechoic surface
- Portal veins – hyperechoic surface
Summary: HPB ultrasound

- Identify gallbladder
- Long axis gallbladder
- Short axis gallbladder – fundus, body, neck
- Identify common duct transverse
- Identify / measure common duct longitudinal
- Check for ascites