



RADIOLOGY TEAM

4 3 3

Lecture 2 :

# Ultrasound of the Liver & Gallbladder



KSU | Collage of Medicine  
2nd Year | CNS BLOCK

# Introduction to ultrasound

## ✧ Definition:

A diagnostic technique in which high frequency sound waves penetrate the body and produce multiple echoes.

- Best modality to assess liver and gall bladder is Ultrasound (US).
- MRI is good but takes long time and expensive

## ✧ Echo patterns: image on a computer screen.

## ✧ Frequency ranges: 2 - 15 MHz

## ✧ Medical use: since late 1950's

## ✧ Ultrasound Language

- ✓ Hyper-echoic = White (solid organs, and visa versa. )
- ✓ Hypo-echoic = Light Grey (Liver appear gray in ultrasound normally, color changes with diseases).
- ✓ An-echoic = Black

## Advantages

1. Inexpensive
2. Easy and available
3. Safe and no radiation

## Disadvantages

1. Inability to penetrate gas or bone.
2. Operator dependent.
3. Less sensitive in some situations.

# Ultrasound Uses

## **Cardiology**

Echocardiography is an essential tool in cardiology, valvular heart disease.

## **Emergency Medicine**

For Trauma patient and acute abdomen

## **Gastroenterology**

In abdominal sonography, the solid organs of the abdomen such as the pancreas, aorta, inferior vena cava, liver, gall bladder, bile ducts, kidneys, spleen and appendix.

## **Gynecology**

Assess female pelvic organs, uterus ovaries

## **Neonatology**

Basic assessment of intracerebral structural abnormalities, bleeds, ventriculomegaly or hydrocephalus.

## **Neurology**

Assessing blood flow and stenoses in the carotid arteries (Carotid ultrasonography)

## **Obstetrics**

Sonography is commonly used during pregnancy for the development of the fetus.

## **Urology**

To study a patient's bladder, prostate or testes.

## **Musculoskeletal**

For assessing tendons, muscles, nerves, ligaments, soft tissue masses, and bone surfaces

## **vascular system**

To assess patency and possible obstruction of arteries Arterial doppler, diagnose DVT venous doppler and determine extent and severity of venous insufficiency

# Indication of Liver & Gall Bladder by Ultrasound

1. Right upper quadrant pain.
2. Jaundice.
3. High liver function test.
4. Fever work up.
5. Screening for metastasis.

## Pathology of the Liver

- Size
- Diffuse liver disease
- Focal liver disease
- Hepatic vascularity
- Biliary system obstruction/pathology

## Pathology of the Gall Bladder

- Intraluminal pathology.
- Mural pathology

## Mural pathology

- **Primary:** Cholecystitis.
- **Secondary:** Cardiac Failure, Cirrhosis, Ascitis, Renal failure, Hypoalbuminaemia

## Size

- **Normal:**  
9 -15 cm at Mid Clavicle Line (MCL)
- **Large :**  
(Hepatomegaly) > 15 cm  
Small < 9 cm

## Diffuse

- **More than normal (more white)**  
e.g. Diffuse fatty infiltration
- **Less than normal (more black)**  
e.g. infection: Acute hepatitis

# Abnormality

## Vascular

- **Portal venous system:**  
Thrombosis.  
Portal hypertension.
- **Hepatic venous system:**  
Thrombosis  
(budd chiari syndrome).

## Biliary

- **Intra-hepatic biliary radicals:**  
Less than 3mm
- **Extra-hepatic common bile duct "CBD":**  
Less than 8mm

Large  
(Hepatomegaly)  
> 15 cm:

- Infection: eg viral hepatitis
- Neoplasm (tumor): eg. Metastasis (Liver nodules in patient with colon cancer )
- Cirrhosis: early phase
- Metabolic: Amyloidosis /fat
- Drugs/toxins: alcohol
- Others: Budd Chiari syndrome

Focal Liver  
Lesions

- **Benign tumor**: Hemangioma.
- **Malignant tumor**:
  - Primary eg. Hepatocellular carcinoma( Hepatitis C virus affected patient have focal lesion in liver)
  - Secondary metastasis eg. Colon breast.
- **Infective**: Abscess, Hydated cyst
- **Congenital**: Hepatic cyst.

Biliary dilatation  
& obstruction:

- Intra-luminal:
- Stone & mass.
- Mural:
- Stricture (benign & malignant)
- Extrinsic:
- Compression mass & Lymph nod

# Common pathological cases



Middle age women presented to ED with fever, RUQ pain. On exam she looks ill, febrile and on pain. Abdomen: RUQ tenderness , Lab high LFTs & WBC.

## Acute calculous cholecystitis

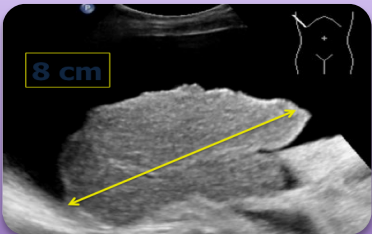
Gall stone, Thickening of GB wall >3mm., Distended GB



Old man recently discovered to have colonic cancer presented to primary health care clinic with vague upper abdominal pain On exam: he was thin, ill not febrile or jaundiced. Mild abdominal tenderness enlarged liver with irregular outline. Lab mildly elevated LFTs.

## Metastatic liver lesions.

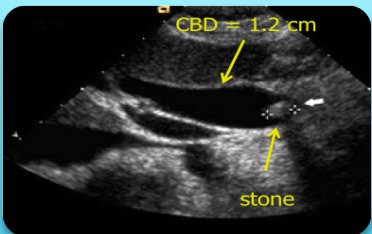
Multiple hypoechoic focal hepatic lesions



Middle age man known case of HCV+ for 10 years presented to GI out patient clinic with history of abdominal distension. No fever. On exam: he was ill, slim ,mildly jaundice not febrile. Abdomen: bulging flanks, dilated tortuous vessels around umbilicus. Mild diffuse abdominal tenderness. Lab high LFTs.

## Liver cirrhosis

Shrunken liver with irregular outline., Free fluid (ascites)



Middle age woman complaining of right upper quadrant pain, dark urine and pale stool. On examination: her skin and sclera are yellowish, not febrile.

## Common bile duct (CBD) stone

Dilated CBD

# Questions:

1- Best modality to assess liver and gall bladder:

- A) US
- B) CT
- C) MRI

2- Common use for ultrasound is:

- A) Musculoskeletal
- B) Obstetrics
- C) Neurology

3- Normal size of the liver:

- A) 5-10 cm
- B) 20-30 cm
- C) 10 -15 cm

4- Focal liver lesions is caused by:

- A) Hemangioma.
- B) Viral hepatitis
- C) Stone & mass

5- Metastases of the liver is assist with :

- A) Redness
- B) Nodules
- C) Pus

6- Intra-mural biliary system we find :

- A) Stones & Masses
- B) abscess
- C) Strictures

7- Portal hypertension is an abnormality in:

- A) Portal venous system
- B) Hepatic venous system
- C) Bile duct system

8-Indication to use liver & gall bladder ultrasound:

- A) Right upper quadrant pain.
- B) Jundnce
- C) A&b

1- A 2-B 3-C 4-A 5-B 6-A 7-A 8-C



# Best Wishes

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