King Saud University

College of medicine

US of liver and gall stone

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outline:

- Introduction to US.
- Indications of liver and gall bladder US.
- Normal anatomy and radiological appearance.
- Pathology of liver and gall bladder.
- Common pathological cases.

Introduction to US

History OF US

- Piezoelectricity discovered by the Curies in 1880 using natural quartz.
- Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress.
- (US) SONAR was first used in 1940's war-time
- Diagnostic Medical applications in use since late 1950's

Definition:

- a diagnostic technique in which high-frequency sound waves penetrate the body, bounce around, and produce multiple echoes; these echo patterns can be viewed as an image on a computer screen.

- Frequency ranges used in medical Ultrasound imaging are 2 - 15 MHz

US machine

MACHINE

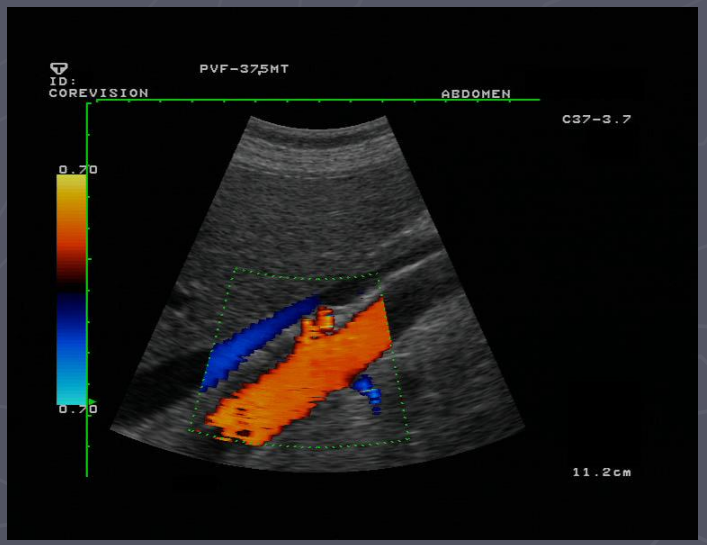
PROBES

B- MODE.

M- MODE.

DUPLEX

COLOR DOPPLER



US 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:
  to assess female pelvic organs, uterus ovaries.

- Obstetrics:
- sonography is commonly used during pregnancy to check on the development of the fetus.

Cont.

- Neurology
- for assessing blood flow and stenoses in the carotid arteries (Carotid ultrasonography)

- Neonatology:
  for basic assessment of intracerebral structural abnormalities, bleeds, ventriculomegaly or hydrocephalus.

- 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

Advantages of US

- noninvasive
- inexpensive.
- Easy and available.
- Safe and non ionizing.

Disadvantages of US

- Inability to penetrate gas or bone.
- Operator dependant.
- Less sensitive in some situations.

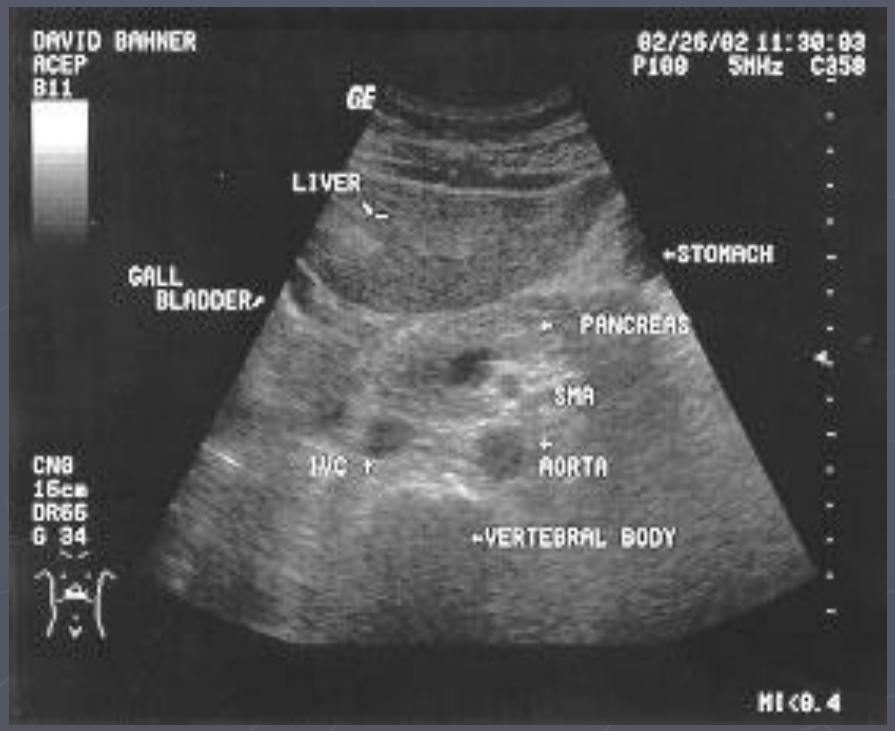
Indications of liver and gall bladder US

- Right upper quadrant pain.
- Jaundice.
- High liver function test.
- Fever work up.
- Screening for metastasis.

Normal anatomy and radiological appearance

Cont.


LIVER


DAVID BANNER
ACEP
B11
02/26/02 11:30:03
P100 5MHz C350
GE
LIVER
STOMACH
GALL BLADDER
PANCREAS
SMA
AORTA
IVC
VERTEBRAL BODY
CN0
16cm
DR66
G 34
MI<0.4

Pathology of the liver:

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

Size abnormality

- Normal liver size:
  15 cm at MCL.
- Hepatomegaly:
- Infective eg viral hepatitis.
- Neoplastic eg. Metastasis.
- Degenerative eg. early cirrhosis.
- Raised venous pressure eg. Congestive cardiac failure.
- Storage disorder eg. Amyloidosis.
- Myeloproliferative disorder eg. Polycythaemia rubra vera.

Cont.

- Small shrunken liver (Late cirrhosis):

- Shrunken liver with irregular outline
- Ascitis
- Portal hypertension.
- +- focal lesion.

Diffuse abnormality

- Diffuse increase parenchymal echogensity

(whiter than normal)

- Diffuse fatty infiltration.
- Other infiltrative:

Malignant

Infectious

Glycogen storage disease

Cont.

- Diffuse decrease in parenchymal echogensity.

(darker than normal)

- Acute hepatitis.
- Other:

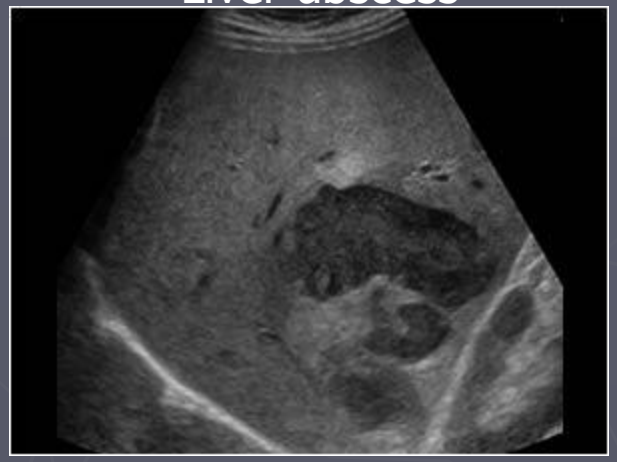
Malignant infiltration.

Focal liver lesions

- Benign tumor:
  - Hemangioma.
- Malignant tumor:
  - Primary eg. Hepatocellular carcinoma.
  - Secondary metastasis eg. Colon breast.
- Infective:
  - Abscess
  - hydated cyst.
- Congenital:
  - Hepatic cyst.

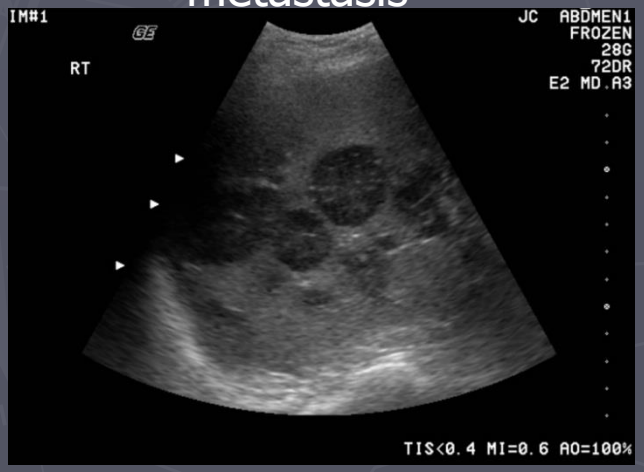
Cont.

Liver abscess



hemangiomas

metastasis



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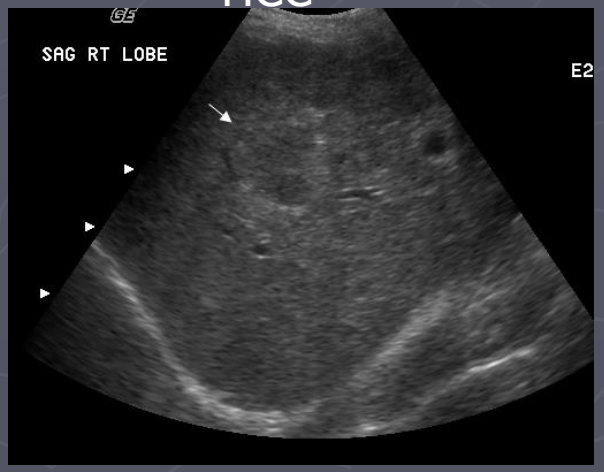

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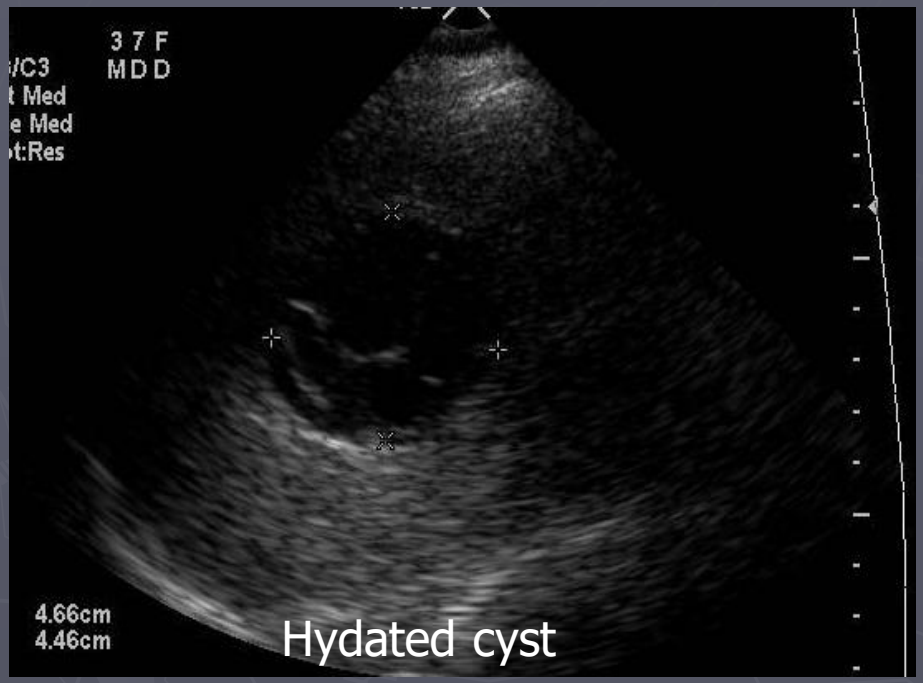


Hydated cyst

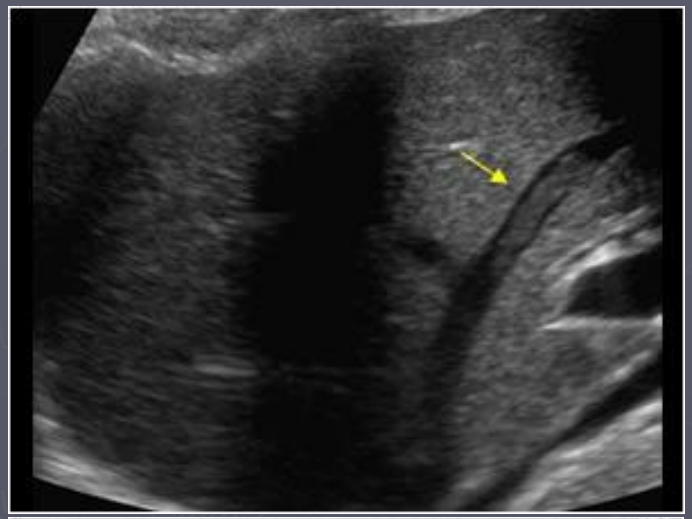
Liver cyst (multiple)

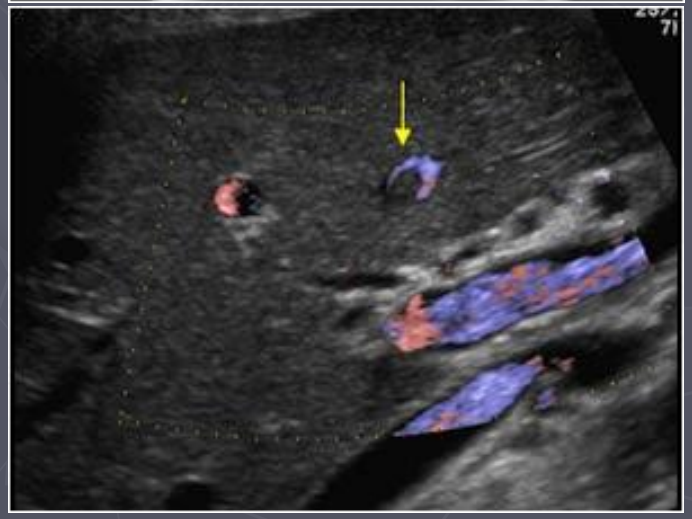
Vascular abnormality

- Portal venous system:
  - thrombosis.
  - Portal hypertension.

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

Cont.





Hepatic vein thrombosis

PV thrombosis

Biliary abnormality

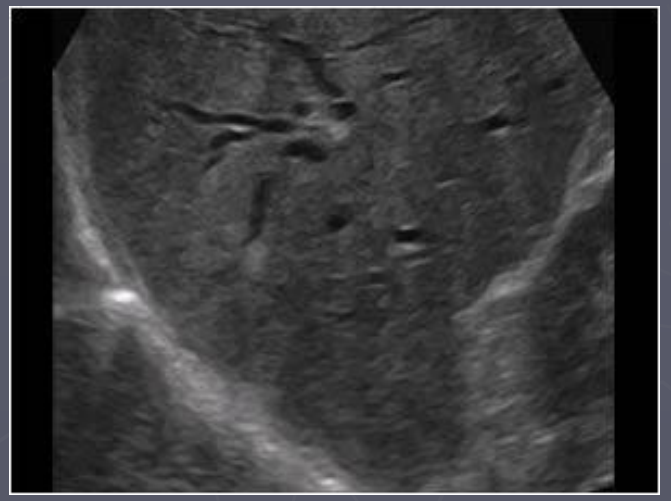
- Intra-hepatic biliary radicals.

Less than 3mm

- Extra-hepatic “CBD”

Less than 8mm

- Causes of dilatation & obstruction:
  - Intra-luminal:
    - ✓ Stone & mass.
  - Mural:
    - ✓ stricture (benign & malignant)
  - Extrinsic:
    - ✓ Compression mass & Lymph node



Pathology of gall bladder

- Intra-luminal pathology.
- Mural pathology.

Intra-luminal pathology

- Gall stone:

Acoustic shadowing

- Polyps

No acoustic shadowing.

Cont.

- Intraluminal:

  Mass lesion

  +- invasion

Gall bladder carcinoma.

Mural pathology

- Mural thickening:
- Primary:

Cholecystitis.

- Secondary:
- ✓ Cardiac failure.
- ✓ Cirrhosis.
- ✓ ascitis
- ✓ Hypoalbuminaemia
- ✓ Renal failure.

Common pathological cases

Case one

- 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.

Cont.

- Thickening of GB wall >3mm.
- Distended GB
- Pericholecystic fluid.
- Hyperemia.
- Gall stone

Acute calcular cholecystitis.

Case two

- Middle age women presented to surgical out patient clinic with 2 years history of recurrent RUQ pain mild to moderate in severity radiated to the right shoulder aggravated by fatty meal.
- On exam:

obese lady well not distressed, febrile or jaundiced.

- Lab LFTs normal.

Cont.

- Multiple oval shaped echogenic structures seen within GB causing acoustic shadowing

GB stones

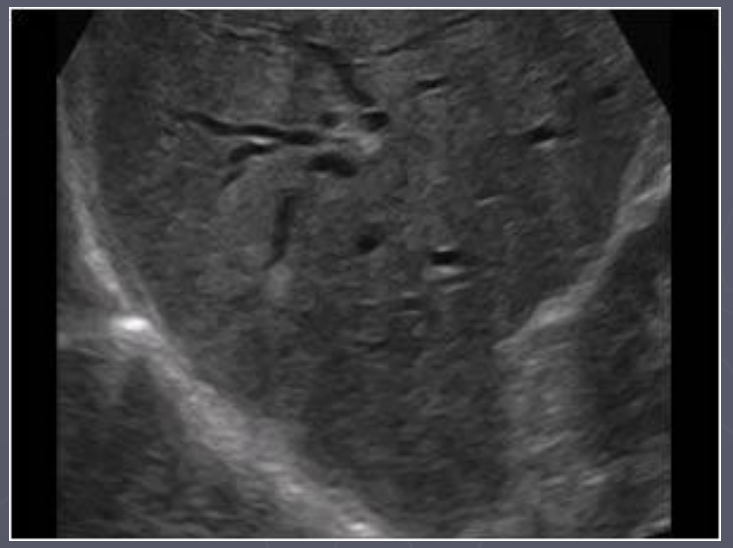
Case three

- Middle age man presented to ER with severe RUQ pain and yellowish discoloration of skin and sclera.
- On exam:

he looks ill, jaundiced and on pain but not febrile

- Lab high LFTs.

Cont.



- Dilated intra-hepatic and extra-hepatic biliary system
- Echogenic structure seen within CBD

CBD stone causing biliary obstruction.

Case Four

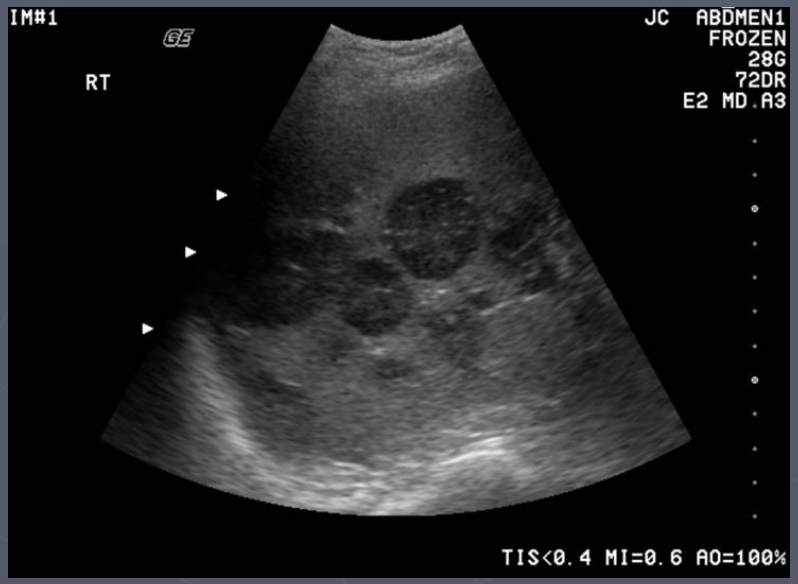
- Old man recently discovered to have colonic cancer presented to primary health care clinic with vague upper abdominal pain
- On exam:

He was thin & ill but not febrile or jaundiced.

Mild abdominal tenderness enlarged liver with irregular outline.

- Lab mildly elevated LFTs.

Cont.



- Multiple hypoechoic focal hepatic lesions

Metastatic liver lesions.

Case Five

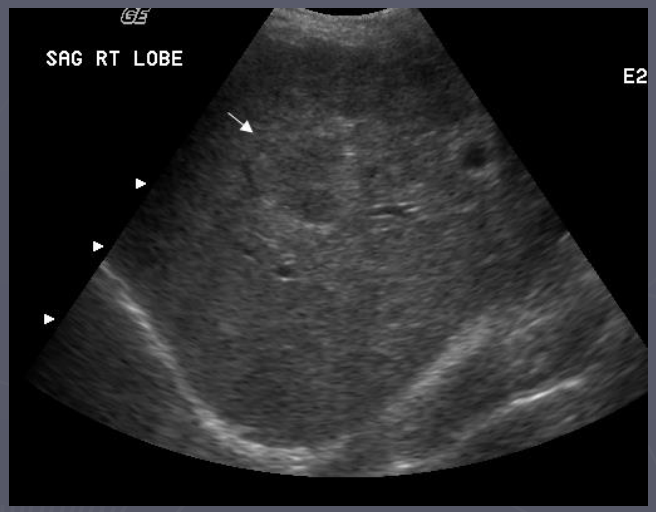
- Middle age man known case of HCV+ for 10 years presented to GI out patient clinic with history of weight loss, indigestion and mild abdominal pain. No fever.
- On exam:

He was ill, slim, mildly jaundice but not febrile.

Abdomen: bulging flanks, dilated tortuous vessels around umbilicus. Mild diffuse abdominal tenderness.

- Lab high LFTs.

Cont.



- Shrunken liver with irregular outline.
- Heterogeneous appearance.
- Focal hypoechoic lesion.

- Cirrhotic liver with HCC.

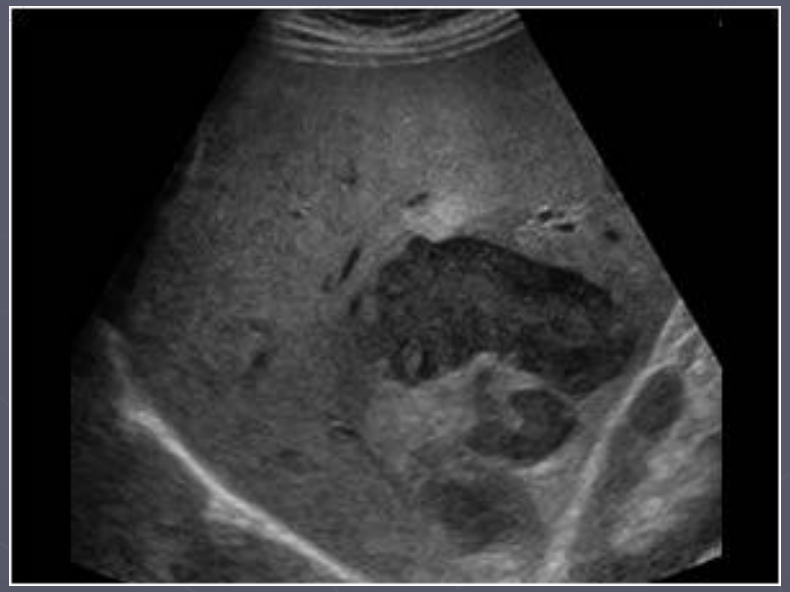
Case Six

- Young man known IV drug addict presented to ER with high fever, chills, upper abdominal pain and vomiting
- On exam:

  He looks very ill, febrile and on pain.

  Abdomen: RUQ tenderness.
- Lab high LFTs & WBC.

Cont.



- Focal hypoechoic liver lesion with ill defined outline.

Liver abscess.


thankyou
Radiology:
The Eye of
Medicine