

RADIOLOGY

GASTROINTESTINAL BLOCK

TEAM 438

Editing File

Color index:

Black: main text

Gray: Extra info

Pink: girls slides

Blue: boys slides

Red: important



US of liver and gall stone



Team leaders:



Nouran Arnous



Omar Aldosari

Team members:

Lina Alosaimi ♥

Faisal Alqifari

Rawan Alzayed

Bassam Alkhuwaitir

Moh Al-Huqbani

إنَّ الله يعطي أصعب المارك لأقوى الجنود فاستمر

Special thanks for
MAHA ALNAHDI

Objectives

1. Introduction to US.
2. Indications of liver and gallbladder US.
3. Normal anatomy and radiological appearance.
4. Pathology of liver and gallbladder.
5. Common pathological cases.

Introduction to US

Definition

a diagnostic technique in which ULTRA=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.

(Solid abdominal organs: Spleen, liver, pancreas. and extra abdominal: thyroid lymph nodes)

Frequency ranges used in medical Ultrasound imaging are 2 - 20 MHz

Advantages of US

1. non-invasive
2. inexpensive
3. easy and available
4. safe
5. non-ionizing, no radiation



MACHINE



PROBES

Disadvantages of US

1. inability to penetrate gas or bone
2. operator dependant
3. less sensitive in some situation

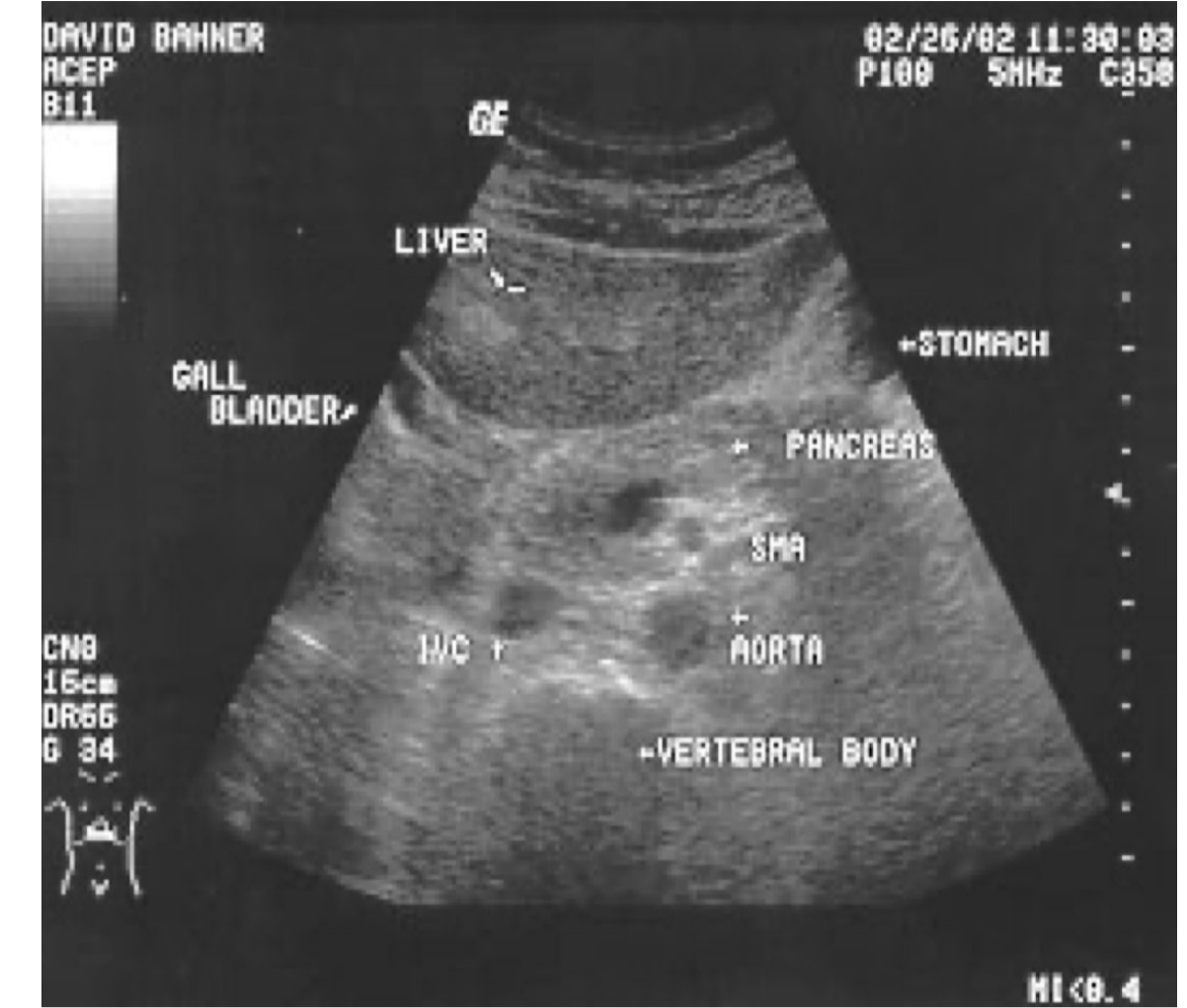
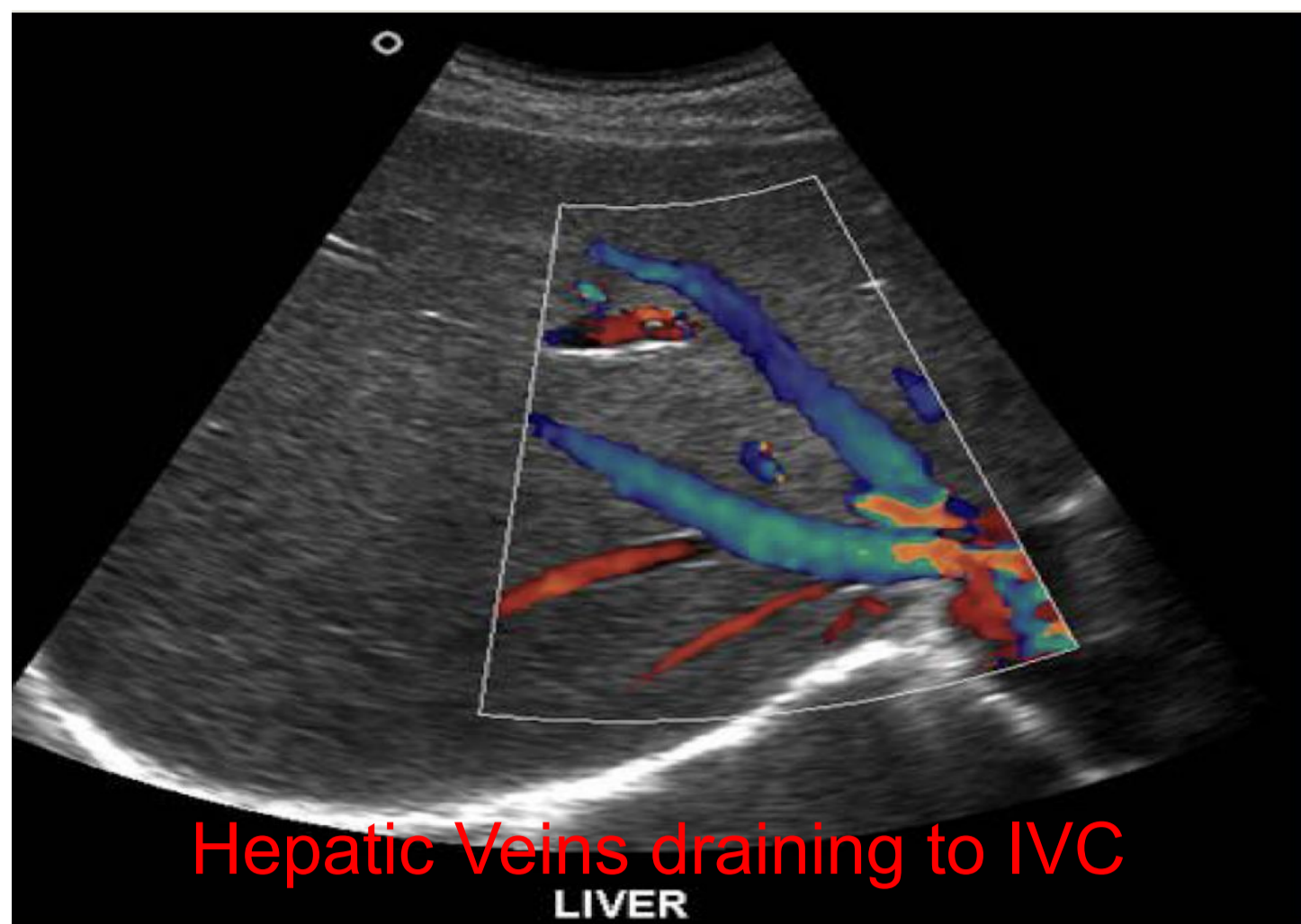
Modes of Ultrasound

<p>B-mode</p>		<p>used to assess the anatomy/structures the normal 2D</p>
<p>M-mode</p>		<p>used to assess Motions for examples we use it to assess the motion of blood in the blood vessels M= motion (eg. Vascular movements) like in DVT.</p>
<p>Duplex</p>		<p>Deeper assessment of both structure and motion of Vessels. -as we can see there's 2 images not one that's why it gives more details To assess the diastolic and systolic blood pressure.</p>
<p>Color Doppler</p>		<p>used to assess Vascularity. can study any vascularity such as artery, capillary, veins, it also assess the structure of vessels for any increased vascularity in the case of inflammation. B mode + coloring, to assess the internal vasculature. The color in the pic depend on the direction of blood flow.</p>

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, gallbladder, 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.
- **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

Normal anatomy and radiological appearance:



Interpretation	
fluids	Black
Tissue	Gray
Denser Tissue	Brighter than normal
Lights Tissue	Darker than normal



Indications of liver and gallbladder US	
Right upper quadrant pain Gallstone and cholecystitis	Jaundice Evaluate liver and pancreatic head cancer (+ weight loss).
High liver function test	Fever work up
Screening for metastasis	

Pathology of the liver:
-Size
-Diffuse liver disease
-Focal liver disease
-Hepatic vascularity
-Biliary system obstruction / pathology

SIZE ABNORMALITY

1-Hepatomegaly

- infective eg: viral hepatitis
- neoplastic eg: metastasis
- degenerative eg: Early cirrhosis
- raised venous pressure eg:
congestive cardiac failure
- storage disorder eg: amyloidosis
- myeloproliferative eg:
polycythaemia rubra Vera

2-Small shrunken liver:

- Late cirrhosis
- Shrunken liver with irregular
outline
- Ascites
- Portal hypertension
- +/- focal lesion

Key: ✨ indicates normal image

Normal liver size:

15 cm at Midclavicular line

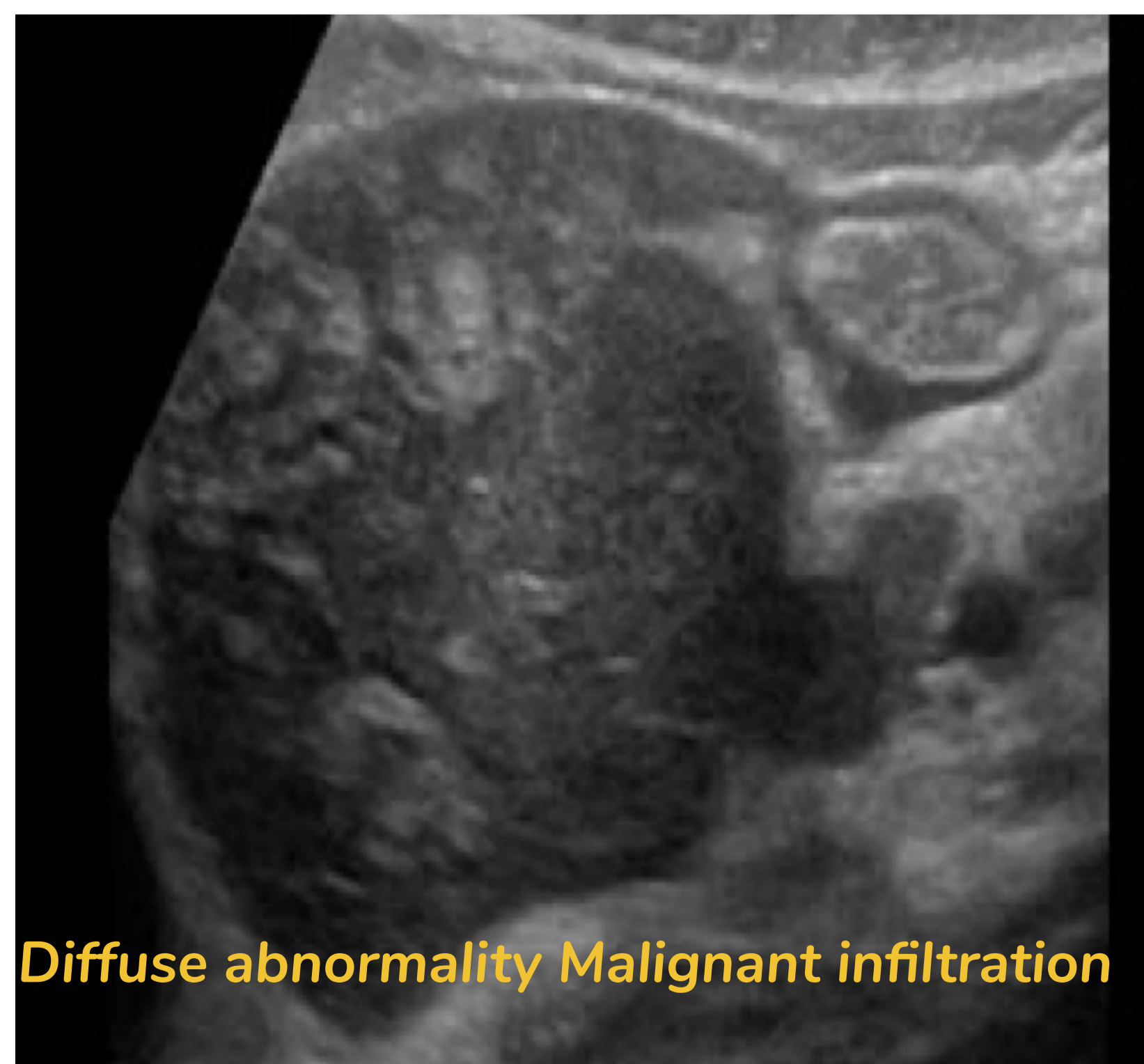
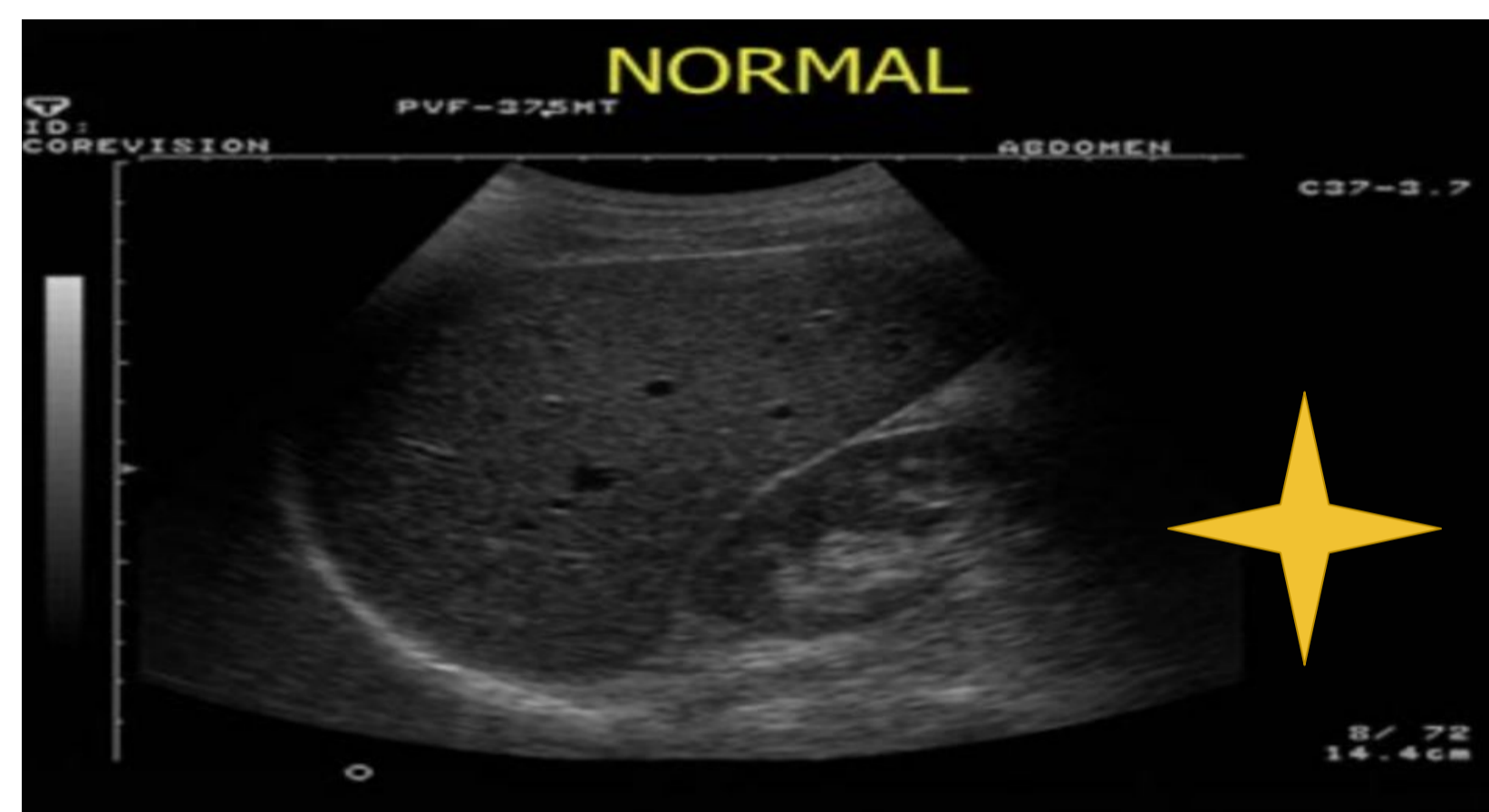
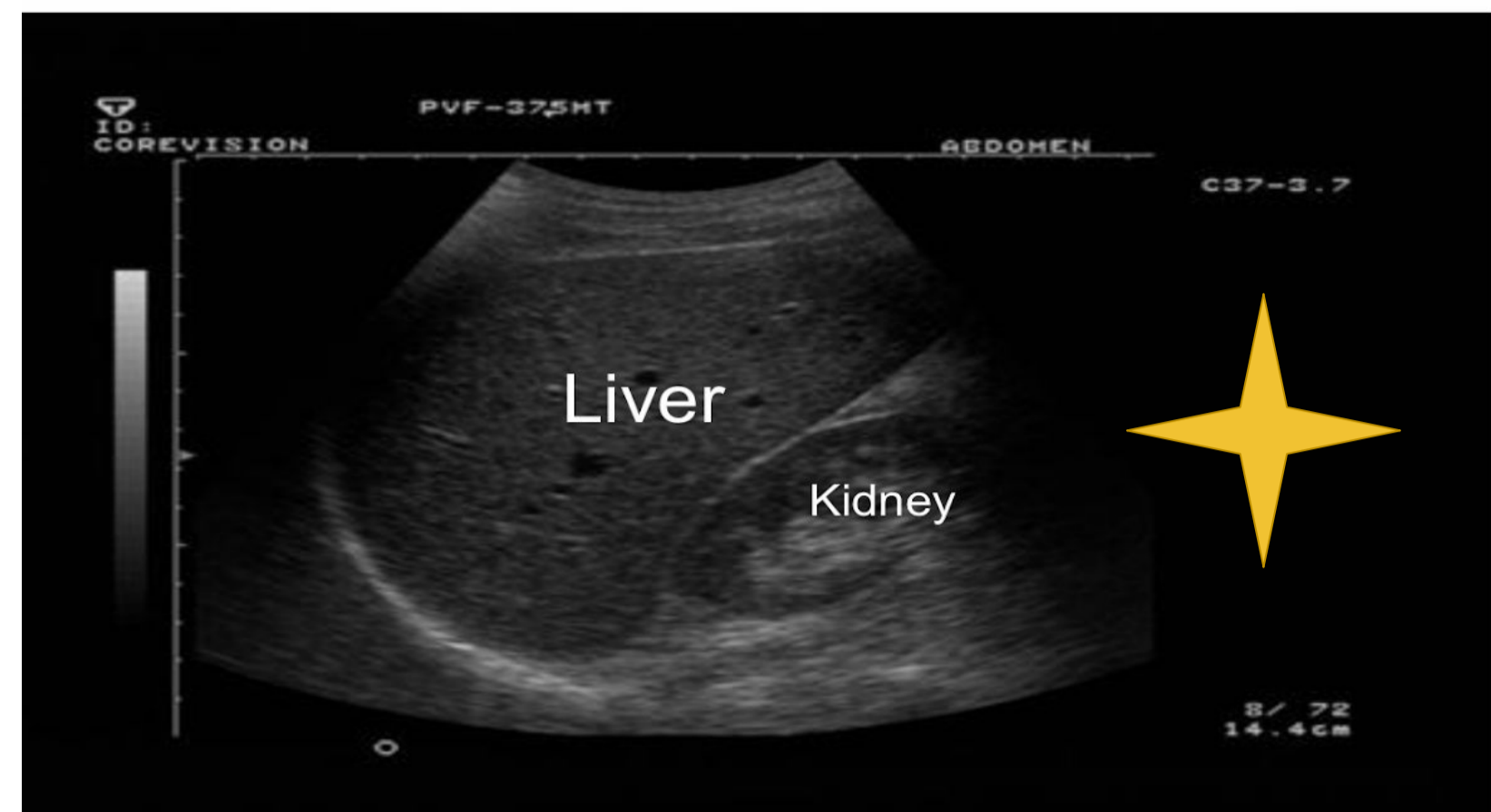
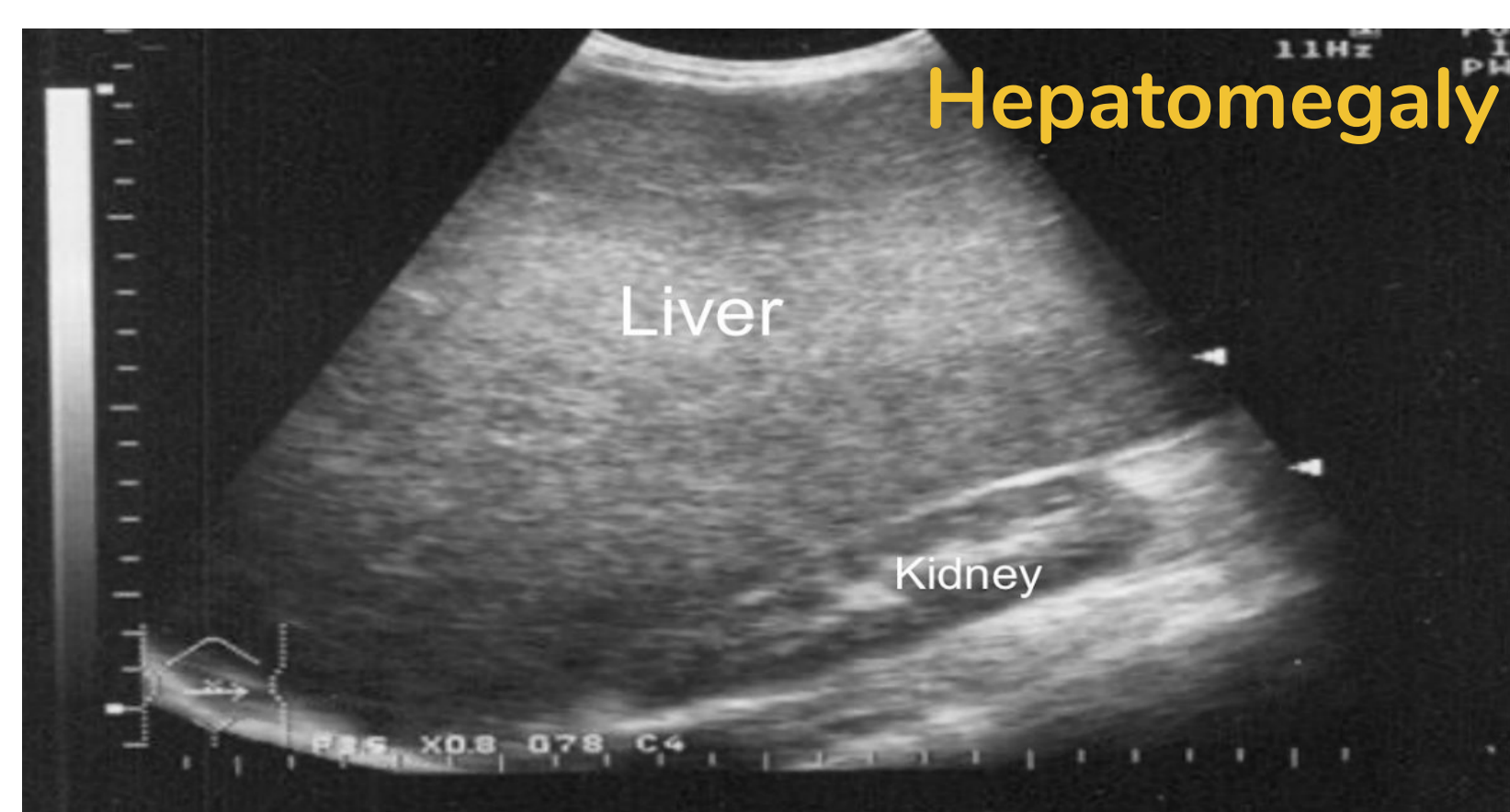
It is important to know that :

-In Early Cirrhosis → Liver enlargement

-In Late Cirrhosis → shrunken liver

how can we know if the liver is shrunken or enlarged?

check the top of the ultrasound picture if you see any space separating the liver from the anterior side of the abdomen you know it's shrunken.



Diffuse abnormality:

1-Diffuse increased parenchymal echogenicity (whiter than normal)

- Diffuse fatty infiltration
- Other infiltrative: Malignant, infectious, or Glycogen storage disease

2-Diffuse decrease in parenchymal echogenicity (darker than normal)

- Acute hepatitis
- Other : Malignant infiltration.

It can also be called hyperechogenic when it is bright or hypoechogenic when it is dark.

Focal liver lesions :

1. Benign tumor: hemangioma
Formed by a collection of excess blood vessels, and it may be visible through the skin as a birthmark, known colloquially as a “strawberry mark”
2. Malignant tumor:
 - Primary eg:
 - hepatocellular carcinoma
 - Secondary metastasis from:
 - colon breast
3. Infective:
 - Abscess
 - Hydatid cyst
4. Congenital: hepatic cyst
Cysts containing fluid that's why it's Black

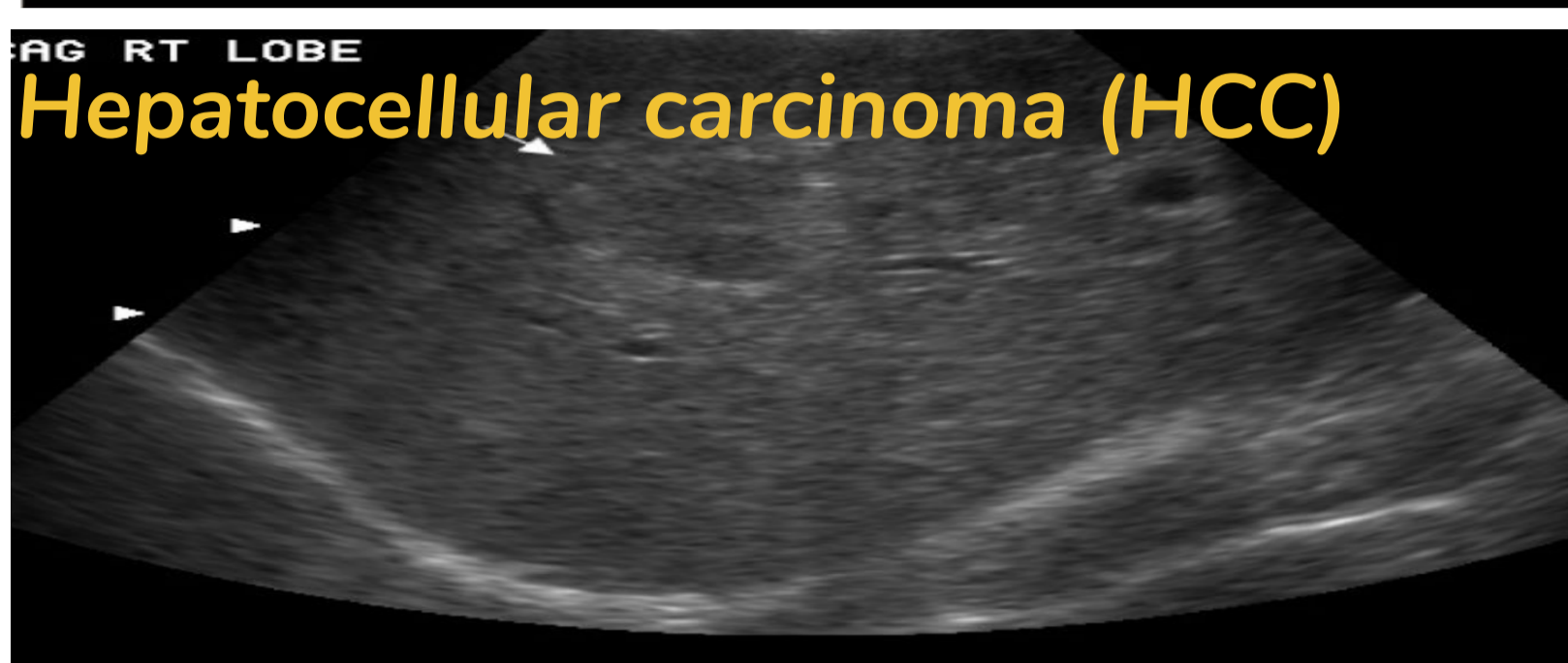
Hemangiomas



Metastasis



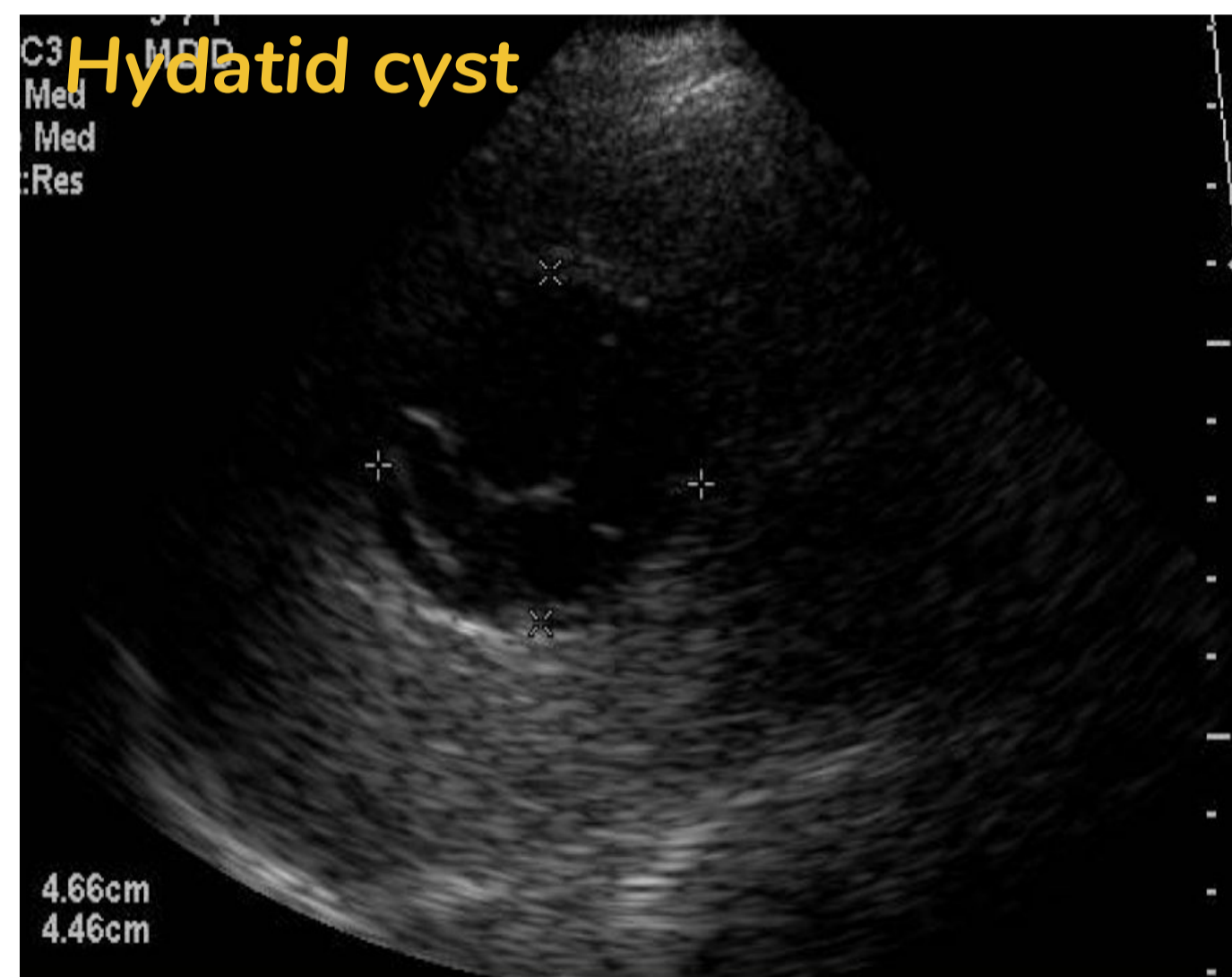
Hepatocellular carcinoma (HCC)



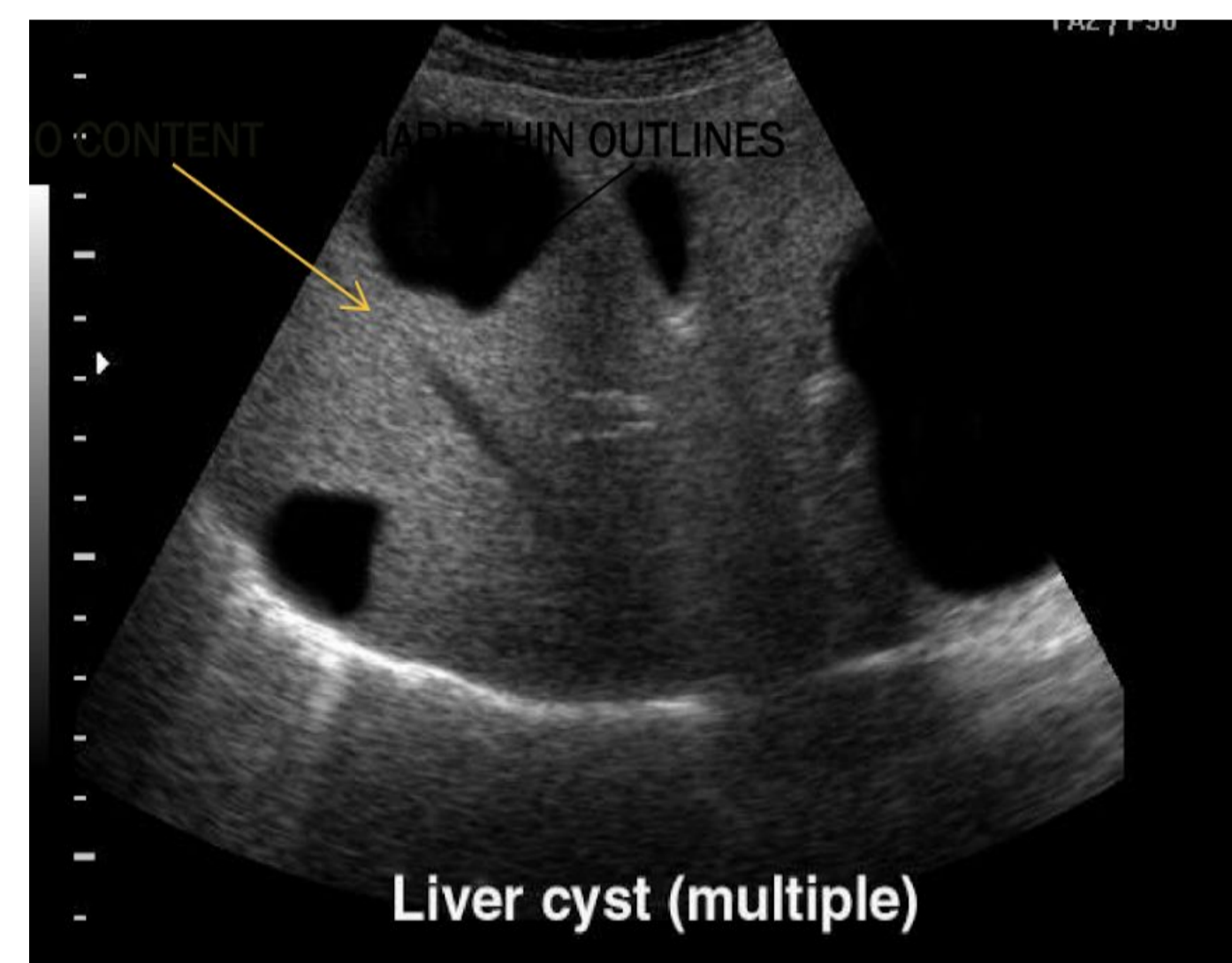
Liver abscess



Hydatid cyst



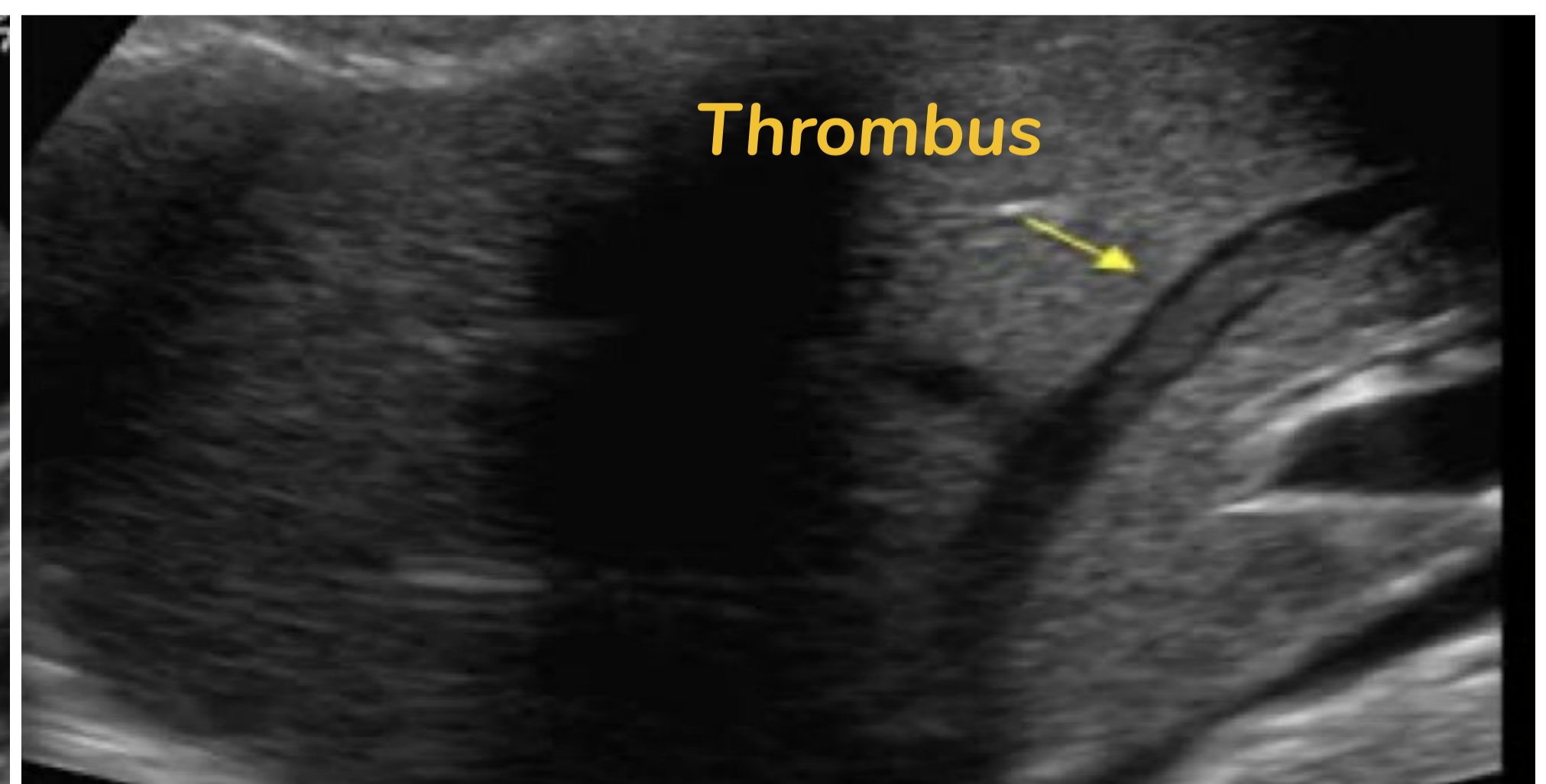
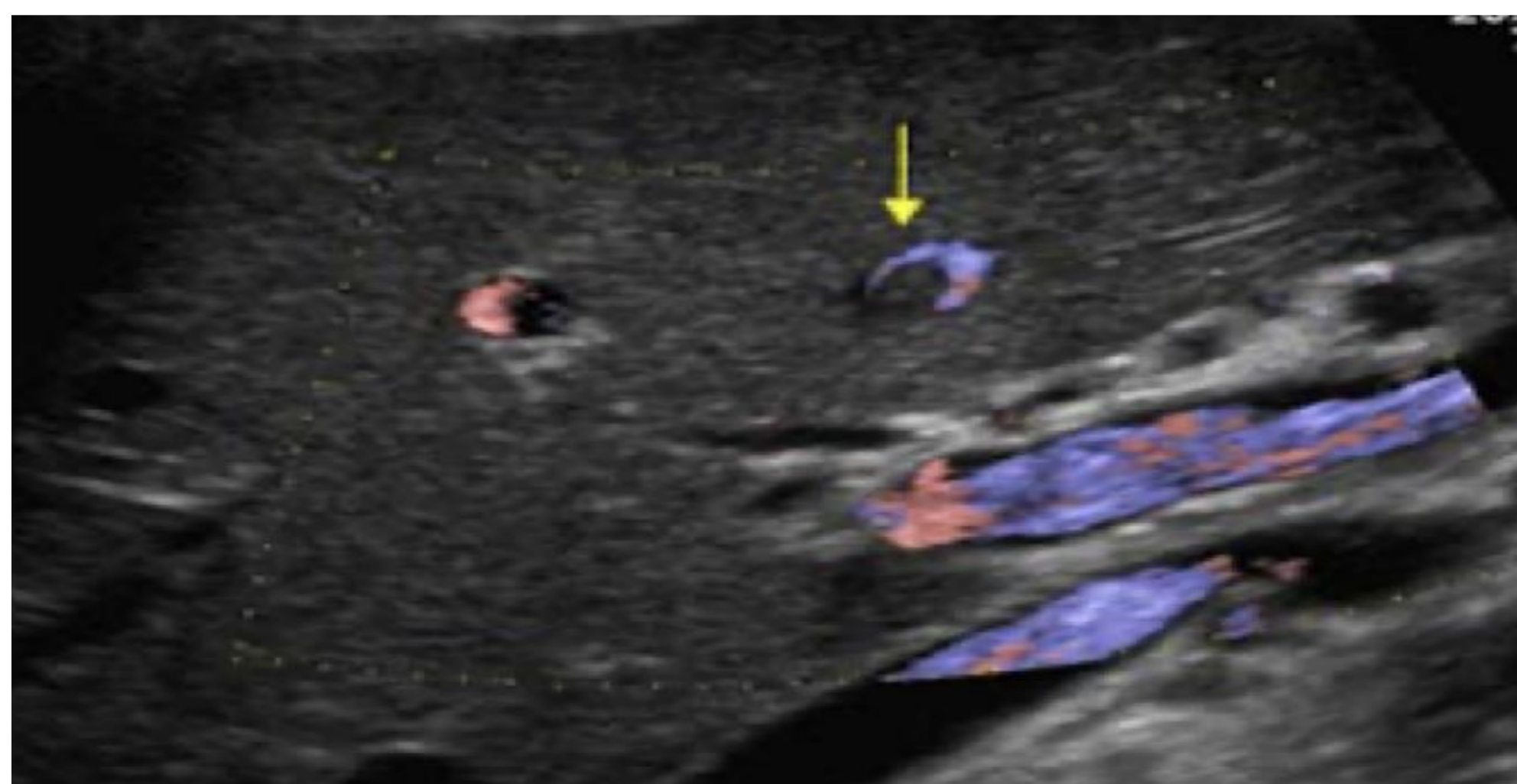
distal acoustic enhancement (fluid signal)



Vascular abnormality:

1. portal venous system:
 - ❖ thrombosis \ portal hypertension
2. Hepatic venous system:
 - ❖ thrombosis \ Budd Chiari syndrome*

*A very rare condition, affecting 1 in a million adults. The condition is caused by occlusion of the hepatic veins that drain the liver. It presents with the classical triad of abdominal pain, ascites, and liver enlargement.



Hepatic vein thrombosis

Biliary abnormality:

1-Intra-hepatic biliary radicals:

Less than **3mm**

2-Extra-hepatic"common bile duct":

Less than **8mm** More than this is considered dilatation.

Causes of dilatation & obstruction:

❖ Intraluminal:

➤ Stone & mass.

❖ Mural:

➤ stricture

■ benign(such as transplantation)

■ malignant

❖ Extrinsic:

➤ Compression mass & Lymph node

Pathology of gallbladder:

1. Intra-luminal pathology

❖ **Gall stone :**

acoustic shadowing

Why shadowing occurs? because waves can't penetrate the stones and it will be reflected as a shadow.

❖ **Polyyps :**

No acoustic shadowing

❑ Intraluminal :

- Mass lesion
- +/- invasion
- gall bladder carcinoma

2. Mural pathology (Mural thickening)

❖ Primary :

cholecystitis

Abnormalities \ **Ultrasound findings:** thickening of the wall of the gallbladder wall, +/- Stone (cholecystitis can be calcular or acalular)

❖ Secondary:

Cardiac failure.

Cirrhosis.

ascites.

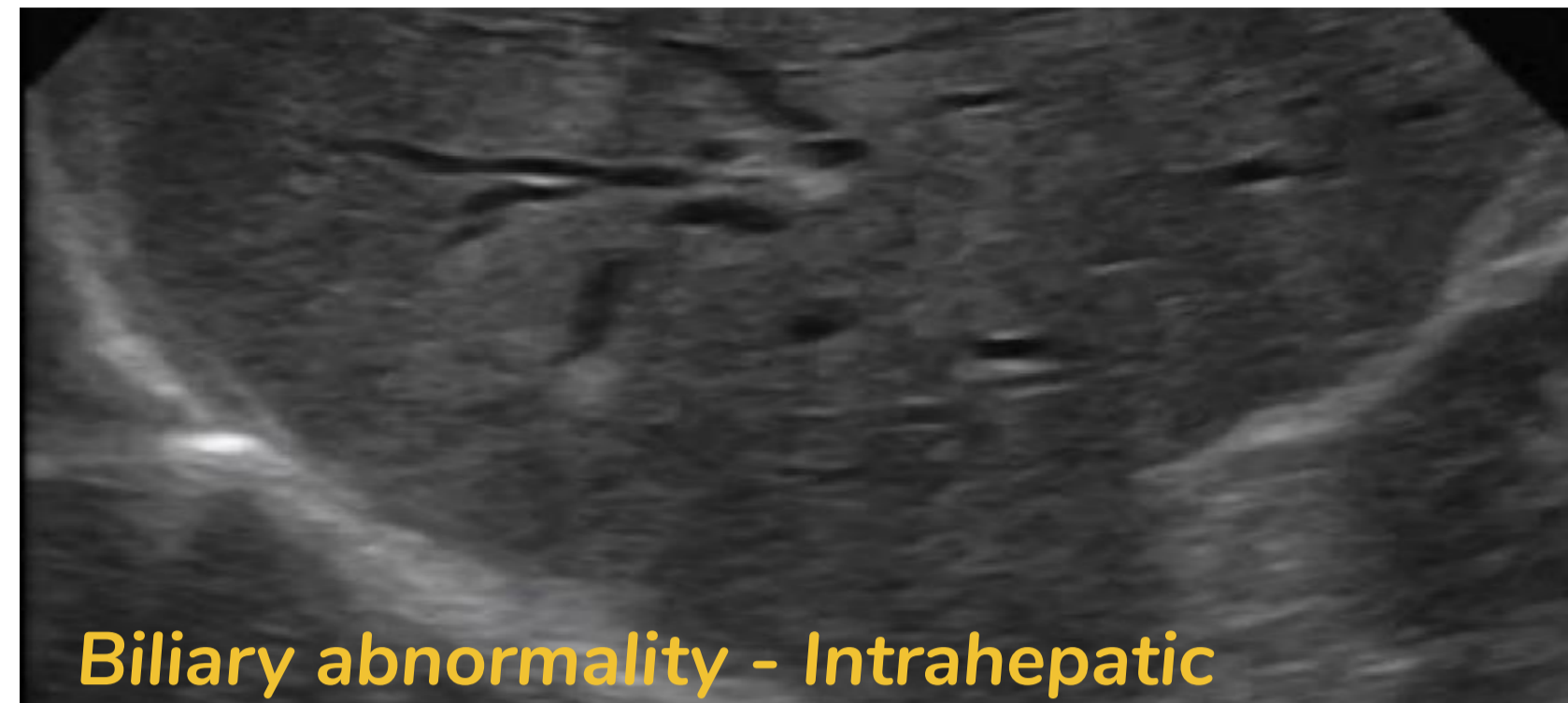
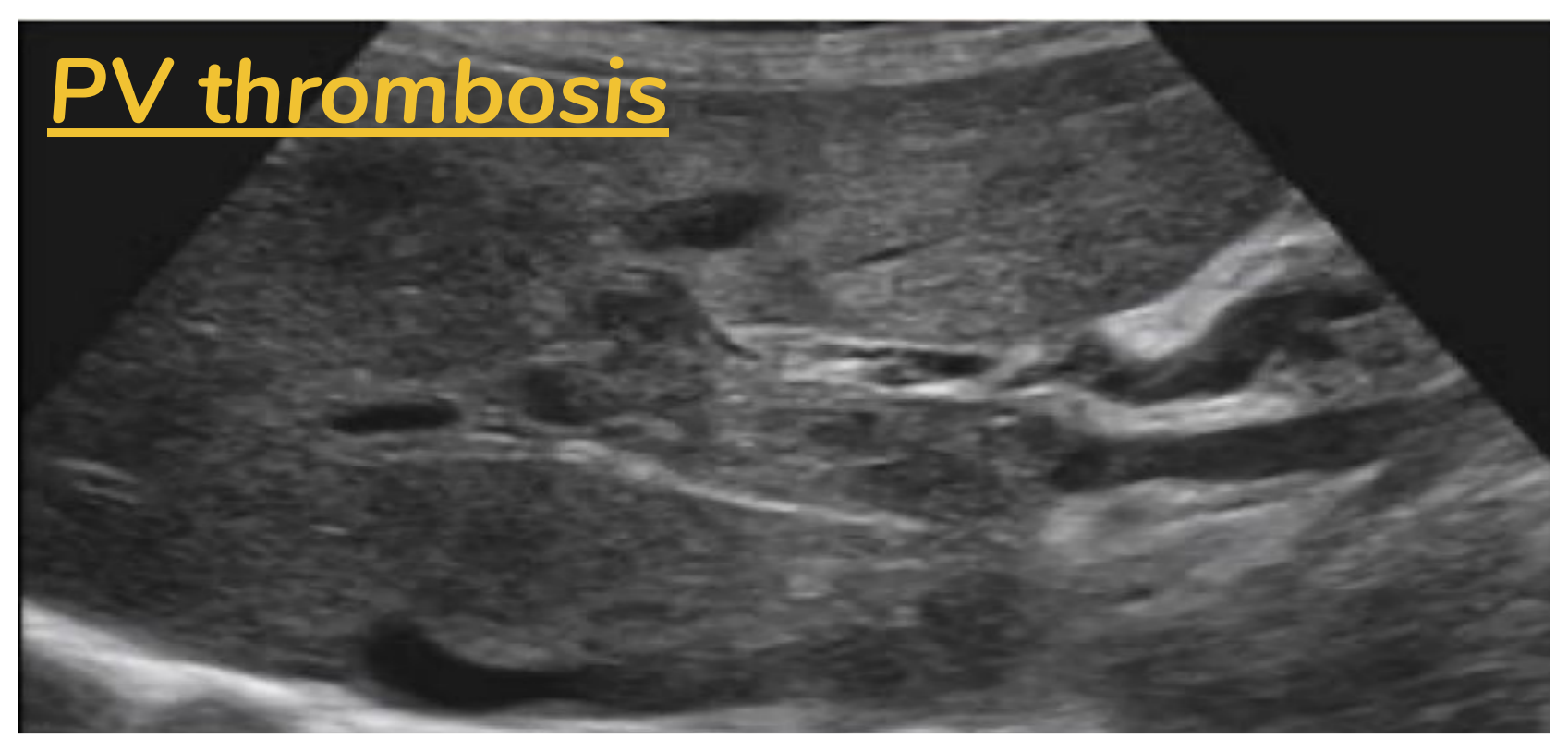
Hypoalbuminemia.

Renal failure.

How did we know?

the whole gallbladder should appear black since it's holding fluid which is anechoic, in this case we can see some tissue inside the gallbladder which appear

PV thrombosis



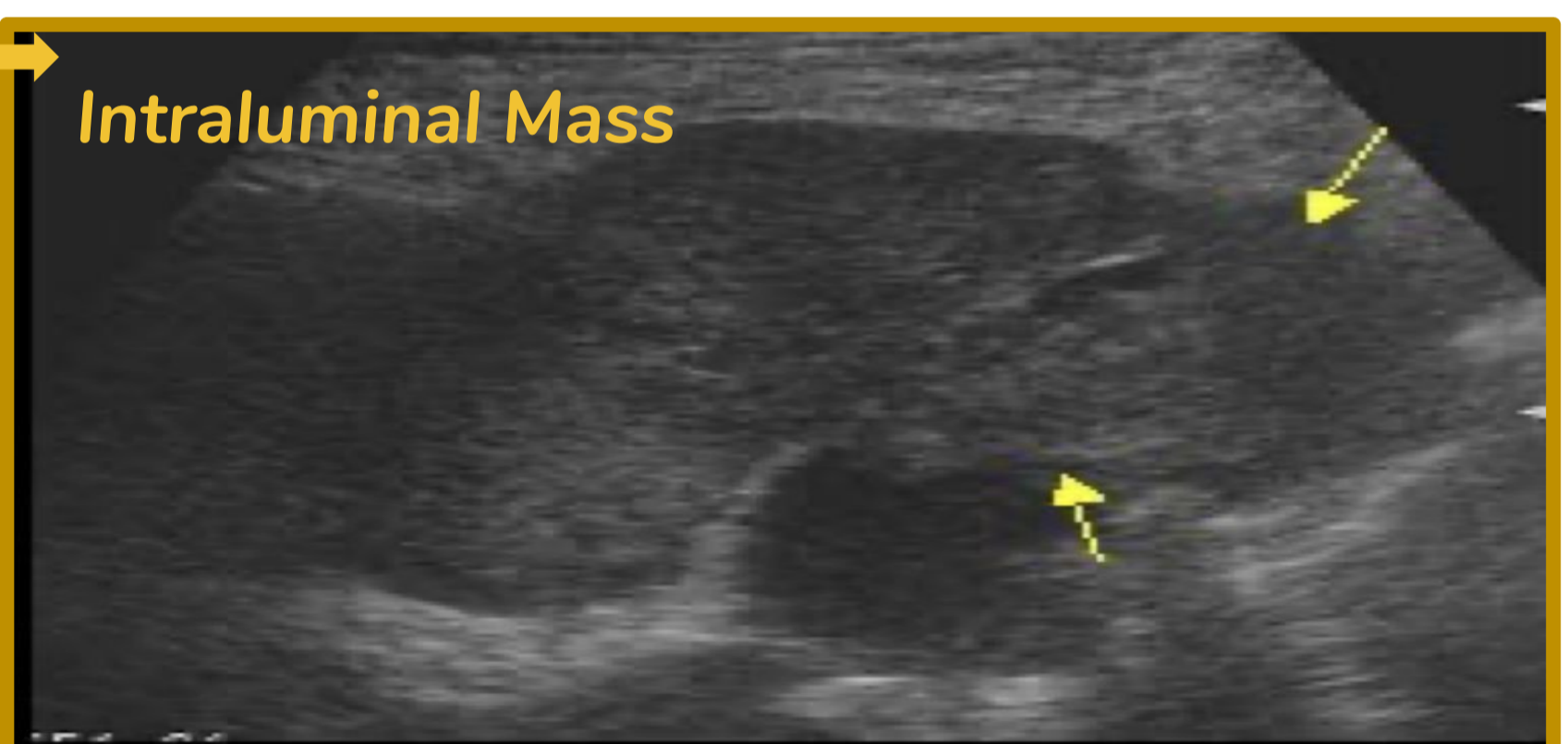
Biliary abnormality - Intrahepatic



Biliary abnormality - Extrahepatic



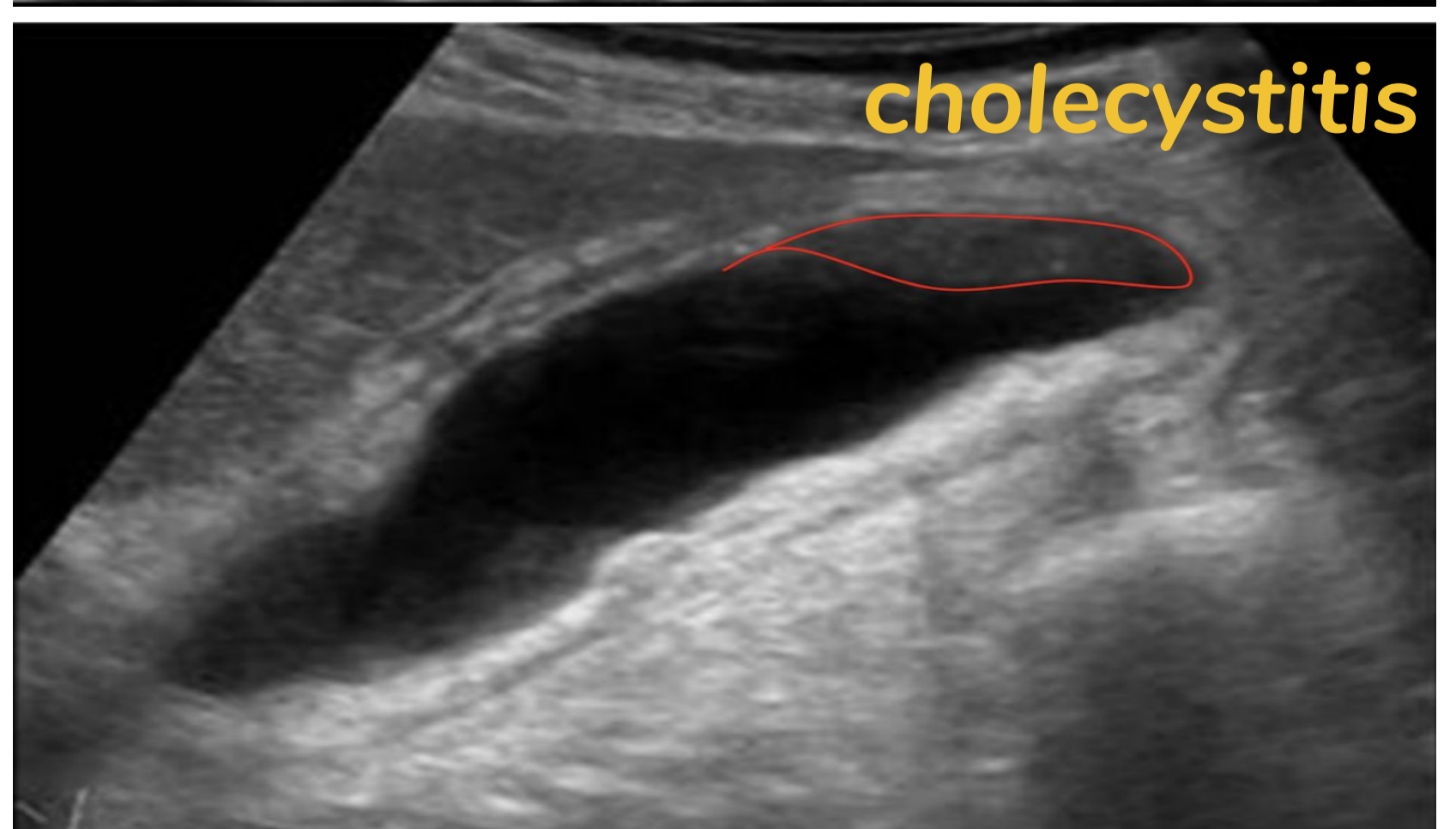
Gallstones



Intraluminal Mass



Polyyps



cholecystitis

Cases from the slides

CASE 1 :

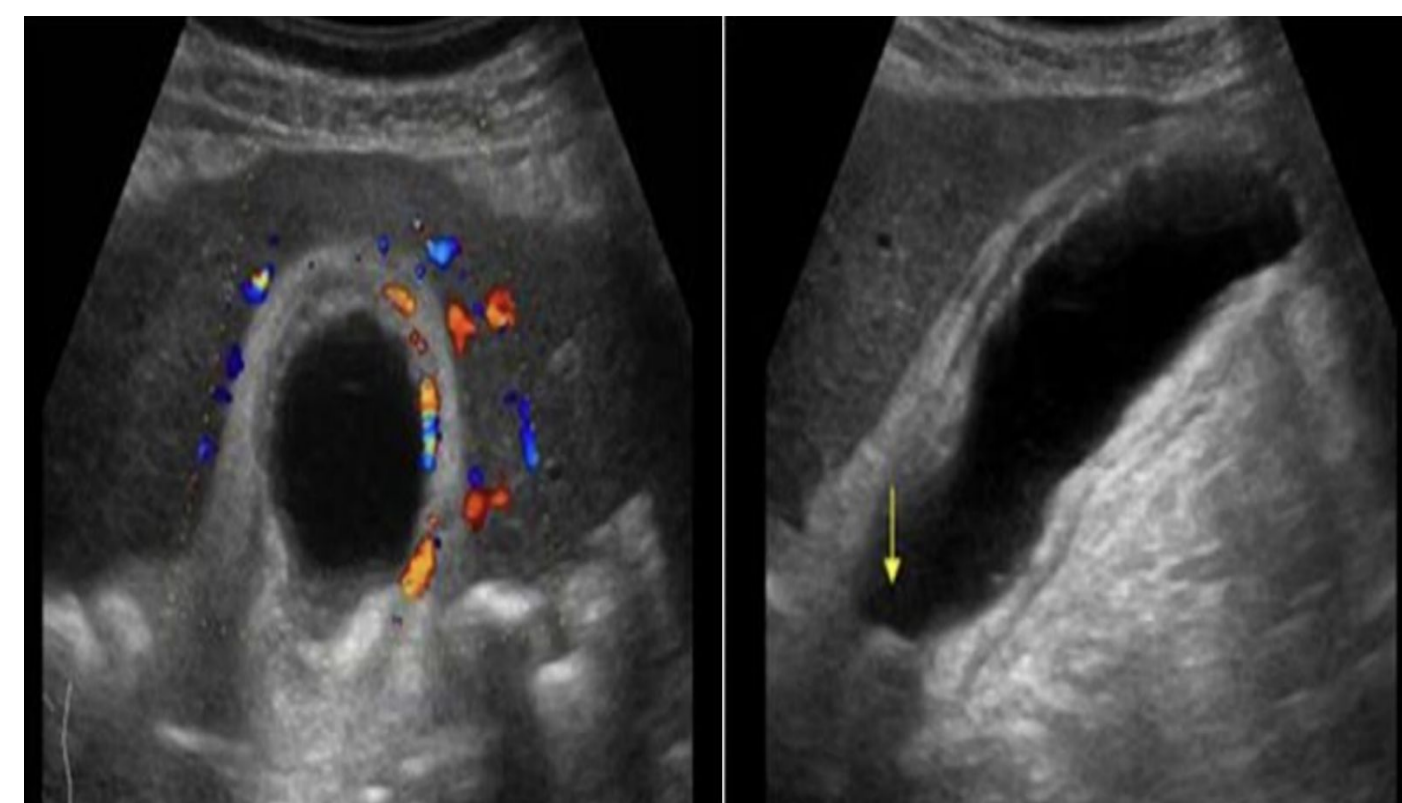
Middle age women presented to ED with fever RUQ (Right upper quadrant) pain

On exam: She looks ill, febrile and on pain

Abdomen: Right upper quadrant tenderness + Lab high LFTs & WBC.

Diagnosis: **Acute calculous cholecystitis.**

Differential diagnosis: Hepatitis.



Case 2 :

Middle age women presented to surgical outpatient 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.

Diagnosis: **GB stones.**



Case 3 :

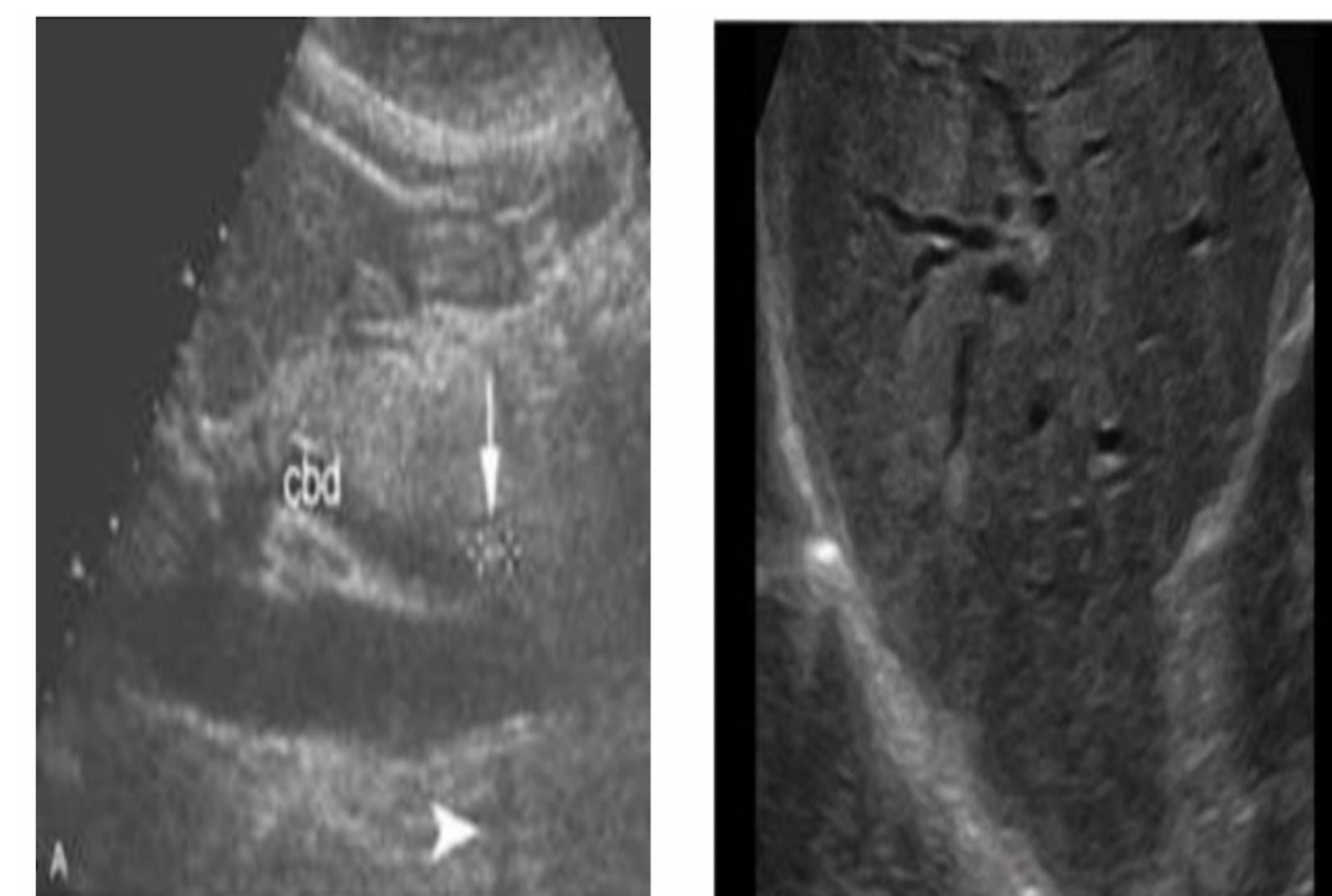
This case is advanced

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.

Diagnosis: **common bile duct stone causing biliary obstruction.**



Case 4 :

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.

Diagnosis: **Metastatic liver lesions.**



Case 5 :

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

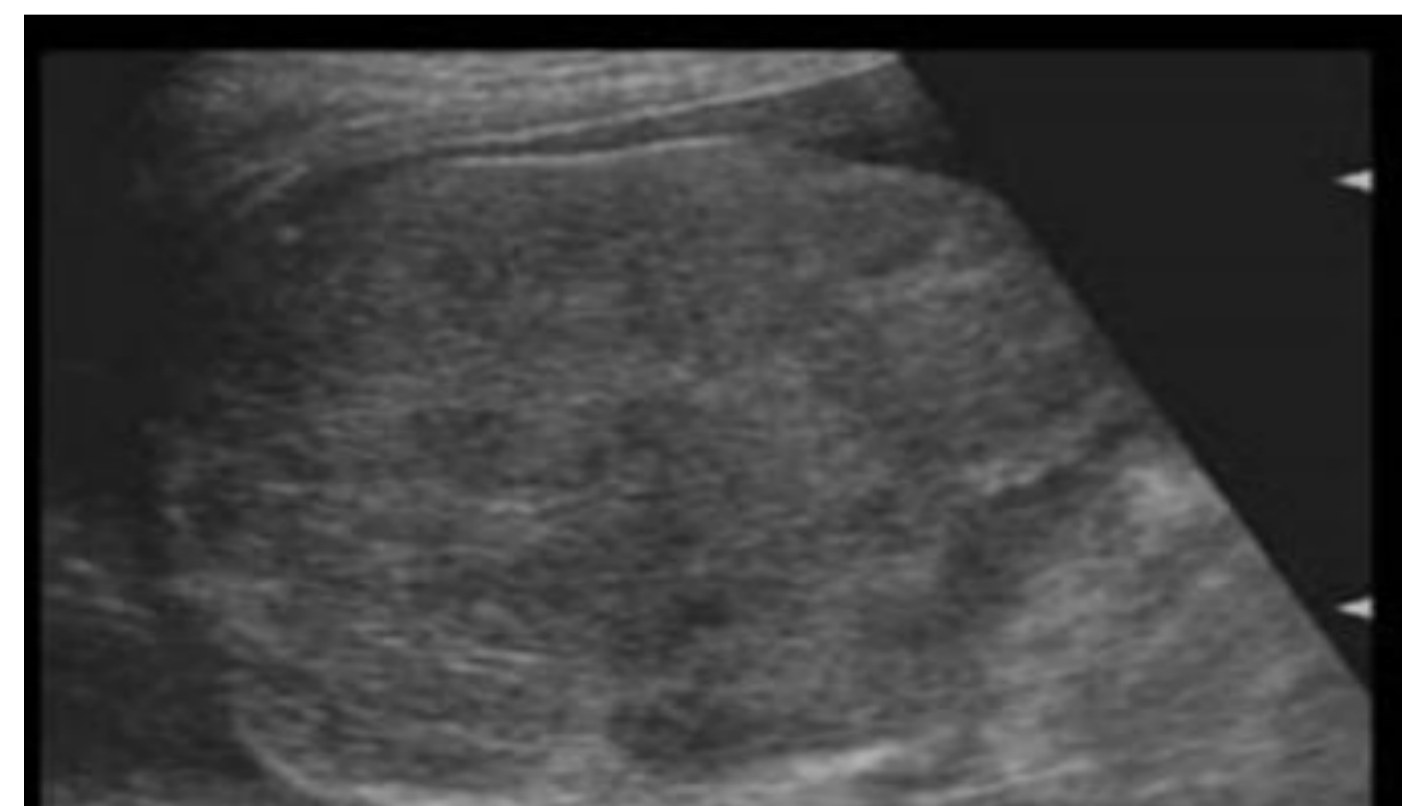
On exam: he was ill, slim, mildly jaundice not febrile.

Abdomen: bulging flanks, dilated tortuous vessels around umbilicus.

Mild diffuse abdominal tenderness.

Lab high LFTs.

Diagnosis: **Cirrhotic liver with HCC Hepatocellular carcinoma.**



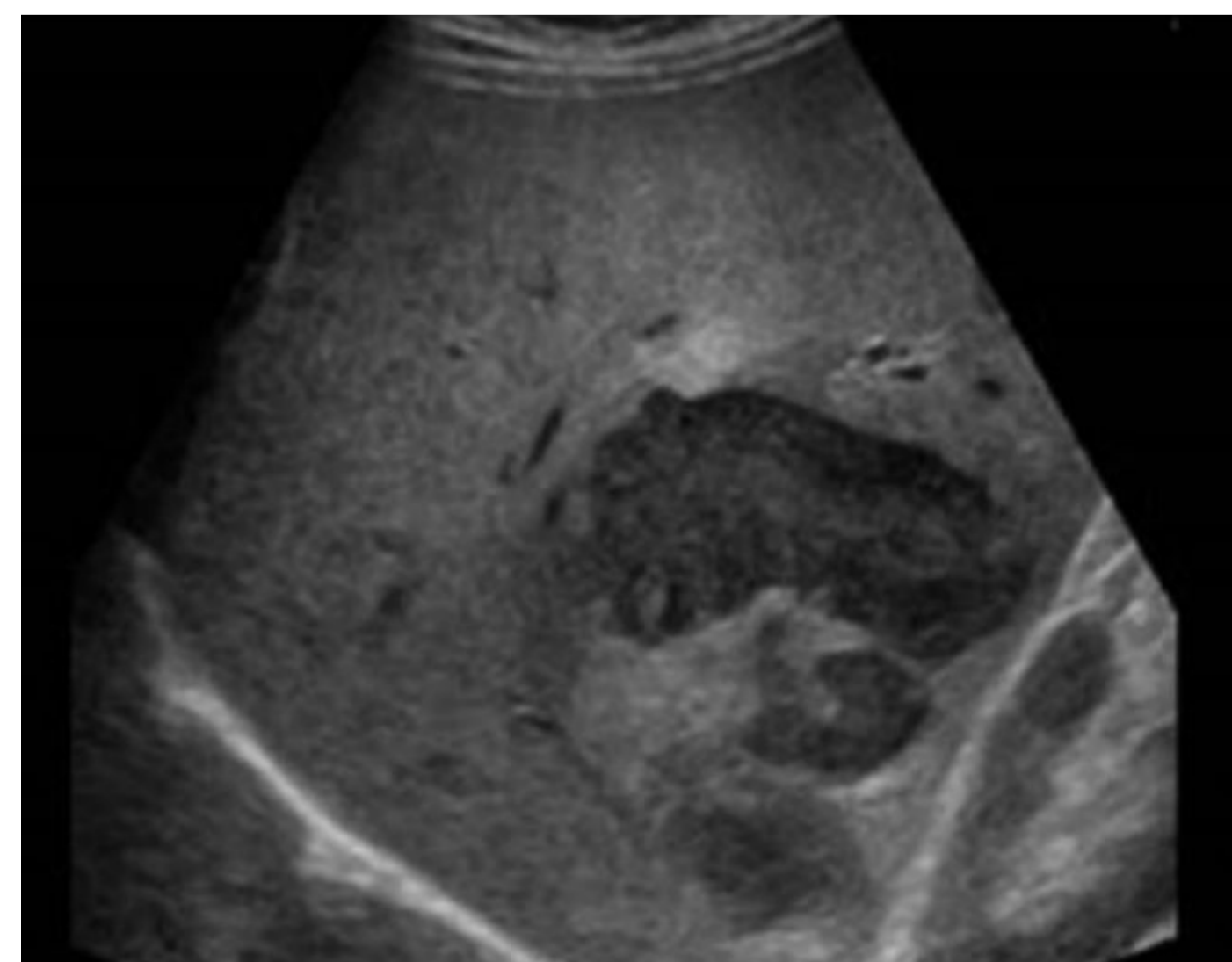
Case 6 :

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.

Diagnosis: **Liver abscess.**



Summary

Ultrasound

Advantages of US

1. non-invasive
2. inexpensive
3. easy and available
4. safe
5. non-ionizing, no radiation



Disadvantages of US

1. inability to penetrate gas or bone
2. operator dependant
3. less sensitive in some situation

Pathology of gallbladder:

1. Intra-luminal pathology

❖ Gall stone :

acoustic shadowing

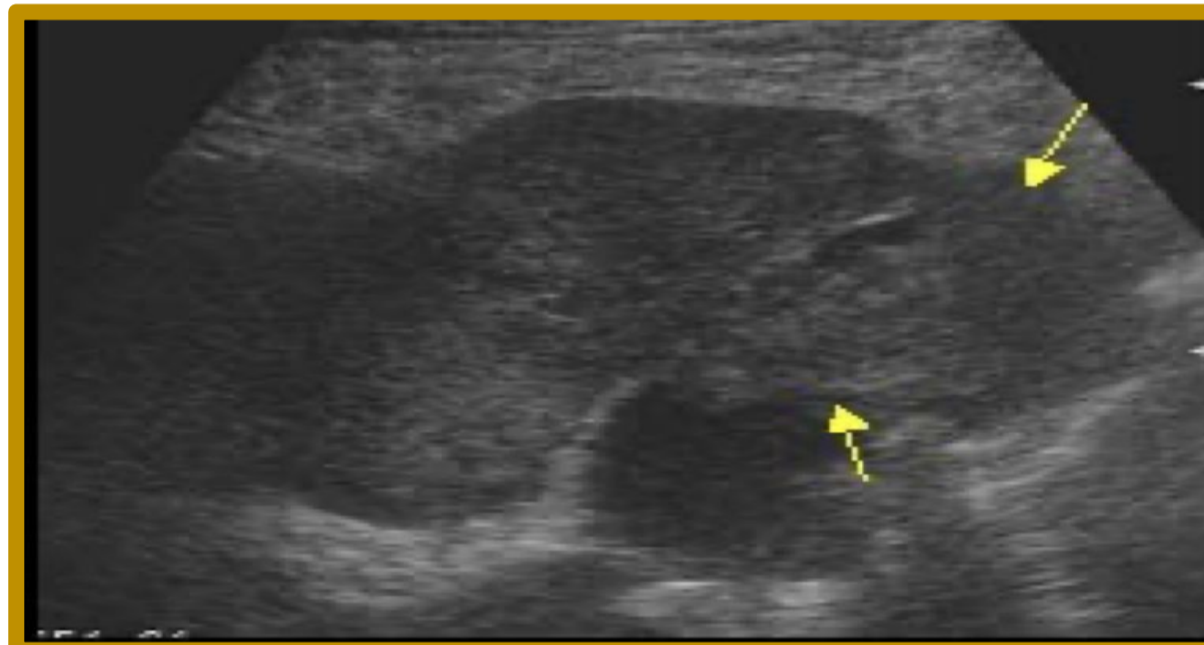
Why shadowing occurs? because waves can't penetrate the stones and it will be reflected as a shadow.

❖ Polyps :

No acoustic shadowing

☐ Intraluminal :

- Mass lesion
- +/- invasion
- gall bladder carcinoma



2. Mural pathology (Mural thickening)

❖ Primary :

cholecystitis

Abnormalities \ Ultrasound findings:

thickening of the wall of the gallbladder wall, +/- Stone (cholecystitis can be calcular or acalular)

❖ Secondary:

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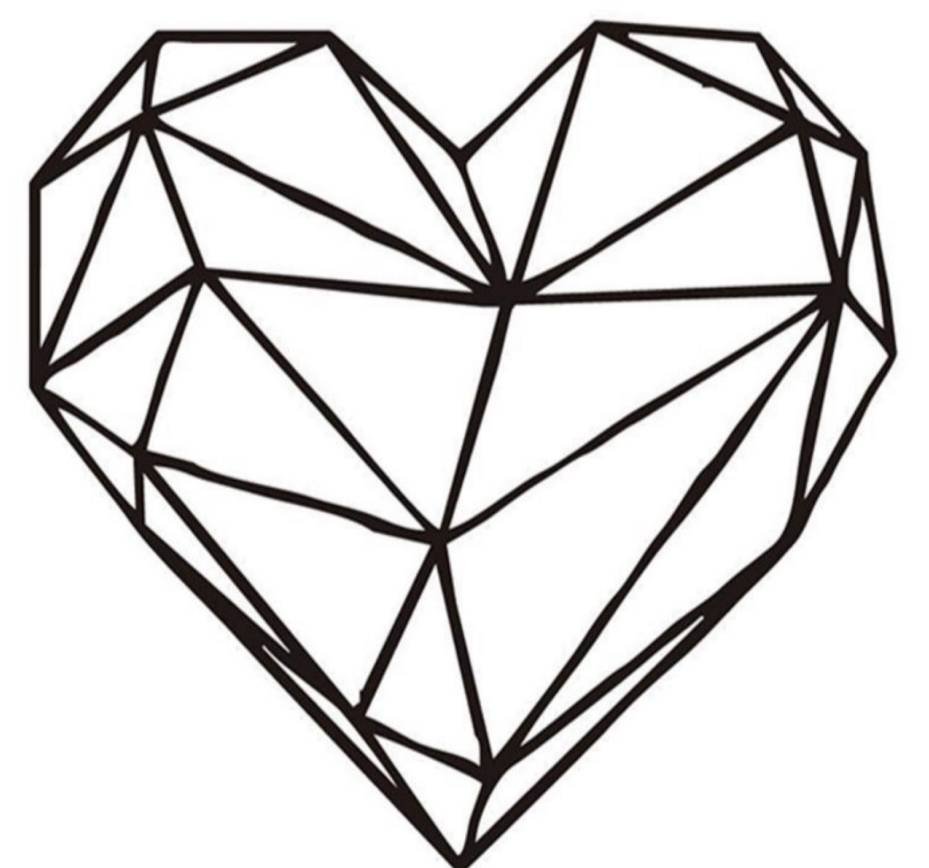
Hypoalbuminemia.

Renal failure.

How did we know?

the whole gallbladder should appear black since it's holding fluid which is anechoic, in this case we can see some tissue inside the gallbladder which appear

Don't
Wait
For
The
Opportunity
Create
it!



■ Cases from the Doctor

1- Patient presented to the emergency with severe abdominal pain (right upper quadrant pain) and fever . They are suspecting gallstones, what is the first modality to start with ?

Ultrasound

2- Patient complaining of abdominal pain, we did an US for him and we found multiple echogenic structures with posterior Acoustic shadowing, what is the most likely diagnosis?

Gallstones

3- Patient complaining of abdominal pain, we did an US for him and we found multiple echogenic structures with NO posterior Acoustic shadowing, what is the most likely diagnosis?

Polyyps

4- Patient complaining of abdominal pain, we did an US for him and we found diffuse thickening of the gallbladder wall with pericholecystic fluid, what is the most likely diagnosis?

Acute cholecystitis

5- Patient complaining of abdominal pain, US showed diffuse thickening of the gallbladder wall with pericholecystic fluid and posterior Acoustic shadowing, what is the most likely diagnosis ?

Acute cholecystitis with gallstones

6- Mention one of the disadvantages of the US ?

Operator dependent

Don't quit ! suffer now and live the rest of your life as a champion

Quiz :

1 - what is the advantage of using ultrasound?

- A - Ionizing
- B - Less sensitive
- C - Operator dependant
- D - Non invasive

2 - which of the following can cause small shrunken liver?

- A - viral Hepatitis
- B - Tumors
- C - Late cirrhosis
- D - Congestive heart failure

3 - Which one of the following modes is used to asses the anatomy and Structures of the liver ?

- A - M Mode
- B - A Mode
- C - B Mode
- D - E Mode

4 - 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 is the definition of ?

- A - CT
- B - MRI
- C - X RAY
- D - Ultrasound

5 - Which of the following is considered a disadvantage of ultrasound?

- A - Operator dependent
- B -Inexpensive
- C -Easy
- D -Safe

6 - patient complaining from abdominal pain and we found diffuse thickening wall of gallbladder with pericholecystic fluid on US , what's the diagnosis ?

- A - Gallstones
- B - Acute cholecystitis with gallstones
- C - Acute cholecystitis
- D - None of the above

7- patient complaining from abdominal pain and we found multiple structures without shadowing

What's the diagnosis ?

- A - Liver enlargement
- B - Cholecystitis
- C - Gallstones
- D - Polyps

8 - which of the following shows acoustic shadowing ?

- A - Polyps
- B - Liver
- C - Spleen
- D - gallstones