



RADIOLOGY

TEAM 435

Radiology of diseases of the hepato-biliary system

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● Done by:

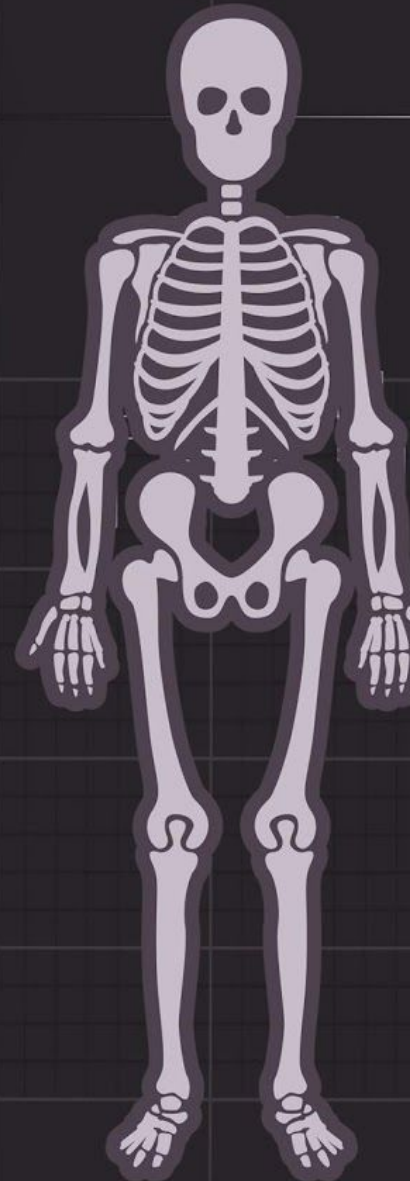
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➤ CASE 1:

45 year-old female with RUQ pain radiating to right shoulder and aggravated by fatty meals associated with vomiting

What is the most likely diagnosis? **Gall stone +/- cholecystitis**

What is the best radiology modality to start with? **Ultrasound**

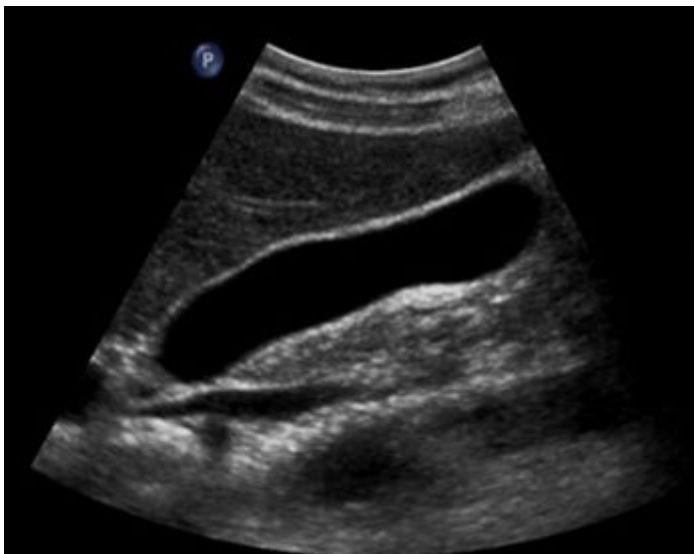
★ Why not X-Ray?

1. Not good at picking up gallstones you can only see less than 10%, so you will miss 90%.
2. It doesn't provide enough information about the gallbladder. you can't see inflammation.

★ Why not CT? can't see fat

★ Why not MRI? too complicated

Normal Gallbladder



Abnormal Gallbladder



- What is abnormal?

This is an image of gallbladder with:

1. hyperechoic structure.
2. posterior acoustic shadow.
3. diffusely thickened wall (Acute calculous cholecystitis).

- How do you know it's a stone?

We have white structure "hyperechoic" with shadow (classic gallstone).

- What are the most common features of acute cholecystitis in ultrasound?

→ Thickening of the gallbladder wall (more than 3mm).

→ Gallbladder distension (Usually happen when there is stone → cause obstruction → bile doesn't go out → distension).

→ Surrounding fluid (as in any inflammation).

→ With gallstone (calculous cholecystitis) or without stone (Acalculous cholecystitis)

- What is the difference between the two images?

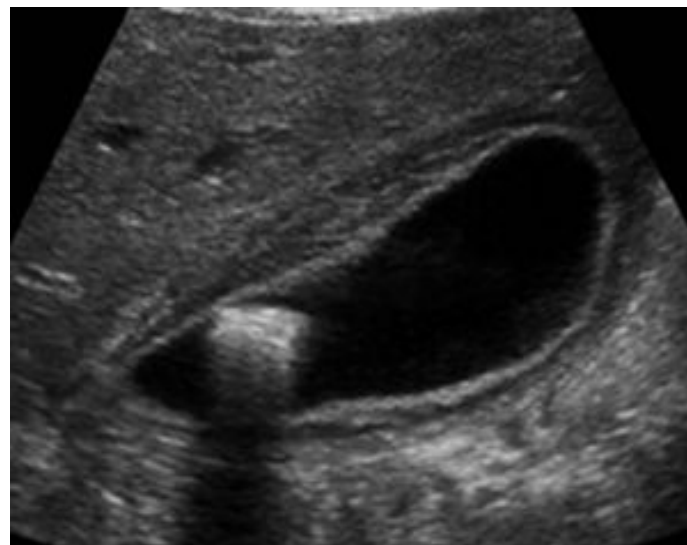
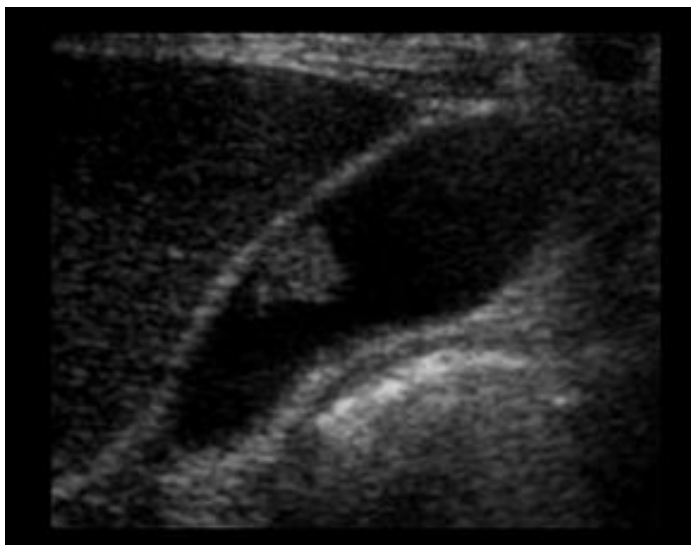


Stone **WITHOUT** inflammation:

- The stone is within the body of gallbladder
- The Wall is normal
- There is no inflammation.

Stone **WITH** inflammation:

- The Stone is in the neck
- The Wall is thickened
- There is inflammation



WITHOUT acoustic shadow (GB **polyp**)

- Filling defect
- No shadow
- There is no inflammation.
- It is a mass "gallbladder Polyp" could be benign or malignant

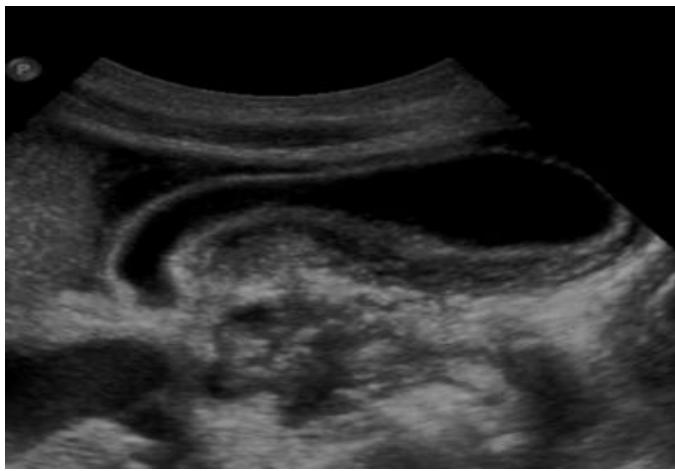
It's not stone b/c there is no shadow, and usually stones move with position but the mass is clearly attached to the anterior wall.

Management: large polyps > cholecystectomy (may be cancerous)

WITH acoustic shadow (GB **stone**)

- Calculus shadow with inflammation

* The key to differentiate between a polyp and stone is the shadow on the soft tissue.



Acalculous cholecystitis
 -The inflammation without stone called **"Acalculous cholecystitis"**
 -It has some fluid around

calculous cholecystitis
 -Inflammation with stone

● **Different Gallstones:**



- Multiple tiny stones
- Big shadow

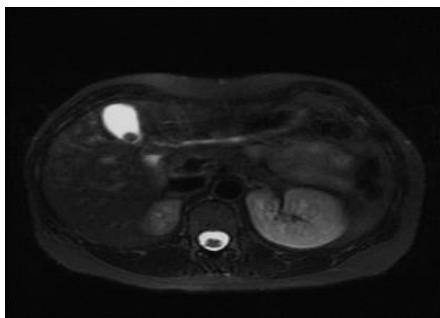


- 2 stones
- shadow

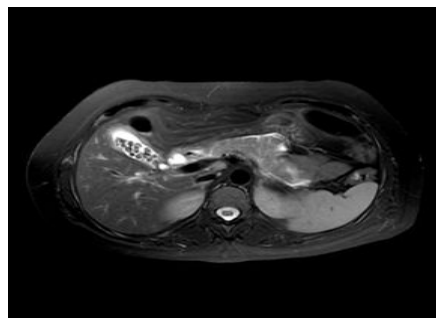


- 1 stone
- shadow

Gallstones on MRI:



- 1 stone



- Multiple stones



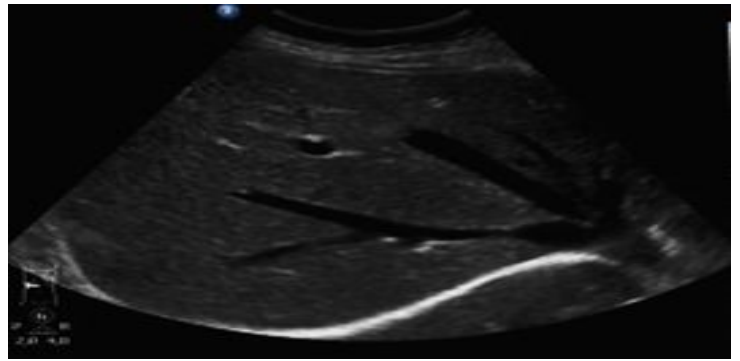
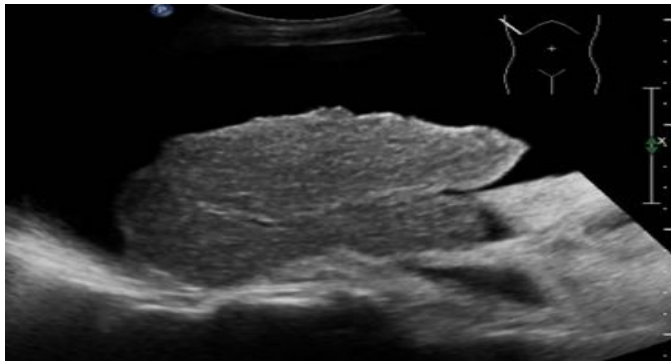
- Stones replacing the whole gallbladder

➤ Case 2:

60 year-old male with chronic alcoholic consumption complaining of fatigue, disorientation and abdomen distension

- What do you think this patient has? [Liver cirrhosis](#)
- What radiology modality you will start with? [ultrasound](#)

- What is the difference between the two images (US)?



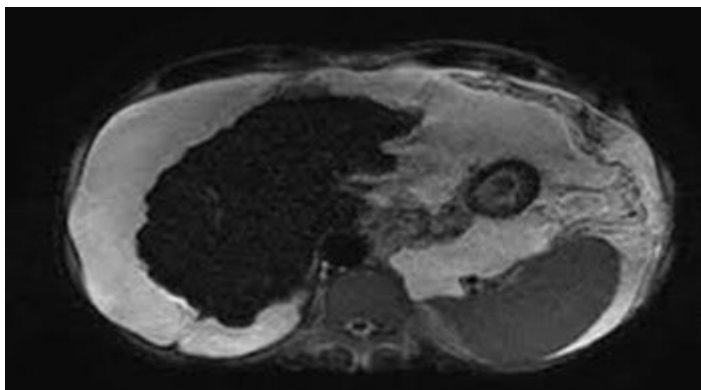
Liver cirrhosis:

- Nodular surface
- Shrunken size
- Hyperechoic parenchyma “replaced by fibrous tissue”
- Ascites “fluid around the liver appears black.”

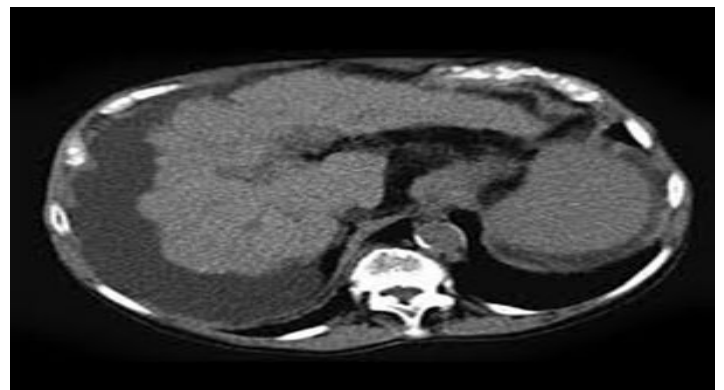
Normal Liver:

- Smooth surface
- Hypoechoic

Cirrhosis on CT scan and MRI:



MRI



CT

- Note: in liver cirrhosis there is spleen enlargement & fluid around liver

➤ Case 3

▪ US for chronic hepatitis B virus patient. What is your diagnosis?
Hypoechoic lesion within the liver (look like a mass), from ultrasound we can't tell if it is benign or malignant

▪ What is DDx?

Benign:

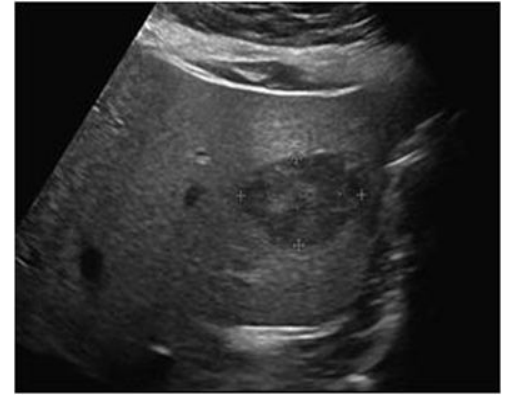
1- Hemangioma 2- Adenoma 3- Focal nodular hyperplasia

Malignant:

1- Hepatocellular carcinoma 2- Metastasis

▪ What is the next step?

CT with contrast to tell if it is benign or malignant



❖ In this case will take an extra step: patient known to have chronic hepatitis (most likely chronic liver disease) do US as routine screening every year you may find hypoechoic lesion within the liver that it's like mass.

❖ In patient known with chronic liver disease First thing you have to think about HCC, could be anything else benign but the the most important thing is to exclude the more serious case "HCC".

❖ The liver can be affected by a benign lesions such as "hemangioma, adenoma, focal nodular hyperplasia" or could be malignant e.g.: HCC or metastasis.

● **How to tell if it's benign or malignant?** DO CT scan or MRI with intravenous contrast.

- Note: sometimes we prefer CT because it's more available than MRI

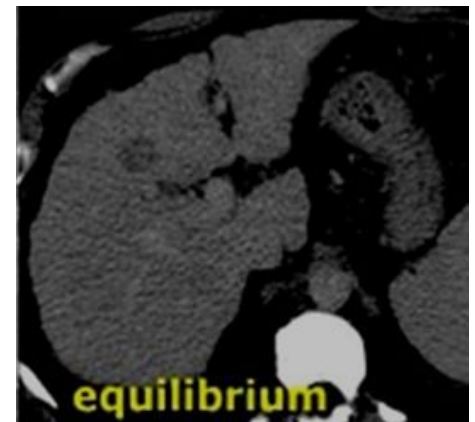
❖ CT scan with IV contrast (triphasic scan):



• The lesion is enhanced "white"
• the liver is not enhanced yet.



• Most of the contrast in the portal vein
• Liver starts taking up the contrast and the lesion starts to wash out > Lesion is almost similar to the liver



Lesion is completely washed out and became black (no contrast)

- equilibrium phase/ delayed phase

❖ In CT even in MR if it's with contrast usually we will do a "triphasic scan.

● **What do we mean by triphasic?** Scanning liver with (IV) contrast in three different phases:

- Phase 1 (arterial): when IV contrast in arteries/ 30 to 40 seconds after IV contrast injection.

- Phase 2 (portal-venous): when IV contrast in veins/ 60 to 70 seconds after IV contrast injection.

- Phase 3 (delayed or equilibrium): after 3 to 5 minutes after IV contrast injection. to give more time for mass to wash out the contrast.

Normal liver parenchyma is 80 supplied% by the portal vein and only 20% by the hepatic artery, so liver will be enhanced in the portal venous phase.

however All liver tumors get 100% of their blood supply from the hepatic artery, so the tumor will be enhanced in the arterial phase

❖ **Triphasic scan helps in differentiating benign from malignant masses:**

- **Benign: BLACK in phase 1 / WHITE in phase 3** (e.g. hemangioma “most common benign tumor of the liver”).
- **Malignant: WHITE in phase 1 / BLACK in phase 3** (e.g. HCC “most common malignant tumor of the liver”).

Mnemonic: Malignant in triphasic CT

الناس الخبيثة تبين لك بياض قلبها بالبداية و مع الوقت يتغير و يبدأ السواد ☀️

★ we do 3 phases because :

1. to differentiate the tumor (e.g. HCC appear in arterial phase and not appear in portal. some tumors may not appear in some phases).
2. in equilibrium phase the malignant tumor may seen as a cyst.
3. when we want to do only one phase we prefer portal phase because all organ will uptake the contrast.

What is the difference between both cases?

- **Hepatocellular carcinoma**



White = up taking contrast

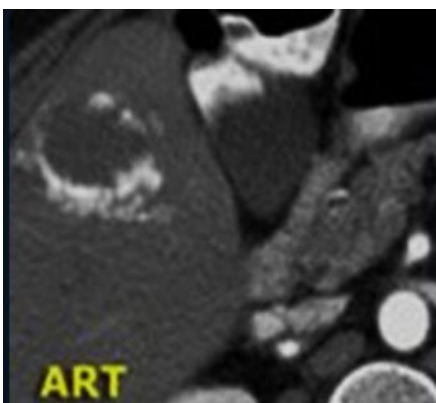


Lesion Similar to liver

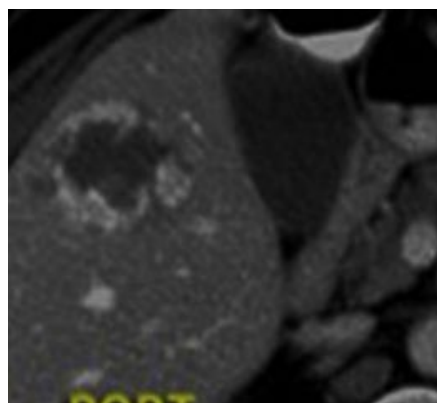


Black lesion

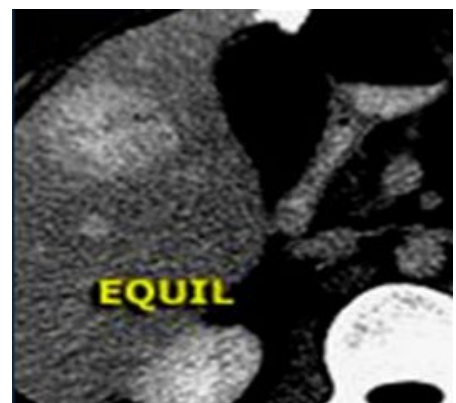
- **Hemangioma**



More black , with some Contrast around

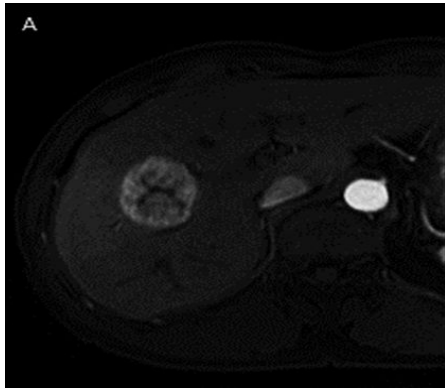


Contrast start to increase around “white area”



Then become more white in late phase

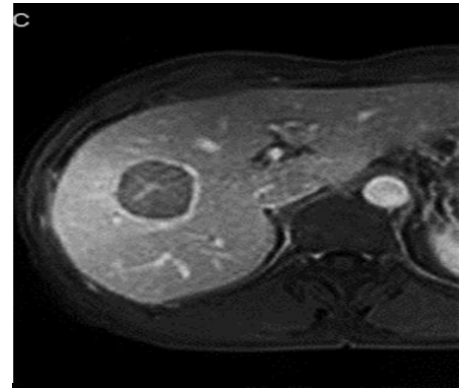
- **MRI: Is it Benign or Malignant? Malignant (HCC)**



In arterial phase it's taking the contrast and rest of liver not yet.



Portal phase liver start to take and lesion is almost similar, surrounded by capsule.



Late phase liver uptake and lesion wash it out become black.

➤ Case 4

Male patient with chronic abdomen pain.

What is abnormal?

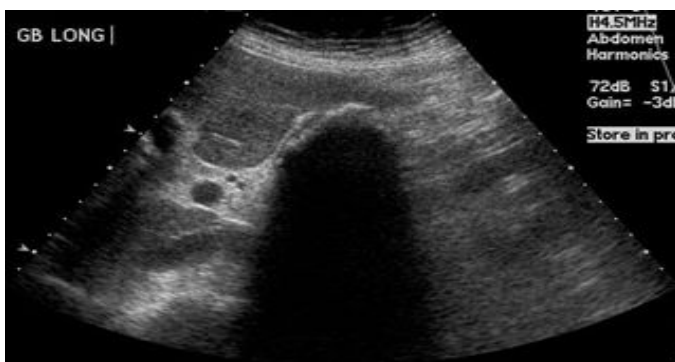
Radio opaque oval shape "Calcification" in the wall of the gallbladder.
we can't reach to the diagnosis using x-ray

How to confirm the diagnosis?

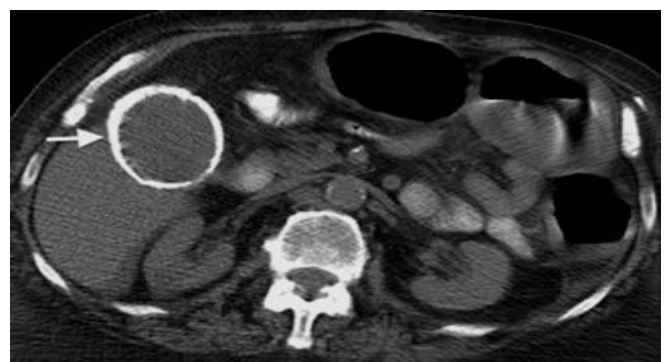
By doing CT scan or US



- Which modality is better? CT



In US this there is a calcification with shadow and we can't differentiate between a large stone with shadow OR calcification on the wall?



In CT we can clearly see the calcification on the wall of gallbladder.

❖ Gallbladder opacity :

1- Porcelain gallbladder (calcification GB wall).

- Complete or partial GB wall calcification. • Needs follow every year or surgical resection.
- Risk of developing cancer 5 -7%.

2- Gallbladder stones (NOT common to see on X-ray).

➤ Case 5:

50 year-old lady presented to the emergency with RUQ pain and yellow discoloration of sclera, pale stool and dark urine.

What is the most likely diagnosis?

- **Obstructive jaundice**

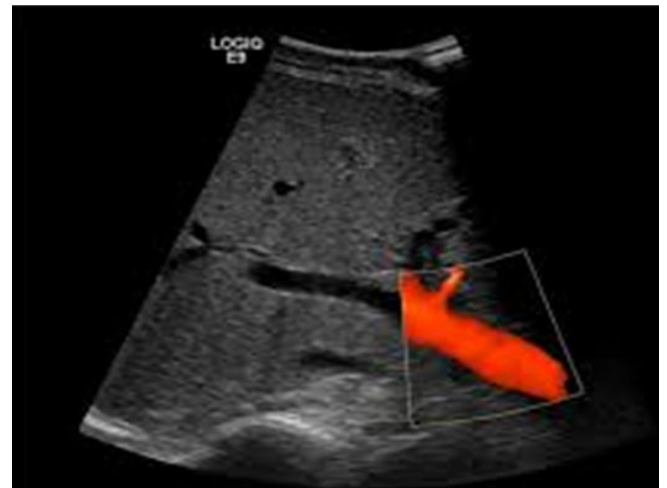
- Causes of biliary obstruction: stones (the most common), tumors.
- Gallstone usually present with pain but neoplasm usually present without pain.

Which radiology modality you prefer to start with? **Ultrasound.**



Abnormal

- on ultrasound we see a tubular structures. is it bile ducts or blood vessels ? you need to do doppler.
- on doppler, not all the tubular structures are blood vessels. so there is a Severe intrahepatic bile duct dilatation



Normal US

red color shows the blood in vessel
“no obstruction”

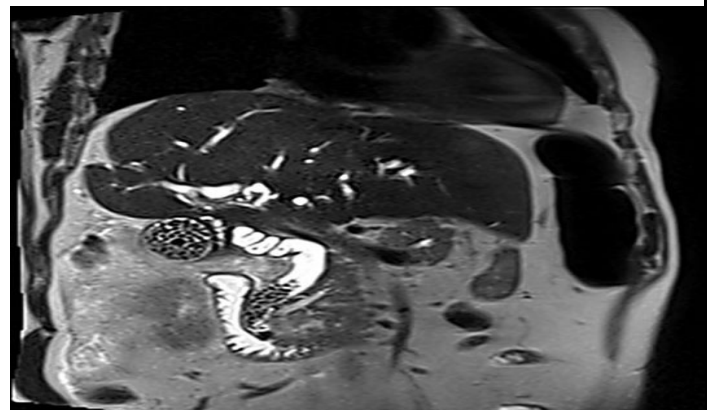
- **What to do next? MRI**

MRI:

Multiple gallstones in GB & common bile duct (CBD).

Treatment: Remove the stones use Endoscopy (ERCP).

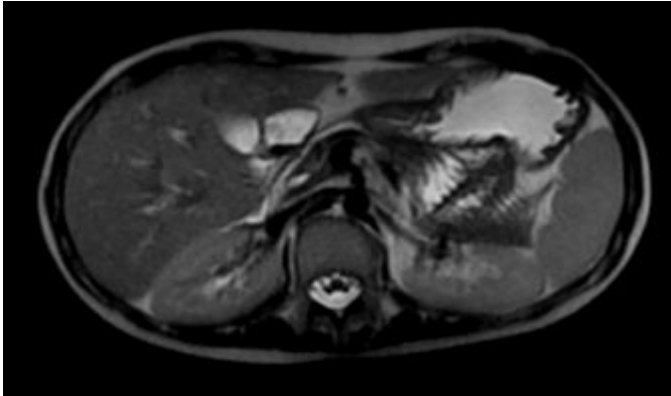
- Note: we do MRI because the stones and CT don't like each other :)



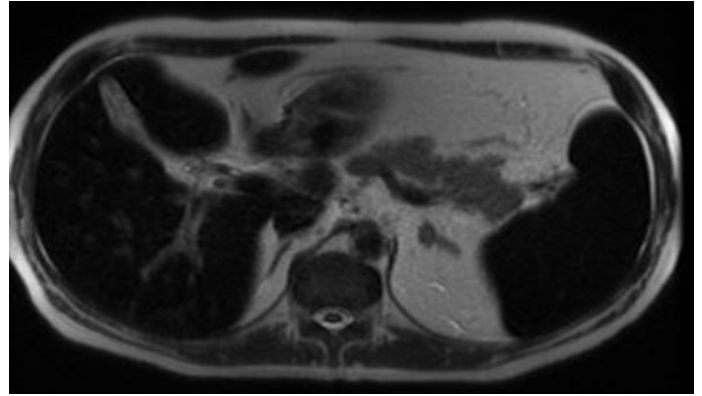
➤ **Case 6:**

20 year-old case of Thalassemia with repeated blood transfusion.

What are the differences between the 2 images?



Normal MRI



Abnormal MRI

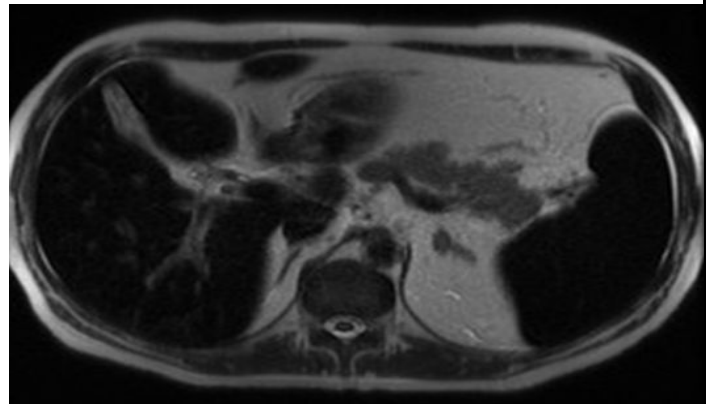
- 1- Enlarged spleen
- 2- Dark spleen
- 3- very dark liver
- 4- dark bone marrow

What is abnormal here?

The liver and spleen are dark in signal (hypo-intense)

Because of iron overload, due to repeated blood transfusion.

MRI is the modality of choice to assess and quantify iron in solid organs, and to follow up treatment & dosing of chelation therapy.

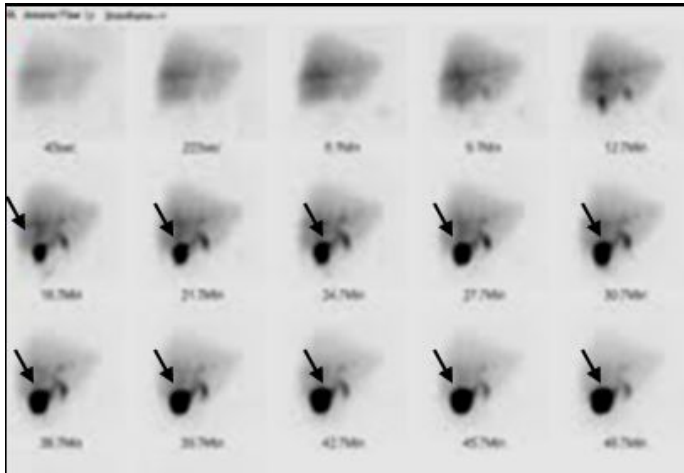


Case:7

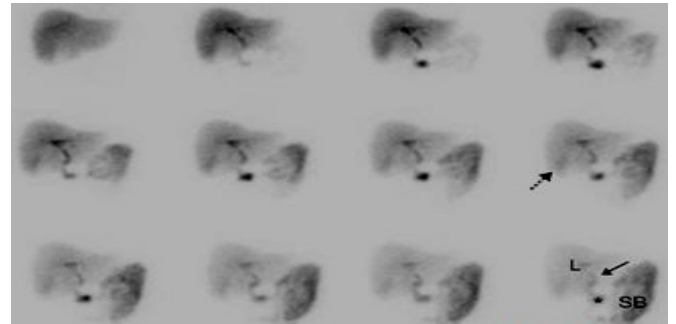
Patient with RUQ pain suspecting cholecystitis. US and MRI was not conclusive would you do next?

Nuclear scan (HIDA scan) .

What is the difference between the two images ?



Normal



Abnormal

No uptake in gallbladder (Acute cholecystitis)

- 1-liver start to uptake radioactive material by hepatocyte
- 2- slowly increase the uptake
- 3- liver start to excrete it in the bile duct (there is something present as it's tube)
- 4- slowly start to fill in gallbladder "black arrow"

❖ Other indication of HIDA scan:

- **Biliary atresia (children):** abnormality or absence of bile duct. Radionuclide go to the liver → nothing comes out.
- **Bile injury post-surgery:** Radionuclide go to the liver → it goes around the liver instead of going to gallbladder.
- **Bile obstruction.**