Normal gallbladder and biliary tract

Hayder Jasim Taher

PhD of Medical Imaging

Outline of my presentation

- ✓ Indications.
- ✓ Normal anatomy of the gallbladder.
- ✓ Nonvisualization of the gallbladder.
- ✓ Enlarged (distended) gallbladder.
- ✓ Echoes within the gallbladder.

Introduction:

Biliary system diseases are a common pathology in medical practice. A frequent situation in every day practice is a patient with pain in the right upper quadrant, in which the suspicion of biliary disease is the first diagnosis to confirm or exclude. Ultrasound is a reliable method for the evaluation of the biliary system and is the first method of choice when a biliary disease is suspected. Ideally a correct examination of the gallbladder and the biliary tree is performed on fasting patients. The gallbladder is evaluated by means of right subcostal oblique sections while for the hilum evaluation sections perpendicular on the ribs are used. The structures are assessed regarding their size, wall thickness and content.

Indications

- Pain in the right upper abdomen: suspected gallstones and/or cholecystitis.
- Jaundice.
- Palpable right upper abdominal mass.
- Recurrent symptoms of peptic ulcer.
- Pyrexia of unknown origin.

Normal anatomy of the gallbladder

On the longitudinal scan the gallbladder will appear as an echo free, pear shaped structure. It is very variable in position, size and shape, but the normal gallbladder is seldom more than 4 cm wide .

The gallbladder may be mobile. It may be elongated and on scanning may be found below the level of the superior iliac crest (especially when the patient is erect). It may be to the left of the midline. If not located in the normal position, scan the whole abdomen, starting on the right side.

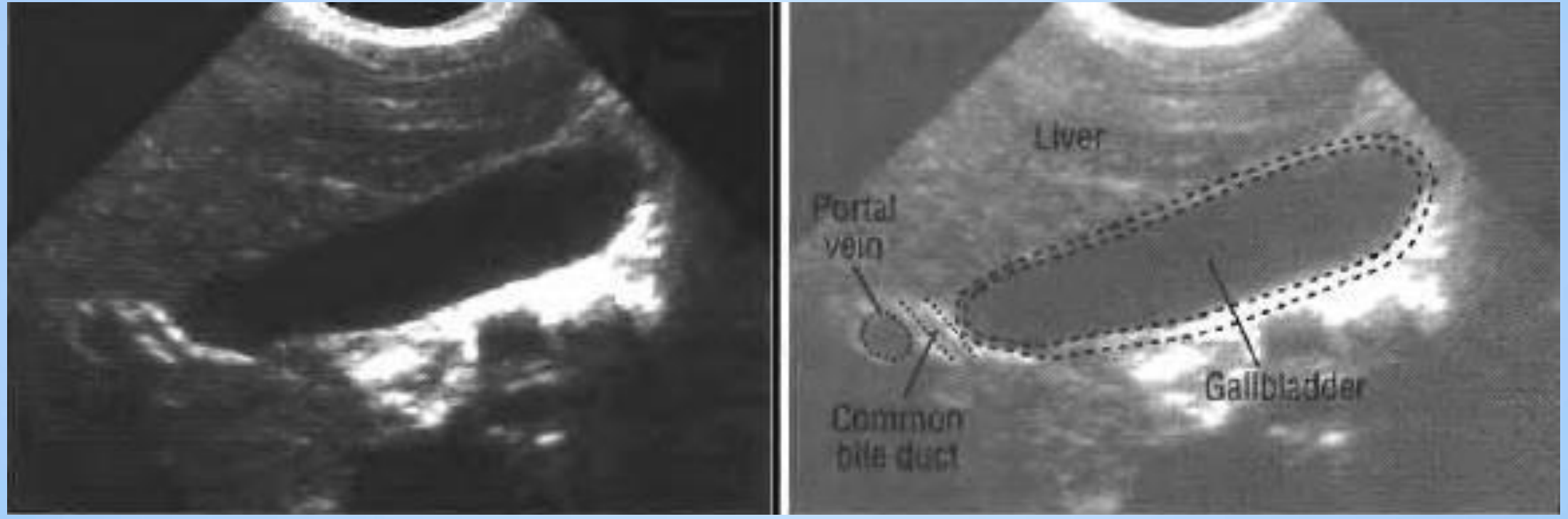
The thickness of the gallbladder wall can be measured on transverse scans; in a fasting patient it

is normally 3 mm or less and 1 mm when the gallbladder is distended.

Normal anatomy of the gallbladder

It is not always easy to identify the normal main right and left hepatic biliary ducts, but when visible they are within the liver and appear as thin walled tubular structures. However, the common hepatic duct can usually be recognized just anterior and lateral to the crossing portal vein, and its cross section at this level should not exceed 5 mm. The diameter of the common bile duct is variable but should not exceed 9 mm near its entrance into the pancreas.

Normal anatomy of the gallbladder



Nonvisualization of the gallbladder

There are various reasons why the gallbladder may not be seen by ultrasound:

1. The patient has not been fasting: re examine after an interval of at least 6 hours without food or drink.
2. The gallbladder lies in an unusual position.
3. The gallbladder is congenitally hypoplastic or absent.
4. The gallbladder is shrunken and full of stones (with associated acoustic shadowing).
5. The gallbladder has been removed surgically: examine the abdomen for scars and ask the patient (or relatives).
6. The examiner is not properly trained or experienced: ask a colleague to examine the patient.

Enlarged (distended) gallbladder

The gallbladder is enlarged if it exceeds 4 cm in width (transverse diameter).

The normal gallbladder may appear distended when the patient is dehydrated, has been on a low-fat diet or on intravenous nutrition, or has been immobilized for some time. If there is no clinical evidence of cholecystitis, and if the gallbladder wall does not appear thickened on ultrasound, give the patient a fatty meal and repeat the ultrasound examination in 45 minutes to 1 hour. A normal gallbladder will contract.

Enlarged (distended) gallbladder

1. A gallstone or other cause of obstruction within the cystic duct. The hepatic and bile ducts will be normal. If there is no internal obstruction, there may be a mass or lymph node pressing externally on the duct.
2. A stone or other obstruction in the common bile duct. The common hepatic duct will be dilated (over 5 mm diameter). Examine the common bile duct for Ascaris.
3. If the gallbladder is distended with thickened walls (greater than 5 mm) and filled with fluid. there may be an empyema: local tenderness is likely. Check the patient clinically (Fig. 61).
4. If the gallbladder is distended with thin walls and filled with fluid. there may be a mucocele. This does not usually result in local tenderness.

Enlarged (distended) gallbladder

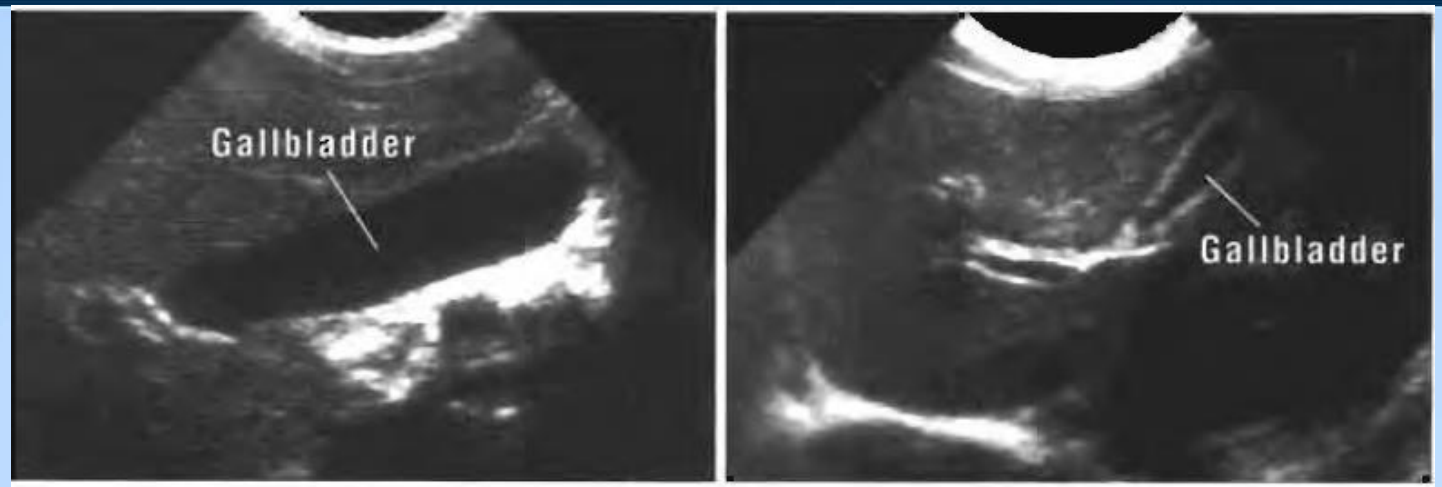


Fig. 60a. **Left:** the gallbladder is full. **Right:** the gallbladder has contracted after a fatty meal.

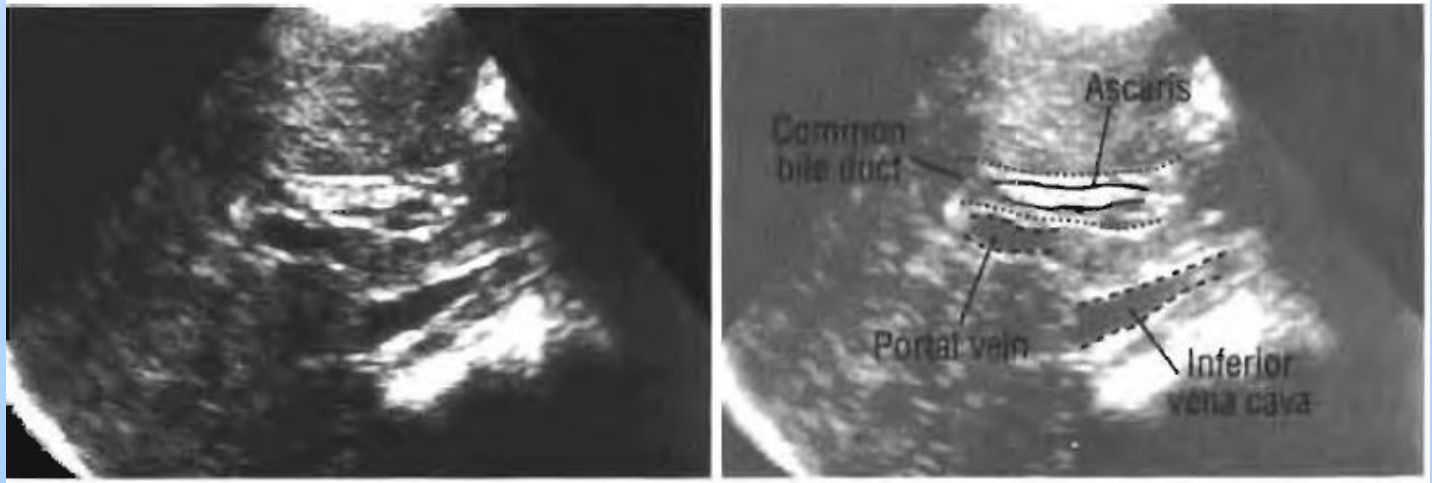


Fig. 60b. Longitudinal scan: *Ascaris* in the common bile duct.

Enlarged (distended) gallbladder

Fig. 61a. Transverse scan: a distended gallbladder with thick walls.

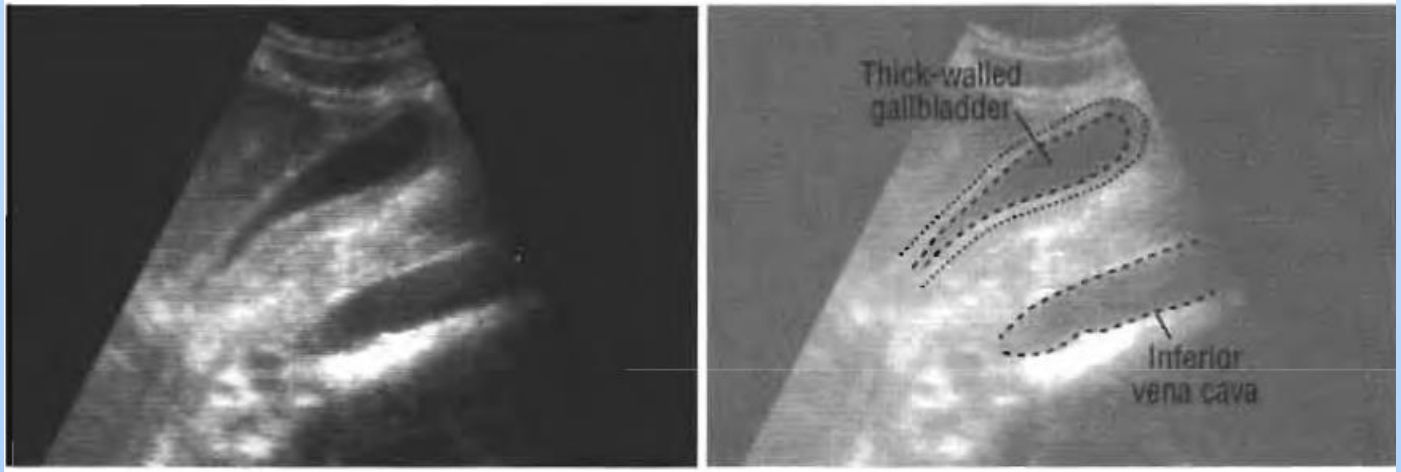


Fig. 61b. Longitudinal scan: the same distended, thick-walled gallbladder.

Acute cholecystitis

Clinically. acute cholecystitis is usually associated with pain in the right upper abdomen and with local tenderness when the transducer is (carefully) applied near the gallbladder. There may be one or more gallstones. probably including a stone in the gallbladder neck or in the cystic duct. The walls of the gallbladder are likely to be thickened and oedematous. and. therefore. the gallbladder is not always distended. If the gallbladder has perforated. there is usually fluid adjacent to it.

Echoes within the gallbladder

Mobile internal echoes with shadowing

1. Gallstones can be recognized as bright intraluminal echogenic structures with an acoustic shadow. The stones may be single or multiple, large or small, calcified or non-calcified. The gallbladder walls may be normal or thickened (Fig. 62a, b).

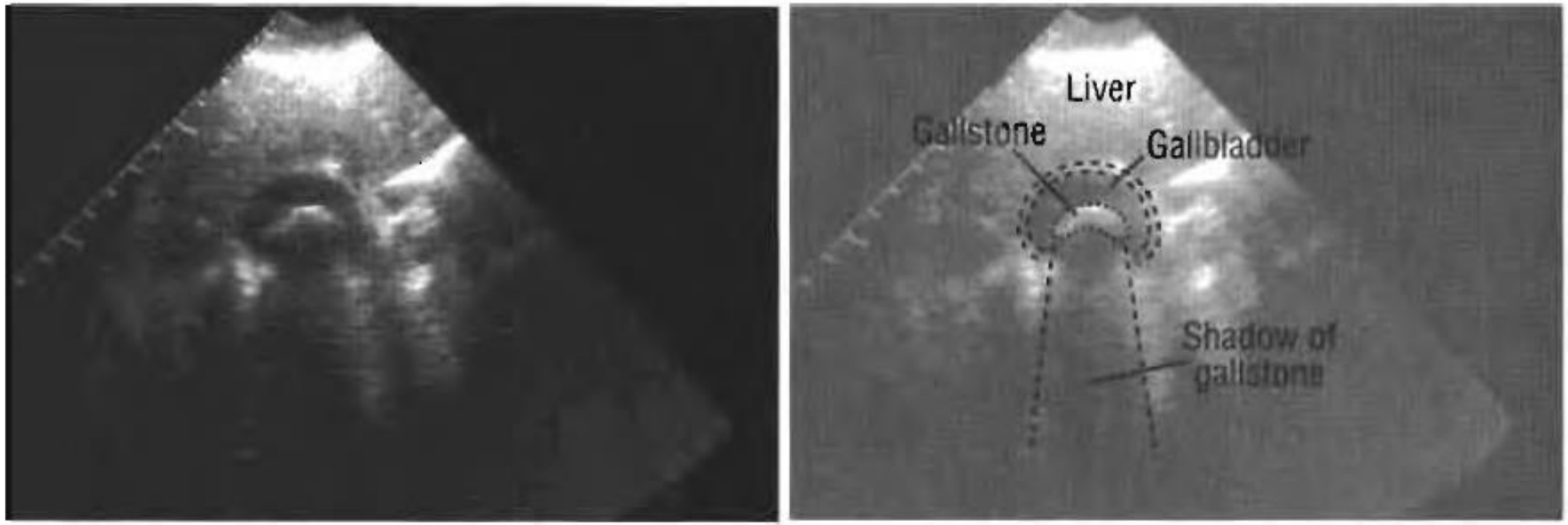


Fig. 62a. Transverse scan: a single stone in the gallbladder.

Echoes within the gallbladder

2. When gallstones are suspected but not seen clearly on routine scans, rescan with the patient oblique or erect. Most gallstones will change position within the gallbladder as the patient moves (Fig 62c, d) .

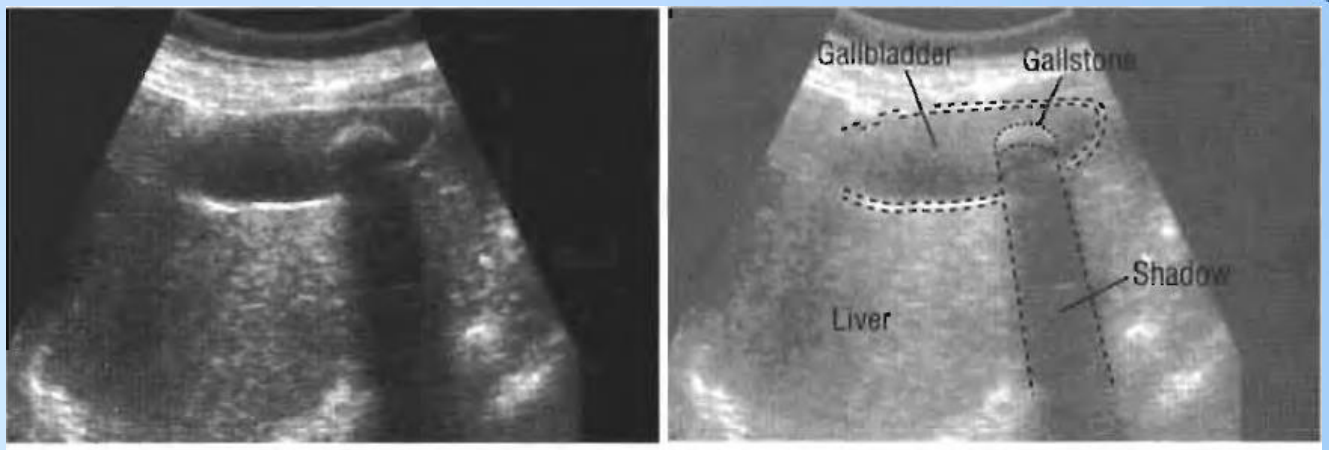


Fig. 62c. A gallbladder containing a large solitary stone.

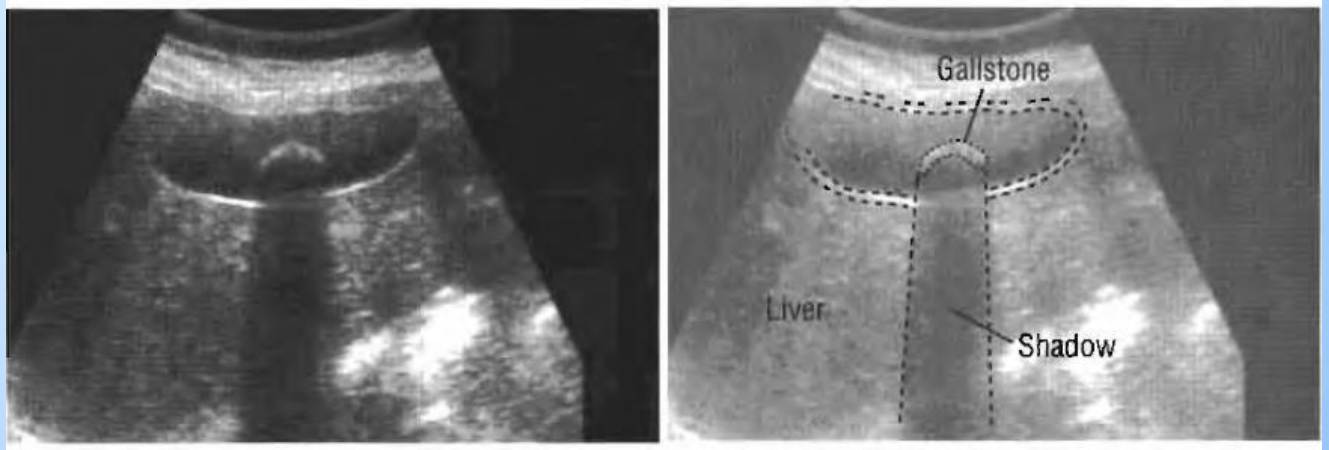


Fig. 62d. When the same patient is moved, the gallstone changes position.

Echoes within the gallbladder

3. If there is still any doubt, scan the patient in the hands/knees position. The gallstones will move anteriorly. This position may also be useful if there is excessive bowel gas (Fig. 62e)

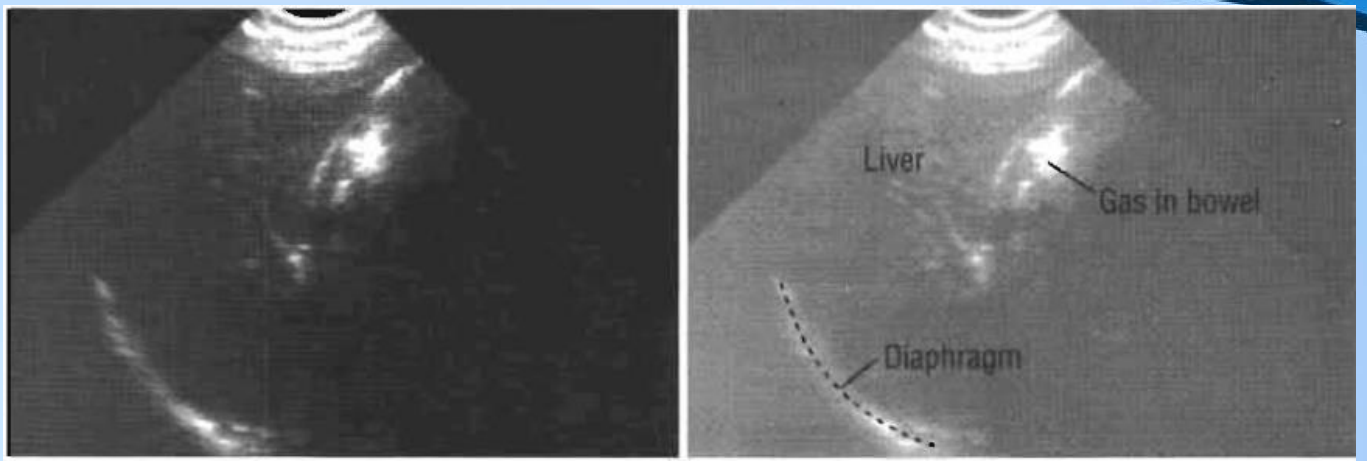


Fig. 62e. An unsuccessful scan, because the gallbladder is obscured by gas in the bowel.

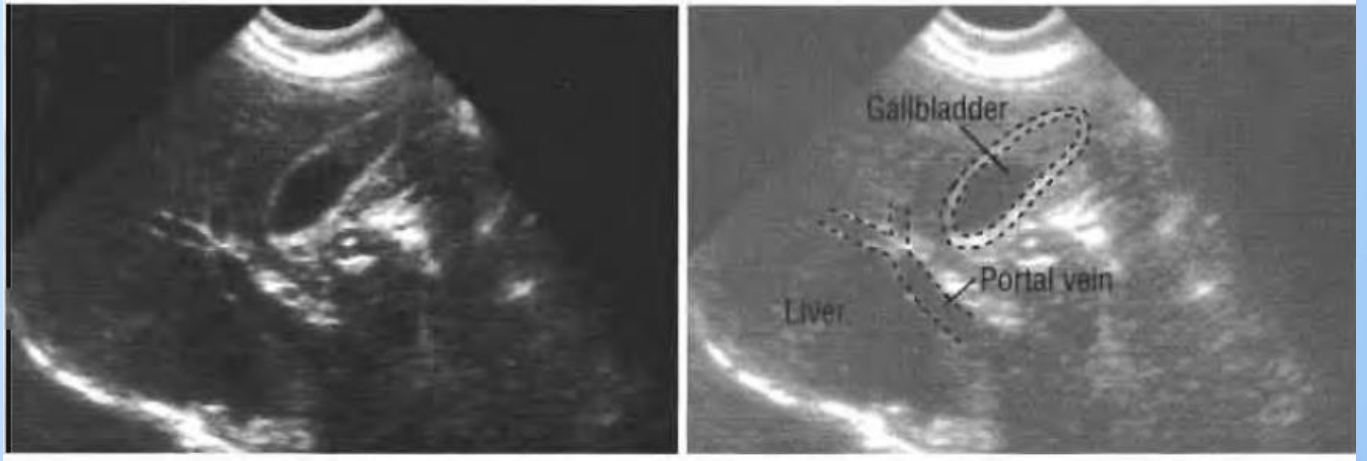


Fig. 62f. With the same patient in the hands/knees position, the gallbladder is seen clearly.

Mobile internal echoes without shadowing

Scans should be taken in different positions. The common causes are:

1. Gallstones. Note that there will be no acoustic shadow if the stones are smaller than the diameter of the ultrasound beam (Fig. 63a).
2. Gallbladder sludge. This is thickened bile which produces fine dependent echoes that move slowly with a change in the position of the patient. unlike stones which tend to move quickly (Fig. 63b).
3. Pyogenic debris (Fig. 63c).
4. Blood clots.
5. Hydatid membranes. Scan the liver for cysts .
6. Ascaris and other parasites. It is unusual for worms such as Ascaris to reach the gallbladder. They are more likely to be seen in the bile duct . In clonorchiasis the hepatic ducts will be dilated and irregular and there is often much intraductal debris

Mobile internal echoes without shadowing

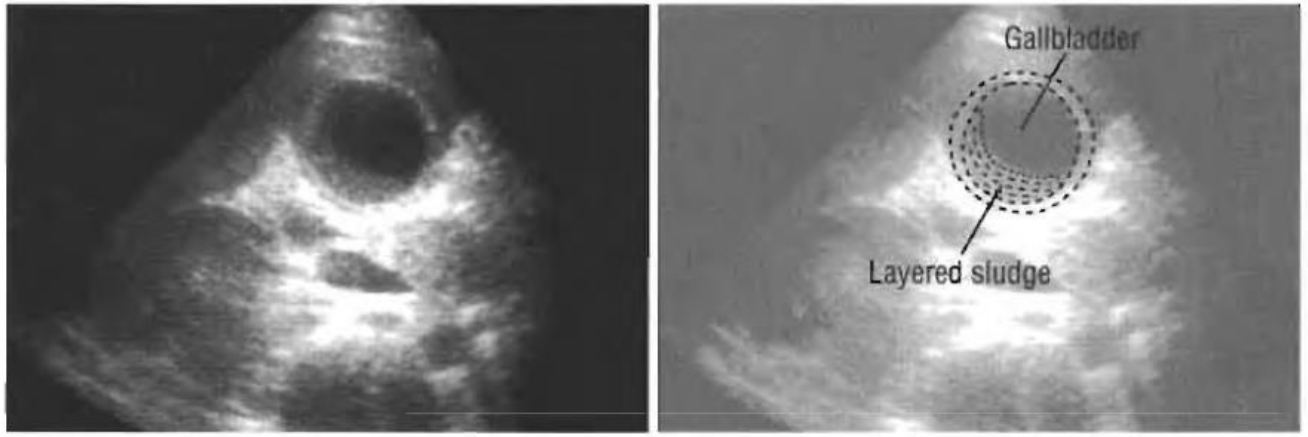


Fig. 63a. Transverse scan: the gallbladder is very distended and contains fine sludge. The distension was due to a small stone in the cystic duct, which did not produce an acoustic shadow.

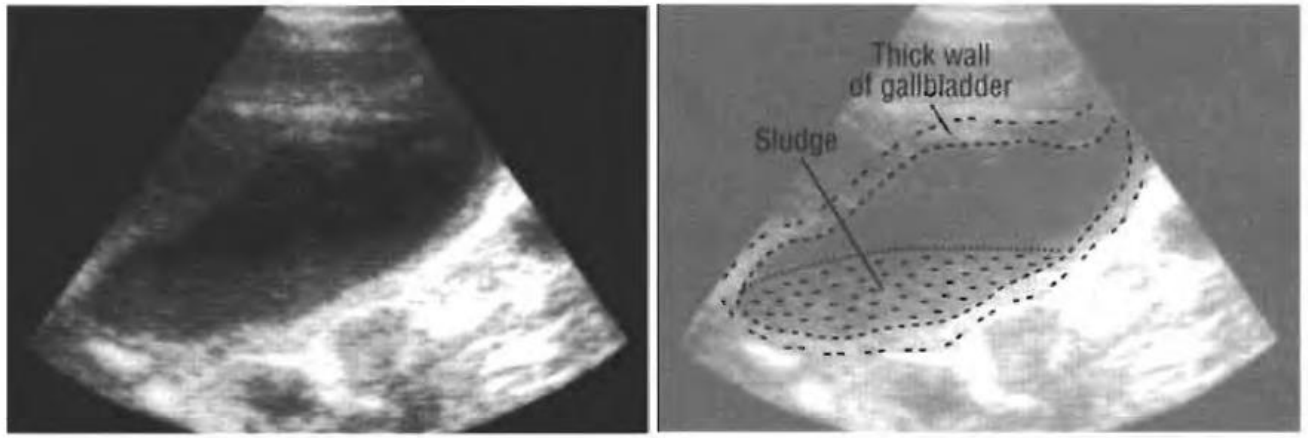


Fig. 63b. Longitudinal scan: sludge in the gallbladder: the thickened walls are the result of chronic inflammation.

Nonmobile internal echoes with shadowing

The commonest cause is an impacted calculus (Fig. 64a): search for other calculi. The calcification may also be in the gallbladder wall: if the wall is also thickened. there may be acute or chronic cholecystitis. But it may be difficult to exclude an associated carcinoma .

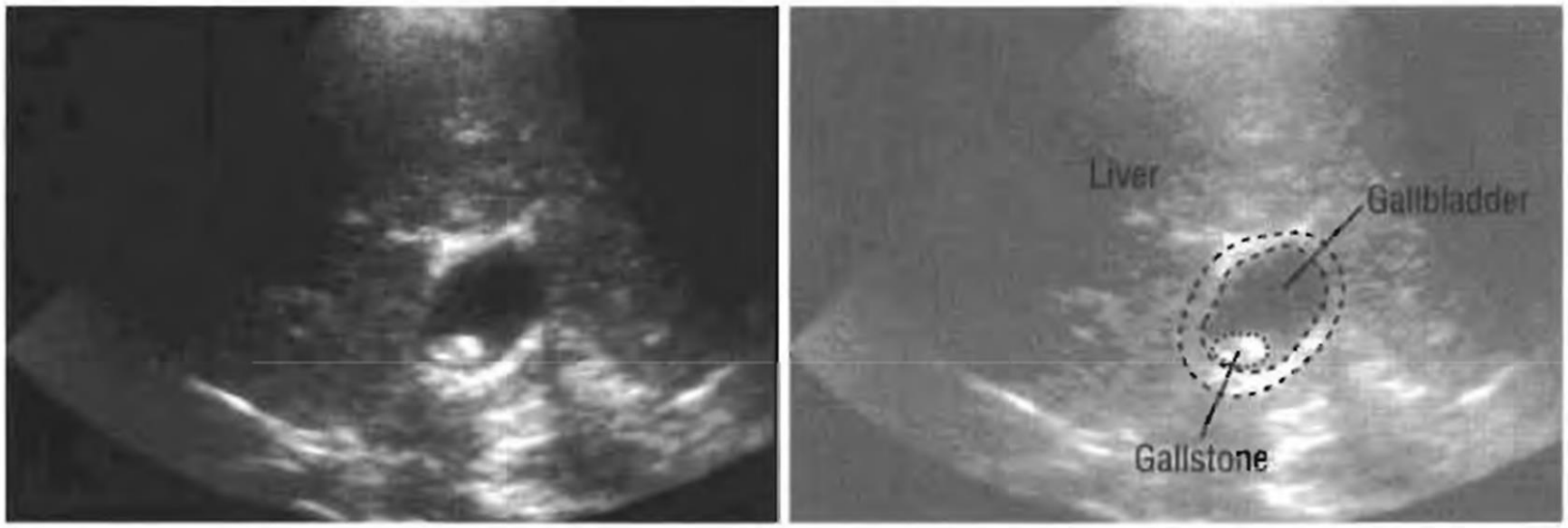


Fig. 64a. Transverse scan of the gallbladder: there will probably be distension when there is a stone impacted in the neck of the gallbladder.

Nonmobile internal echoes without shadowing

1. The most common cause is a polyp (Fig. 64b). It may be possible to identity the pedicle by using different scanning projections. There should be no acoustic shadowing. and changing the patient's position will not move the polyp but may alter its shape. Malignant disease may resemble a polyp but is more often associated with thickening of the gallbladder wall and does not usually have a pedicle. A malignant tumour is less likely to change its shape when the patient changes position.
2. A septum or fold within the gallbladder is not likely to be of any clinical significance.
3. A malignant tumour (Fig. 64c) .

Nonmobile internal echoes without shadowing

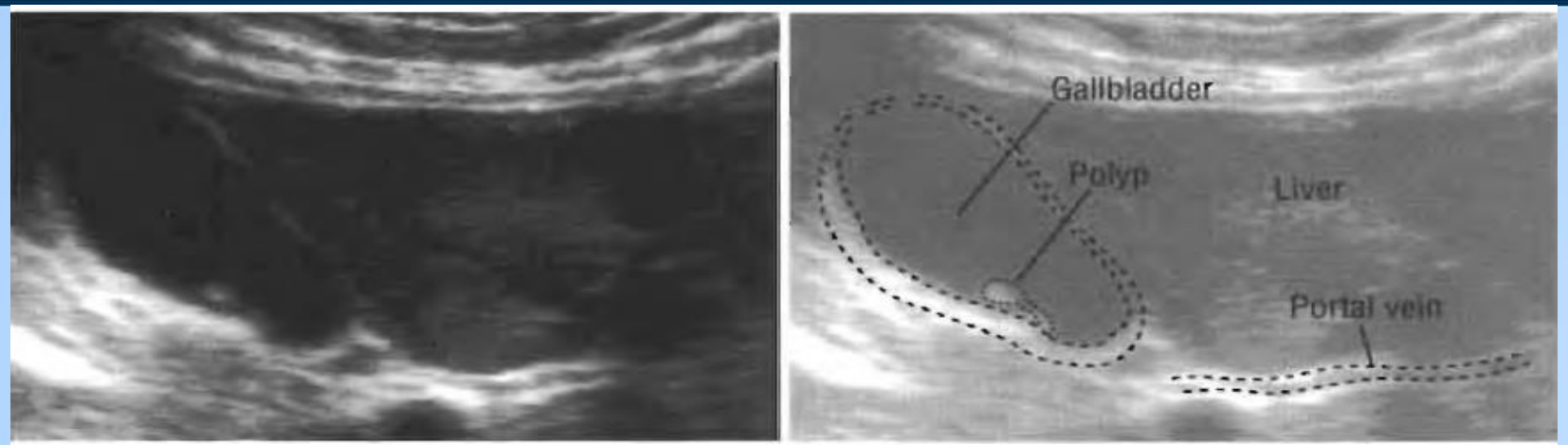


Fig. 64b. Longitudinal scan of the gallbladder showing a small pedunculated polyp.

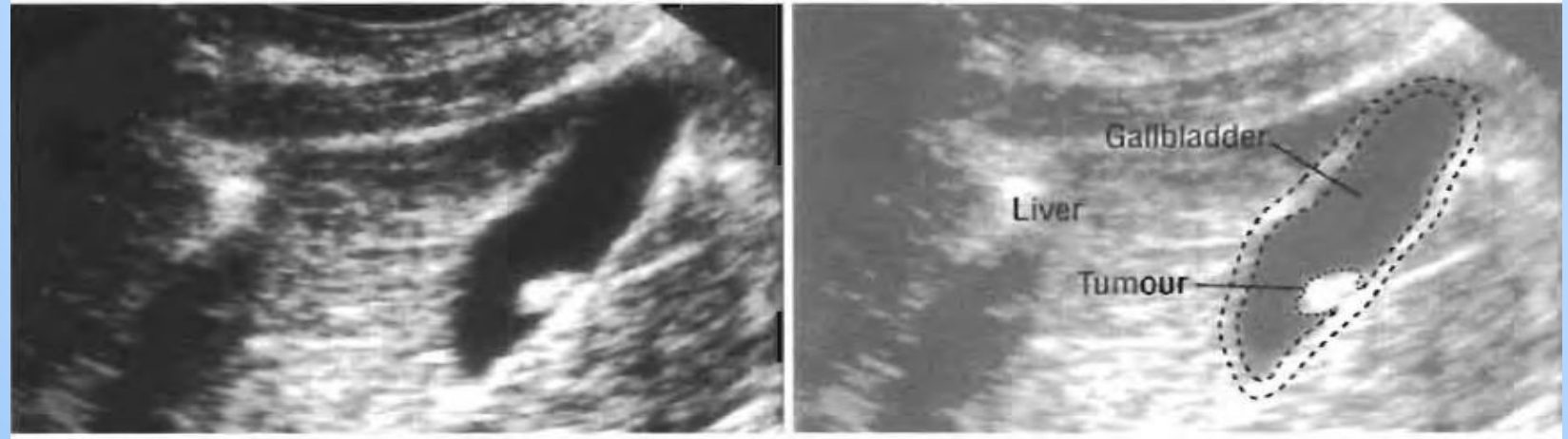


Figure 64c. Longitudinal scan: a small sessile tumour in the gallbladder.

Thank you