

## Ultrasound examination of normal gall bladder and biliary system

Alina Popescu, Ioan Sporea

Department of Gastroenterology and Hepatology, University of Medicine and Pharmacy Timișoara

### Abstract

Biliary system diseases are a common pathology in medical practice. A frequent situation in everyday 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.

**Keywords:** gallbladder, biliary system, ultrasonography

### Rezumat

Patologia biliară este o patologie comună în practica medicală. O situație frecventă în practica de zi cu zi este un pacient cu durere în hipocondrul drept, situație în care trebuie exclusă sau confirmată suspiciunea de patologie biliară.

Ecografia este o metodă fiabilă de evaluare a sistemului biliar și este prima metodă imagistică pe care o folosim atunci când suspectăm o patologie biliară.

Ideal, o examinare corectă a veziculei biliare și a arborelui biliar se face la pacienți în condiții a jeun. Pentru examinarea vezicii biliare folosim secțiunea oblic recurentă subcostală dreaptă în timp ce pentru hilul hepatic vom folosi secțiunea perpendiculară pe rebordul costal. Vom evalua structurile urmărind dimensiunea, grosimea pereților, conținutul.

**Cuvinte cheie:** vezicula biliară, căi biliare, ecografia

Biliary system diseases are a common pathology in medical practice. A frequent situation in everyday 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. It is actually a

routine examination in the daily practice, performed in asymptomatic patients as a screening tool, but also for the evaluation of any abdominal pain. It is an accurate, safe, non-invasive, inexpensive, accessible, repeatable imaging modality, highly sensitive and specific for the detection of gallstones and biliary obstruction, which also frequently demonstrates an alternate diagnosis as the cause of the patient's symptoms when the biliary system is normal. But it is an operator dependent method that has a few limitations in several situations as obesity, surgical dressings, distended abdomen due to intestinal gas.

The gallbladder is a saccular structure for bile storage, situated in the gallbladder fossa of the posterior right hepatic lobe. It is divided into fundus, body, infundibulum (Hartman's pouch, which is the portion of

Received Accepted  
Med Ultrason  
2010, Vol. 12, No 2, 150-152

Address for correspondence: Alina Popescu  
Barbu Iscovescu str. 8, Sc. A, Ap. 7  
300561 Timișoara, Romania  
Tel: 0748331233, Fax: 0256488003  
Email: alinamircea.popescu@gmail.com

body that joins the neck) and neck. It has a pear or teardrop shape, laterally situated to the second part of the duodenum and anteriorly to the right kidney and transverse colon.

Ideally a correct examination of the gallbladder and the biliary tree should be performed on fasting patients (they should not eat or drink anything at least 8 hours before ultrasound examination), because fasting distends the gallbladder and reduces the bowel gas for an optimal visualization. In emergency situations, however, the examination can be also performed if the gallbladder is partially contracted.

It is recommended to take a short history of the patient and to palpate the abdomen before the examination, in order to complete the ultrasound information with clinical data.

The “real-time” examination should be performed in all standard and any other necessary planes. Routinely, a convex multifrequency (2-5 MHz) transducer should be used for the evaluation of the gallbladder. The examination can be started in a supine position and continued with the patient in a left lateral decubitus (a mobile content of the gallbladder will then move with the patient position change). Sometimes, in order to demonstrate the mobility of gallbladder stones, prone or standing positions can be used. The examination can start with a right subcostal oblique section, following the ribs, angling the probe superiorly in order to avoid the bowel while the patient is asked to take a suspended full inspiration. Longitudinal sections can be used in the same area as well as intercostal sections (depending on the position of the gallbladder).

Useful landmarks for the evaluation of the gallbladder are the edge of the right hepatic lobe and the liver hilum. In the right subcostal oblique section, the landmark structure to be used is the interlobar fissure and the gallbladder will be found by aligning the probe with the fissure and then tilting it. The gallbladder is located inferiorly or laterally to the fissure (between liver segments IV and V). It should be evaluated regarding the size, wall thickness and content. The normal gallbladder will have an anechoic content, with thin (1-3 mm) echoic walls (fig 1-3). If the patient is not fasting the gallbladder will be partially contracted and the walls will appear thicker (fig 4, fig 5).

The demonstration of the cystic duct is easiest in deep inspiration with the patient in supine or left lateral decubitus. It is visualized beginning from the infundibulum of the gallbladder.

The next step in the evaluation of the biliary system is the visualization of the main biliary duct (MBD). It can be demonstrated with the patient in supine or lat-



**Fig 1, 2, 3.** Normal gall bladder with thin walls and anechoic content

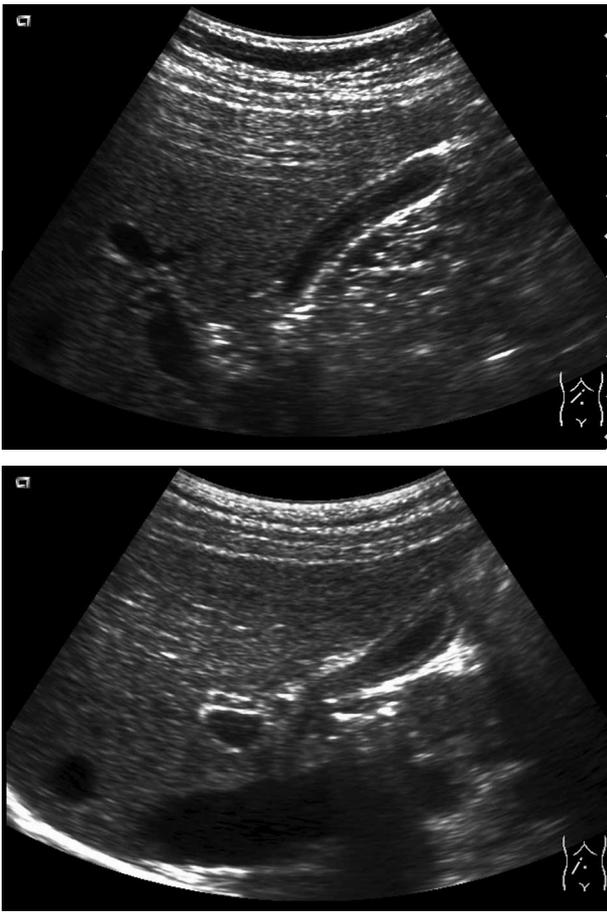


Fig 4, 5. Partially contracted gallbladder

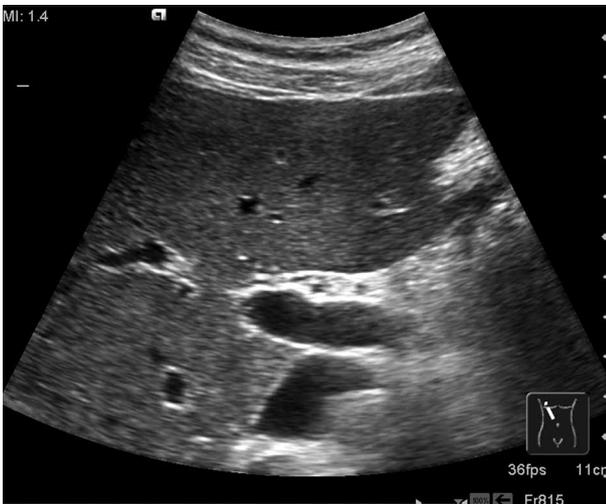


Fig 6. The normal hilum with the main biliary duct and the portal vein

eral decubitus by using a perpendicular on the ribs section in the right hipocondrium. The main biliary duct appears as a tube situated in front of the portal vein (fig 6). In the same section the hepatic artery will appear as a round structure between the MBD and the portal vein. Sometimes, if there is a good acoustic window, the MBD can be also followed into the retro pancreatic portion. It must be evaluated regarding the size (normal up to 6 mm), wall thickness and content. After colecystectomy the normal size of the MBD may increase.

Normally, the intrahepatic biliary ducts are not visible (they become visible when they are dilated). Sometimes they can be also visualized in the left liver lobe in normal subjects, accompanying the portal branches.

The evaluation of the biliary system as presented here allows the ultrasonographers to answer the question if there is or not a suspicion of biliary disease.

#### Selective references

1. Anderhub B. Manual of Abdominal Sonography. Baltimore, University Park Press, 1983.
2. Freitas ML, Bell RL, Duffy AJ. Choledocholithiasis: evolving standards for diagnosis and management. *World J Gastroenterol* 2006; 12: 3162-3167.
3. Greiner L, Mueller J. Biliary tree and gallbladder. In Schmidt G. *Differential Diagnosis in Ultrasound Imaging*, Thieme Medical Publishers, 2006.
4. Hanbidge AE, Buckler PM, O'Malley ME, Wilson SR. From the RSNA refresher courses: imaging evaluation for acute pain in the right upper quadrant. *Radiographics* 2004; 24: 1117-1135.
5. Høgholm Pedersen M, Bachmann Nielsen M, Skjoldbye B. Basics of clinical ultrasound, Ed. Ultrapocketbooks, Copenhagen, 2006: 41-53.
6. Nuernberg D, Ignee A, Dietrich CF. Ultrasound in gastroenterology. Biliopancreatic system. *Med Klin* 2007; 102: 112-126.
7. Sporea I, Cijevschi Prelipcean C. *Ecografia abdominală în practica clinică*, Ediția a II-a, Editura Mirton, Timișoara Editura Mirton, 2004: 9-99.