



BILIARY PATHOLOGY

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EFSUMB Ultrasound Learning Centre

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UCL International
Hepatology
ULTRASOUND COURSE

2026

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Disclosure of Conflicts of Interest

I herewith declare the following paid or unpaid consultancies, business interests or sources of honoraria payments for the past three years, and anything else which could potentially be viewed as a conflict of interest:

General Electric, Siemens, Mindray – speaker fee

General Electric, Siemens, Mindray, Samsung – research support (loan of equipment)

- Gallbladder and biliary system diseases are frequent pathologies in clinical practice and their burden is increasing worldwide
- Ultrasound is the preferred first line imaging technique in related clinical situations and in screening of asymptomatic cases.
- It is a safe, inexpensive, non-invasive, bed side tool that can provide shortcut to positive diagnosis and explores alternative pathologies
- Very frequently the gallbladder diseases are asymptomatic
- Incidental findings of the biliary system are detected in 6.2% of patients

*Alina Popescu, Suzane Elhakim, Antonio C Matteoni - GALLBLADDER AND BILE DUCT SYSTEM – SONOPATHOLOGY, in WFUMB Course Book
Jenssen C, et al. Incidental Findings of Gallbladder and Bile Ducts-Management Strategies: General Aspects, Gallbladder Polyps and Gallbladder Wall
Thickening-A World Federation of Ultrasound in Medicine and Biology (WFUMB) Position Paper. Ultrasound Med Biol. 2022 Dec;48(12):2355-2378.*

Clinical scenarios

1. The patient presents with different symptoms - upper abdominal discomfort, mostly in the right upper abdomen, bloating, nausea, stool changes (frequency and/or consistency), that are **suggestive for a functional disorder**.
 - **Ultrasound** should be the first imaging investigation that will **exclude a biliary pathology** and suggest the next investigations needed to confirm the functional disorder diagnosis.
2. **Asymptomatic patients** with or without family history of biliary pathology, where screening for biliary pathology is desired.

Popescu A, Nica C. How can I use US in biliary pathology? In: Integrating Ultrasound in Clinical Practice. A collective book of the European WFUMB Centers of Education. Sporea I, Popescu A, Puiu S, Cela D, Saraci B, Grgurevic I, Brkljacic B, Nurnberg D (Eds.). Ed. „Victor Babeş” Timișoara 2025.

Clinical scenarios

3. **Suspected Cholelithiasis or Cholecystitis:** the patient presents with
 - Right upper quadrant (RUQ) pain, particularly postprandial or colicky in nature, accompanied or not by nausea, vomiting - suspicion of biliary colic.
 - Right upper quadrant (RUQ) pain accompanied by fever, with positive Murphy's sign on physical examination – suspicion of acute cholecystitis.

4. **Jaundice, Hyperbilirubinemia or Abnormal Liver Function Tests:** the patient can present with
 - Unexplained elevation in liver enzymes, particularly cholestatic patterns, with or without hyperbilirubinemia.
 - Jaundice with or without pain.

Popescu A, Nica C. How can I use US in biliary pathology? In: Integrating Ultrasound in Clinical Practice. A collective book of the European WFUMB Centers of Education. Sporea I, Popescu A, Puiu S, Cela D, Saraci B, Grgurevic I, Brkljacic B, Nurnberg D (Eds.). Ed. „Victor Babeş” Timișoara 2025.

Gallbladder stones

- Is the most frequent disease of the biliary system
- It is estimated that **10% of the adult population have gallbladder stones**, and that 1/3 of the population over 70 years of age will have gallbladder stones.
- On the other hand 35% of the patients with gallstones will become in time symptomatic and will require surgery.
- Transabdominal ultrasound examination is the most commonly used screening modality for this disease.
- The accuracy of ultrasonography for the diagnosis of gallstones is **up to 96%**.

1. Freitas ML et al – World J Gastroenterol 2006

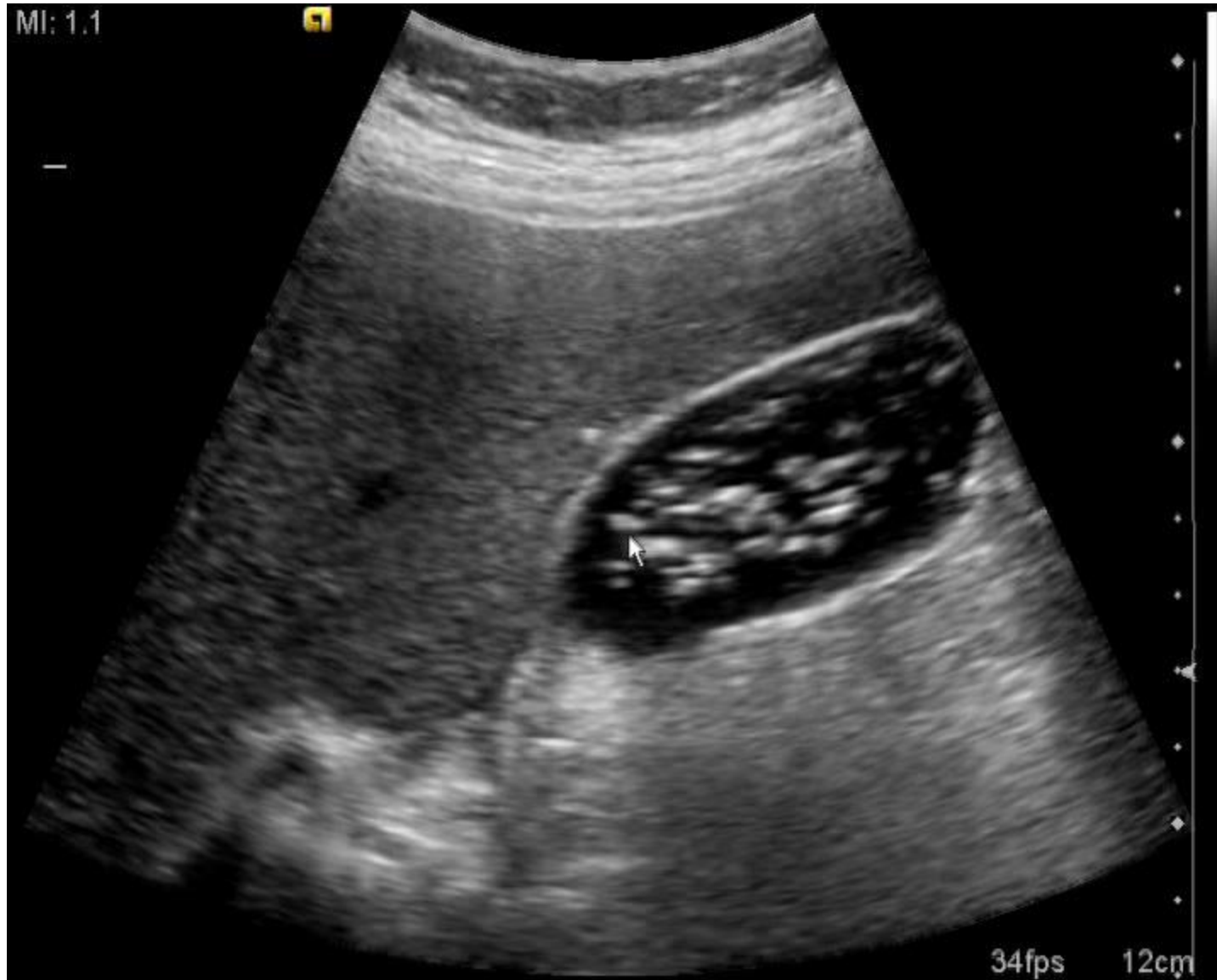
2. Schirmer BD et al- J Long Term Eff Med Implants 2005

3. Alina Popescu, Suzane Elhakim, Antonio C Matteoni - GALLBLADDER AND BILE DUCT SYSTEM – SONOPATHOLOGY, in WFUMB Course Book

4. Zeman R. Cholelithiasis and cholecystitis. In Gastrointestinal Radiology 1994

Gallbladder stones



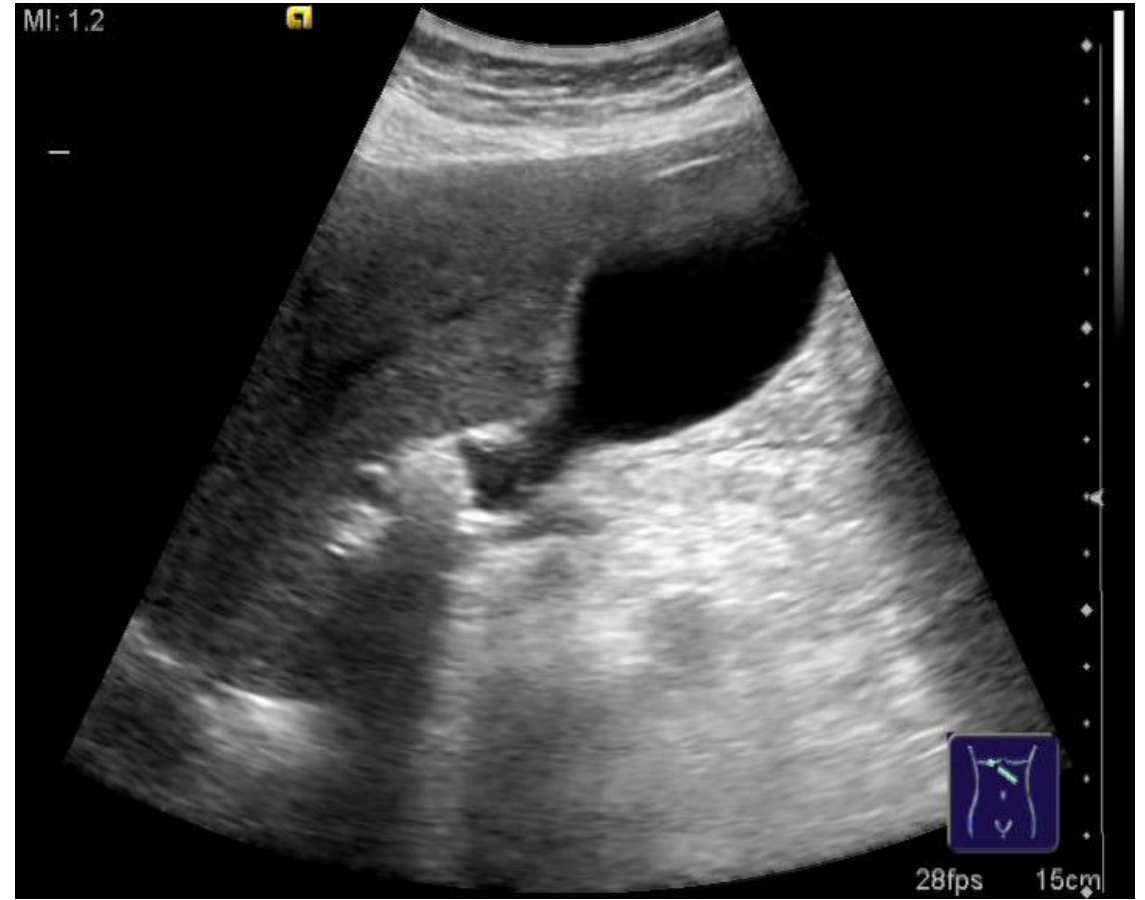


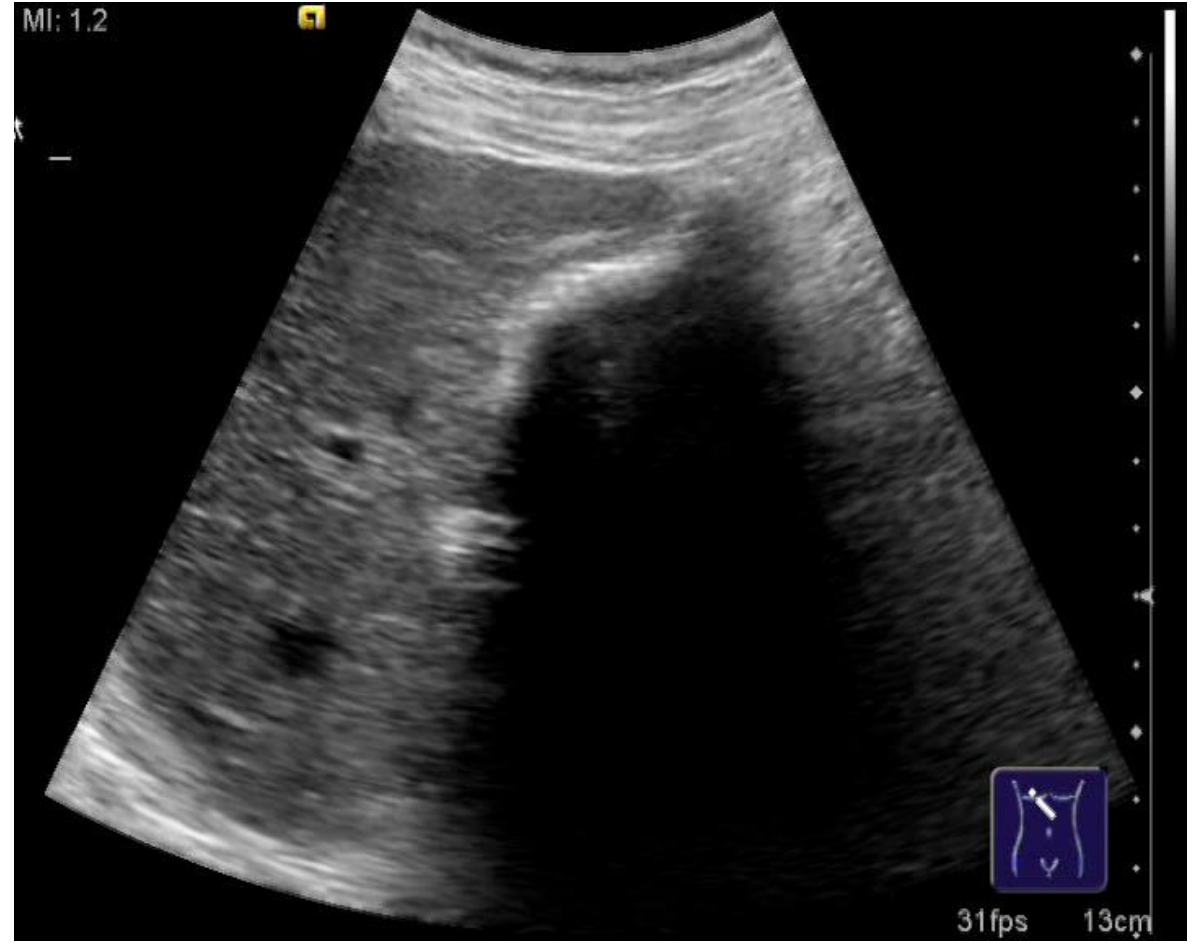
Gallbladder stones



Gallbladder stones

- Difficult to see when are small
- Gallstones size and number can not be estimated accurately by means of ultrasound.
- Gallbladder filled with stones and no bile left - **shell aspect** can be easily mistaken with air in the digestive tube, if the examiner is not enough experienced.
- *The presence of one gallstone impacted in the gallbladder infundibulum creates a hydrops and the diagnosis of gallstones is missed!*
- There are also limitations of this method generated by the lack of acoustic window in some patients and also by the obesity.





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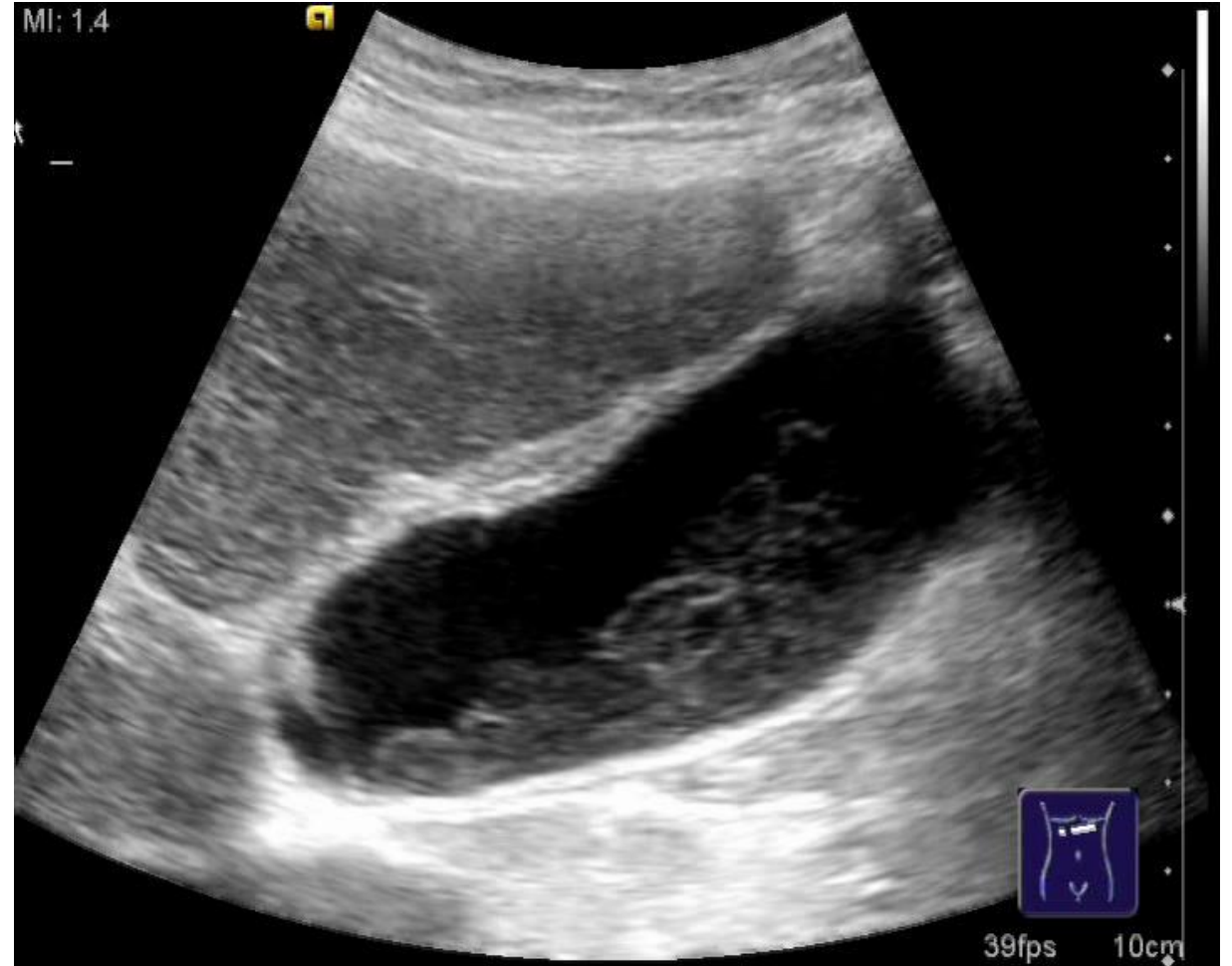
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Biliary sludge

- homogenous echogenic material in the gallbladder lumen, with no posterior acoustic shadowing





Acute cholecystitis

- Occurs in aprox. $1/3$ of the patients with gallstones (1).
- 95% of the cases are due to calculous obstruction of the gallbladder neck or cystic duct
- The presence of the gallstones at ultrasound in combination with sonographic Murphy sign has a positive predictive value of 92% (2)

1. Laing FC – in Diagnostic Ultrasound 1998

2. Ralls PW et al- Radiology 1985

3. Alina Popescu, Suzane Elhakim, Antonio C Matteoni - GALLBLADDER AND BILE DUCT SYSTEM – SONOPATHOLOGY, in WFUMB Course Book



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Gallbladder polyps

- Gallbladder polyps are benign tumors, completely asymptomatic, incidentally found on ultrasound.
- The most frequent types are the adenomas and the cholesterol polyps (contain cholesterol deposits).
- Gallbladder polyps have a wide estimated prevalence in adults of 0.3–12.3%.
- Differential diagnosis polyp ≠ gallbladder stone or ball like sludge

Riddell ZC, et al. Gallbladder polyps and adenomyomatosis. Br J Radiol. 2023 Feb;96(1142):20220115.

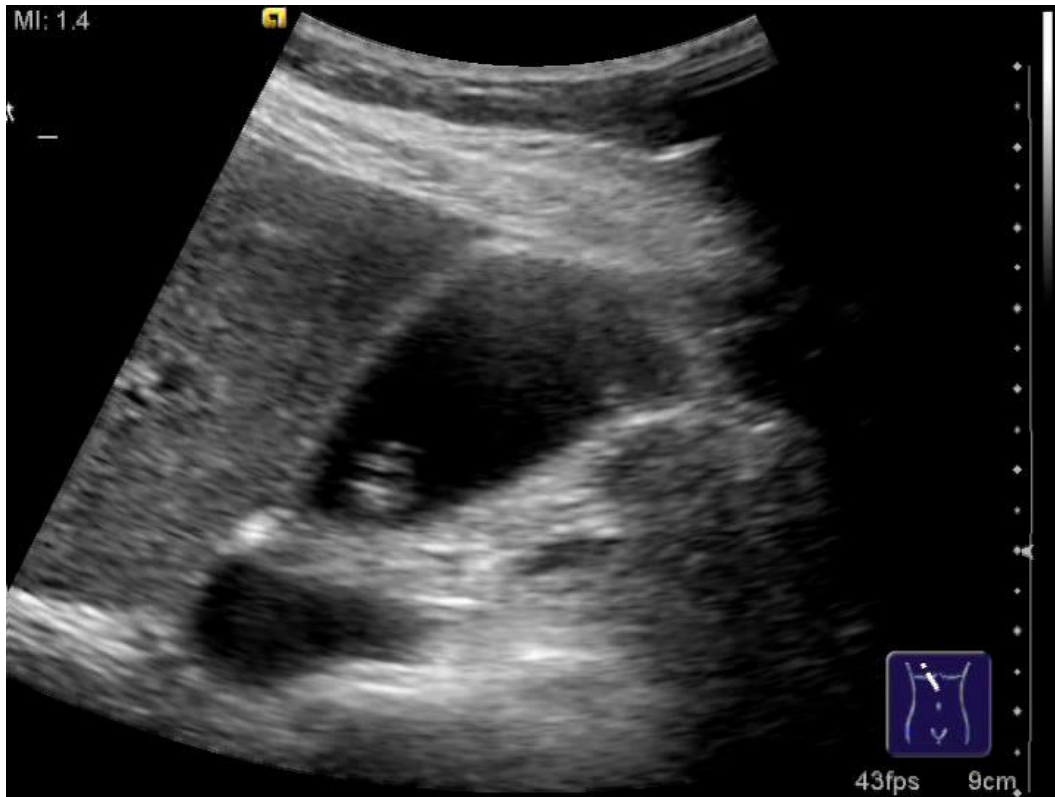
Wennmacker SZ, et al. Transabdominal ultrasound and endoscopic ultrasound for diagnosis of gallbladder polyps. Cochrane Database Syst Rev. 2018 Aug 15;8(8):CD012233.

Alina Popescu, Suzane Elhakim, Antonio C Matteoni - GALLBLADDER AND BILE DUCT SYSTEM – SONOPATHOLOGY, in WFUMB Course Book

Gallbladder polyps



Gallbladder polyps



Gallbladder carcinoma

- Rare but highly fatal malignancy, associated in almost 100 % of the cases with cholecystolithiasis
- Arising in the majority of cases from underlying chronic cholecystitis
- More frequent in patients older than 60 years.
- The risk of developing gallbladder cancer in a patient with gallbladder stones is 0.3 % over 30 years, and with much higher cancer risk in stones larger than 3 cm.

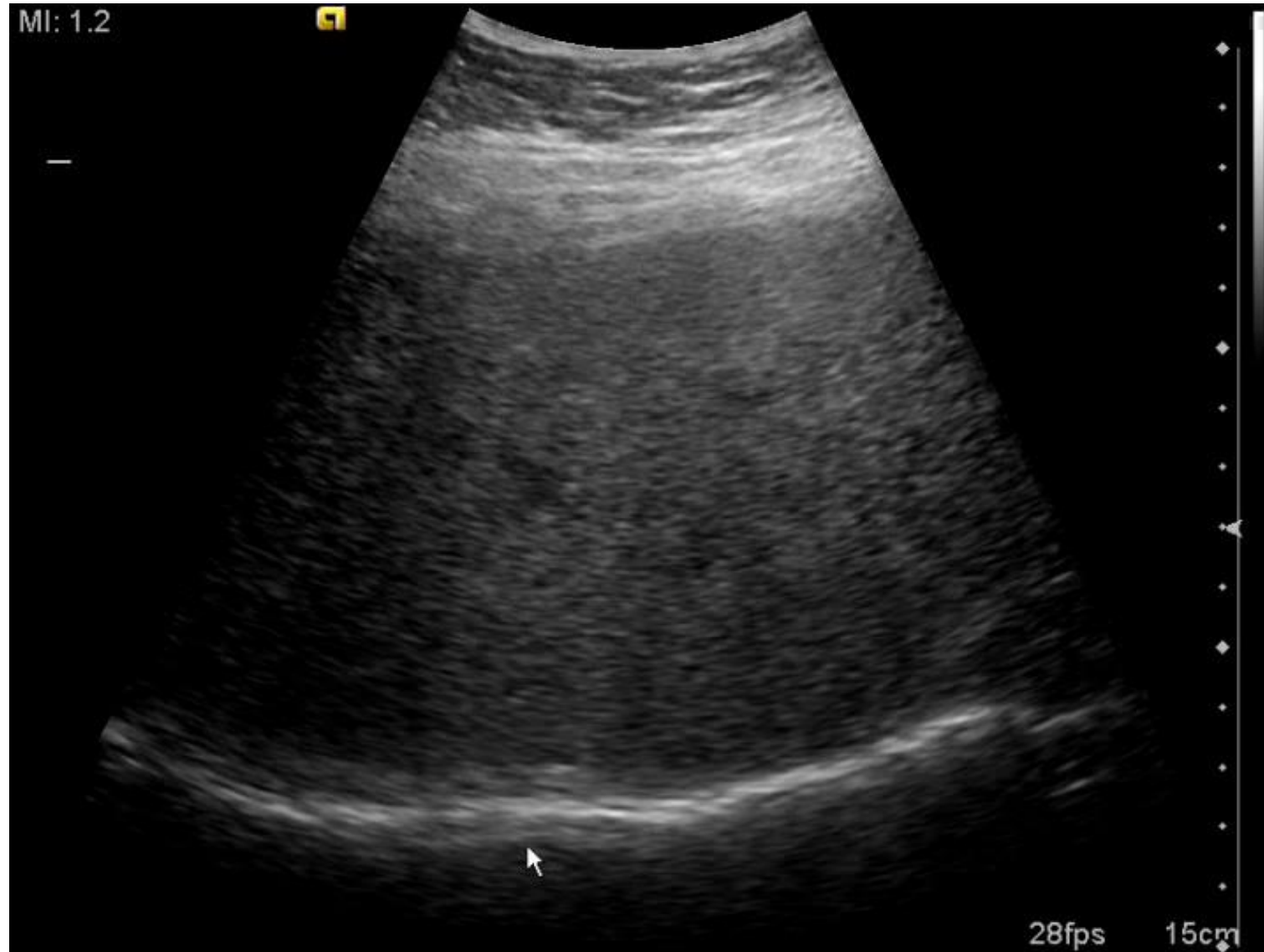
WGO Practice Guideline: Asymptomatic Gallstone Disease

Alina Popescu, Suzane Elhakim, Antonio C Matteoni - GALLBLADDER AND BILE DUCT SYSTEM – SONOPATHOLOGY, in WFUMB Course Book

Most important risk factors are

- gallbladder calculi (particularly ≥ 30 mm and > 20 years),
- a body mass index > 30 kg/m²,
- gallbladder polyps (especially ≥ 10 mm, solitary, broad based and associated with calculi),
- primary sclerosing cholangitis (PSC).

Jenssen C, et al. Incidental Findings of Gallbladder and Bile Ducts-Management Strategies: General Aspects, Gallbladder Polyps and Gallbladder Wall Thickening-A World Federation of Ultrasound in Medicine and Biology (WFUMB) Position Paper. Ultrasound Med Biol. 2022 Dec;48(12):2355-2378.





In patients with equivocal or suspicious results of US, contrast enhanced CT and (diffusion-weighted) MRI are recommended for evaluation and staging

Jenssen C, et al. Incidental Findings of Gallbladder and Bile Ducts-Management Strategies: General Aspects, Gallbladder Polyps and Gallbladder Wall Thickening-A World Federation of Ultrasound in Medicine and Biology (WFUMB) Position Paper. Ultrasound Med Biol. 2022 Dec;48(12):2355-2378.

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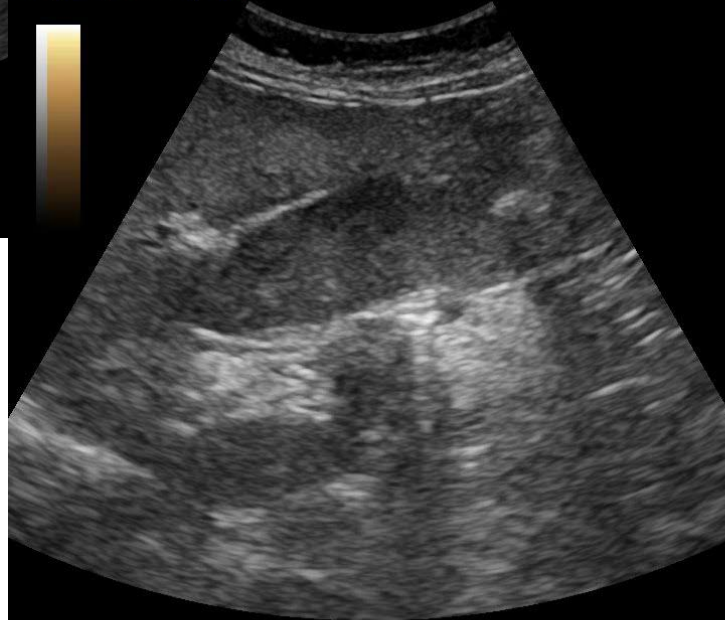
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Biliary obstruction

- Ultrasound should be the first diagnostic imaging modality chosen for detecting biliary obstruction, due to its high accuracy
 - in detecting the presence of the obstruction
 - for establishing the level and etiology of the obstruction.
- In a jaundiced patient, ultrasound is able in almost all cases to differentiate obstructive from hepatic parenchymal causes
- The ultrasound diagnosis of obstructive jaundice is based on the visualization of the dilated bile ducts, with a **sensitivity of 87% and specificity 99%** (1) [in some studies sensitivity 91% (2)].
- MRCP, EUS, ERCP (therapeutic).

1. Cooperberg PL et al – Radiology 1980

2. Liu TH et al – Ann Surg 2001

3. Alina Popescu, Suzane Elhakim, Antonio C Matteoni - GALLBLADDER AND BILE DUCT SYSTEM – SONOPATHOLOGY, in WFUMB Course Book



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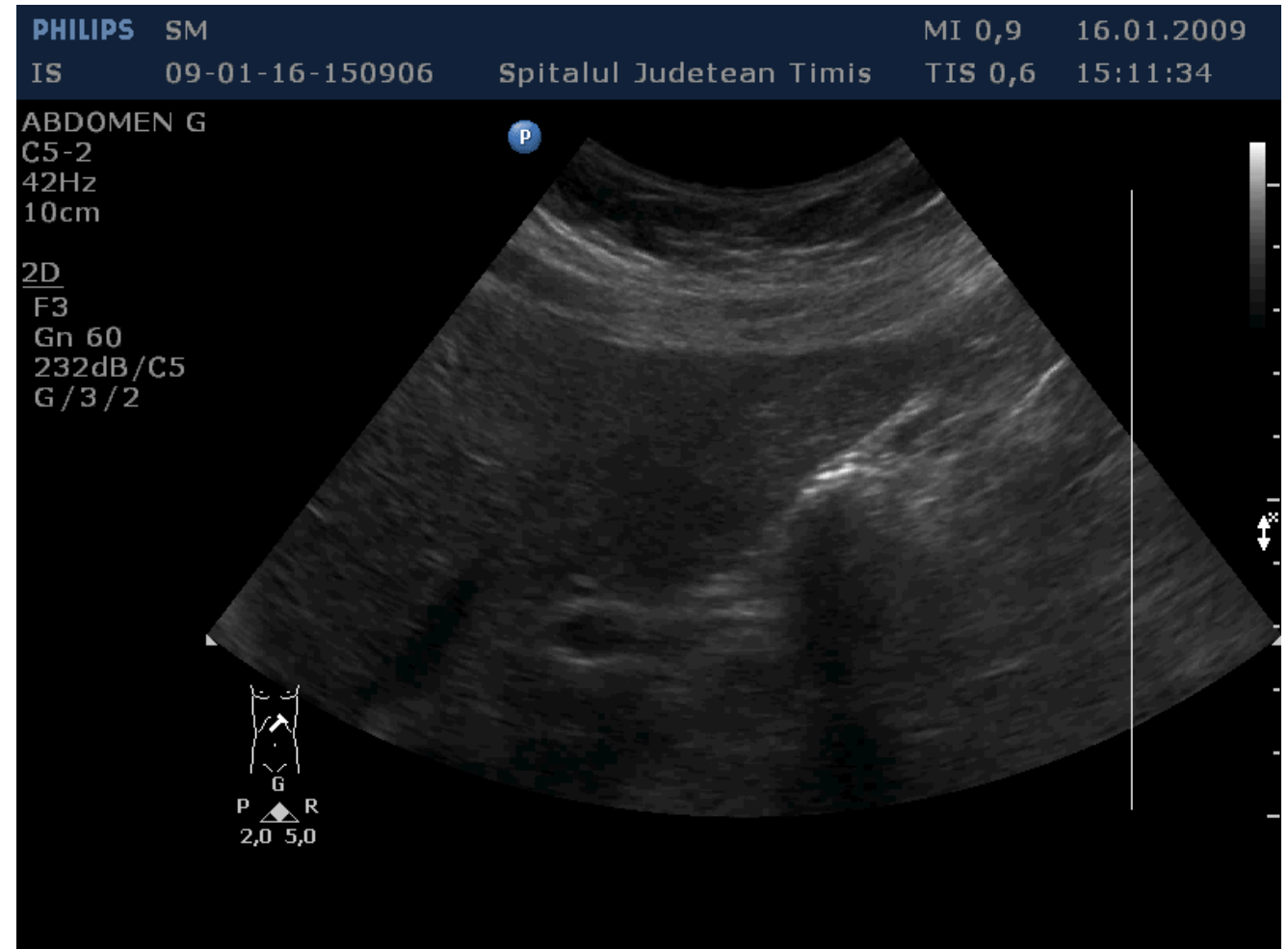
- The localization of the **level** of the obstruction is possible in **90%** of the cases and the **evaluation** of its character in **70%** of the cases (1).



1. Liu TH et al – Ann Surg 2001

Choledocholithiasis

- Develops in about **10-20%** of the patients with gallbladder stones(1).
- About **3-10%** of the patients **undergoing cholecystectomy** will have **common bile duct stones** (1).



1. Freitas ML et al – World J Gastroenterol 2006

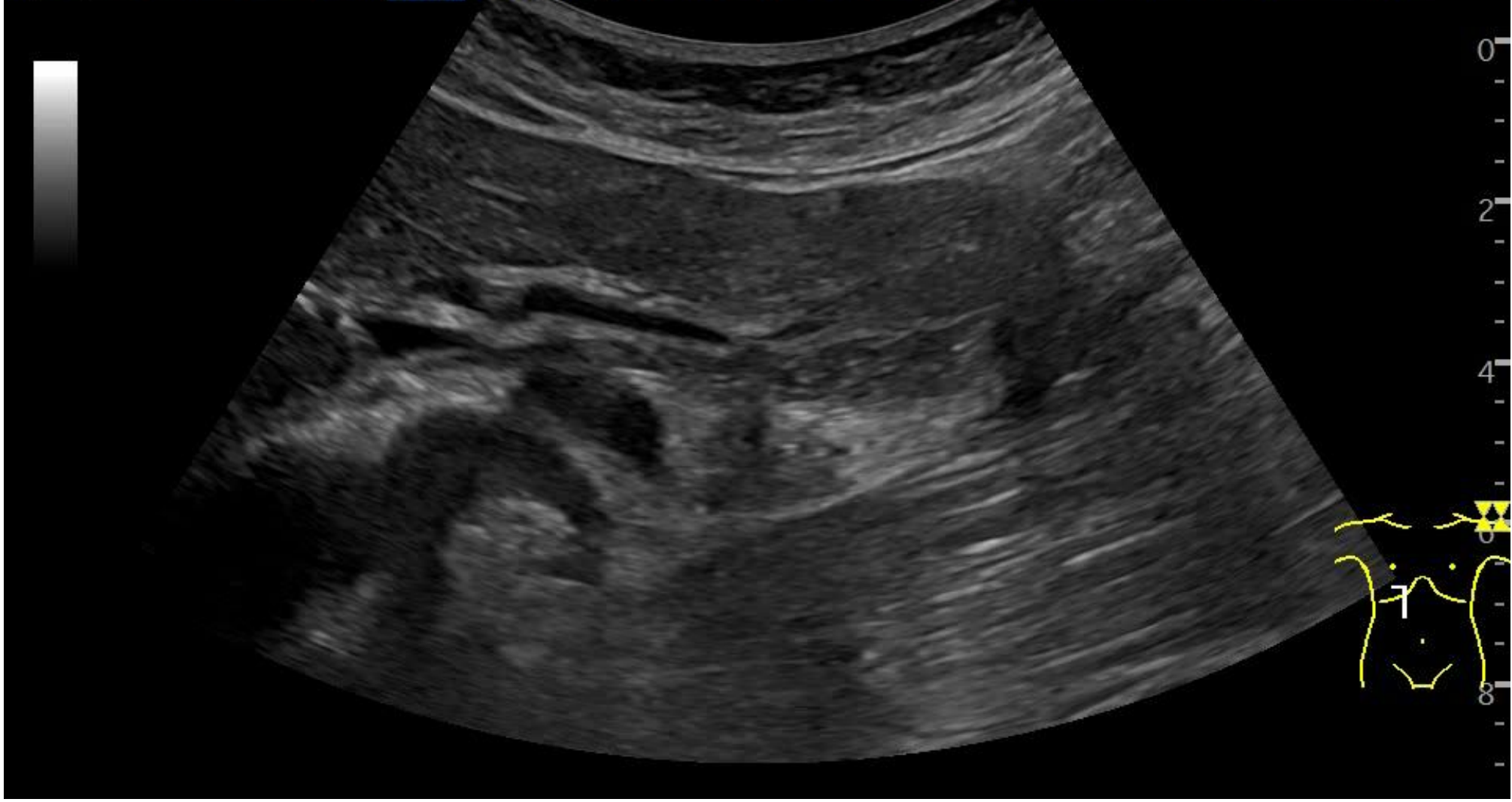
Choledocholithiasis

- US has a sensitivity of 70-75% for detection of common bile duct stones (1)
- Difficulties when the stones are located in the distal, intrapancreatic part of the common bile duct (the most frequent location)
- CT is an alternative diagnostic method with a sensitivity of 80% and 100% specificity (2)
- But MRCP is superior with a sensitivity of 81-100% and 92-100% specificity (3).
- EUS - sensitivity of 88-97% and 96-100% specificity (4, 5).
- ERCP - therapy

1. Hanbidge AE et al – *RadioGraphics* 2004
2. Jimenez CI et al – *Eur Radiol* 2001
3. Hallal AH – *J Am Coll Surg* 2005
4. Freitas ML – *World J Gastroenterol* 2006
5. Nuernberg D – *Med Klin* 2007



16/09/24 17:00:54 ADM FLOREAN ANGELICA, DR. POPESCU ALINA 160924-160953 Abdomen MI 1.3 TIs 0.6



Hilar cholangiocellular carcinoma (Klatskin tumor)

- Klatskin tumor is the most frequent cause of high-level biliary obstruction.
- The ultrasound examination will commonly reveal dilated bile ducts proximal to a stricture and may not reveal the underlying tumor.
- The main biliary duct is usually also not visible due to its invasion by the tumor or because it is not dilated.
- Contrast enhanced ultrasound can sometimes improve the delineation of the tumor.
- Hilar location of cholangiocellular carcinoma is the most common type.

Alina Popescu, Suzane Elhakim, Antonio C Matteoni - GALLBLADDER AND BILE DUCT SYSTEM – SONOPATHOLOGY, in WFUMB Course Book

412/2011 CEUS HCC?

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TAKE HOME MESSAGES!

- Gallbladder and biliary system diseases are frequent pathologies in clinical practice
- Ultrasound is the preferred first line imaging technique in symptomatic but also asymptomatic cases.
- It is the gold standard method for gallbladder stones diagnosis and their complications.
- Ultrasound is the first line imaging modality chosen for detecting biliary obstruction and the level of the obstruction



Thank you!

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