Ultrasound – Gallbladder Evaluation

PURPOSE:
Targeted evaluation of the gallbladder and intra- and extra-hepatic bile ducts for pathology.

SCOPE:
Applies to all ultrasound studies targeted to the gallbladder performed in Imaging Services / Radiology

INDICATIONS:
- Signs or symptoms (pain, jaundice, etc) referred to the gallbladder;
- Abnormal lab values (increased LFTs, etc);
- Abnormal findings on other imaging studies;
- Follow up known gallbladder abnormalities.

CONTRAINDICATIONS:
No absolute contraindications

EQUIPMENT:
Curvilinear array transducer with a frequency range of approximately 1-9 MHz that allows for appropriate penetration and resolution depending on patient's body habitus.

PATIENT PREPARATION:
- OUTPATIENTS: Patient should be NPO for 4-6 hours prior to study, allowing for distention of gallbladder and decrease in bowel gas.
- ER/INPATIENTS: Fasting not needed given urgency of exam. Follow up imaging may be required if area of interest obscured by bowel gas, gallbladder distention is needed, etc.

EXAMINATION:

GENERAL GUIDELINES:

A complete examination includes evaluation of the gallbladder, intra-hepatic ducts, and extra-hepatic bile ducts.

EXAM INITIATION:
- Introduce yourself to the patient
- Verify patient identity using patient name and DOB
- Explain test
- Obtain patient history including symptoms. Inquire if the patient has received pain medication. Enter and store data page
- Place patient in supine and/or left lateral decubitus (LLD) positions

TECHNIQUE CONSIDERATIONS:
- Review any prior imaging, making note of associated abnormalities requiring evaluation.
- Fasting for 4-6 hours prior to exam will permit adequate gallbladder distention (not needed for ER or IP exams, although follow-up imaging may be needed if GB distention is desired).
- Liberal use of cine sweeps allows for better evaluation of focal or indeterminate findings.
- Deep inspiration facilitates imaging of the liver and gallbladder in the supine position via a subcostal approach.

- In LLD position, the gallbladder shifts towards midline, improving accessibility for scanning
- Gallbladder and intra/extrahepatic bile ducts should be evaluated for dilatation, wall thickening, and intraluminal findings, if abnormal.
- In addition to supine and/or LLD imaging, upright or prone imaging may be necessary to evaluate mobility of sludge and stones or to differentiate them from a polyp.
- Evaluation for a sonographic Murphy sign requires focal tenderness to **transducer pressure immediately over the gallbladder**, in an unaltered patient and in the absence of pain medication. This should be distinguished from diffuse abdominal tenderness.
- Color Doppler may be used to identifying twinkling artifact within biliary sludge (small stones), and evaluate for gallbladder wall or hepatic parenchyma hyperemia.
- Color Doppler should be used to differentiate hepatic arteries and portal veins from dilated intrahepatic bile ducts.
- The common duct should be imaged longitudinally, adjacent to the main portal vein, distinguished from the hepatic artery by color Doppler.
- The duct should be measured from inner wall to inner wall at the porta hepatis near the crossing of the right hepatic artery. Remainder of the common duct should be evaluated as far distally toward the pancreatic head as possible if common duct measurement is abnormal or for obvious choledochocele variant, with an evaluation for obstructing intraluminal or extrinsic lesions, if possible
- A brief check for intra-hepatic biliary ductal dilatation should be performed. Linear probe evaluation of the left lobe may be useful. Documentation should include images at the level of the intra-hepatic portal bifurcation, and along the main right and left portal veins, without and with color, to check for dilated ducts.
- Wall thickening and edema should be documented without and with thickness measurements, and without and with color Doppler to assess for wall hyperemia.
- Spectral Doppler with measurement of Peak Systolic Velocity (PSV) of the hepatic and cystic arteries may be useful in equivocal cases of acute cholecystitis.

DOCUMENTATION:

- Longitudinal images:
  - Representative still and cine sweep images of gallbladder including as much of neck, mid body, and fundus as possible, with additional sweeps of any focal abnormality.
  - Annotate image if focal tenderness was or was not observed (example: "+ pain" or "no tenderness"). Document if patient altered or received pain medication.
  - Common duct with largest diameter measurement at porta hepatis.
  - Color Doppler of wall if thickened/edematous.
- Transverse images:
  - Representative still and cine sweep images of gallbladder at neck, mid body, and fundus, with additional cine sweep of any focal abnormality.
- Check for intrahepatic ductal dilatation:
  - Representative images of the intrahepatic bile ducts, along the portal veins, 1) at the level of the portal/intra-hepatic bile duct bifurcation, 2) at the level of the left, and 3) right portal veins, without and with color Doppler.
- Doppler:
  - In cases equivocal for acute cholecystitis, Duplex (color and Spectral Doppler) of hepatic artery (HA) and cystic artery, with PSV, should be considered.

PROCESSING:

- Review examination images and data
- Export all images to PACS
- Document relevant history, if the patient was altered or received pain medication prior to the examination, absence or presence of sonographic Murphy sign, and any study limitations

REFERENCES:

ACR-AIUM Practice Guideline (Revised 2007)

REVISION HISTORY:

SUBMITTED BY:	David T. Fetzer, MD	**Title**	Medical Director
APPROVED BY:	David T. Fetzer, MD	**Title**	Medical Director
APPROVAL DATE:	11-09-2015		
REVIEW DATE(S):	11-12-2018		David T. Fetzer
REVISION DATE(S):	05-24-2016	**Brief Summary**	Added intrahepatic duct dilatation check
	03-08-2022		Clarified that fasting not needed to ER/IP orders. Added need for color Doppler eval of wall
	10-10-2022		Included information regarding Hepatic and Cystic Artery waveforms. Included Appendix information regarding GB polyp evaluation

APPENDIX:

Hepatic and Cystic Artery Waveforms:

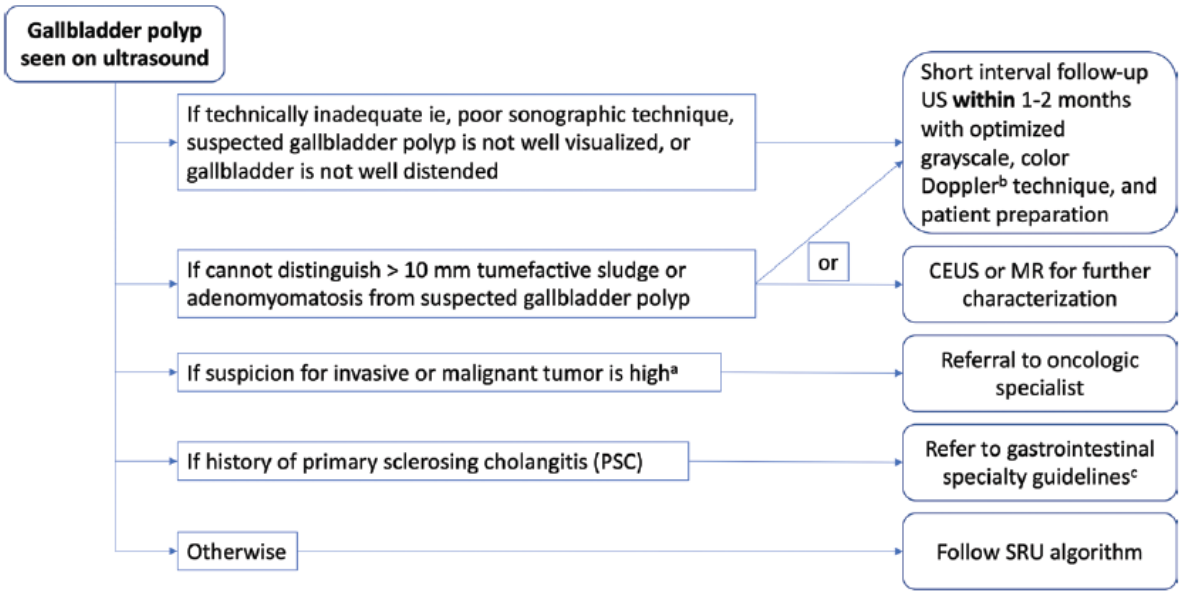
Hepatic Artery (HA):

- Peak systolic velocities (PSV) of HA ≥ 100 cm/s may help differentiate acute from chronic cholecystitis. DOI: 10.1007/s00261-017-1288-z
- PSV > 200 cm/s specific for acute hepatic dysfunction (including infection and sepsis). DOI: 10.1002/jcu.22885

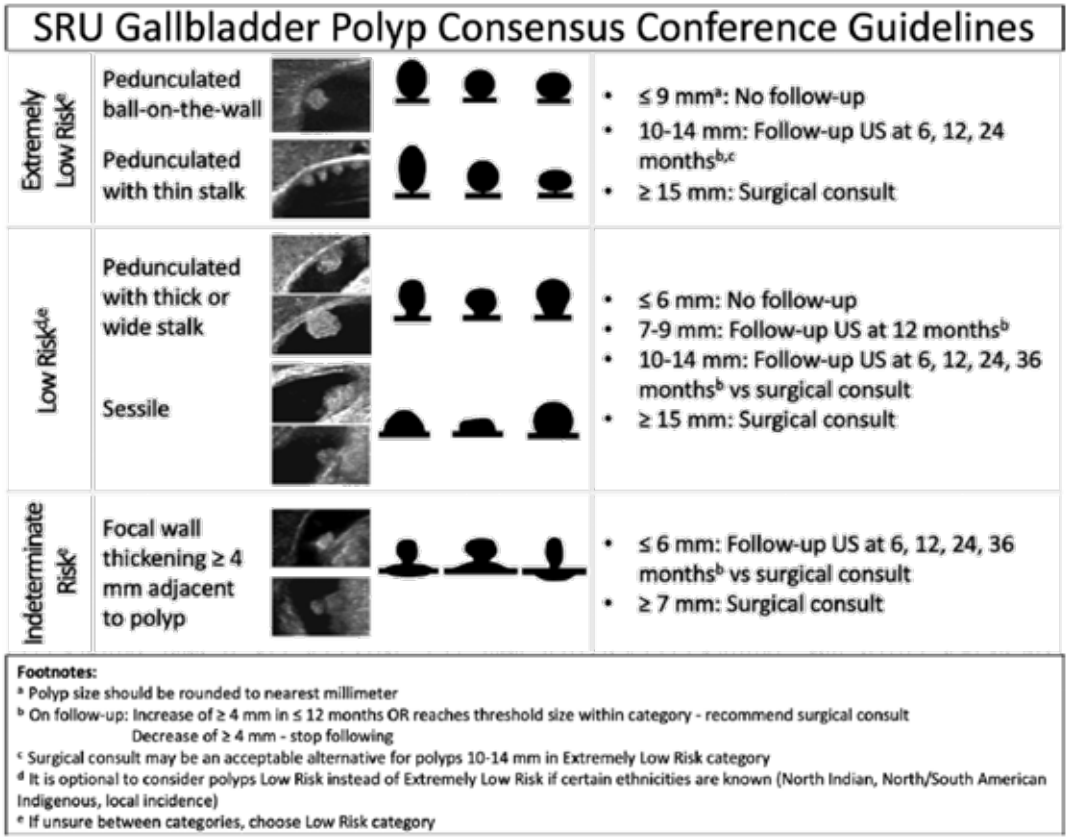
Cystic Artery:

- PSV ≥ 40 cm/s associated with acute cholecystitis (PPV 94.7%; accuracy 81.4%). DOI: 10.1007/s00261-021-03020-z

Management of Gallbladder Polyps*



[a] Findings that may indicate invasive tumor include the following: wall invasion, concurrent liver masses, malignant biliary obstruction, or pathologic lymph node enlargement at the porta hepatis or para-aortic chain
[b] Higher sensitivity Doppler techniques such as power Doppler, B-Flow, and microvascular Doppler may help differentiate a polyp from tumefactive sludge
[c] American Gastroenterology Association https://www.cghjournal.org/article/S1542-3565(19)30744-X/pdf



* https://doi.org/10.1148/radiol.213079