

TYPES OF CHOLECYSTITIS AND RADIOLOGICAL FINDINGS (USG + CT)

1) Acute Cholecystitis

Clinical Findings

- Right upper quadrant (RUQ) pain, Murphy positive (see – Special Radiological Signs)
- Fever, leukocytosis
- Mild bilirubin/ALP elevation
- Usually cystic duct obstruction (stone >90%)

Ultrasound Findings (First-Line Modality)

- Wall thickening >3 mm
- Pericholecystic fluid / increased echogenicity in fatty planes (inflammation)
- Positive sonographic Murphy sign
- Non-compressible, distended gallbladder
- Stones within lumen + acoustic shadow
- Distension (>4 cm transverse)

Trick Points

- Gallbladder wall thickening alone is not specific → can also be seen in heart failure, hypoalbuminemia, hepatitis.
- Pericholecystic fluid, especially if localized, supports acute cholecystitis.

CT Findings

- Wall thickening (symmetric/asymmetric)
 - Pericholecystic fat stranding
 - Increased wall enhancement
 - Gallbladder distension
 - Stones (especially calcified)
 - If complicated: necrosis, gas, pericholecystic collection
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2) Chronic Cholecystitis

Clinical Findings

- Recurrent, mild RUQ pain
- Usually silent course
- Frequently associated with chronic stones

Ultrasound Findings

- Thick but sclerotic-appearing wall
- Reduced gallbladder contractility; may be small and fibrotic
- Multiple stones, shadowing
- Sometimes “porcelain gallbladder” (calcified wall) (see – Special Radiological Signs)

Trick Points

- Wall usually appears smooth and homogeneously thick
- No pericholecystic fluid (differentiating point)

CT Findings

- Thick but poorly enhancing fibrotic wall
 - Wall calcifications
 - Compact, small gallbladder
 - Long-term changes related to stones
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3) Acalculous Cholecystitis

(ICU patients, sepsis, burns, trauma, TPN)

Clinical Findings

- Pain minimal or absent
- Fever, sepsis
- Faster progression to perforation/complications

Ultrasound Findings

- Wall thickening (most prominent finding)
- Pericholecystic fluid
- Hyperechoic wall, edema
- No stones
- Possible biliary sludge

- Distension

Trick Points

- Primary pathology is ischemia → prominent wall edema + rapid deterioration
- USG may be negative → CT more sensitive

CT Findings

- Marked wall edema (double wall sign – see – Special Radiological Signs)
 - Pericholecystic fat inflammation
 - Distension
 - Sludge in lumen
 - Frequent complications (gangrene/perforation)
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4) Emphysematous Cholecystitis

(Common in diabetics, anaerobic bacteria)

Clinical Findings

- Severe pain, toxic appearance
- Sepsis
- More common in diabetics

Ultrasound Findings

- Gas in gallbladder wall or lumen → hyperechoic lines + dirty acoustic shadow
- Reverberation / “dirty shadowing”
- Distension
- Pericholecystic inflammation

Trick Points

- USG limited due to gas → CT is gold standard

CT Findings

- Gas in gallbladder wall or lumen

- Wall destruction
 - Pericholecystic fluid
 - Rapidly progressing necrotizing process
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5) Gangrenous Cholecystitis

(Advanced stage of acute cholecystitis)

Clinical Findings

- Severe pain
- Toxic appearance, fever, sepsis
- More common in elderly and diabetics

Ultrasound Findings

- Intraluminal membranes (necrotic wall fragments)
- Irregular wall
- Pericholecystic fluid
- Positive Murphy may decrease (nerve destruction)

CT Findings

- Irregular, fragmented wall
- Loss of wall enhancement (ischemia/necrosis)
- Intraluminal membranes
- Pericholecystic collection
- Closest stage to perforation

Trick Points

- “Wall enhancement loss + intraluminal membrane” = most specific CT finding for gangrene
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GALLBLADDER PERFORATION

Clinical Findings

- Severe pain, rebound

- Fever, sepsis
- Rapidly worsening clinical course
- Common in elderly/comorbid patients

Cholecystitis → Perforation Types (Niemeier Classification)

- **Type 1:** Acute free perforation → biliary peritonitis (most severe)
 - **Type 2:** Localized perforation → pericholecystic abscess
 - **Type 3:** Chronic perforation → internal fistula (duodenum, colon)
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DETAILED RADIOLOGICAL FINDINGS – NIEMEIER TYPES

📌 Type 1: Acute Free Perforation (Biliary Peritonitis)

Clinical

- Sudden, severe pain
- Peritonitis signs (rigidity, rebound)
- Rapid deterioration, sepsis
- Most fatal type

Ultrasound Findings

- Widespread free fluid distant from gallbladder (subhepatic + Douglas)
- Focal wall defect (low sensitivity on USG)
- Irregular, thickened, edematous wall
- Free fluid rather than localized collection
- Stone outside gallbladder may be seen

Trick Points – USG

- Widespread free fluid + acute cholecystitis → consider Type 1
- Wall defect often not visible → absence does not exclude

CT Findings

- Wall defect (most reliable)
- Widespread intra-abdominal bile fluid (“bilioperitoneum”)
- Low attenuation bile
- Perihepatic, pelvic, paracolic fluid
- Extracaliber stone may be seen

Trick Points – CT

- Free fluid + segmental wall loss = classic Type 1 combination
 - Fluid attenuation 8–20 HU
 - Extracaliber stone = very specific for perforation
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🔍 Type 2: Localized Perforation (Pericholecystic Abscess)

Clinical

- Severe pain, less widespread than peritonitis
- Fever, leukocytosis
- Possible septic state
- Subacute course

Ultrasound Findings

- Localized, hyperechoic-walled fluid collection adjacent to gallbladder (abscess)
- Wall irregularity
- Localized pericholecystic fluid forming collection
- Stones may appear outside gallbladder

Trick Points – USG

- Localized, round pericholecystic fluid → consider abscess, not edema
- “Pericholecystic collection + stone visible” = strong Type 2 indicator

CT Findings

- Wall defect or suspicious segmental loss
- Pericholecystic abscess/collection
- Surrounding fat inflammation
- Extracaliber stone may be present
- Well-defined, encapsulated collection typical

Trick Points – CT

- Most common type of gallbladder-related collection → matches Type 2
- “Wall irregularity at one point + adjacent encapsulated collection” = classic Type 2

- Collection may have heterogeneous attenuation (bile + necrotic debris)
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🔍 Type 3: Chronic Perforation (Fistula)

Clinical

- Long-standing symptoms
- Nausea, vomiting, intermittent pain
- Sometimes ileus (gallstone ileus)
- Older population

Ultrasound Findings

- Echo changes / fistula tract between gallbladder and duodenum/colon (hard to see)
- Gas in gallbladder (pneumobilia → suggests fistula)
- Irregular, chronically changed wall
- Large stone in lumen → may have triggered fistula

Trick Points – USG

- Gas in gallbladder → emphysematous cholecystitis vs fistula
- Fistula indicators: chronic wall, close bowel contact, occasional intraluminal stone
- USG sensitivity low for direct fistula visualization

CT Findings

- Fistulous tract between gallbladder and duodenum/colon
- Pneumobilia (intrahepatic bile duct air)
- Large stone in lumen
- Ectopic stone in bowel (gallstone ileus)
- Chronically irregular wall
- Inflammatory fat changes

Trick Points – CT

- Best modality for Type 3 perforation
- “Air-filled tract between gallbladder and bowel” = direct sign
- Gallstone ileus: bowel obstruction, ectopic stone, pneumobilia → Rigler triad

SUMMARY: Comparative Table

Type	Clinical	USG	CT	Trick Points
Type 1	Acute, peritonitis	Widespread free fluid	Free fluid + wall defect	Extracaliber stone = specific
Type 2	Subacute, abscess	Pericholecystic encapsulated collection	Local abscess + wall irregularity	Localized collection = Type 2
Type 3	Chronic, fistula	Air, chronic wall	Fistula tract + pneumobilia	Rigler triad

TERMINOLOGY AND SPECIAL RADIOLOGICAL SIGNS

● Rigler Sign (Not Triad, Single Sign)

Definition:

Visualization of both the mucosal (inner) and serosal (outer) surfaces of the bowel wall simultaneously.

Mechanism:

- Air in lumen → inner line
- Air in peritoneum → outer line
- Both visible → Rigler sign

CT Appearance:

- Bowel wall appears as thin ring with both sides delineated
- Lumen side: normal gas
- Outer side: free air
- Best seen on CT; subhepatic area in supine position is optimal
- Outer serosa: 0–30 HU low attenuation air strip

Trick Point:

- Two parallel lines along bowel wall → Rigler sign → pneumoperitoneum

USG Appearance:

- Two hyperechoic parallel lines
- Reverberation artifact from free air
- Inner + outer wall lines visible

Meaning:

- Indicates pneumoperitoneum → perforation

✓ Rigler Triad

Definition:

Combination of three findings specific to gallstone ileus:

1. Small bowel obstruction
2. Pneumobilia
3. Ectopic gallstone (usually in ileum)

Best Modality: CT

Meaning: Indicates cholecystoenteric fistula + obstructing stone

Quick Difference:

Feature	Rigler Sign	Rigler Triad
Type	Single finding	Combination of 3
Disease	Any perforation	Gallstone ileus
Anatomy	Bowel wall	Biliary system + bowel
Shows	Pneumoperitoneum	Stone + fistula + obstruction

Trick:

- Rigler sign → 99% perforation
- Rigler triad → pathognomonic for gallstone ileus

🔍 Double Wall Sign (Double Rim Sign)

Occurs in two scenarios:

- A) Gallbladder wall edema (double wall)
- B) Bowel lumen with free air (another version of Rigler)

A) Gallbladder Double Wall

- Inner mucosa + outer serosa separated by hypoattenuating/hypoechoic edema → two lines
- Associated with acalculous, acute, or gangrenous cholecystitis

USG:

- Two parallel hyperechoic lines
- Hypoechoic band in between (wall edema)
- Sometimes appears as “target sign”
- Wall thickness ≥ 3 mm

Trick Points:

- Indicates inflammation + edema → acute cholecystitis
- Hypoalbuminemia or heart failure may mimic → check pericholecystic fluid + sonographic Murphy
- Double wall + wall irregularity → think gangrenous

CT:

- Three layers: inner (enhancing mucosa), middle (low HU edema), outer (enhancing serosa)
- Best seen in portal phase
- Hypoenhancing middle layer → ischemia
- Low enhancement + thick wall → gangrenous
- Prominent hypodense band → acalculous cholecystitis

PORCELAIN GALLBLADDER

Definition:

Calcification of gallbladder wall → “porcelain” appearance radiologically

- Usually chronic inflammation
- Female predominance, 50–70 years

Clinical:

- Often asymptomatic
- Some present with chronic RUQ pain
- History of gallstones common
- Carcinoma risk: 5–12%, especially with complete wall calcification

Radiological Findings & Classification**A) USG**

- Hyperechoic, posterior acoustic shadowing wall thickening

Types:

1. Complete wall calcification → entire wall hyperechoic + posterior shadow
2. Partial/segmental → only part of wall calcified, localized shadow
3. With stones → hyperechoic area + stone shadow, differentiation required

Trick Points – USG:

- Partial calcification easy to miss → check multiple angles
- Posterior shadow → confirms calcification
- Full wall shadow → porcelain gallbladder
- Partial + stone → malignancy risk

B) CT

- Hyperdense wall calcification
- Lumen may contain fluid or stones

Classification:

1. Complete wall → uniform, lumen soft tissue
2. Partial/focal → part calcified, rest normal
3. Complicated / suspected malignancy → irregular wall, segmental thickening, surrounding fat infiltration

Trick Points – CT:

- Thin-section CT important for partial
- Complete → hypodense lumen, easy differentiation

- Irregular calcification/nodules → suspect malignancy

Localization / Appearance:

- Can be localized, not entire wall
- Segmental → US hyperechoic + shadow
- CT → focal calcification + wall thickness + surrounding infiltration

Summary Trick Points:

- US posterior shadow + hyperechoic segment → calcification
 - Partial vs complete → malignancy risk differs
 - CT hyperdense wall + irregularity → malignancy/complication suspicion
 - Localized → may mimic stone/shadow
 - Usually asymptomatic, consider chronic inflammation or stones
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MURPHY SIGN / SONOGRAPHIC MURPHY SIGN

Definition:

- Clinical Murphy: palpation in RUQ during inspiration → acute cholecystitis
- Sonographic Murphy: US probe pressed on maximally thickened area → sudden pain
- Sonographic Murphy = US-induced, not manual palpation

Clinical Significance:

- One of the most sensitive findings for acute cholecystitis
- Positive → correlates with wall edema/inflammation
- May be negative in asymptomatic, elderly, immunocompromised

US Findings:

- Wall thickening ≥ 3 mm
- Minimal or pronounced pericholecystic fluid
- Sudden pain/reflex with probe
- Additional: distended lumen, stone/sludge, target sign (hyperechoic inner + hypoechoic edema)

Trick Points – US Murphy:

1. Probe speed: too fast → false negative
2. Localization: press on maximal thickening
3. Elderly/immunocompromised → may be negative → rely on US findings
4. Stones may trigger → distinguish from inflammation
5. Positive Murphy + wall edema + pericholecystic fluid → strongest acute cholecystitis combination

CT Murphy:

- No direct Murphy sign
- Indirect: wall thickening, pericholecystic fluid, stones, inflammation → interpret with clinical correlation

Summary:

- US palpation → Sonographic Murphy
- Positive → acute cholecystitis
- Trick: press over thickest wall, differentiate from stones/sludge, consider age

✓ **Note:** Murphy is a clinical + US sign, unlike direct radiological signs like Rigler or double wall.