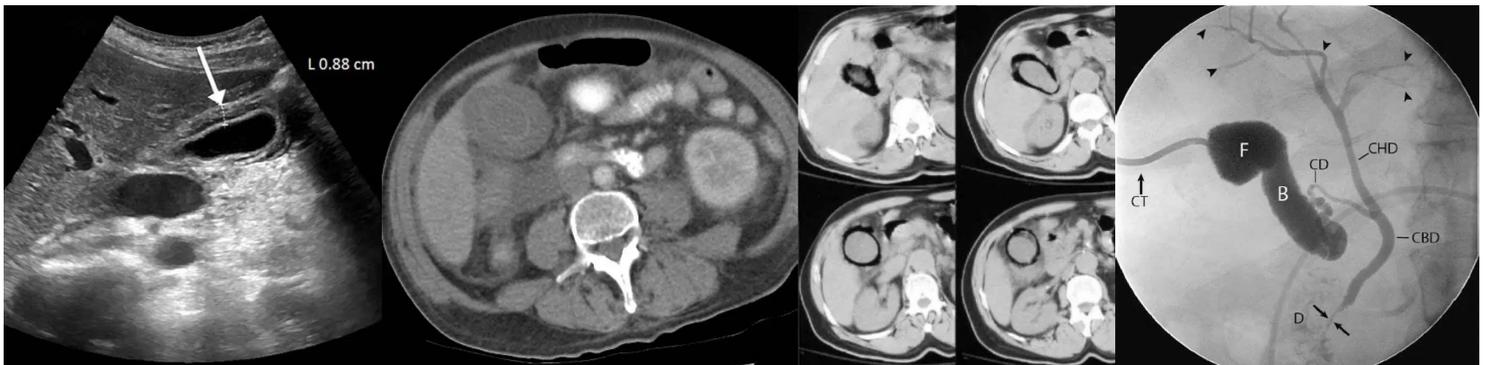


[HOME](#)
[ABOUT THE IBCC](#)
[TWEET US](#)
[CONTACT US](#)

The Internet Book of Critical Care

Acalculous cholecystitis

November 7, 2019 by [Josh Farkas](#)



CONTENTS

- [Basics \(#basics\)](#)
- [Epidemiology \(#epidemiology\)](#)
- [Clinical presentation \(#clinical_presentation\)](#)
- [Differential diagnosis \(#differential_diagnosis\)](#)
- [Investigations \(#investigations\)](#)
- [Treatment \(#treatment\)](#)
- [Podcast \(#podcast\)](#)
- [Questions & discussion \(#questions_&_discussion\)](#)
- [Pitfalls \(#pitfalls\)](#)
- [PDF of this chapter \(or create customized PDF \(<https://emcrit.org/ibcc/about-guide/#pdf>\)\)](#)

basics

[\(back to contents\) \(#top\)](#)

overview

- Acalculous cholecystitis is defined as cholecystitis that occurs without a gallstone.
- This typically occurs in critically ill patients due to a combination of factors (e.g. bile stasis and hypoperfusion).
- Acalculous cholecystitis often goes unrecognized initially, because of intubation and sedation. This can lead to a high rate of progression to gallbladder necrosis (50%) and perforation (10%).
 - The term “necrotizing cholecystitis” has been proposed for this disease, to emphasize its potentially malignant course.

pathogenesis

- Pathogenesis may be summarized roughly as follows. In some ways, this may be conceptualized as a *paralytic ileus of the gallbladder*.

- (1) Lack of enteral nutrition and hypoperfusion create a hypotonic, dilated gallbladder.
 - Distension of the gallbladder increases wall tension, further impairing perfusion of the gallbladder wall.
 - Biliary stasis causes concentration of biliary detergents, which may damage the gallbladder wall.
- (2) Further complications ensue:
 - Necrosis and perforation of the gallbladder may occur.
 - Superinfection with enteric bacteria may occur (empyema of the gallbladder). Note that many cases of acalculous cholecystitis occur *without* bacterial infection.

epidemiology

[\(back to contents\) \(#top\)](#)

uncommon overall

- Acalculous cholecystitis is seen mostly in the intensive care unit as a *complication* of pre-existing critical illness.
- This may account for ~5% of cholecystitis. However, the precise incidence is murky given lack of definitive diagnostic criteria.

risk factors

- **(a) Critical illness**
 - Trauma, burns
 - Sepsis
 - Multi-organ failure
 - Non-biliary surgery (especially cardiac or aortic surgery)
- **(b) Gallbladder distension**
 - Total parenteral nutrition
 - Lack of enteral nutrition
 - Opioids
- **(c) Hypoperfusion**
 - Global hypoperfusion, heart failure
 - Vascular disease (diabetes, hypertension, atherosclerosis, vasculitis)

clinical presentation

[\(back to contents\) \(#top\)](#)

1) can cause clinical findings generally associated with biliary disease

- Right upper quadrant pain (Murphy's sign)
- Nausea/vomiting
- Abdominal distension, decreased bowel sounds
- Fever
- Jaundice

2) can cause sepsis of unknown origin

- May have no localizing symptoms.
- Can present as fever or sepsis with no obvious source.

differential diagnosis

[\(back to contents\) \(#top\)](#)

Depending on the presentation, the differential may be quite broad.

common considerations include:

- Other biliary disease

- calculous cholecystitis
- ascending cholangitis
- choledocholithiasis
- Pancreatitis
- Peptic ulcer disease with perforation
- Pyelonephritis
- Clostridioides difficile colitis
- Pneumonia
- Hepatic abscess
- Hepatitis (may cause thickening of gallbladder wall)
- Mesenteric or colonic ischemia

labs

[\(back to contents\) \(#top\)](#)

labs are not helpful

- Leukocytosis may be seen.
- Variable elevation in bilirubin and alkaline phosphatase can occur, but are neither sensitive nor specific.

ultrasonography

[\(back to contents\) \(#top\)](#)

overall role of ultrasound

- Ultrasound is probably the best single imaging modality overall.
- It may be challenging because the gallbladder is usually “abnormal” to some extent in critical illness (e.g. mild wall thickening due to edema and volume overload).

imaging criteria for diagnosis of acute acalculous cholecystitis

- These criteria haven't been validated, but may be useful to provide a general schema ([20478490 \(https://www.ncbi.nlm.nih.gov/pubmed/20478490\)](https://www.ncbi.nlm.nih.gov/pubmed/20478490)).
- Satisfied either if two major criteria are present, or one major criterion plus two minor criteria.
- **Major criteria**
 - Gallbladder wall thickening >3.5 mm
 - Striated gallbladder (i.e. gallbladder wall edema)
 - Sonographic Murphy sign
 - Pericholecystic fluid (especially in the absence of ascites or hypoalbuminemia)
 - Mucosal sloughing into the lumen of the gallbladder
 - Intramural gas (emphysematous cholecystitis)
- **Minor criteria**
 - Gallbladder distension (>5 cm in transverse diameter)
 - Echogenic bile (sludge)



Meghan Herbst
@EUSmkh

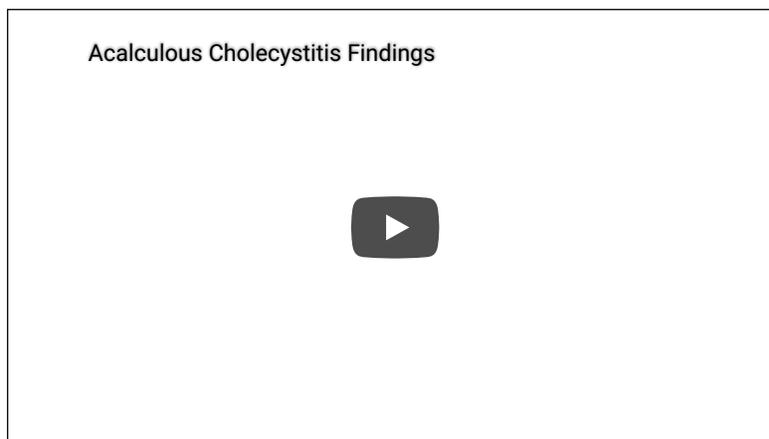
Which of the following does this patient LEAST likely have?



Above tweet: Spoiler alert, the diagnosis is acalculous cholecystitis. Note how thickened and striated the gallbladder wall is.

comments on specific findings

- Sonographic Murphy's sign
 - Care should be taken, including evaluation of many points on the abdomen (to differentiate this from generalized abdominal tenderness).
 - Sonographic Murphy's sign may be absent due to analgesia/obtundation or gangrene of the gallbladder.
 - If *present*, this is one of the more specific findings.
- Thickening of the gallbladder wall
 - *Sensitive*
 - This is the most sensitive finding on imaging.
 - Using a cutoff of 3 mm, sensitivity may approach 100%.
 - Lack of wall thickening argues strongly against a diagnosis of calculus cholecystitis.
 - *Nonspecific*
 - Can be caused by many factors which are common among critically ill patients (e.g., ascites, anasarca).
 - Viral hepatitis may cause dramatic thickening of the gallbladder wall.



approach to the ambiguous ultrasound

- In equivocal cases, *repeat ultrasonography* may be considered (8497021 (<https://www.ncbi.nlm.nih.gov/pubmed/8497021>)).
 - Interval deterioration (e.g. increasing wall thickness) supports a diagnosis of cholecystitis.
 - Stable or improved findings argue against cholecystitis.

CT scan

[\(back to contents\) \(#top\)](#)

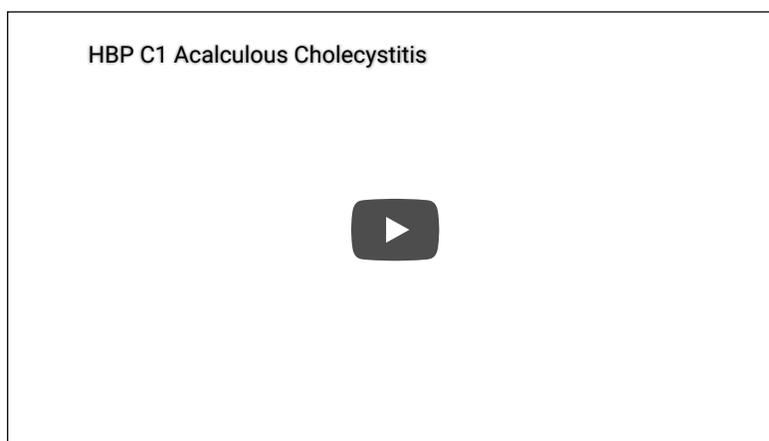
overall role of CT

- Overall performance is *similar* to ultrasonography.
- It may be especially useful in the following situations:
 - Ultrasonographic windows are poor.

- Differential diagnosis is broad (CT scan allows survey of entire abdomen & lung bases).
- Findings are largely the same as on ultrasonography (discussed above).

imaging criteria for diagnosis of acute acalculous cholecystitis

- These criteria haven't been validated, but may be useful to provide a general schema ([20478490](https://www.ncbi.nlm.nih.gov/pubmed/20478490) (<https://www.ncbi.nlm.nih.gov/pubmed/20478490>)).
- Satisfied either if two major criteria are present, or one major criterion plus two minor criteria.
- **Major criteria**
 - Gallbladder wall thickening >3 mm
 - Subserosal halo sign (intramural lucency caused by edema – equivalent to striated gallbladder on ultrasound)
 - Pericholecystic infiltration of fat (“dirty fat”)
 - Pericholecystic fluid (in the absence of either ascites or hypoalbuminemia)
 - Mucosal sloughing
 - Intraluminal gas (emphysematous cholecystitis)
- **Minor criteria**
 - Gallbladder distension (>5 cm in transverse diameter)
 - High-attenuation bile (sludge)



other imaging findings on CT

- Lack of gallbladder wall enhancement

HIDA scan

[\(back to contents\) \(#top\)](#)

HIDA scan (cholescintigraphy) generally doesn't help

- This is a nuclear medicine scan involving dye secreted by the liver which normally accumulates in the gallbladder. A “positive” scan consists of inability to visualize the gallbladder, implying obstruction of the gallbladder neck or cystic duct.
- Overall performance is *inferior* to ultrasonography or CT scan.
- Sensitivity is limited, reported to be as low as 68% ([20478490](https://www.ncbi.nlm.nih.gov/pubmed/20478490) (<https://www.ncbi.nlm.nih.gov/pubmed/20478490>)).
 - Unlike calculus cholecystitis, the pathogenesis may not involve complete obstruction of the gallbladder neck. Therefore, entry of radiotracer dye into the gallbladder doesn't necessarily exclude acalculous cholecystitis.
- Specificity is limited. False-positive scans occur when radiotracer fails to enter the gallbladder in patients without cholecystitis. This may occur for the following reasons:
 - Severe liver disease (bilirubin >5 mg/dL) – liver is unable to take up radiotracer dye.
 - Fasting or total parenteral nutrition, which may cause the gallbladder to be maximally distended already.
 - Status post biliary sphincterotomy: low resistance to bile flow may divert bile directly into duodenum.

overall diagnostic approach?

[\(back to contents\) \(#top\)](#)

no bullet-proof diagnostic criteria

- Occasionally, imaging findings may be encountered which are essentially diagnostic (e.g. air in the gallbladder wall).
- In most cases, this is a clinical diagnosis which is based upon weighing roughly three factors:
 - (a) How persuasive is the evidence of acalculous cholecystitis?
 - (b) How sick is the patient?
 - (c) Are there alternative infectious sources?

examples of possible clinical approaches

- Watchful waiting
 - If acalculous cholecystitis is deemed to be relatively unlikely, it may be reasonable to follow the patient clinically and radiologically.
 - *Serial abdominal ultrasound examinations* may be used to evaluate for worsening (which could reveal the presence of disease) or stability/resolution (exonerating the gallbladder).
 - Percutaneous drainage
 - If acalculous cholecystitis is deemed to be fairly likely, drainage may be reasonable.
 - Drainage may be reasonable even if the diagnosis remains uncertain (especially if the patient is extremely ill and no alternative explanation is present).
-

treatment

[\(back to contents\) \(#top\)](#)

percutaneous cholecystostomy

- This is generally the intervention of choice, unless the patient has developed necrosis, perforation, or emphysematous cholecystitis.
- Successful in ~85-90% of cases ([20478490](https://www.ncbi.nlm.nih.gov/pubmed/20478490) (<https://www.ncbi.nlm.nih.gov/pubmed/20478490>)).
 - Patients *should* improve within ~24 hours. Failure to improve raises a question of gangrenous cholecystitis, drain dysfunction/dislodgment, bile leakage causing peritonitis, incorrect diagnosis, or peri-procedure complication (e.g. hemorrhage, sepsis due to procedure-related bacteremia).
 - Surgical cholecystectomy may be considered if there is failure to improve.
- Major complications occur with a rate of <10% (including catheter dislodgment, bile peritonitis, hemorrhage, or hypotension due to procedure-related bacteremia).
- Patients typically don't need follow-up cholecystectomy. After they recover from critical illness, their gallbladder function should return and the percutaneous cholecystostomy drain may simply be removed ([25539703](https://www.ncbi.nlm.nih.gov/pubmed/25539703) (<https://www.ncbi.nlm.nih.gov/pubmed/25539703>)).
 - Transhepatic drain placement may improve the safety of early drain removal, by reducing the risk of bile leaking into the peritoneum.
 - Tube cholangiography may be performed before removing the drain, to exclude gallstones which may have been missed initially.

cholecystectomy

- Generally, surgery isn't needed. This should be avoided if possible, as these patients are generally poor surgical candidates.
- Potential indications for cholecystectomy:
 - Perforation of gallbladder (~10% of patients)
 - Necrosis/gangrene of the gallbladder (~50% of patients)
 - Emphysematous cholecystitis (infection with anaerobic gas-producing organisms)
 - Failure to improve with cholecystostomy drainage combined with a definite diagnosis of acalculous cholecystitis.

antibiotics

- Many patients have sterile necrosis of the gallbladder, but some patients will have superinfection. Overall, the role of antibiotics is strictly *secondary* (after source control, described above).
- Bacteria involved reflect those typically involved in biliary infections:
 - (i) Typical pathogens include gram-negatives (e.g. *E. coli*, *Klebsiella* spp) and *Enterococcus* spp.

- (ii) Anaerobes can be involved (particularly in patients with emphysematous cholecystitis).
- (iii) In patients with prior antibiotic exposure and prolonged ICU courses, more resistant organisms may also be involved (e.g. Pseudomonas, Staphylococci, or Enterobacter spp.)
- Broad-spectrum coverage is appropriate, focusing on gut flora:
 - **Piperacillin-tazobactam** is a good regimen for patients who haven't been exposed to lots of antibiotics.
 - **Meropenem** might be reasonable for patients with a long ICU stay (which increases the risk of resistant organisms).
- Coverage for resistant gram-positives generally isn't necessary (e.g. MRSA and vancomycin-resistant enterococcus). However, this could be considered in the sickest patients.
 - Vancomycin may not be a great choice here, because it will cover MRSA but *not* vancomycin-resistant enterococcus.
 - Linezolid or daptomycin could be superior here, as they will cover both MRSA and nosocomial enterococcal species (e.g. Enterococcus faecium).
- The duration of therapy isn't well defined, but antibiotics can likely be discontinued 4-5 days after source control is achieved ([30371792](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6194724/) (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6194724/>)).

podcast

[\(back to contents\) \(#top\)](#)



(<https://i1.wp.com/emcrit.org/wp-content/uploads/2016/11/apps.40518.14127333176902609.7be7b901-15fe-4c27-863c-7c0dbfc26c5c.5c278f58-912b-4af9-88f8-a65fff2da477.jpg>)

Follow us on [iTunes](https://itunes.apple.com/ca/podcast/the-internet-book-of-critical-care-podcast/id1435679111) (<https://itunes.apple.com/ca/podcast/the-internet-book-of-critical-care-podcast/id1435679111>)

questions & discussion

[\(back to contents\) \(#top\)](#)

To keep this page small and fast, questions & discussion about this post can be found on another page [here](https://emcrit.org/pulmcrit/acalculous-cholecystitis/) (<https://emcrit.org/pulmcrit/acalculous-cholecystitis/>).



(<https://i1.wp.com/emcrit.org/wp-content/uploads/2016/11/pitfalls2.gif>)

- Acalculous cholecystitis should be considered in any critically ill patient with right upper quadrant abdominal pain, persistent fever, sepsis, or jaundice which is otherwise unexplained.
- Be careful interpreting radiologic studies of the gallbladder in critically ill patients, because these patients often have moderately abnormal gallbladders at baseline (e.g. pericholecystic fluid and increased wall thickness due to volume overload).
- HIDA scan probably doesn't add much meaningful information to ultrasound or CT scan.
- Acalculous cholecystitis could potentially be avoided by using generally advisable practices in critical care:
 - Avoidance of excessive opioid use.
 - Early enteral nutrition & avoidance of unnecessary parenteral nutrition.
 - Defending perfusion.
 - Early liberation from mechanical ventilation and expedited discharge from intensive care (?).

Going further:

- [Acalculous Cholecystitis Imaging](https://emedicine.medscape.com/article/365553-overview#a4) (<https://emedicine.medscape.com/article/365553-overview#a4>) (David Lane, MedScape)
- [Acute acalculous cholecystitis](https://radiopaedia.org/articles/acute-acalculous-cholecystitis?lang=us) (<https://radiopaedia.org/articles/acute-acalculous-cholecystitis?lang=us>) (Bruno Muzio and Yuranga Weerakkody, Radiopaedia).

- [Acalculous cholecystitis](https://wikem.org/wiki/Acalculous_cholecystitis) (https://wikem.org/wiki/Acalculous_cholecystitis)(WikEM)

The Internet Book of Critical Care is an online textbook written by Josh Farkas (@PulmCrit), an associate professor of Pulmonary and Critical Care Medicine at the University of Vermont.

EMCrit is a trademark of Metasin LLC. Copyright 2009-. This site represents our opinions only. See [our full disclaimer](#), [our privacy policy](#), [commenting policy](#), and [here for credits and attribution](#).