



Acute Cholangitis and Cholecystitis

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Acute Cholangitis: Introduction

- Acute cholangitis, a potentially fatal medical emergency
- It is a severe inflammatory condition of the biliary duct, caused by **blockage of the biliary tract** with resultant raised pressure within the ducts and **bacterial growth**
- First described by Charcot as “**Symptoms of hepatic fever**” in **1877**

Pathogenesis

- **Primary Cause**
- **Bacterial infection** in the setting of **biliary obstruction**
- Most often due to **ascending infection from the duodenum**
- Rarely via **hematogenous spread** from the portal vein

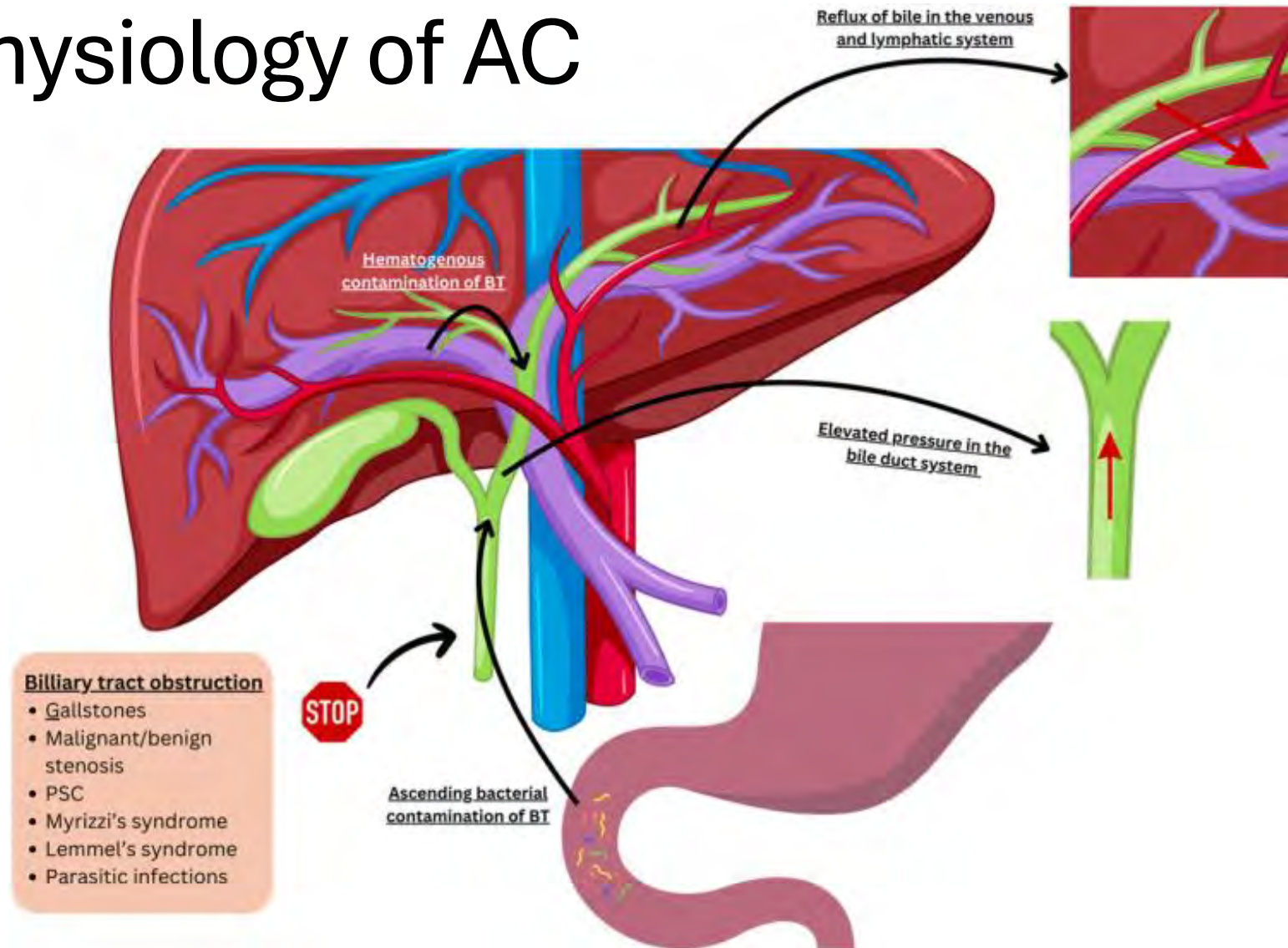
- **Normal Protective Mechanisms**
- **Sphincter of Oddi**: effective mechanical barrier to duodenal reflux
- Continuous **bile flow & bacteriostatic bile salts** maintains bile sterility
- **Secretory IgA** and biliary mucus → prevent bacterial adherence

Pathogenesis

- **Role of Foreign Bodies**
- Stones or stents act as nidus for bacterial colonization
- Without obstruction → bile usually sterile
- Gallstones: ~70% have bacteria in bile
- Common bile duct stones → higher bile culture positivity than gallbladder stones

- **Microbiology**
- Bile cultures positive in >90% of cases of acute cholangitis
- **Gram-negative (colonic origin):**
- *E. coli* (25–50%)
- *Klebsiella* spp. (15–20%)
- *Enterobacter* spp. (5–10%)
- **Gram-positive:** *Enterococcus* spp. (10–20%)
- **Anaerobes:** *Bacteroides*, *Clostridia* (often in recurrent or post-surgical cases; underdetected by routine cultures)

Pathophysiology of AC



Clinical presentation

- **Charcot's Triad** (seen in ~50–75%):
 - Fever
 - Abdominal pain
 - Jaundice
- **Frequency of Symptoms**
 - Fever: ~80%
 - Abdominal pain: ~80%
 - Jaundice: 60–70%
- **Severe Disease – Suppurative Cholangitis**
 - **Reynolds' Pentad:**
 - Charcot's Triad +
 - Hypotension
 - Mental status changes
- In older adults or those on glucocorticoids:
 - Hypotension may be the only symptom

Clinical presentation

- **Complications from Bacteremia**
- Hepatic abscess
- Sepsis
- Multi-organ dysfunction
- Shock

Evolution of the Tokyo Guidelines

- TG07: Initial criteria, low sensitivity
- TG13: Improved diagnostic criteria
- TG18: Adoption of TG13 + evidence validation + management bundles

TG18 Diagnostic Criteria for Acute Cholangitis

- **A. Systemic inflammation**
 - A-1. Fever and/or shaking chills
 - A-2. Laboratory data: evidence of inflammatory response
- **B. Cholestasis**
 - B-1. Jaundice
 - B-2. Laboratory data: abnormal liver function tests
- **C. Imaging**
 - C-1. Biliary dilatation
 - C-2. Evidence of the etiology on imaging (stricture, stone, stent etc.)
- **Suspected diagnosis:** one item in A + one item in either B or C
- **Definite diagnosis:** one item in A, one item in B and one item in C

Diagnostic Performance

- TG13/TG18 sensitivity: ~90%
- Improved early diagnosis (vs TG07 ~79%)
- Limited in very mild or atypical cases

Severity Grading (TG18)

- Grade I (Mild): No dysfunction/risk factors
- Grade II (Moderate): ≥ 2 predictive factors
- Grade III (Severe): Organ failure (≥ 1 system)

TG18/TG13 severity assessment criteria for acute cholangitis

Grade III (severe) acute cholangitis

Acute cholangitis is considered Severe (Grade III) if it is associated with the onset of dysfunction at least in **any one** of the following organs/systems:

- Cardiovascular dysfunction: hypotension requiring dopamine ≥ 5 mcg/kg per min, or any dose of norepinephrine
- Neurological dysfunction: disturbance of consciousness
- Respiratory dysfunction: $\text{PaO}_2/\text{FiO}_2$ ratio < 300
- Renal dysfunction: oliguria, serum creatinine > 2.0 mg/dl
- Hepatic dysfunction: PT-INR > 1.5
- Hematological dysfunction: platelet count $< 100,000/\text{mm}^3$

TG18/TG13 severity assessment criteria for acute cholangitis

Grade II (moderate) acute cholangitis

Acute cholangitis is defined as moderate (Grade II) if it is associated with **any two** of the following conditions:

- Abnormal WBC count ($>12,000/\text{mm}^3$, $<4,000/\text{mm}^3$)
- High fever ($\geq 39^\circ\text{C}$)
- Age (≥ 75 years old)
- Hyperbilirubinemia (total bilirubin ≥ 5 mg/dl)
- Hypoalbuminemia

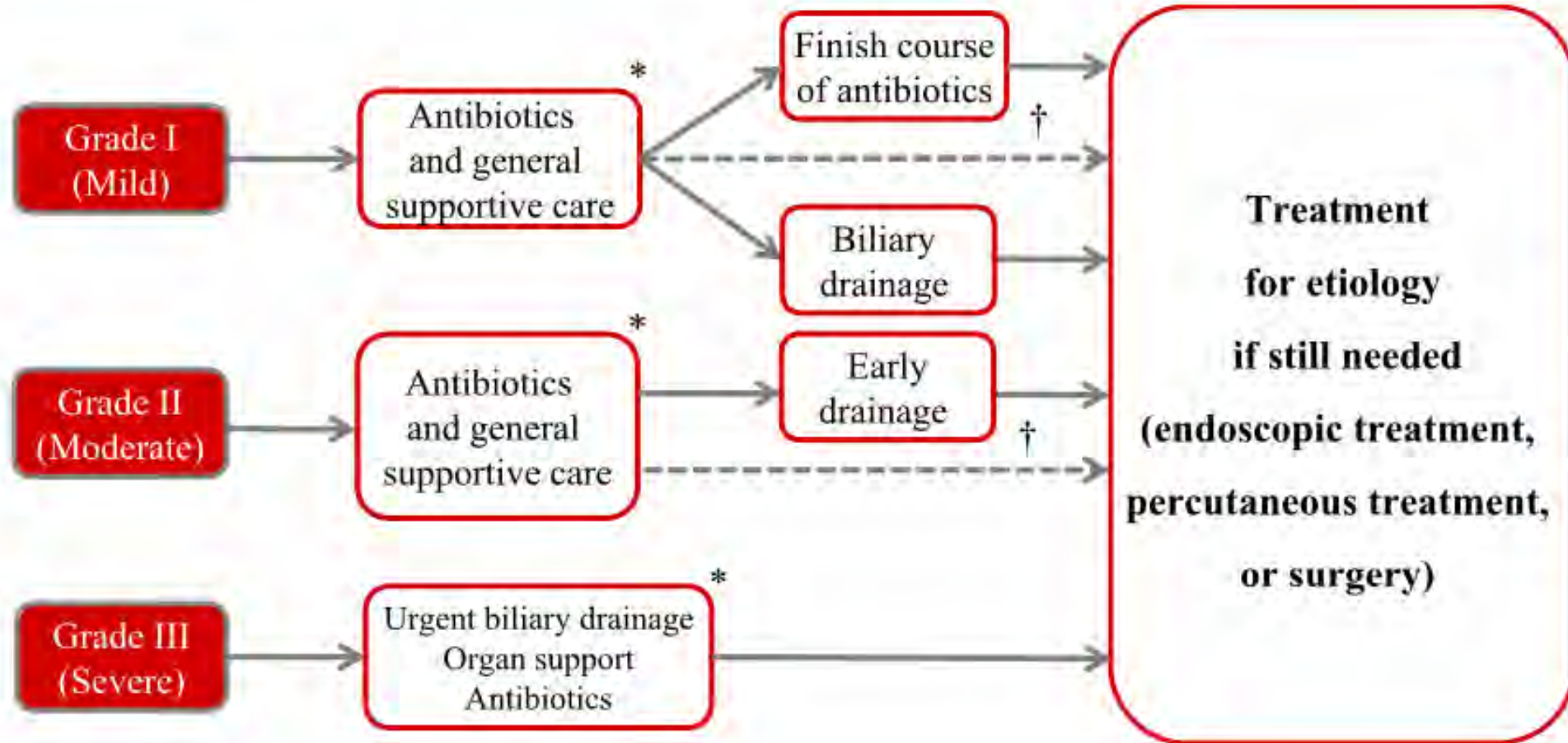
Grade I (mild) acute cholangitis

- Mild (grade I) acute cholangitis is acute cholangitis does not meet the criteria for “Grade III (severe)” or “Grade II (moderate)” acute cholangitis at initial diagnosis

Imaging in Cholangitis

- US: First line, high specificity
- CT: Identifies cause, complications
- MRCP: High sensitivity for stones, malignancy
- ERCP: Diagnostic + therapeutic

TG18 flowchart for the management of acute cholangitis



Empiric Antibiotic Therapy

- Initiate ASAP (within 1 hr in Grade III)
- Cover Gram-negative enteric bacteria (e.g., *E. coli*, *Klebsiella*)
- Adjust for local resistance patterns and biliary penetration

Antibiotic Considerations

- Mild: Ceftriaxone or cefotaxime ± metronidazole
- Moderate–Severe: Piperacillin–tazobactam or carbapenems
- Consider ESBL/CRE in high-risk or nosocomial cases
- Adjust based on cultures & clinical course

TG 2018 Management Bundle

- Initial assessment: Vital signs, labs, imaging
- Early risk stratification by TG18 severity
- Prompt empiric antibiotics
- Early biliary drainage (if Grade II/III)
- Hemodynamic and organ support (ICU if needed)
- Monitor response and adjust management

Indications for Biliary Drainage in Acute Cholangitis

- **When to Drain?**
- recommended for acute cholangitis regardless of the degree of severity except in some cases of mild acute cholangitis in which antibiotics and general supportive care are effective
- **Urgent drainage** for:
 - Grade II (moderate)
 - Grade III (severe)
- Goal: relieve biliary obstruction → reduce sepsis/mortality

Techniques of Biliary Drainage in Acute Cholangitis

- **Preferred Modality**

- **Endoscopic transpapillary drainage (ERCP)** ± endoscopic sphincterotomy (EST) with
 - Stone extraction **and/or**
 - Stent insertion
- Less invasive, internal drainage → less discomfort, shorter stay.

- **Alternatives:**

- **Percutaneous transhepatic cholangiography/drainage (PTCD)** – if papilla inaccessible or failed ERCP.
- **EUS-BD** – after failed ERCP, in expert centers.
- **Surgery** – rarely indicated, high morbidity — reserve for cases where other methods fail.

Techniques of Biliary Drainage in Acute Cholangitis

- **Special Situations**
- **Coagulopathy / Antithrombotics**
 - Use ERCP first.
 - Avoid EST & PTCD
 - Continue aspirin if high thromboembolic risk; stop thienopyridines 5–7 days prior if possible.
 - EPBD safer, less bleeding risk compared to EST.
- **Surgically Altered Anatomy**
 - BE-ERCP in experienced hands (both ballon enteroscopy and ERCP)
 - If unsuccessful → EUS-BD or PTCD.

Timing of biliary drainage

Table 3 Thirty-day mortality rate relevant to the timing of biliary drainage and severity grading by TG13 [17]

Severity grade	30-day mortality according to the timing or absence of biliary drainage					
	Urgent biliary drainage			Urgent or early biliary drainage		
	Within 24 h (<i>n</i> = 2,709)	After 24 h or absence (<i>n</i> = 3,354)	<i>P</i> -value	Within 48 h (<i>n</i> = 3,730)	After 48 h or absence (<i>n</i> = 2,333)	<i>P</i> -value
Grade III (<i>n</i> = 1,521)	5.4% (42/781)	4.9% (36/740)	0.727	4.9% (50/1,017)	5.6% (28/504)	0.622
Grade II (<i>n</i> = 2,019)	1.7% (16/939)	3.4% (37/1,080)	<0.05	2.0% (25/1,272)	3.7% (28/747)	<0.05
Grade I (<i>n</i> = 2,523)	1.3% (13/989)	1.2% (18/1,534)	0.853	1.1% (16/1,441)	1.4% (15/1,082)	0.586
Total (<i>n</i> = 6,063)	2.6% (71/2,709)	2.7% (91/3,354)	0.873	2.4% (91/3,730)	3.0% (71/2,333)	0.164

Urgent performed on the admission day (within 24 h), *early* performed on the day following admission (24–48 h)



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Liver, Pancreas and Biliary Tract

Outcomes and predictors of delayed endoscopic biliary drainage for severe acute cholangitis due to choledocholithiasis in an intensive care unit



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Background: Acute cholangitis (AC) is an infection of the biliary tract secondary to biliary obstruction requiring biliary drainage through endoscopic retrograde cholangiopancreatography. This study aims to compare the outcome between the early and delayed ERCP in patients with severe AC.

Methods: Patient with severe AC due to choledocholithiasis admitted to intensive care unit were included. Early ERCP was defined as ERCP performed within 24 h following hospital admission. Propensity-score matching was used to reduce the imbalance between groups. The primary outcome was 30-day mortality. Secondary outcomes included length of hospital and ICU stay, onset or persistent organ failure.

Results: The delayed ERCP group had a higher mortality rate at 30 days (45,5 versus 13%, $p < 0.001$) and at 1 year (59,7% versus 15,6%, $p < 0.001$). Delayed ERCP had also a higher rate of respiratory adverse events (54,5 versus 27,8%, $p = 0.002$), longer ICU (7,41 versus 4,61, $p = 0.004$) and hospital (11,88 versus 9,22, $p = 0.042$) length of stay. Predictors of delayed ERCP were cardiac arrhythmias, liver disease, creatinine value and white blood cell count at baseline.

Conclusions: Delays in ERCP for patients with severe AC appear to be associated with higher mortality rate and prolonged ICU and hospital stays.

Summary

- Acute cholangitis is a condition with potentially high mortality that requires prompt diagnosis and treatment
- TG18 provides validated, structured framework
- Diagnostic and severity grading tools guide therapy
- Imaging and biomarkers assist diagnosis
- Timely antibiotics and drainage improve outcomes

Acute Cholecystitis

Acute Cholecystitis

- Acute cholecystitis is an acute inflammatory disease of the gallbladder that is caused by gallstone obstruction of the cystic duct in approximately 90% to 95% of people diagnosed with this condition.

Epidemiology

- Gallbladder disease affects ~20 million in the US
- Acute cholecystitis: ~200,000 cases/year
- 10-15% of adults have gallstones; 20% develop complications
- Acute cholecystitis is the first presentation in 10-15% of symptomatic cases

Etiology

- **Calculous (90-95%):** Gallstone obstructing cystic duct
- **Acalculous (5-10%):** No stones, often in critically ill patients
 - Risk factors: critical illness, diabetes, HIV, TPN, atherosclerosis

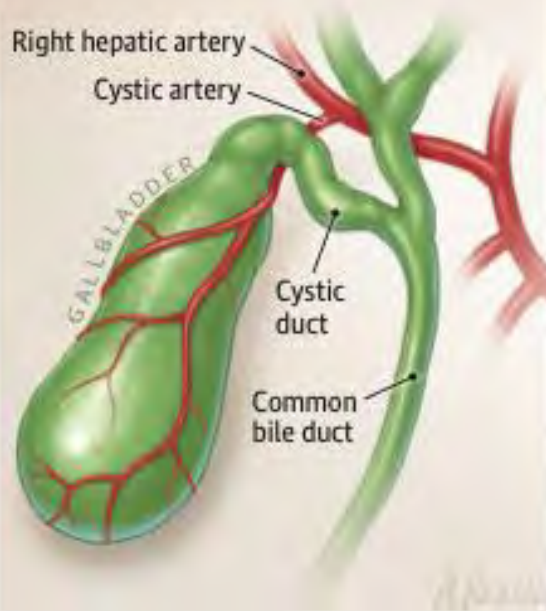
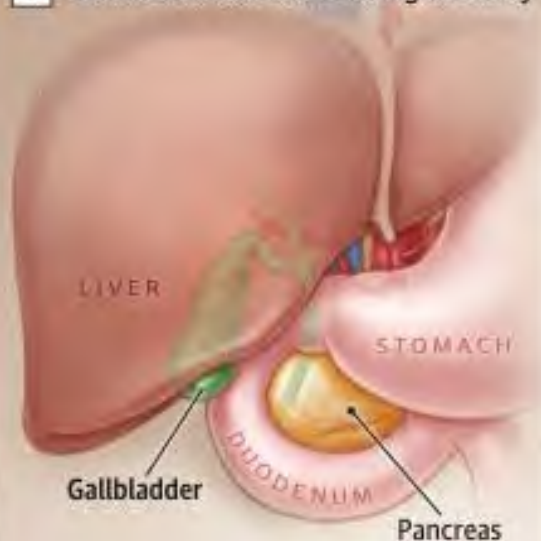
Risk Factors

- Cholelithiasis
- Female sex, older age
- Hispanic & Native American ethnicity- higher prevalence
- Obesity, rapid weight loss, pregnancy
- Diabetes mellitus, octreotide, ceftriaxone use
- Hemolytic anemia (e.g. thalassemia , sickle cell disease)

Pathophysiology

- Cystic duct obstruction → bile stasis → inflammation
- Increased intraluminal pressure, wall ischemia
- Secondary bacterial infection (*E. coli*, *Klebsiella*)
- Acalculous: ischemia, bile stasis, critical illness

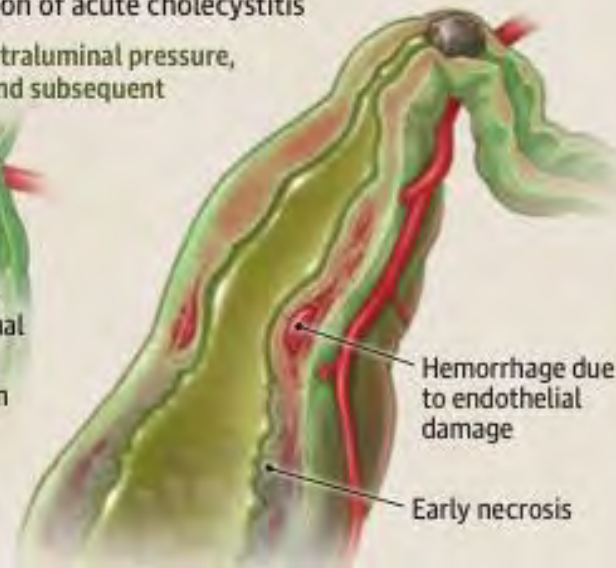
A Gallbladder and surrounding anatomy



B Development and progression of acute cholecystitis

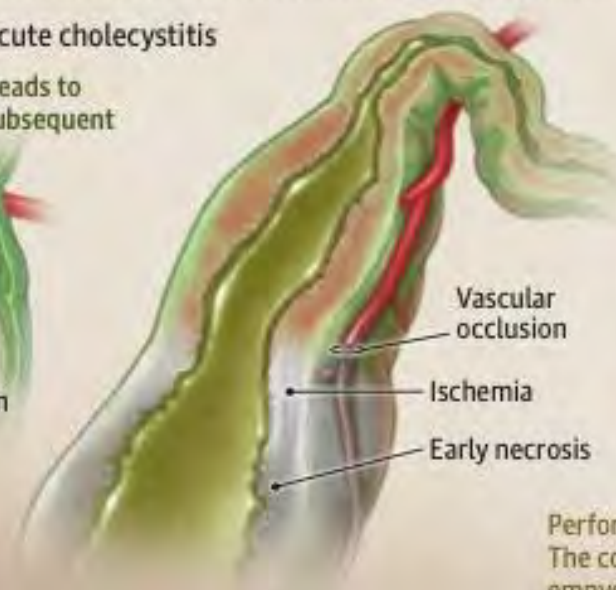
Cystic duct obstruction leads to intraluminal pressure, cholesterol supersaturated bile, and subsequent inflammatory response.

Cystic duct obstruction



C Progression of acalculous acute cholecystitis

Decreased gallbladder emptying leads to bile stasis, epithelial injury, and subsequent inflammatory response.



Clinical Presentation

- Right upper quadrant pain, fever, nausea
- Murphy sign (sensitivity 62%, specificity 96%)
- Typically have leukocytosis
- In severe acute cholecystitis, mild jaundice (<3 mg/dL) may be present
- Tokyo Guidelines (2018) for diagnosis

TG18 Diagnostic Criteria for Acute Cholecystitis

A- Local signs of inflammation

- Murphy's sign,
- RUQ mass/pain/tenderness

B- Systemic signs of inflammation

- Fever,
- elevated CRP,
- elevated WBC count

C -Imaging findings

- Imaging findings characteristic of acute cholecystitis

- Suspected diagnosis: one item in A + one item in B
- **Definite diagnosis:** one item in A + one item in B + C

Diagnosis - Imaging

- **Ultrasound:** First-line (Sensitivity 81%, Specificity 83%)
- **CT:** Good for complications, less accurate for stones
- **HIDA scan:** Gold standard (Sensitivity 96%, Specificity 90%)
- **MRI/MRCP:** Use in suspected choledocholithiasis

TG18/TG13 severity grading for acute cholecystitis

Grade III (severe) acute cholecystitis

Acute cholecystitis is considered Severe (Grade III) if it is associated with dysfunction of **any one** of the following organs/systems

- Cardiovascular dysfunction: hypotension requiring dopamine ≥ 5 mcg/kg per min, or any dose of norepinephrine
- Neurological dysfunction: disturbance of level of consciousness
- Respiratory dysfunction: $\text{PaO}_2/\text{FiO}_2$ ratio < 300
- Renal dysfunction: oliguria, serum creatinine > 2.0 mg/dl
- Hepatic dysfunction: PT-INR > 1.5
- Hematological dysfunction: platelet count $< 100,000/\text{mm}^3$

TG18/TG13 severity grading for acute cholecystitis

Grade II (Moderate) acute cholecystitis

Acute cholecystitis is considered moderate (Grade II) if it is associated with **any one** of the following conditions

- Elevated WBC count ($>18,000/\text{mm}^3$)
- Palpable tender mass in the right upper abdominal quadrant
- Duration of complaints >72 h
- Marked local inflammation (gangrenous cholecystitis, pericholecystic abscess, hepatic abscess, biliary peritonitis, emphysematous cholecystitis)

Grade I (mild) acute cholecystitis

- Grade I acute cholecystitis does not meet the criteria of “Grade III” or “Grade II” acute cholecystitis.
- It can also be defined as acute cholecystitis in a healthy patient with no organ dysfunction and mild inflammatory changes in the gallbladder, making cholecystectomy a safe and low-risk operative procedure

Diagnostic Tests Available for Acute Cholecystitis

Table 1. Characteristics of Diagnostic Tests Available for Acute Cholecystitis

Diagnostic test	Findings for diagnosis of acute cholecystitis	Diagnostic accuracy for acute cholecystitis	Advantages of diagnostic test	Appropriate population
Ultrasonography of the right upper quadrant	<ul style="list-style-type: none"> • Gallstones or sludge • Pericholecystic fluid • Gallbladder distention • Edematous or thickened gallbladder wall 	<ul style="list-style-type: none"> • Sensitivity: 81% • Specificity: 83%⁴⁶ 	<ul style="list-style-type: none"> • Inexpensive • Readily available • No radiation exposure 	<ul style="list-style-type: none"> • Patients with right upper quadrant pain • Use should be limited in patients with morbid obesity
Computed tomography	<ul style="list-style-type: none"> • Gallbladder distention • Gallbladder wall thickening • Pericholecystic fat stranding • Pericholecystic fluid 	<ul style="list-style-type: none"> • Sensitivity: 94% • Specificity: 59%⁴⁶ • 20% of gallstones are not detectable on scan⁴⁷ 	<ul style="list-style-type: none"> • Able to assess other causes of abdominal pain 	<ul style="list-style-type: none"> • Diffuse abdominal pain or uncharacteristic history
Hepatobiliary scintigraphy (hepatic iminodiacetic acid scan)	<ul style="list-style-type: none"> • Absent uptake of radiotracer into the gallbladder before and after morphine administration 	<ul style="list-style-type: none"> • Sensitivity: 96% • Specificity: 90%⁴⁶ 	<ul style="list-style-type: none"> • The most sensitive and specific test for acute cholecystitis 	<ul style="list-style-type: none"> • Reserved for patients with a prior nondiagnostic ultrasound result
Magnetic resonance imaging and magnetic resonance cholangiopancreatography	<ul style="list-style-type: none"> • Gallstones (often obstructing the neck) • Gallbladder wall thickening (>3 mm) • Gallbladder wall edema • Gallbladder distention (>40 mm) • Pericholecystic fluid • Fluid around the liver 	<ul style="list-style-type: none"> • Sensitivity: 88% • Specificity: 89%⁴⁸ 	<ul style="list-style-type: none"> • Able to evaluate potential complications of cholecystitis and evaluate for concurrent choledocholithiasis 	<ul style="list-style-type: none"> • Reserved for patients with suspected choledocholithiasis or biliary injury

Treatment Options for Acute Cholecystitis

Table 2. Summary of Treatment Options for Acute Cholecystitis

Disease process	Disease process definition	Treatment options	Additional information	Adverse events associated with treatment
Uncomplicated calculous acute cholecystitis	Acute inflammation of the gallbladder due to cystic duct obstruction by a gallstone without abscess, perforation, or gangrene	Laparoscopic cholecystectomy	<ul style="list-style-type: none">• Should be performed early (1-3 d) after diagnosis• Available for pregnant patients (during any trimester)• Older patients have better clinical outcomes with laparoscopic cholecystectomy vs nonoperative management• Should be offered to patients with mild to moderate liver cirrhosis	<ul style="list-style-type: none">• Common bile duct injury: 0.4%-0.6% of cases^{56,57}• Infectious or bleeding complications: 1%-2% of cases⁵⁶
		Combination ampicillin and sulbactam or combination piperacillin and tazobactam	<ul style="list-style-type: none">• Antibiotics should be used before and at the time of surgery• Not indicated postoperatively	

Treatment Options for Acute Cholecystitis

Table 2. Summary of Treatment Options for Acute Cholecystitis

Disease process	Disease process definition	Treatment options	Additional information	Adverse events associated with treatment
Complicated calculous acute cholecystitis	Acute inflammation of the gallbladder due to cystic duct obstruction by a gallstone with abscess, perforation, or gangrene	Laparoscopic vs open cholecystectomy	<ul style="list-style-type: none"> Should be performed early to obtain source control 	<ul style="list-style-type: none"> Common bile duct injury: 0.4%-0.6% of cases^{56,57} Infectious or bleeding complications: 1%-2% of cases⁵⁶ Cystic duct leak: 18% of cases^{58,59} Postoperative abscess: 5%-6% of cases⁵⁸ Recurrent biliary event: 9%-18% of cases⁶⁰
		Subtotal cholecystectomy	<ul style="list-style-type: none"> Available when the gallbladder cannot be safely removed A gallbladder fossa drain should be left postoperatively 	
		Combination ampicillin and sulbactam or combination piperacillin and tazobactam	<ul style="list-style-type: none"> Antibiotics should be used before and at the time of surgery Continue a 4- to 7-d course postoperatively in patients without adequate source control or signs of sepsis 	

Treatment Options for Acute Cholecystitis

Table 2. Summary of Treatment Options for Acute Cholecystitis

Disease process	Disease process definition	Treatment options	Additional information	Adverse events associated with treatment
Acalculous acute cholecystitis	Acute inflammation of the gallbladder without gallstones	Laparoscopic vs open cholecystectomy	<ul style="list-style-type: none">• In patients with acceptable perioperative risk, should proceed with early cholecystectomy	<ul style="list-style-type: none">• In critically ill patients, higher composite postoperative complications vs percutaneous cholecystostomy tube (8% vs 5%)⁶¹
		Percutaneous cholecystostomy tube	<ul style="list-style-type: none">• Reserved for patients with exceptionally high perioperative risk or severe critical illness• Uncommonly used for patients with calculous cholecystitis	<ul style="list-style-type: none">• Mortality: 4.7% vs 1.2% for cholecystectomy• Bleeding: 17.1% vs 9.5% for cholecystectomy• Infection: 13.3% vs 4.5% for cholecystectomy⁶²

Management - Uncomplicated Cases

- **Early laparoscopic cholecystectomy (within 72h)**
 - Fewer complications (11.8% vs 34.4%)
 - Shorter hospital stay (5.4 vs 10.0 days)
 - Lower cost
- Pre-op antibiotics (e.g. piperacillin-tazobactam)

Management - Complicated or Acalculous

- Subtotal cholecystectomy if anatomy unsafe
- Percutaneous cholecystostomy tube in high-risk patients
 - has higher complication rates vs surgery
 - Use cautiously, especially in calculous cases

Special Populations

- **Older Adults:**

- Early surgery preferred, improves survival (2-year mortality: 15.2% vs 29.3%)

- **Pregnancy:**

- Safe in all trimesters; early surgery reduces fetal risk (1.6% vs 18.4%)

- **Cirrhosis:**

- Safe if Child-Pugh A or B, MELD <15

Complications of Cholecystectomy

- Bile duct injury (0.4%-0.6%)
- Infections, bleeding (~1%-2%)
- Subtotal cholecystectomy: risk of bile leak, abscess, recurrence

Summary

- Acute cholecystitis: common and potentially severe
- Early diagnosis with ultrasound and clinical criteria
- Early laparoscopic cholecystectomy is standard of care
- Special considerations for elderly, pregnancy, cirrhosis



THANK YOU!

