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REVIEW

Acute cholecystitis: Diagnosis and treatment according to contemporary literature

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ABSTRACT

Background: Acute cholecystitis remains a leading cause of emergency visits in patients with gallstone disease and requires an integrated approach including clinical assessment, imaging, severity grading, antibiotic therapy, and timely source control.
Method: The Tokyo Guidelines 2018 and WSES guidelines provide a standardized diagnostic framework and recommend early laparoscopic cholecystectomy as the treatment of choice when the patient is physiologically fit. Ultrasonography is the first-line imaging modality, though its sensitivity is moderate; therefore, CT, MRI/MRCP, or hepatobiliary scintigraphy may be required in equivocal or complicated cases.
Results: Early laparoscopic cholecystectomy during the index admission is the definitive treatment, with subtotal cholecystectomy or alternative strategies considered when safe dissection is not feasible. Antibiotics are essential in the acute phase but should not replace definitive source control. Gallbladder drainage (percutaneous or endoscopic) remains an important option for high-risk surgical patients but should be applied selectively rather than as a routine alternative to surgery.
Conclusion: A practical, streamlined algorithm integrating disease severity, patient condition, and institutional expertise is recommended to optimize management.

Keywords: acute cholecystitis, laparoscopic cholecystectomy, Tokyo guidelines, WSES, percutaneous, antibiotics, gallbladder drainage

Introduction

Acute cholecystitis is an inflammatory disorder of the gallbladder, predominantly resulting from cystic duct obstruction caused by gallstones, accompanied by intraluminal distension, ischemia, chemical inflammation, and potential bacterial infection. The clinical significance is attributed not only to its prevalence but also to the necessity of early differentiation among uncomplicated inflammation, complicated local disease, and systemic organ dysfunction, as these classifications dictate the urgency and nature of infection source control.[1]

The last ten years have changed the way things are done. In the past, surgery was often put off until the inflammation went down, especially in older people or people with a lot of risk. Recent guidelines and comparative data endorse early laparoscopic cholecystectomy during the initial hospitalization, provided patients can endure the surgery, as this approach diminishes the disease duration and lowers the incidence of recurrent biliary events.[2]

At the same time, modern literature warns against using just one method for everything. When making decisions about individual patients, you need to think about their frailty, organ dysfunction, local surgical

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problems, antimicrobial resistance, and whether or not interventional radiology or advanced endoscopy is available. So, the best way to understand modern care is as a whole: confirm the diagnosis, figure out how bad it is, stabilize the patient, start the right antibiotics, start source control on time, and figure out what to do next after nonoperative drainage.[3]

Method

This article is composed as a narrative literature review. Peer-reviewed guidelines, randomized controlled trials, systematic reviews, meta-analyses, and large cohort studies published from 2016 onward were prioritized, particularly those from indexed journals in surgery, emergency medicine, radiology, infectious diseases, and gastroenterology. To keep the evidence base up to date, older sources were not used on purpose.

This review concentrates on acute calculous cholecystitis in adults, as it represents the primary clinical phenotype in emergency surgical practice. Acalculous cholecystitis, pediatric diseases, and rare gallbladder disorders are referenced solely when they influence diagnostic or therapeutic decision-making. This manuscript prevents redundancy by structuring the evidence into a sequential clinical pathway instead of reiterating identical recommendations across various sections.

Pathophysiology and Clinical Phenotype

Cystic duct obstruction is a common cause, which leads to gallbladder distention and an inflammatory cascade that can go from edema to empyema, gangrene, perforation, or pericholecystic abscess. The inflammatory process may either remain localized or advance to systemic involvement; therefore, clinical diagnosis should be accompanied by an evaluation of severity, rather than being regarded as a binary present-or-absent condition.[1]

Patients frequently exhibit right upper quadrant pain, fever, nausea, vomiting, and localized tenderness; however, none of these symptoms is specific in isolation. Older people and people with diabetes, weakened immune systems, kidney disease, or a serious illness may have less severe symptoms even though their disease is more advanced. This is why imaging and physiological testing are so important.[4]

Acalculous cholecystitis is a unique phenotype frequently linked to critical illness, trauma, burns, sepsis, parenteral nutrition, or cardiovascular instability. Even though its diagnostic principles are similar to those of calculous disease, clinical suspicion should stay high because gallstones may not be present and symptoms may be hidden by sedation or other health problems.[5]

Diagnosis

Diagnosis in the clinic and the lab

The 2018 Tokyo Guidelines categorize diagnoses into three domains: localized inflammatory signs, systemic inflammatory signs, and imaging results. Local signs encompass right upper quadrant pain, tenderness, or Murphy's sign; systemic signs include fever, elevated inflammatory markers, or leukocytosis; imaging offers corroborative evidence for a conclusive diagnosis.[1]

This structure is helpful because it stops doctors from diagnosing too many patients based only on pain and stops doctors from missing patients who don't have all the lab or clinical signs. In practice, a suspected diagnosis should lead to early imaging and reevaluation, whereas a definitive diagnosis necessitates an assessment of severity and the formulation of a treatment plan.[6]

Laboratory testing aids in diagnosis and risk stratification, yet it is not conclusive. A complete blood count, C-reactive protein, liver biochemistry, bilirubin, renal function, coagulation profile, and lactate in unstable patients assist in identifying systemic inflammation, potential common bile duct obstruction, organ dysfunction, and surgical risk.[3]

Imaging

Ultrasonography of the right upper quadrant is still the best first imaging test because it is quick, non-invasive, easy to get, and can find gallstones and changes in the gallbladder that show inflammation. A recent systematic review and meta-analysis determined that ultrasonography exhibits commendable overall diagnostic efficacy. Nonetheless, the overall sensitivity is inadequate, and a negative ultrasonography does not entirely exclude the disease when clinical suspicion persists.[7]

Computed tomography is especially helpful when ultrasound results are unclear, when there are other possible abdominal diagnoses, or when complications like gangrene, perforation, abscess, emphysematous changes, or pancreatitis are suspected. A 2024 meta-analysis determined that CT exhibits diagnostic performance comparable to ultrasound and that sequential testing following a definitive positive or negative CT frequently contributes minimally to patient management.[8]

Magnetic resonance cholangiopancreatography (MRCP) is most useful when there is a suspicion of cholelithiasis or biliary obstruction. Hepatobiliary scintigraphy may be helpful when ultrasound and CT do not provide clear answers. The 2024 imaging update from the Infectious Diseases Society of America backs using ultrasound as the first test. If ultrasound doesn't give a clear answer, CT should be used next. If there is still doubt, MRI/MRCP or nuclear imaging should be used.[9]

Evaluation of severity

It is important to determine how serious the problem is soon after the diagnosis, because it affects how treatment is prioritized. Grade I disease is mild acute cholecystitis without organ dysfunction or marked local inflammation. Grade II indicates moderate disease with an elevated white blood cell count, a palpable and tender mass, symptoms lasting more than 72 hours, or marked local inflammation. Grade III indicates organ dysfunction.[1]

The severity assessment must be evaluated in conjunction with surgical readiness. Patients with Grade II disease who are physiologically fit may benefit from early laparoscopic cholecystectomy at a proficient center. Conversely, individuals with Grade III disease and unstable organ failure may necessitate resuscitation and provisional gallbladder drainage prior to definitive intervention.[6]

Initial Management

The first steps in treatment are complete fasting, giving fluids through an IV, giving pain relief, giving antiemetics if needed, fixing electrolyte imbalances, and checking for sepsis or organ dysfunction early on. Blood cultures are essential for severe infections, immunocompromised individuals, or suspected bacteremia; however, they should not postpone the initiation of antibiotic therapy or source control.[3]

Antimicrobial therapy must encompass prevalent enteric gram-negative organisms and anaerobes, contingent upon the severity, medical history, local resistance patterns, renal function, and recent antibiotic exposure. Antibiotics are meant to keep the infection under control while the source is being controlled, not to take the place of definitive treatment in patients who can have surgery.[10]

Once the source of the infection is under control, the length of antibiotic treatment should be carefully limited. The Surgical Infection Society says that antibiotics should be given before and after surgery for acute cholecystitis but not after surgery for mild or moderate uncomplicated cholecystitis that was treated with laparoscopic cholecystectomy. For severe Grade III disease, treatment should typically not exceed four days post-surgery once the source of infection has been controlled.[11]

Recent antimicrobial reviews underscore that extended therapy without source control heightens selective pressure for resistance and offers minimal advantages in uncomplicated postoperative scenarios. Consequently, a reassessment within 24–48 hours is essential to ascertain if the patient's condition is improving, necessitates additional imaging, or demands immediate source control.[12]

Management

Early laparoscopic cholecystectomy

For most people with acute calculous cholecystitis who can handle general anesthesia and pneumoperitoneum, early laparoscopic cholecystectomy is the best treatment. The 2020 WSES guidelines say that early laparoscopic cholecystectomy should be the standard of care whenever possible, even for many patients who are usually thought to be weak.[2]

The goal is to have surgery during the first hospital stay, as soon as possible, while still consider logistics and the best interests of the patient. A recent review looked at the evidence and said that surgery should be done as soon as possible, within 72 hours of diagnosis. However, it also said that cholecystectomy can still be done outside of this time frame if the team is experienced and the patient is still fit for surgery.[13]

The main safety rule is not to go fast but to finish safely. Before dividing ductal or vascular structures, it is important to take a critical look at safety. If inflammation makes safe dissection impossible, surgeons

should use salvage methods like subtotal cholecystectomy, fundus-first dissection, conversion, or drainage instead of continuing with a dangerous Calot's triangle dissection.[14]

Recent extensive data indicate that standardized early cholecystectomy can yield favorable composite outcomes in emergency care when the perioperative process is optimized, as evidenced by a post hoc analysis of the SPRi study. MACC introduced the standardized outcome as a multidimensional metric encompassing complications, conversions, mortality, length of stay, readmissions, and reinterventions.[15]

Only antibiotics

Antibiotics alone should be utilized solely when surgical intervention or drainage is not feasible or when symptoms are minimal and the patient is under vigilant observation. Nevertheless, conservative therapy entails the risk of recurrence, readmission, and delayed intervention, as it fails to eradicate the obstructive gallbladder pathology.[16]

Kivivuori and colleagues conducted a Finnish retrospective randomized cohort trial involving patients over 75 years of age, comparing laparoscopic cholecystectomy with antibiotic therapy. They discovered that surgical management resulted in fewer readmissions and reinterventions within the larger cohort. Nonetheless, recruitment constraints influenced the randomized aspect.[16] Consequently, antibiotics should typically be regarded as bridge or adjunctive therapy rather than definitive treatment, except in cases where surgical risk remains excessively elevated following thorough multidisciplinary evaluation.[2]

Percutaneous cholecystostomy

Percutaneous cholecystostomy quickly relieves pressure on the gallbladder and can save the lives of people with sepsis, organ failure, or a very high risk of surgery. This procedure is most effective as a temporary source control measure rather than as the standard definitive treatment for all high-risk patients.[3] The CHOCOLATE randomized trial contested the presumption that drainage is safer than surgery in high-risk patients by revealing a lower incidence of major complications following laparoscopic cholecystectomy compared to percutaneous catheter drainage in selected high-risk patients with acute calculous cholecystitis.[17] Recent systematic reviews and meta-analyses have demonstrated that cholecystectomy is correlated with improved survival rates and reduced readmission rates compared to percutaneous treatment in various comparative datasets. However, selection bias persists, as the most critically ill patients are more inclined to undergo drainage.[7,18]

Following percutaneous drainage, interval cholecystectomy ought to be reevaluated once acute inflammation and physiological instability have subsided. It is still unclear when this procedure will take place, but a systematic review shows that surgery that is put off can be technically difficult. It ought to be tailored according to recovery, comorbidities, and the likelihood of recurrent biliary incidents.[19] Pathway-based comparisons indicate that early cholecystectomy may be more advantageous than percutaneous drainage followed by delayed cholecystectomy when surgical intervention is viable.[20]

More proof about drainage, time to put it into action, and service level results

The TG18 management package stresses that early recognition, severity assessment, antimicrobial therapy, infection source control planning, and reassessment should all be part of the same care pathway and not done as separate tasks.[21] Observational assessment of percutaneous transhepatic gallbladder drainage within the TG18 framework corroborates its function as a salvage or bridging procedure in specific patients, particularly when immediate cholecystectomy is deemed unsafe.[22]

Population-level studies indicate that outcomes following cholecystostomy and cholecystectomy are significantly affected by underlying disease and selection bias; thus, observational comparisons should be regarded as service-level indicators rather than conclusive evidence of indication.[23,24] In elderly and high-risk populations, percutaneous cholecystostomy can stabilize infection but is linked to recurrence, readmission, or additional intervention in a significant number of patients, thereby underscoring the necessity for structured follow-up rather than passive tube management.[25]

Research involving critically ill and moderately ill stage II patients indicates that emergency cholecystectomy, delayed cholecystectomy following drainage, and drainage alone each present distinct risk profiles. Consequently, the decision should consider local expertise and the patient's physiological reserve.[26,27] A comparison between emergency cholecystectomy and delayed cholecystectomy following percutaneous drainage in patients with moderate disease indicates that a staged approach may be

advantageous. However, it should not be selected solely to evade challenging early surgery when secure acute surgery is accessible.[28]

Endoscopic drainage of the gallbladder

For patients who are not good candidates for surgery and have access to advanced endoscopic expertise, endoscopic ultrasound-guided gallbladder drainage has become an option. This technique can eliminate the necessity for external tubes and enhance patient comfort; however, it demands advanced technical proficiency and meticulous patient selection.[29]

Endoscopic drainage should not be regarded as a standard alternative to laparoscopic cholecystectomy in patients who are candidates for surgery. Its primary justification is for patients who are not candidates for surgery, particularly when internal drainage is more beneficial than percutaneous drainage, especially in facilities with established interventional endoscopy programs.[30]

Difficult diseases and special groups

Being older doesn't mean you can't have surgery. Population-based and comparative studies indicate that elderly patients frequently derive benefits from definitive treatment when physiological reserve is sufficient. Preoperative decisions should still take into account frailty, cognition, cardiopulmonary reserve, renal function, anticoagulation, and the patient's goals.[31]

Cirrhosis, severe heart disease, renal failure, pregnancy, and immunosuppression necessitate tailored planning. The principle is still the same: source control should not be put off just because the patient is in a high-risk group. The 2020 WSES clearly downplays the importance of gallbladder drainage compared to earlier guidelines and stresses the need for surgery in a skilled setting whenever possible.[2]

Complicated cholecystitis, encompassing gangrenous alterations, perforation, emphysematous cholecystitis, abscess formation, or generalized peritonitis, necessitates immediate management of the infection source. CT is especially helpful when these problems are suspected, and the surgical plan should put the patient's safety and the safety of the biliary tract ahead of finishing a total cholecystectomy at all costs.[8,14]

Table 1. A comparative summary of recent literature regarding the diagnosis and treatment of acute cholecystitis

Study (Year)	Design / Focus	Key Findings	Clinical Implications
Yokoe et al. (2018)[1]	Tokyo Guidelines 2018: diagnostic criteria and severity grading	Validated diagnostic domains and severity classification	Use structured diagnosis and assess severity before treatment
Okamoto et al. (2018)[6]	TG18 management flowchart	Integrates severity, comorbidities, organ dysfunction, surgical risk	Follow algorithm, tailor to patient physiology
Pisano et al. (2020)[2]	WSES guidelines update	Early laparoscopic cholecystectomy recommended	Index admission surgery is standard
Huang et al. (2023)[32]	Systematic review (ultrasound)	High specificity, moderate sensitivity	Negative US does not exclude diagnosis
de Oliveira et al. (2024)[8]	Meta-analysis CT vs US	Comparable accuracy, reduces repeated testing	Use CT if US inconclusive
Colling et al. (2022)[11]	Antibiotic guidelines	No postop antibiotics mild–moderate; ≤4 days severe	Limit antibiotics after source control
Loozen et al. (2018)[17]	RCT CHOCOLATE trial	Surgery superior to drainage	Do not routinely replace surgery
Kivivuori et al. (2023)[16]	Cohort >75 years	Surgery ↓ readmissions vs antibiotics	Age alone not contraindication
Huang et al. (2022)[7]	Meta-analysis drainage vs surgery	Surgery better outcomes	Reserve drainage for very high risk
Cirocchi et al. (2023)[30]	Systematic review	No evidence drainage = surgery	Individualize treatment
Fanciulli et al. (2025)[18]	Meta-analysis	Surgery ↓ mortality/readmission	Prefer surgery if feasible
Nassar et al. (2022)[20]	Meta-analysis early vs delayed	Early surgery better outcomes	Avoid routine delay
Kourounis et al. (2022)[19]	Timing drainage meta-analysis	Optimal timing unclear	Reassess after drainage

Teoh et al. (2021)[29]	EUS vs surgery analysis	EUS drainage effective selected cases	Option in specialized centers
Fugazzola et al. (2024)[15]	Post hoc analysis	Composite outcomes useful	Assess multidimensional outcomes

Practical Algorithms Based on Evidence

The practical pathway commences with clinical suspicion and immediate evaluation for sepsis, organ dysfunction, and differential diagnoses. An ultrasound should be done right away if there are signs of inflammation in the area or throughout the body. If the ultrasound results are unclear, the presentation is unusual, or complications are suspected, a CT scan may be added.[9,32]

The next step is to figure out how bad it is after imaging has confirmed it. Most Grade II patients and I should have early laparoscopic cholecystectomy during their first hospital stay, with antibiotics before and after the surgery and a safe surgical method. Patients with Grade III need to be resuscitated, given organ support, given antibiotics, and have a team of doctors make decisions before surgery or drainage.[1,6]

For patients who qualify for surgery, early laparoscopic cholecystectomy should not be postponed solely due to the onset of inflammation. Surgeons should use a salvage procedure instead of trying to do a total cholecystectomy if the anatomy is not safe. This is a way to avoid damaging the core bile duct.[14]

For patients not fit for immediate surgery, percutaneous cholecystostomy or EUS-guided gallbladder drainage offers source control. These patients necessitate scheduled reassessment for interval cholecystectomy, tube removal, or prolonged nonoperative management, as drainage without subsequent evaluation increases the risk of recurrent episodes and tube-associated morbidity.[19,29]

Discussion

Recent research has consistently shown that controlling the source of infection early and definitively is very important for a good outcome. Antibiotics are essential for initial infection control; however, an obstructed and inflamed gallbladder continues to be a source of recurrence unless it is surgically removed or drained. This elucidates the rationale behind contemporary guidelines and clinical trials increasingly advocating for early cholecystectomy when patients are capable of withstanding the procedure.[2,17]

A second important point is that being at high risk doesn't always mean you can't have surgery. It is important to tell the difference between physical weakness and organ failure and age or other health problems. Older patients or those with specific comorbidities may still derive benefits from laparoscopic cholecystectomy, whereas unstable patients experiencing active organ failure may necessitate resuscitation and drainage prior.[16,18]

The third message is to be humble when diagnosing. Ultrasonography is suitable as an initial examination; however, its moderate sensitivity necessitates additional imaging in the presence of ongoing clinical suspicion, rather than hastily discounting the diagnosis. This is especially important for older people with complicated diseases, obesity, intestinal gas disorders, or unusual symptoms.[8,32]

Last but not least, the quality of surgery must always come first. Early surgery should not be seen as a way to cut things up as quickly as possible. Guidelines for safe laparoscopic cholecystectomy stress the importance of taking a critical look at safety and salvage options. This is in line with the modern goal of reducing bile duct injury while still providing definitive treatment.[14]

This review is a narrative and not a formal systematic review. Consequently, it lacks reproducible database search strategies, double-masked independent screening, and risk-of-bias evaluation. The objective is to deliver a clinically applicable synthesis for journal manuscript development, rather than to produce new aggregated estimates. Another drawback is that randomized data does not answer all of the questions. These encompass the ideal timing of interval cholecystectomy following percutaneous cholecystostomy, the relative efficacy of EUS-guided drainage in non-expert centers, and the most effective approach for patients exhibiting significant frailty and multi-organ dysfunction.

Conclusion

An integrated pathway that includes structured diagnosis, severity assessment, early antimicrobial therapy, and timely source control should be used to treat acute cholecystitis. The 2018 Tokyo Guidelines offer a pragmatic framework for diagnosis and severity assessment, with subsequent evidence endorsing early laparoscopic cholecystectomy during the initial hospitalization if the patient is physiologically capable.

Ultrasonography is still the first choice for imaging, but if there is any doubt or the case is not right for it, CT, MRI/MRCP, or hepatobiliary scintigraphy may be needed, depending on the situation. Antibiotics are necessary, but they should be reduced and shortened once the source of the infection is under control. Percutaneous or endoscopic gallbladder drainage should be reserved for patients who are temporarily or permanently unfit for surgery, accompanied by a definitive follow-up plan. So, the main idea in the current literature is not just surgery right away, but also early, safe, personalized, and permanent control of the infection source.

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