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Chapter 11

Acute Acalculous Cholecystitis: Current Diagnosis and Management

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Abstract

Acute acalculous cholecystitis is defined by the inflammation of the gallbladder in the absence of gallstones. This condition is predominantly observed in elderly and critically ill patients. The etiology is diverse, encompassing infective, inflammatory, traumatic, and connective tissue disorders. Acute acalculous cholecystitis is associated with an elevated risk of complications, such as gangrene and perforation. Clinical examination and laboratory investigations lack sensitivity for diagnosing acute acalculous cholecystitis. Ultrasonography serves as the primary imaging modality for diagnosis, followed by cholescintigraphy. The management of acute acalculous cholecystitis is categorized into cholecystectomy and percutaneous cholecystostomy. In this chapter, we will examine the risk factors, diagnostic investigations, and treatment strategies for acute acalculous cholecystitis.

Keywords: Acute Acalculous Cholecystitis, Cholecystectomy, Gallbladder Drainage, HIDA scan, Percutaneous Cholecystostomy, Ultrasonography and Risk Factors.

1. Introduction

Acute acalculous cholecystitis is a clinical condition characterized by inflammation of the gallbladder in the absence of gallstones. This condition predominantly occurs in critically ill patients, either with underlying medical conditions or following major surgical procedures. It is associated with a mortality rate of 30% and presents an elevated risk of gallbladder gangrene and perforation. Patients with diabetes mellitus, congestive cardiac failure, and end-stage renal disease are particularly susceptible to this condition. Furthermore, acute acalculous cholecystitis is linked to an increased risk of secondary bacterial infections of the gallbladder, involving pathogens such as Salmonella, Shigella, Mycobacterium, and viruses, including hepatitis A and B, as well as the human immunodeficiency virus [1, 2].

The clinical manifestation of acute acalculous cholecystitis is atypical, with right-sided upper abdominal pain occurring in only 25% of cases. Eliciting a positive Murphy's sign is challenging, as the majority of these patients are elderly and have comorbidities. Furthermore, blood investigations such as full blood count, liver function tests, and inflammatory markers like C-reactive protein are not diagnostically useful. The diagnosis of acute acalculous cholecystitis is confirmed through imaging modalities, with ultrasonography being the most commonly employed. Ultrasonography reveals gallbladder wall thickening exceeding 4 cm, the presence of pericholecystic fluid collection, and the absence of gallstones. It boasts a sensitivity of up to 92% and a specificity of 90%, and can be performed in the intensive care unit. Cholescintigraphy is another diagnostic tool used for acute acalculous cholecystitis, with a sensitivity of 79% and specificity of 87%. However, its main disadvantage lies in the use of nuclear tracers and the necessity to transport the patient, which poses challenges for those admitted to the Intensive Care Unit. Computed tomography is indicated for complications such as gangrene and perforation of the gallbladder. The treatment of acute acalculous cholecystitis can be categorized into conservative management with antibiotics and definitive interventions, including percutaneous cholecystostomy and cholecystectomy [3–7].

The diagnosis and management of acute acalculous cholecystitis present significant clinical challenges. This chapter aims to investigate the risk factors associated with the development of acute acalculous cholecystitis. Additionally, we will examine the efficacy of various imaging modalities in diagnosing this condition and evaluate the roles of percutaneous cholecystostomy and cholecystectomy in its management. A comprehensive literature review was conducted utilizing PUBMED, the Cochrane Database of Clinical Reviews, and Google Scholar, focusing on clinical trials, observational studies, cohort studies, systematic reviews, and meta-analyses published between

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1985 and 2025. The search employed the following keywords: “Acute acalculous cholecystitis,” “Gallbladder drainage,” “Percutaneous cholecystostomy,” “Ultrasonography,” “HIDA scan,” “Cholecystectomy,” and “Risk factors.” Only articles published in English were considered. Additional relevant articles were identified through manual cross-referencing of the literature. Exclusion criteria included case reports, studies with fewer than ten patients, and editorials. The study population comprised adult male and female patients, with pediatric patients being excluded.

2. Discussion

2.1. Risk factors for acute acalculous cholecystitis

Risk factors for the development of acute acalculous cholecystitis include age over 50 years and the occurrence of a cerebrovascular accident [8]. Critically ill patients are also at increased risk for this condition. A retrospective study conducted by Laurila et al. examined patients admitted to the intensive care unit, identifying 39 individuals diagnosed with acute acalculous cholecystitis. The mean APACHE score among these patients was 25, with 64% experiencing up to three organ failures. The average hospital stay was 19 days, and the mortality rate was 44% [9]. Additionally, patients undergoing major surgical procedures, such as abdominal aortic aneurysm repair, and those receiving long-term total parenteral nutrition are at heightened risk for developing acute acalculous cholecystitis [10].

Patients with severe burns are at an elevated risk of developing acute acalculous cholecystitis. Theodorou et al. investigated the predisposing factors for acute acalculous cholecystitis in patients with severe burns. The study included 15 patients and concluded that advanced age, the requirement for blood transfusion, and mechanical ventilation were significant risk factors for the development of acute acalculous cholecystitis [11]. Walsh et al. conducted a review of acute acalculous cholecystitis in burn patients, reporting an incidence rate ranging from 0.4% to 3.5%. This condition was predominantly observed in patients with burns covering more than 30% of their body surface area. Identified risk factors included the necessity for blood transfusion, mechanical ventilation, and prolonged total parenteral nutrition [12]. Markaki et al. examined the infectious causes of acute acalculous cholecystitis, identifying Salmonella typhi, which may disseminate into the bloodstream, and Hepatitis A virus, which can directly invade the gallbladder. Other pathogens, such as cytomegalovirus, cryptosporidium, and Mycobacterium tuberculosis, are noted in immunocompromised patients [13].

2.2. Diagnosis of acute acalculous cholecystitis

The diagnosis of acute acalculous cholecystitis presents significant challenges, as clinical examination may not yield definitive findings, and blood tests, including leukocytosis, elevated inflammatory markers such as C-reactive protein (CRP), and elevated liver enzymes, often prove uninformative. Imaging techniques, particularly ultrasonography, are the most frequently employed methods for diagnosing acute acalculous cholecystitis, with cholescintigraphy serving as a secondary option. Computed tomography is typically reserved for cases involving additional abdominal pathologies or complications such as gangrene, perforation, and empyema of the gallbladder [14]. Ultrasonography remains the primary imaging modality for diagnosing acute acalculous cholecystitis, capable of detecting gallbladder wall thickening exceeding 3 mm, pericholecystic fluid accumulation, and the absence of gallstones. The sensitivity of ultrasonography ranges from 20% to 100%, while its specificity is between 93% and 97% [15]. Lin et al. investigated the prognostic value of ultrasonography in the early diagnosis of acute acalculous cholecystitis among elderly bedridden patients. In this study, which included 43 patients with acute acalculous cholecystitis, ultrasonography proved to be both effective and easily administered for early diagnosis in bedridden patients [16].

Cholescintigraphy serves as a secondary imaging modality for patients with acute acalculous cholecystitis when ultrasonography yields inconclusive results. This procedure entails the intravenous administration of technetium 99, followed by imaging to assess the absence of gallbladder enhancement. Although it necessitates transferring the patient from the intensive care unit and involves the use of nuclear material, cholescintigraphy demonstrates high sensitivity and specificity in diagnosing acute acalculous cholecystitis [17]. Mariat et al. conducted a comparative study between ultrasonography and cholescintigraphy for diagnosing this condition, finding that cholescintigraphy exhibited superior sensitivity and specificity. However, ultrasonography was noted for its ease of execution and did not require patient transport [18].

Morgan et al. conducted an evaluation of imaging modalities utilized in the diagnosis of acute acalculous cholecystitis, identifying ultrasonography as the preferred initial investigative technique. This preference is attributed to its cost-effectiveness, widespread availability, and absence of ionizing radiation. Diagnostic criteria are categorized into major and minor criteria. The major criteria encompass gallbladder wall thickening exceeding 3 mm, the presence of pericholecystic fluid collection, and mucosal sloughing accompanied by intramural gas. The minor criterion includes gallbladder distension. Although scintigraphy demonstrates superior sensitivity and specificity for diagnosing acute acalculous cholecystitis, its limited availability and the involvement of radiation are notable drawbacks. Computed tomography is frequently employed to identify alternative abdominal pathologies or to detect complications associated with acute acalculous cholecystitis, such as gangrene, perforation, and necrosis of the gallbladder [19].

Table 1: Ultrasonography vs Cholescintigraphy in the Diagnosis of Acute Acalculous Cholecystitis

Feature	Ultrasonography (US)	Cholescintigraphy (HIDA)
Sensitivity	20–100% (highly variable)-Phipps et al	38–100% (variable)-Phipps et al
Specificity	93–97% (high)-Phipps et al	78–100%, but may be as low as 38% in Acute Acalculous Cholecystitis due to false positives-Phipps et al
Strengths	Bedside, rapid, no radiation; high specificity; prognostic value-Lin et al	Functional test; guides surgical vs medical management-Gokhale et al
Limitations	Wide sensitivity variability; operator dependent-Phipps et al	Frequent false positives; reduced specificity in Acute Acalculous Cholecystitis-Mariat et al

2.3. Management of acute acalculous cholecystitis

The initial management of acute acalculous cholecystitis involves the administration of intravenous antibiotics and analgesics, followed by definitive treatment options, which include cholecystectomy—performed either via open or laparoscopic methods—and percutaneous drainage of the gallbladder [20]. The choice of management strategy is contingent upon the patient's clinical condition and their suitability for general anesthesia. Laparoscopic cholecystectomy is generally the preferred approach; however, there is a potential need to convert to an open cholecystectomy in the event of complications such as gangrene or perforation of the gallbladder. For patients who are not candidates for surgery, percutaneous cholecystostomy may be employed to achieve stabilization [21].

Soria-Aledo et al. conducted a systematic review of the literature concerning the role of cholecystectomy in managing acute acalculous cholecystitis. This review included a total of 10 studies, wherein cholecystectomy was performed on low-risk patients. In contrast, high-risk patients underwent percutaneous cholecystostomy due to the procedure's low morbidity. In certain cases, percutaneous cholecystostomy may even be considered a definitive therapeutic approach [22]. Do et al. conducted a retrospective study examining the role of percutaneous cholecystostomy as a definitive treatment for acute acalculous cholecystitis. This study included 124 patients, demonstrating clinical effectiveness in 100% of cases, with a recurrence rate of 4.1%. The catheter removal rate was observed in 99.6% of patients [23]. Noh et al. also evaluated the role of percutaneous cholecystostomy in acute acalculous cholecystitis, including 271 patients in their study. The clinical success rate was 86.7%, with complications occurring in 2.2% of cases, and a recurrence rate of 2.3% following catheter removal [24]. Lo et al. investigated the role of percutaneous cholecystostomy in managing acute acalculous cholecystitis, including 30 patients in their study, and reported a success rate of 93% [25].

Chen et al. investigated the efficacy of percutaneous cholecystostomy as a definitive treatment for moderate to severe acute acalculous cholecystitis. This retrospective study included 44 patients, of whom 47.7% did not experience recurrent symptoms following tube removal, while 13.8% reported symptom recurrence. The mortality rate was 38.6% [26]. In another retrospective study, Chung et al. evaluated the potential of percutaneous cholecystostomy as a definitive treatment for acute acalculous cholecystitis. This study involved 57 patients and reported a technical success rate of 93%, with a recurrence rate of 7% after a 32-month follow-up period [27]. Ozyer et al. examined the long-term outcomes of percutaneous cholecystostomy as a definitive treatment for acute acalculous cholecystitis. A total of 47 patients underwent the procedure, with follow-up extending up to 10 years post-catheter removal. The long-term clinical success rate was 87.2%, the complication rate was 5.3%, and the mortality rate was 9.3% [28]. A similar retrospective study by Kirkegard et al. also concluded that percutaneous cholecystostomy was effective as a definitive treatment for acute acalculous cholecystitis [29].

Bea et al. investigated the management of acute acalculous cholecystitis within a tertiary teaching hospital setting. The study encompassed 487 patients, with delayed cholecystectomy performed in 88.8% of cases, which correlated with the lowest recurrence rate. The findings indicate that delayed cholecystectomy is the predominant surgical intervention for acute acalculous cholecystitis [30]. In a separate study, Ueno et al. examined the role of emergency laparoscopic cholecystectomy in managing acute acalculous cholecystitis. This study involved 27 patients who underwent emergent laparoscopic cholecystectomy, and these individuals exhibited a higher risk of conversion to open cholecystectomy and an increased need for blood transfusion [31].

Chang et al. conducted an evaluation of conservative treatment for acute acalculous cholecystitis. The study encompassed 171 cases, with 103 patients receiving conservative management and 68 undergoing cholecystectomy. The outcomes of both treatment modalities showed no significant differences. The etiology of acute acalculous cholecystitis was deemed crucial in determining the appropriate therapeutic approach for each patient.[32].

Table 2: Percutaneous Cholecystostomy vs Cholecystectomy in Acute Acalculous Cholecystitis: Comparative Summary

Parameter	Percutaneous Cholecystostomy (PC)	Cholecystectomy (Open/Laparoscopic)
Primary role in Acute Acalculous Cholecystitis (AAC)	Minimally invasive source control is one of the two prevailing options for AAC. (Sarago et al)	Definitive removal of the gallbladder is a major option when feasible. (Sarago et al)
Timing of procedure	Critically ill/high-risk surgical candidates; safer than open surgery in severely ill AAC; often the first step. (Treinen et al)	Patients fit for anesthesia and laparoscopy; early Laparoscopic Cholecystectomy preferred when conversion/anesthesia risk is low. (Treinen et al)
Definitive vs bridging therapy	Often definitive with no need for interval cholecystectomy in many AAC patients; can also be a bridge to later surgery. (Soria-Aledo et al., Noh et al)	Definitive treatment prevents recurrence; chosen after stabilization or upfront in suitable patients. (Soria-Aledo et al., Noh et al)
Outcomes (summary)	Large AAC cohorts show good clinical success and low recurrence/mortality after PC. (Noh et al)	Effective with favorable outcomes in suitable patients; risk increases with critical illness. (Trienen et al)

3. Conclusion

Acute acalculous cholecystitis represents an uncommon variant of cholecystitis characterized by the absence of gallstones, with a multifactorial etiology. The diagnosis of this condition is challenging, as it predominantly affects critically ill patients who do not present with the typical clinical features of acute cholecystitis. Blood tests are generally non-specific, and ultrasonography serves as the primary imaging modality for diagnosis, with cholescintigraphy being the second most frequently employed technique. Percutaneous cholecystostomy is the most prevalent treatment option, whereas cholecystectomy is considered a definitive therapeutic approach for patients who are suitable candidates for surgery or those experiencing complications such as gangrene and perforation of the gallbladder. The decision regarding the timing of cholecystectomy for acute acalculous cholecystitis rests with the treating surgeon. In cases where surgical intervention poses a significant mortality risk, percutaneous cholecystostomy may be considered as an alternative treatment option.

Article Information

Conflict of interest: There is no conflict of interest.

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