

Conversion from laparoscopic to Open Cholecystectomy in Acute Calculus Cholecystitis: An Update

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Abstract

Laparoscopic cholecystectomy is widely regarded as the gold standard procedure for the treatment of acute calculus cholecystitis. However, conversion to an open cholecystectomy is occasionally necessary to avert bile duct injury. The risk factors associated with conversion include male gender, age over 65 years, obesity, and comorbidities such as diabetes mellitus and hypertension. Acute cholecystitis also constitutes a significant risk factor, with patients classified under Tokyo Guidelines grade 3 exhibiting a heightened risk of conversion. Blood investigations, including elevated C-reactive protein (CRP) levels and leukocytosis, are common indicators that can predict the likelihood of conversion to an open cholecystectomy. Additionally, ultrasonography may reveal gallbladder wall thickening and the presence of pericholecystic fluid collection. In this chapter, we will examine the risk factors for conversion from laparoscopic to open cholecystectomy and its implications in the management of acute calculus cholecystitis.

Keywords: Acute calculus cholecystitis, Laparoscopic cholecystectomy, Open cholecystectomy, Conversion, Complications, and Tokyo Guidelines.

1. Introduction

Acute calculus cholecystitis represents the most prevalent condition among patients with symptomatic gallstone disease, manifesting in 25% of cases. Laparoscopic cholecystectomy is recognized as the gold standard for managing acute cholecystitis and is categorized into early and delayed procedures. Early laparoscopic cholecystectomy is conducted within 72 hours of hospital admission, whereas delayed laparoscopic cholecystectomy is performed approximately 8 weeks following the onset of symptoms [1, 2]. In instances where laparoscopic cholecystectomy is not feasible due to severe adhesion or inflammation, a bailout procedure, such as a subtotal cholecystectomy or conversion to an open cholecystectomy, should be undertaken [3–5].

The Tokyo Guidelines of 2013 recommended that patients with grade 1 acute cholecystitis should undergo an elective laparoscopic cholecystectomy, while those with grade 2 should receive an early laparoscopic cholecystectomy. The Tokyo Guidelines of 2018 further expanded the indications for performing a laparoscopic cholecystectomy in cases of severe acute cholecystitis. If the critical view of safety cannot be achieved, a bail-out procedure, such as conversion to an open cholecystectomy, is advised to prevent bile duct injury [6–8]. The World Society of Emergency Surgeons (WSES), in their guidelines for the diagnosis and management of acute calculous cholecystitis in 2016 and 2020, recommended conversion to an open cholecystectomy if severe inflammation is present at Calot's triangle, as further dissection could result in injury to the common bile duct and other vascular structures [9, 10].

This chapter examines the transition to open cholecystectomy in the treatment of acute calculus cholecystitis. Additionally, it investigates the risk factors associated with conversion to open cholecystectomy and the potential complications that may arise. A thorough literature review was conducted utilizing PubMed, the Cochrane Database of Clinical Reviews, and Google Scholar, with a focus on clinical trials, observational studies, cohort studies, systematic reviews, and meta-analyses published between 1990 and 2025. The search incorporated the following keywords: "Acute calculus cholecystitis," "open cholecystectomy," "laparoscopic cholecystectomy," "conversion," "Tokyo Guidelines," and "complications." Only articles published in English were considered. Additional articles were identified through manual cross-referencing of the literature. Case reports and studies with fewer than 10 patients, as well as editorials, were excluded. The study included adult male and female patients, while pregnant and pediatric patients were excluded.

2. Discussion

2.1. The Incidence of Conversion rates for laparoscopic to open cholecystectomy

The global conversion rate from laparoscopic to open cholecystectomy is influenced by the severity of acute cholecystitis, patient-specific factors, and the surgeon's level of experience. The overall global conversion rate is reported to be between 5% and 10%. Livingston et al. conducted a nationwide study examining this conversion, including 135,210 patients with acute cholecystitis, and found a conversion rate of 5% to 10% [11]. Another retrospective study by Medina Lopez et al., which involved 362 patients who underwent laparoscopic cholecystectomy for acute cholecystitis, reported a conversion rate of 9.6% [12]. Thangngew et al. also evaluated the conversion rate for patients transitioning from laparoscopic to open cholecystectomy, finding a rate of 4.4% [13].

Table 1: Conversion rates for laparoscopic to open cholecystectomy

Study	Year	Study Type	Conversion Rate (%)
Chin et al	2023	Systematic Review	2.5%-50%
Cwik et al	2013	Review article	24%
Wever et al	2013	Retrospective study	24%

Table showing the conversion rates for laparoscopic to open cholecystectomy in acute calculus cholecystitis

2.2. The Risk factors for conversion to open cholecystectomy

In a retrospective study conducted by Warchalowski et al., the analysis of risk factors associated with the conversion from laparoscopic to open cholecystectomy was performed on a cohort of 263 patients. The study concluded that male gender, age over 65 years, and the presence of comorbidities such as diabetes mellitus and neurological diseases were significant risk factors for conversion to open cholecystectomy [14]. Similarly, Licciardello et al. investigated preoperative risk factors for conversion from laparoscopic to open cholecystectomy in a sample of 414 patients who underwent laparoscopic cholecystectomy and acute cholecystitis, identifying age over 65 as a risk factor for conversion [15]. Gangemi et al. also conducted a retrospective study on the risk factors for conversion from laparoscopic cholecystectomy, concluding that acute cholecystitis and male gender were significant risk factors for conversion to open cholecystectomy [16]. A comparable retrospective study by Sapmaz et al. corroborated these findings [17].

Ohya et al. conducted an assessment of preoperative risk factors associated with challenging laparoscopic cholecystectomy in cases of acute cholecystitis. The study involved 327 patients who underwent laparoscopic cholecystectomy, identifying a symptom duration exceeding 72 hours as a risk factor for conversion to open cholecystectomy [18]. Similarly, research by Simopoulos et al. on the risk factors for conversion from laparoscopic to open cholecystectomy concluded that acute cholecystitis, male gender, and age over 65 years were significant risk factors for conversion [19]. Furthermore, Genc et al. retrospectively analyzed 5164 patients who had undergone laparoscopic cholecystectomy to identify risk factors for conversion to open surgery, determining that male gender was the most significant risk factor for such conversion [20].

Altiner et al. evaluated the role of preoperative ultrasound in predicting the likelihood of conversion from laparoscopic to open cholecystectomy in cases of acute cholecystitis. In their study, 80 patients with acute cholecystitis underwent laparoscopic cholecystectomy, and it was found that the presence of pericholecystic fluid and a gallbladder wall diameter exceeding 5.75 mm were significant risk factors for conversion to open cholecystectomy [21]. Similarly, Cwik et al. investigated the utility of ultrasound in predicting the conversion from laparoscopic to open cholecystectomy in acute cholecystitis. Their study included 542 patients, and they identified the presence of pericholecystic fluid and a gallbladder wall diameter greater than 5 mm as factors associated with conversion to open cholecystectomy [22]. Furthermore, studies conducted by Izquierdo et al. and Chavez et al. concluded that increased gallbladder wall thickness was correlated with a heightened risk of conversion from laparoscopic to open cholecystectomy [23, 24].

Farahani et al. evaluated the role of preoperative C-Reactive Protein (CRP) as a predictor for the conversion from laparoscopic to open cholecystectomy in cases of acute cholecystitis. Their study involved 180 patients who underwent laparoscopic cholecystectomy, revealing that a CRP level exceeding 7.5 mg was associated with an increased risk of conversion to open cholecystectomy [25]. Similarly, Tang et al. investigated the risk factors and outcomes for patients who experienced conversion from laparoscopic to open cholecystectomy, identifying elevated CRP as a significant risk factor [26]. Kadirvel et al. examined prognostic factors leading to such conversions, finding that a CRP level greater than 10 mg/L and a total white cell count exceeding 10,000 were linked to a higher risk of conversion [27]. Wevers et al. explored the predictive role of CRP and age, concluding that a CRP level above 165 mg/L and age over 60 were significant risk factors for conversion to open cholecystectomy [28].

Chin et al. conducted a systematic review examining preoperative and intraoperative risk factors associated with the conversion of laparoscopic to open cholecystectomy. This study incorporated 30 studies encompassing 108,472 patients, of whom 5,477 underwent conversion from laparoscopic to open cholecystectomy. The findings indicated that older male patients, those experiencing symptoms of acute cholecystitis for more than 72 hours, and individuals with diabetes mellitus, obesity, and elevated C-Reactive Protein (CRP) levels exceeding 76 mg/L were at an increased risk of conversion [29]. Similarly, Rothman et al. conducted a systematic review and meta-analysis of observational studies examining preoperative risk factors for conversion from laparoscopic to open cholecystectomy. This analysis included 10 studies with a total of 25,778 patients, identifying male gender, age above 65, the presence of acute cholecystitis, gallbladder wall thickness greater than 5 mm, and a contracted gallbladder as significant risk factors for conversion [30]. Furthermore, Magnano San Lio et al. conducted a systematic review and meta-analysis on preoperative risk factors for conversion from laparoscopic to open cholecystectomy, incorporating 35 studies. Their findings highlighted male gender, age above 65 years, the presence of acute cholecystitis, and comorbidities such as diabetes mellitus, hypertension, heart disease, obesity, and previous abdominal surgery as factors associated with an elevated risk of conversion from laparoscopic to open cholecystectomy [31].

Table 2: Risk factors for conversion from laparoscopic to open cholecystectomy

Category	Risk Factor	Evidence	Sources
Demographic Factors	Advanced age	Age >60–65 significantly increases conversion risk.	Medina-Lopez et al
	Male sex	Consistently associated with higher conversion rates.	Magnano San Lio et al
Comorbidities	Diabetes mellitus	Strongly associated in multiple analyses.	Magnano San Lio et al
	Obesity / Overweight	Increased risk of conversion.	Medina-Lopez et al
	Hypertension / Heart disease	Associated with higher conversion odds.	Magnano San Lio et al
History	Previous upper abdominal surgery	Adhesions contribute to conversion.	Magnano San Lio et al
Laboratory Predictors	Elevated CRP	CRP >10 mg/dL or >76 mg/L predicts conversion.	Medina-Lopez et al., Farhani et al.
	Leukocytosis	>10,000/mm ³ associated with difficult cases.	Medina-Lopez et al
Acute Cholecystitis Severity	Severe inflammation	Strong independent risk factor; includes fever, ↑AST/ALT, ↑WBC.	Magnano San Lio et al
Ultrasound Findings	Gallbladder wall thickening	Predicts difficult dissection and conversion.	Altiner et al

Table showing the risk factors for conversion from laparoscopic to open cholecystectomy

3. Conclusions

The incidence of conversion from laparoscopic to open cholecystectomy has demonstrated a declining trend, currently ranging from 5% to 10%. Understanding the risk factors associated with conversion is crucial, as it enables the operating surgeon to better anticipate which patients may necessitate conversion. Key risk factors include male gender, age over 65 years, and the severity of acute cholecystitis. Additionally, the presence of comorbidities such as diabetes mellitus and hypertension, along with biomarkers like elevated C-Reactive Protein and ultrasonographic evidence of gallbladder inflammation, are significant considerations. These factors are essential for the general surgeon to assess the likelihood of requiring conversion to an open cholecystectomy, thereby mitigating the risk of bile duct injury if laparoscopic cholecystectomy is pursued.

Article Information

Conflict of interest: There is no conflict of interest.

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