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CONVERSION FROM LAPAROSCOPIC TO OPEN CHOLECYSTECTOMY IN ACUTE CALCULUS CHOLECYSTITIS: REVIEW ARTICLE

Kumar H.R. (MBBS, MS)*

Associate Professor of Surgery, Taylor University School of Medicine and Health Science, 47500 Subang Jaya, Malaysia.

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***Corresponding author:**
Kumar H. R. (MBBS, MS)
Associate Professor of Surgery, Taylor University School of Medicine and Health Science, 47500 Subang Jaya, Malaysia.

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ABSTRACT

Laparoscopic cholecystectomy is considered the gold standard operation for the management of acute calculus cholecystitis. Still, conversion to an open cholecystectomy is required in certain cases to avoid bile duct injury. The risk factors for conversion include male sex, patients who are older than 65 years, obesity, and comorbidities like diabetes mellitus and hypertension. Acute cholecystitis is also an important risk factor, with patients with Tokyo Guidelines grade 3 being associated with a higher risk of conversion. Blood investigations, such as elevated C-reactive protein (CRP) and leukocytosis, are common indices that can predict the risk of conversion to an open cholecystectomy, and ultrasonography will reveal thickening of the gallbladder wall and the presence of pericholecystic fluid collection. In this review, we will investigate the risk factors for the conversion from laparoscopic to open cholecystectomy and the role it plays in the management of acute calculus cholecystitis.

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

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INTRODUCTION

Acute calculus cholecystitis is the most common clinical manifestation in patients with symptomatic gallstone disease, occurring in 25% of cases. Laparoscopic cholecystectomy is the gold standard in the management of acute cholecystitis, and it is divided into early and delayed. Early laparoscopic cholecystectomy is performed within 72 hours of admission, and delayed laparoscopic cholecystectomy is performed at 8 weeks from the onset of symptoms.[1,2] If a laparoscopic cholecystectomy cannot be performed due to severe adhesion or inflammation at the Calot's triangle than a bailout procedure, like performing a subtotal cholecystectomy or a conversion to an open cholecystectomy, should be done.[3–5]

The Tokyo Guidelines of 2013 had recommended that patients with grade 1 should undergo an elective laparoscopic cholecystectomy, and patients with grade 2 should undergo an early laparoscopic cholecystectomy. The Tokyo Guidelines of 2018 further expanded the indications of performing a laparoscopic cholecystectomy for severe acute cholecystitis, and if the identification of the critical view of safety was not possible than a bail-out procedure, like a conversion to an open cholecystectomy, was indicated to prevent injury to the bile ducts.[6–8] The World Society of Emergency Surgeons(WSES) in their guidelines for the diagnosis and management of acute calculus cholecystitis of 2016 and 2020 have recommended conversion to an open cholecystectomy if there is severe inflammation at the Calot's triangle and further dissection could lead to injury to the common bile duct and other vascular structures.[9,10]

This review will explore the conversion to open cholecystectomy in the management of acute calculus cholecystitis. We will also look at the risk factors for

conversion to open cholecystectomy and the complications that can occur. A comprehensive literature review was conducted using 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 1990 and 2025. The search employed the following keywords: "Acute calculus cholecystitis," "open cholecystectomy," "laparoscopic cholecystectomy," "conversion," "Tokyo Guidelines," and "complications." Only articles in the English language 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.

DISCUSSION

The Incidence of Conversion rates for laparoscopic to open cholecystectomy

The Global conversion rate for laparoscopic to open cholecystectomy will depend on the severity of acute cholecystitis, patient factors, and the experience of the operating surgeon. The overall global conversion rate is at 5% to 10%. Livingston et al conducted a nationwide study on the conversion from laparoscopic to open cholecystectomy. A total of 135,210 patients with acute cholecystitis were included in this study, and the conversion rate was at 5% to 10%.[11] Another retrospective study by Medina Lopez et al, which included 362 patients who had acute cholecystitis and had undergone laparoscopic cholecystectomy, found that the conversion rate was 9.6%.[12] Thangngew et al also assessed the conversion rate for patients who had undergone laparoscopic cholecystectomy to open cholecystectomy, with the conversion rate being at 4.4%.[13]

Table I.

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

The Risk factors for conversion to open cholecystectomy

A retrospective study by Warchalowski et al on the analysis of risk factors for the conversion from laparoscopic to open cholecystectomy reviewed 263 patients, and they concluded that male gender, age above 65 years, and the presence of co-morbidities like diabetes mellitus and neurological diseases were risk factors for conversion to open cholecystectomy.[14] Licciardello et al also looked at the preoperative risk factors for conversion from laparoscopic to open cholecystectomy. A total of 414 patients had undergone laparoscopic cholecystectomy and acute cholecystitis, and age above 65 were risk factors for conversion to open cholecystectomy.[15] Gangemi et al conducted a retrospective study on the risk factors for conversion from laparoscopic cholecystectomy, and they concluded that acute cholecystitis and male gender were risk factors for conversion to open cholecystectomy.[16] A similar retrospective study by Sapmaz et al also concluded the same.[17]

The preoperative risk factors for a difficult laparoscopic cholecystectomy in acute cholecystitis were assessed by Ohya et al. A total of 327 patients underwent laparoscopic cholecystectomy, and the duration of symptoms of more than 72 hours was considered a risk factor for conversion to open cholecystectomy.[18] Another study by Simopoulos et al on the risk factors for conversion from laparoscopic to open cholecystectomy also concluded that acute cholecystitis, male gender, and age above 65 years were risk factors for conversion to open cholecystectomy.[19] Genc et all retrospectively assessed 5164 patients who had undergone laparoscopic cholecystectomy, looking for the risk factors for conversion to open, and they concluded that male gender was the most significant risk factor for conversion to open cholecystectomy.[20]

The role of preoperative ultrasound in predicting the risk of conversion from laparoscopic to open cholecystectomy in acute cholecystitis was assessed by Altiner et al. A total of 80 patients with acute cholecystitis underwent laparoscopic cholecystectomy, and the presence of pericholecystic fluid and a gallbladder wall diameter of more than 5.75mm were risk factors for conversion to open cholecystectomy.[21] Cwik et al looked at the value of ultrasound in predicting the conversion of laparoscopic to open cholecystectomy in acute cholecystitis. A total of 542 patients with acute cholecystitis were included in this study, and the presence of pericholecystic fluid and a gallbladder wall diameter of more than 5mm were associated with conversion to open cholecystectomy.[22] Studies by Izquierdo et al and Chavez et al concluded that the presence of gallbladder wall thickness was

associated with a higher risk of conversion from laparoscopic to open cholecystectomy.[23,24]

The role of preoperative C-Reactive Protein (CRP) as a predictor of conversion from laparoscopic to open cholecystectomy for acute cholecystitis was assessed by Farahani et al. A total of 180 patients with acute cholecystitis had undergone laparoscopic cholecystectomy, and a C-Reactive Protein (CRP) level of more than 7.5mg and above was associated with a higher risk of conversion to open cholecystectomy.[25] Tang et al looked at the risk factors and outcomes in the patients who had undergone conversion from laparoscopic to open cholecystectomy, and elevated C-Reactive Protein(CRP) was associated with a higher risk of conversion.[26] Kadirvel et al looked at the prognostic factors that can lead to conversion from laparoscopic to open cholecystectomy, and elevated C-Reactive Protein(CRP) of more than 75mg /l and elevated Total White cell count of more than 10,000 were associated with a higher risk of conversion.[27] Wevers et al looked at the role of C. Reactive Protein(CRP) and age as predictors of conversion to open cholecystectomy, and they concluded that elevated C. Reactive Protein(CRP) above 165mg/l and age above 60 were risk factors for conversion to open cholecystectomy.[28]

A systematic review on preoperative and intraoperative risk factors for conversion of laparoscopic to open cholecystectomy was conducted by Chin et al. A total of 30 studies with 108,472 patients were included in this study, with 5477 patients having undergone conversion from laparoscopic to open cholecystectomy. Older male patients, patients with symptoms of acute cholecystitis for more than 72 hours, the presence of diabetes mellitus, obesity, and elevated C-Reactive Protein (CRP) of more than 76mg/l were associated with a higher risk of conversion.[29] A systematic review and meta-analysis of observational studies on the pre-operative risk factors for conversion from laparoscopic to open cholecystectomy was conducted by Rothman et al. A total of 10 studies with 25,778 patients were included in this study, and male gender, patients above the age of 65, the presence of acute cholecystitis, gallbladder wall thickness of more than 5mm and contracted gallbladder were risk factors for conversion to open cholecystectomy.[30] A systematic review and meta-analysis for preoperative risk factors for conversion from laparoscopic to open cholecystectomy was conducted by Magnano San Lio et al. A total of 35 studies were included, and male gender, patients with age above 65 years, the presence of acute cholecystitis, and co-morbidities like diabetes mellitus, hypertension, heart disease, and obesity and previous abdominal surgery were associated with a higher risk of conversion from laparoscopic to open cholecystectomy.[31]

Table II.

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/mm³ 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.

CONCLUSIONS

The conversion from laparoscopic to open cholecystectomy has seen a downward trend, with the current rate being at 5% to 10%. Knowledge of the risk factors for conversion is important, as this will better prepare the treating surgeon to anticipate those patients who will require conversion. Male patients, patients who are older than 65 years, and the severity of acute cholecystitis are the most important risk factors for conversion from laparoscopic cholecystectomy to open cholecystectomy. The presence of co-morbidities like diabetes mellitus and hypertension is also another factor to consider, in addition to biomarkers like elevated C-Reactive Protein and ultrasonography findings of gallbladder inflammation. These factors are important for the general surgeon treating these patients to predict if the need for conversion to an open cholecystectomy needs to be done to prevent bile duct injury if a laparoscopic cholecystectomy is continued. Conversion to open cholecystectomy should not be considered as failure to perform laparoscopic cholecystectomy, but as a bailout procedure to prevent injury to the bile ducts.

Conflict of Interest: There is no conflict of interest.

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