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Early Laparoscopic Cholecystectomy in the Management of Acute Calculus Cholecystitis: Review Article

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ABSTRACT

Acute calculus cholecystitis is a common surgical emergency that has traditionally been treated with conservative treatment followed by delayed laparoscopic cholecystectomy. The Tokyo Guidelines of 2013/2018 and the World Society of Emergency Surgeons (WSES) 2020 guidelines on acute calculus cholecystitis have recommended early laparoscopic cholecystectomy. Early laparoscopic cholecystectomy is performed within 7 days from the onset of symptoms and is associated with better outcomes, shorter stay in the hospital, and reduced cost. In this review, we will investigate the role of early laparoscopic cholecystectomy and the risk of conversion to open cholecystectomy in the management of acute calculus cholecystitis.

INTRODUCTION

Gallstones are a common occurrence in the population and are seen in 1 in 7 adults, but it is symptomatic is 20% of patients. The global prevalence of gallstones is 20% in Europe, while it is 5%-20% in Asia. Cholesterol stones are the most common type of stone, followed by pigment and mixed stones. The most common local complication of gallstones is acute cholecystitis, which is predominantly seen in female patients. (Ibrahim et al., 2018; Lammert et al., 2016). Acute calculus cholecystitis is characterized by inflammation of the gallbladder, secondary to obstruction of the cystic duct by gallstones. The clinical presentation reveals fever and a positive Murphy's sign on abdominal examination. Blood investigations may reveal leukocytosis and elevated C. Reactive Protein (CRP). Ultrasound abdomen is the most common imaging modality that is used to diagnose acute calculus cholecystitis, and it will reveal inflammation of the gallbladder wall, the presence of gallstones, and pericholecystic fluid collection(Chung & Duke, 2018; Costanzo et al., 2023; Elwood, 2008; Knab et al., 2014; Schuld & Glanemann, 2015; Strasberg, 2008). The management of acute calculus cholecystitis is by performing a laparoscopic cholecystectomy, which can be done as an early laparoscopic cholecystectomy or a delayed/interval laparoscopic cholecystectomy(Bagla et al., 2016; Gomes et al., 2017; Kuhlenschmidt et al., 2021).

The 2016 World Society of Emergency Surgeons (WSES) guidelines on acute calculus cholecystitis have defined early laparoscopic cholecystectomy for patients who present symptoms of acute cholecystitis within 72 hrs. or less than 7 days, or within 4 to 6 days of diagnosis. They have recommended early laparoscopic cholecystectomy for the management of acute calculus cholecystitis(Ansaloni et al., 2016). The 2020 World Society of Emergency Surgeons (WSES) guidelines further recommended that early laparoscopic cholecystectomy be performed for patients with acute calculus cholecystitis within 7 days from admission and 10 days from the onset of symptoms(Pisano et al., 2020). The Tokyo Guidelines of 2013, in their guidelines for the management of acute calculus cholecystitis, have recommended early laparoscopic cholecystectomy within 72 hours from the onset of symptoms, and it should be performed for patients with grade 2 severity of acute calculus cholecystitis(Takada et al., 2013; Yamashita et al.,

2013). The Tokyo Guidelines of 2018 adopted the recommendation of early laparoscopic cholecystectomy for the management of grade 2 severity for acute calculus cholecystitis(Mayumi et al., 2018; Okamoto et al., 2018).

There has been a trend towards early laparoscopic cholecystectomy for the management of acute calculus cholecystitis. We have conducted this review article to investigate the role of early laparoscopic cholecystectomy in the management of acute calculus cholecystitis. We will look at what is the optimal time to perform early laparoscopic cholecystectomy and what are the complication that occur from it. We conducted a literature review using PUBMED, Cochrane database of clinical reviews, and Google Scholar, looking for clinical trials, observational studies, cohort studies, systematic reviews, and meta-analyses from 1990 to 2025. We used the following keywords: "Acute calculus cholecystitis", "early laparoscopic cholecystectomy", "Tokyo Guidelines", "cholelithiasis "," cholecystectomy, "complications", and "conversion". All articles were in the English language only. Further articles were obtained by manually cross-referencing the literature. Case reports and studies with fewer than 10 patients, as well as editorials, were excluded. Adult male and female patients were included in this study; pregnant and pediatric patients were excluded.

DISCUSSION

Early laparoscopic cholecystectomy in Acute Cholecystitis

Early laparoscopic cholecystectomy is performing the procedure within seven days from the onset of symptoms. It is associated with reduced complications, shorter length of hospital stays, and reduced cost as it eliminates the need for another admission to perform an interval laparoscopic cholecystectomy. The duration of operation may be longer due to the inflammation at the calot's triangle and gallbladder fossa(Hartwig & Büchler, 2014; Koti et al., 2015; Thangavelu et al., 2018).A randomized controlled study on early laparoscopic cholecystectomy was conducted by Kao et al. A total of 86 patients were included in this study, and early laparoscopic cholecystectomy was associated with lower morbidity, length of hospital stays, and cost(Kao et al., 2018). A similar randomized study by Agrawal et al also concluded the same(Agrawal et al., 2015). A retrospective by Acar et al., which compared early laparoscopic cholecystectomy with delayed laparoscopic cholecystectomy, also concluded that early laparoscopic cholecystectomy was associated with reduced morbidity and length of hospital stay(Acar et al., 2017).

A French Nationwide retrospective study on the optimal timing for early laparoscopic cholecystectomy was conducted by Polo et al. A total of 42,452 patients were included in this study, and the morbidity was significantly lower if the laparoscopic cholecystectomy was performed within 3 days of admission(Polo et al., 2015).A similar retrospective study on the optimal timing for emergency cholecystectomy for acute cholecystitis in England by Wiggins et al also concluded that early cholecystectomy within 3 days of admission was associated with reduced morbidity(Wiggins et al., 2019). Blohm et al looked at the optimal timing of cholecystectomy in acute cholecystitis from the National Swedish Registry for gallstone surgery. A total of 15,760 patients underwent cholecystectomy for acute cholecystitis, and early cholecystectomy within 2 days from admission was associated with reduced morbidity, but these patients will need to be optimized first(Blohm et al., 2017). A multicentric Prospective Observational study on the timing of early cholecystectomy for acute calculus cholecystitis was conducted by Fugazzola et al. A total of 1117 patients were included in this study, and early laparoscopic cholecystectomy was associated with reduced morbidity and conversion rates, and should be performed at the earliest from admission(Fugazzola et al., 2023).

A meta-analysis comparing early versus delayed laparoscopic cholecystectomy for acute cholecystitis was conducted by Wu et al. A total of 16 studies with 1625 patients were included in this study. Early laparoscopic cholecystectomy was associated with reduced wound infection, shorter stay in hospital, and earlier return to work. There were no differences in mortality and bile duct injury between the groups(Wu et al., 2015).A meta-analysis on the timing of cholecystectomy for acute calculus cholecystitis was conducted by Papi et al. A total of 12 studies with 1255 patients were included in this study, and the operative complication rate was 3.11%, and the conversion rate was 7.99% for the early laparoscopic cholecystectomy group. The length of hospital stay was shorter in the early laparoscopic cholecystectomy group(Papi et al., 2004).A systematic review and meta-analysis on early cholecystectomy for acute cholecystitis in the elderly was conducted by Loozen et al. A total of 8 studies with 592 patients were included, and the morbidity was 24%, and mortality was 3.5%. This study showed that early cholecystectomy was feasible in the elderly, but careful patient selection was essential(Loozen et al., 2017).

Borzellino et al conducted a meta-analysis of randomized controlled trials on the timing of early laparoscopic cholecystectomy for acute calculus cholecystitis. A total of 15 studies with 1251 patients were included in this study, and early laparoscopic cholecystectomy being performed 72hours from the onset of symptoms, was associated with reduced postoperative complications and reduced risk of conversion(Borzellino et al., 2021). Another meta-analysis of randomized controlled trials comparing early versus delayed cholecystectomy for acute cholecystitis was conducted by Shikata et al. A total of 10 studies with 1014 patients were included in this study, and there were no differences in morbidity, length of hospital stays, and conversion rates between the procedures(Shikata et al., 2005). Gurusamy et al conducted a meta-analysis of randomized controlled trials on the safety and effectiveness of early and delayed laparoscopic cholecystectomy for acute cholecystitis. A total of 5 studies with 451 patients were included in this study. There were no differences concerning bile duct injury and conversion between the groups, and early laparoscopic cholecystectomy was associated with a shorter stay in the hospital(Gurusamy et al., 2010).

An up-to-date meta-analysis of randomized controlled trials on early versus delayed laparoscopic cholecystectomy for acute cholecystitis was conducted by Lyu et al. A total of 15 studies with 1669 patients were included, with 829 patients undergoing early laparoscopic cholecystectomy and 840 undergoing delayed laparoscopic cholecystectomy. There were no significant differences regarding the postoperative complications, bile leak, and conversion to open surgery between the procedures. Early laparoscopic cholecystectomy was associated with a shorter hospital stay, but the duration of surgery was longer(Lyu et al., 2018).A meta-analysis of case -control studies by Cao et al showed that early laparoscopic cholecystectomy was superior to delayed laparoscopic cholecystectomy in the management of acute cholecystitis(Cao et al., 2016).

Table 1. Evidence Summary Comparing Early vs Delayed Laparoscopic Cholecystectomy in Acute Calculus Cholecystitis

Study	Design & N	Early definition of laparoscopic cholecystectomy	Key Outcomes	Take-home message
Gurusamy et al. (2010)	Systematic review of Randomized Controlled Trials, n=541	Less than 7 days/same admission	Early laparoscopic cholecystectomy reduces total Length of Stay; no increase in Bile Duct Injury/, conversions/complications	At least as safe, more efficient than a delayed Laparoscopic Cholecystectomy
Lyu et al. 2018	Meta-analysis of 15 Randomized Controlled Trials, n=1669	3–7 days	No difference in Bile Duct Injury, leak, conversions, infections; shorter total Length Of Stay	Supports the safety/efficiency of early Laparoscopic Cholecystectomy
Zhou et al. 2014	Meta-analysis (7 RCTs; n=1106)	3–7 days	4 days total Length of Stay with early Laparoscopic Cholecystectomy: no difference in Bile Duct Injury or conversions	Early Laparoscopic Cholecystectomy lowers hospital resource use
Wu et al. 2023	Systematic review/meta-analysis (21 RCTs + 13 retrospective studies; n=1625)	Less than 7 days	Lower complications, lower conversion, shorter hospitalization	Early Laparoscopic Cholecystectomy is superior across several endpoints

Risk Factors for conversion to open cholecystectomy

Some of the risk factors for conversion from laparoscopic to open cholecystectomy include male sex, age above 60 years, and the presence of co-morbidities like diabetes mellitus. Obesity is an independent risk factor for conversion due to technical difficulties, such as the placement of the ports, the presence of excessive omental fat, and the difficulty in retracting the liver to expose the gallbladder. Elevated C.reactive protein (CRP) is also associated with a higher risk of conversion, and the presence of acute cholecystitis is another risk factor for the conversion to open cholecystectomy(Rosen et al., 2002; Sippey et al., 2015; Terho et al., 2016; van der steeg & Roumen, 2011).

Chin et al conducted a systematic review on the preoperative and intraoperative risk factors for the conversion from laparoscopic to open cholecystectomy. A total of 30 studies with 108,472 patients were included, and older male patients, the presence of acute cholecystitis with prolonged symptoms of more than 72 hours, obesity, and elevated C-reactive protein of more than 76mg/l were associated with a higher risk of conversion(Chin et al., 2023).A systematic review and meta-analysis on the pre-operative risk factors for conversion from laparoscopic to open cholecystectomy. A total of 11 studies were included, and increasing age, male, obesity, the presence of acute cholecystitis, and elevated C-reactive protein were risk factors for conversion(Magnano San Lio et al., 2023).

CONCLUSION

Modern guidance and high-quality evidence support early laparoscopic cholecystectomy as the standard for most patients with acute calculus cholecystitis. Early Laparoscopic Cholecystectomy reduces total hospitalization, is associated with reduced risk of bile duct injury and conversion and often lowers postoperative complications. Outcomes are optimal within 48 hours, though the Tokyo Guidelines and the World Society of Emergency Surgeons (WSES) permit performing early laparoscopic cholecystectomy within 7–10 days from the onset of symptoms. With better training, most general surgeons will be able to perform elective cholecystectomy and reduce the conversion to open cholecystectomy.

Conflict of interest-There is no conflict of interest

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