# Laparoscopic Cholecystectomy in Acute Cholecystitis: An Updated Review


## Abstract

Laparoscopic cholecystectomy is the gold standard for the management of gallstone disease, but it has recently been incorporated into the treatment of acute cholecystitis. It is divided into early and delayed laparoscopic cholecystectomy. Early laparoscopic cholecystectomy is done within 72 hours of the onset of symptoms, and delayed laparoscopic cholecystectomy is done after eight weeks. As there is no consensus on the timing of early laparoscopic cholecystectomy in adults and elderly patients, we have conducted this review article to examine the timing of early laparoscopic cholecystectomy, the risk factors for conversion to open cholecystectomy, and the role of laparoscopic subtotal cholecystectomy in the management of acute cholecystitis.



Keywords: acute cholecystitis, early laparoscopic cholecystectomy, timing of laparoscopic cholecystectomy, conversion of laparoscopic cholecystectomy for acute cholecystitis, surgical treatment of acute cholecystitis.


## Introduction

Acute cholecystitis is characterized by inflammation of the gallbladder secondary to gallstones. It is diagnosed by a combination of clinical presentation and investigations, including blood investigations and ultrasound imaging. The initial treatment consists of intravenous fluids and antibiotics, but definitive treatment is performed surgically via cholecystectomy. Surgical management can be divided into open or laparoscopic cholecystectomy with laparoscopic cholecystectomy being the current most popular mode of treatment. (1)

As laparoscopic cholecystectomy was considered the treatment of choice for acute cholecystitis, the timing of cholecystectomy was often debated, with the patient being managed conservatively, and laparoscopic cholecystectomy was performed after six to eight weeks. However, evidence suggests that early cholecystectomy is safe and feasible for the management of acute cholecystitis. Early laparoscopic cholecystectomy can be performed within 72 hours of admission. (2)

Surgical treatment of acute cholecystitis was divided into early and delayed laparoscopic cholecystectomy. Early laparoscopic cholecystectomy involves performing cholecystectomy during the initial admission, and delayed cholecystectomy involves performing the surgery six–to eight weeks after surgery. Early laparoscopic cholecystectomy is being encouraged now as it is associated with reduced cost and prevents readmission for recurrent attacks of acute cholecystitis. (3)

The optimal timing for performing laparoscopic cholecystectomy in acute cholecystitis is controversial, with more cases managed with early laparoscopic cholecystectomy rather than delayed laparoscopic cholecystectomy. The optimal timing of early laparoscopic cholecystectomy is also controversial, with no clear definition of early cholecystectomy. The most common time is to perform laparoscopic cholecystectomy within 72 hours from the onset of symptoms. (4)

The Tokyo guidelines (TG) 13 and 18 have recommended that patients who present with grades 1 and 2 disease should be managed with early laparoscopic cholecystectomy, and patients with grade 3 can be managed with delayed laparoscopic cholecystectomy after initial management of the patient with percutaneous cholecystostomy and conservative treatment. Early laparoscopic cholecystectomy was defined as performing the procedure in less than 72 hours from the onset of symptoms. (5,6)

The World Society of Emergency Surgeons (WSES) has recommended that laparoscopic cholecystectomy is the treatment of choice for acute cholecystitis, and early laparoscopic cholecystectomy should be offered with the definition of early laparoscopic cholecystectomybeing surgery performed in patients who present with symptoms within 72hours or seven days. Laparoscopic cholecystectomy is also safe, feasible and associated with reduced morbidity and hospital stay. (7,8)

There is no current consensus on the definition of early laparoscopic cholecystectomy, the optimal time for performing early laparoscopic cholecystectomy, and whether laparoscopic cholecystectomy should be performed as an early or delayed procedure. Conversion from laparoscopic cholecystectomy is also discussed along with its indications. We conducted this review article to answer all these questions regarding the role of laparoscopic cholecystectomy in the management of acute cholecystitis. We conducted a literature review using PUBMED, the Cochrane database of systemic reviews, Google Scholar, and semantic scholars to search for randomized control trials, non-randomized trials, observational and cohort studies, clinical reviews, systemic reviews, and meta-analyses from 1995 to 2023. The following keywords were used: “acute cholecystitis”, “early laparoscopic cholecystectomy”, “timing of laparoscopic cholecystectomy”, “conversion of laparoscopic cholecystectomy for acute cholecystitis,”” and “surgical treatment for acute cholecystitis”. All articles were in English and assessed by manual cross-referencing of the literature. Commentaries, case reports, and editorials were excluded from this review. Only adult patients were included in this study and pregnant patients with acute cholecystitis were excluded. Pediatric patients were excluded from this study.

**Early laparoscopic cholecystectomy**

Early laparoscopic cholecystectomy is often performed within 72 hours of admission for acute cholecystitis. It was found to be safe and was associated with reduced morbidity and length of hospital stay. The conversion rates are not affected if early laparoscopic

cholecystectomy is performed, and there is also an added economic benefit. The operative time may be longer than that of delayed laparoscopic cholecystectomy. (9–19)

The inflammatory changes that occur during acute cholecystitis make dissection of the gallbladder during early laparoscopic cholecystectomy easier as the edema and adhesion are not dense and fibrotic. (20)

A retrospective study was conducted by Ambe et al., looking at the critical time for performing early cholecystectomy. A total of 152 patients were included in this study and were divided into those who underwent laparoscopic cholecystectomy within 24 hours of admission and those who underwent laparoscopic cholecystectomy within 72 hours of admission. This study concluded that laparoscopic cholecystectomy can be conducted within 72 hours of admission. (21)

A randomized controlled trial comparing early laparoscopic cholecystectomy versus delayed laparoscopic cholecystectomy for acute cholecystitis was conducted by Johansson et al,145 patients were included of which 74 underwent early laparoscopic cholecystectomy and 71 underwent delayed laparoscopic cholecystectomy after six weeks. There were no differences in conversion rates, bile duct injury, and mortality. The length of hospital stay was shorter in the early laparoscopic cholecystectomy group. This was also confirmed by another prospective randomized controlled study on early versus delayed laparoscopic cholecystectomy for acute cholecystitis by Ozkardes et al. (22,23)

A meta-analysis by Wu et al. compared early and delayed laparoscopic cholecystectomy for acute cholecystitis and included 16 studies and 1625 patients. This study concluded that early laparoscopic cholecystectomy is associated with lower wound infection rates, reduced hospital stays, and reduced costs. There was no difference in mortality, bile duct injury, and conversion to open cholecystectomy. (24)

Gurusamy et al. conducted a systematic review and meta-analysis of randomized control trials on the safety and effectiveness of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Five studies with a total of 451 patients were included in this study and this study concluded that there was no difference with regards to bile duct injury and conversion to open cholecystectomy between the groups and the early laparoscopic cholecystectomy was associated with reduced hospital stay. (25)

An up-to-date meta-analysis of randomized controlled trials on early versus delayed laparoscopic cholecystectomy by Lyu et al. also showed no significant difference in wound infection rates, bile duct injury, and total complication rates. The operation time was increased in early laparoscopic cholecystectomy, but the hospital stay was reduced. This was also confirmed by further meta-analyses of randomized control trials on early versus delayed cholecystectomy for acute cholecystitis by Shikata et al, Siddiqui et al, and Borzellino et al. (26–29)

A meta-analysis of case-control studies by Cao et al. compared early and delayed laparoscopic cholecystectomy for acute cholecystitis, and 77 studies were included. The results from the study showed that early laparoscopic cholecystectomy was associated with reduced complication rates, bile duct injury, wound infection rate, and length of hospital stay. (30)

Meta-analyses by Zhou et al and Papi et al compared the safety and efficacy of early laparoscopic cholecystectomy versus delayed laparoscopic cholecystectomy and they concluded that early laparoscopic cholecystectomy was safe, and it reduces the stay in the hospital. (31,32)

**Table 1:** Definition of early laparoscopic cholecystectomy.

| Study | Study type | year | Definition of early laparoscopic cholecystectomy |
|---|---|---|---|
| Johansson et al | Randomized control trial | 2004 | Within 48 hrs. of admission |
| Okardes et al | Prospective randomized study | 2014 | Within 24 hrs. of admission |
| Agrawal et al | Prospective randomized study | 2014 | Within 24 hrs. of admission |
| Cao et al | Meta-analysis | 2015 | From 72hrs to 7days from admission |
| Wiggins et al | Prospective randomized study | 2019 | Within 7 days from admission |

**Early laparoscopic cholecystectomy in elderly patients**

A systematic review and meta-analysiswereconducted byLoozen et al. on early cholecystectomy for acute cholecystitis in the elderly population. Eight studies with 592 patients were included in this study. The conversion, morbidity, and mortality rates were

23 %, 24%, and 3.5 %, respectively. This meta-analysis concluded that cholecystectomy is feasible and safe for the management of acute cholecystitis in elderly patients, although patient selection is important. (33)

The factors affecting early cholecystectomy for acute cholecystitis in older patients include patient and hospital factors. Patient factors included comorbidities such as history of diabetes mellitus, hypertension, heart disease, and personal and social reasons. The hospital factors include the experience of the surgeon, the availability of emergency theatre time, and intensive care services. (34)

Early laparoscopic cholecystectomy in the elderly was associated with better postoperative recovery, reduced morbidity, mortality, and better outcomes than delayed laparoscopic cholecystectomy. The factors that affect the recovery of elderly patients are independent factors that are related to the age and co-morbidities of the patient. (35,36)

A systemic review and meta-analysis of early versus delayed laparoscopic cholecystectomy following percutaneous cholecystostomy in elderly patients was conducted by Kourounis et al. 29 studies were included and there was no difference with regards to conversion rates, morbidity, and mortality between the groups. This study concluded that the timing of cholecystectomy after percutaneous cholecystostomy has no impact on the management of acute cholecystitis. (37)

**Conversion to open cholecystectomy**

This is often performed in patients who undergo laparoscopic cholecystectomy where the anatomy of the structures in the Callot’s triangle are obscured by acute inflammation and risk of injury to the bile ducts are high. The rate of conversion is anywhere from 2%-23% The risk factors for conversion include male sex, leukocytosis, hyperglycemia, elevated serum amylase, and presence of co-morbidities. Delay in the presentation to the hospital with symptoms of acute cholecystitis also increases the risk of conversion. (38–42)

A retrospective study by Sippey et al on the risk factors for conversion to an open procedure in acute cholecystitis include age, body-mass effect, elevated serum alkaline phosphatase, and low serum albumin. (43)

A systemic review and meta-analysis on the risk factors for conversion from laparoscopic to open cholecystectomy was conducted by San Lio et al. A total of 35 studies were included and the majority were retrospective studies. The conversion rate was 6% and the following risk factors, age more than 65, male sex, history of acute cholecystitis, presence of diabetes mellitus and previous abdominal surgery increased the risk of conversion. (44)

A systemic review on the preoperative and intraoperative risk factors for conversion of laparoscopic cholecystectomy to open cholecystectomy was conducted by Chin et al. A total of 30 studies and 5,477 cases were converted to open cholecystectomy. Male sex, older patients, symptoms of more than 72 hours, obesity, elevated C reactive protein, and diabetes mellitus were risk factors for conversion. (45)

**Table 2:The conversion rate and complication rates for early laparoscopic cholecystectomy for acute cholecystitis.**

| Study | Year | Study type | N=numbers | Conversion rate-% | Complication rate-% |
|---|---|---|---|---|---|
| Papi et al | 2004 | Meta-analysis | 1255 | 7.99% | 3.11% |
| Lau et al | 2005 | Meta-analysis | 504 | 16% | 3.9% |
| Gurusamy et al | 2009 | Meta-analysis | 451 | 20.3% | 0.5% |

**Laparoscopic subtotal cholecystectomy**

This is considered a bail-out technique or a rescue procedure to complete the cholecystectomy laparoscopically, when there is severe inflammation over the calot's triangle and performing a cholecystectomy is difficult. This procedure is an alternative to converting to an open cholecystectomy. A systemic review by Toro et al looked at the various methods of performing this procedure.19 articles were included, and 678 patients had undergone subtotal cholecystectomy. This study concluded that closure of both the anterior and posterior walls of the gallbladder stump represented the best method to reduce complications. (46)

Another systemic review by Azzawi et al on laparoscopic subtotal cholecystectomy for difficult gallbladders was conducted with 45 studies and 2,166 patients who had undergone a subtotal cholecystectomy. The most common procedure performed was the closure of the cystic duct stump with intracorporeal suturing. The most common complication was bile leak and intra-abdominal collection. (47)

## Conclusion

Laparoscopic cholecystectomy is considered the gold standard for the management of acute cholecystitis and early laparoscopic cholecystectomy is recommended due to its reduced morbidity, mortality, and reduced cost. The ideal time for performing early laparoscopic cholecystectomy is less than 72 hours from the onset of symptoms.

The problems of implementing early laparoscopic cholecystectomy in most general hospitals are the availability of senior, trained consultant general surgeons, the availability of emergency theatre time, the use of imaging services, and being able to convert and perform an open cholecystectomy. Patients who are undergoing an early laparoscopic cholecystectomy should be counseled about the risks of conversion to an open procedure.

Some general surgical units perform a delayed laparoscopic cholecystectomy after eight weeks for acute cholecystitis due to the problems that come when attempting to perform an early laparoscopic cholecystectomy. As we progress, early laparoscopic cholecystectomy will become the norm in the management of acute cholecystitis in the future.

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