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Original Research Article

Comparison of Early versus Delayed Laparoscopic Cholecystectomy for Treatment of Acute Cholecystitis: A Prospective Cohort Study

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Abstract: ***Background:*** Acute cholecystitis is a surgical emergency, and laparoscopic cholecystectomy is the definitive surgery. The timing of surgery, however, is still a subject of debate. Acute cholecystitis was compared between early and delayed laparoscopic cholecystectomy in this study. ***Objective:*** To analyze the results of early versus delayed Laparoscopic Cholecystectomy in Acute Cholecystitis. ***Methods:*** This is a prospective cohort study carried out in the Department of General Surgery, Allama Iqbal Teaching Hospital, DG Khan, from 28th August, 2025 to 27th November, 2025. In all, 166 patients were enrolled and were randomly allocated to two groups: early laparoscopic cholecystectomy (83 patients) and delayed laparoscopic cholecystectomy (83 patients). The findings during surgery, conversion rate, complications after surgery, hospital stay, and recovery were compared. ***Results:*** Early laparoscopic cholecystectomy correlated with shorter duration of surgery, fewer dense adhesions, lower conversion rate, shorter hospital stays, and fewer re-admissions. The postoperative complications in both groups were similar, and the delayed surgery had more complicated dissection and greater total treatment time. ***Conclusion:*** Laparoscopic cholecystectomy is safe, effective, and preferred in clinically stable patients with acute cholecystitis.

Keywords: Acute cholecystitis, early laparoscopic cholecystectomy, delayed laparoscopic cholecystectomy, gallstones, surgical outcomes

INTRODUCTION

Cholecystitis is one of the most frequently seen acute presentations in general surgical practice, and it is primarily caused by the obstruction of the cystic duct by gallstones, which causes the inflammation, edema, infection, and subsequent local adhesions of the gall bladder. The symptoms include right upper abdominal pain, fever, nausea, vomiting, leukocytosis, and ultrasonographic features of gallbladder wall thickening and pericholecystic fluid (1). Surgical removal of the diseased gall bladder, prevention of recurrent attacks, and the benefits of minimally invasive surgery, decreased postoperative pain, early mobilization, shorter hospital stay, and

faster return to normal activity have led to laparoscopic cholecystectomy becoming the standard definitive treatment. In a resource-limited environment, however, in which operating room availability, patient presentation time, and surgeon preference may impact management decision-making, an optimal window for laparoscopic cholecystectomy during an acute attack is still important.

The traditional treatment of acute cholecystitis was conservative (intravenous fluids, antibiotics, analgesia, and bowel rest), and delayed laparoscopic cholecystectomy was performed after several weeks, once the inflammation had resolved. This was done with the assumption that acute inflammation makes dissection of the bile duct difficult, leads to bleeding, bile duct injury, and conversion to open surgery (2). Laparoscopic cholecystectomy, on the other hand, is done during the index admission, usually within 72 hours to 7 days of the onset of symptoms, to treat the disease before the presence of heavy fibrosis and re-flared inflammation. In recent comparative studies, the older delayed approach has been questioned, and it is now becoming increasingly possible to do early surgery in a safe and effective manner when offered by experienced teams. The decision between early and delayed laparoscopic cholecystectomy is of clinical relevance, due to the fact that both have practical benefits and drawbacks.

Early surgery can shorten the duration of hospitalization, minimize rehospitalization, prevent complications of biliary colic, empyema, gangrene, perforation, and pancreatitis, and lower overall costs of treatment. It has been reported to be related to challenging dissection; however, because of acute edema and friability of the liver, and also due to the disorganization of the Calot's triangle anatomy. Waiting for the acute inflammation to resolve is useful, but it does mean that patients are at risk of recurrent symptoms and emergency readmission, as well as interval complications. Encouraging results have been achieved from single-center experiences of early surgery for the appropriate cases performed with due care and attention (3). Early laparoscopic cholecystectomy has also been successfully supported by prospective and randomized studies in acute calculous cholecystitis. The studies typically compare the operative time, conversion rate, intraoperative complications, postoperative morbidity, hospital stay, and return to routine activity between early and delayed.

While surgical delay may be technically simpler in some patients, surgery may be complicated due to chronic fibrosis and adhesion that may occur during the waiting period. The timing decision should not be solely dependent upon theoretical operative difficulty, but should also consider the overall disease course, healthcare burden, safety and risk of repeated acute episodes (4). In some comparative studies from the surgical environment in South Asia, early LC has been shown to have a shorter total hospital stay and the absence of a second hospitalization. Early intervention can cure many patients in the first occurrence, and also minimize the need for extended antibiotic treatments and multiple outpatient visits.

Patients with severe sepsis, uncontrolled comorbidities, late presentation with mass formation or lack of surgical fitness may still benefit from delayed surgery, but for patients who are stable with mild to moderate acute cholecystitis, early surgery is still gaining traction (5). Larger evidence has been gathered from systematic reviews and meta-analyses combining data from several studies and making comparisons between early and delayed laparoscopic cholecystectomy. Overall, these analyses indicate that major bile duct injury and conversion rates are not significantly elevated with early surgery if it is performed in an appropriate institution, and that overall treatment time and length of hospital stay are often shorter. (6) In addition to the standard surgical outcomes, studies have been conducted on the quality of life after surgery, with some suggesting that surgical timing may affect the physical healing process, patient satisfaction, and the return to social and occupational function (7).

This debate has been focused on complications after surgery. Infection of wound, bile leak, the presence of stones, and intra-abdominal collection and conversion to open surgery are significant factors of safety. Variable results have been reported in comparative studies, but many have been inconclusive and noted no difference in complication rates with early surgery, particularly after optimization of patients and with the use of safe surgical techniques such as subtotal cholecystectomy or bail-out techniques when necessary (8). In studies that have evaluated outcomes and complications of acute calculous cholecystitis, the benefits of early surgery have also been highlighted, and this approach has been shown to decrease the number of subsequent inflammatory events prior to definitive treatment (9). Recent comparative studies have confirmed early laparoscopic cholecystectomy as a feasible option in the treatment of acute cholecystitis, though, there are some factors that may influence the outcome, such as the severity of the disease, the timing of presentation and the availability of the institutions (10).

Severity-based assessment has also been advocated by the Tokyo Guidelines, and in Grade II acute cholecystitis, it seems reasonable to perform early surgery if there is careful consideration of the level of difficulty of the surgery and the postoperative morbidity (11). However, regional studies have indicated that early surgery can also minimize the postoperative burden and complications in some patients (12). Comparative studies have also found

that this early approach has substantial benefits without compromising the safety of the patient (13). This is also underscored by other leading biliary diseases like acute biliary pancreatitis, in which a later cholecystectomy may result in greater risk of recurrent biliary accidents (14). Studies of real-world outcomes have shown benefit of early management when comprehensive surgical resources are available (15). In addition, Pakistani experience of pancreatitis following biliary stones further highlights the role of timely cholecystectomy in preventing recurrence of pancreatitis (16). Thus, the discussion between early and late laparoscopic cholecystectomy (LC) in acute calculous cholecystitis is still relevant not only to tertiary care surgical centers but also to local hospitals in Malaysia (17).

Objectives

A prospective cohort study of clinical outcomes in acute cholecystitis comparing early versus delayed laparoscopic cholecystectomy including operative difficulty, complications, conversion rate, hospital duration, recovery, and overall effectiveness of the treatment.

MATERIALS AND METHODS

Study Design

Prospective cohort study.

Study Setting

The study was carried out in the Department of General Surgery, Allama Iqbal Teaching Hospital, Dera Ghazi Khan.

Study Duration

From 28th August, 2025 to 27th November, 2025.

Inclusion Criteria

Acute cholecystitis cases diagnosed clinically, based on laboratory and ultrasonographic parameters were included irrespective of gender. Patients that were able for general anesthesia and laparoscopy and gave informed consent were included.

Exclusion criteria

The study excluded patients with choledocholithiasis, obstructive jaundice, generalized peritonitis, severe cardiopulmonary disease, bleeding disorders, pregnancy, and previous upper abdominal surgery, and patients who were unfit for a general anesthetic.

Methods

A detailed history, physical examination, CBC, LFT, RFT, serum electrolytes, coagulation profile, and abdominal USG were performed on all the patients who presented with clinical features of acute cholecystitis. The patients who met the inclusion criteria were split into two groups based on the time of surgery. Laparoscopic cholecystectomy was performed during the index admission in the early group, and conservative management with intravenous fluids, antibiotics, analgesics, and supportive care was initially provided, followed by laparoscopic cholecystectomy once the acute episode had passed in the delayed group. The four-port laparoscopy technique was used with general anesthesia for all procedures. Intraoperative findings, surgical time, gall bladder condition, presence of adhesions, bleeding, bile spillage, and conversion to open surgery were recorded. The postoperative complications, such as pain, fever, wound infection, bile leakage, hospital stay, readmission, and recovery, were recorded. Data were recorded and analyzed to compare the results of the early and delayed groups of laparoscopic cholecystectomy

RESULTS

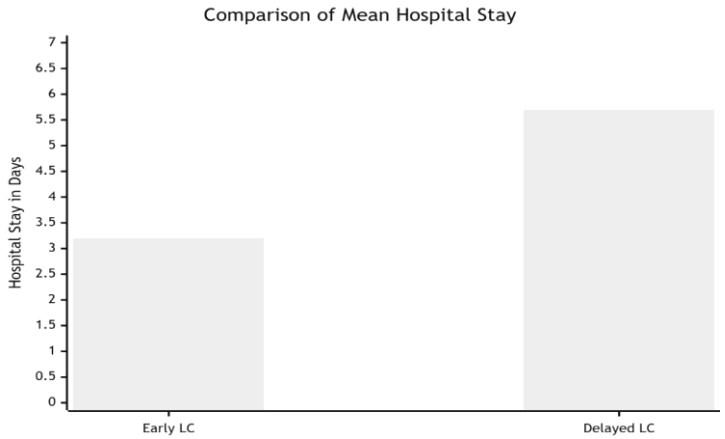
This study included 166 patients with acute cholecystitis – 83 in the delayed group of laparoscopic cholecystectomy and 83 in the early group of laparoscopic cholecystectomy. The mean age was 42.8 ± 10.6 years in the early group and 44.3 ± 11.2 years in the delayed group. There were more female patients in both groups. The clinical characteristics at baseline were similar for both groups.

Variable	Early LC (n=83)	Delayed LC (n=83)
Mean age (years)	42.8 ± 10.6	44.3 ± 11.2
Male	31 (37.3%)	34 (41.0%)
Female	52 (62.7%)	49 (59.0%)
Fever	46 (55.4%)	43 (51.8%)
Leukocytosis	57 (68.7%)	54 (65.1%)

In terms of the dissection of the wound, the delay group was found to have more difficult dissection because of the presence of dense adhesions and fibrosis. Mean operative time was lower in the early group as compared to the delayed group. In the early group, 5 patients, and the delayed group, 9 patients, required conversion to an open cholecystectomy. In addition, the occurrence of bile spillage and the difficulty of dissection of the Calot's triangle were more common in delayed cases.

Operative Outcome	Early LC (n=83)	Delayed LC (n=83)
Mean operative time (minutes)	63.5 ± 15.2	74.6 ± 17.8
Dense adhesions	24 (28.9%)	38 (45.8%)
Difficult Calot's dissection	21 (25.3%)	33 (39.8%)
Bile spillage	10 (12.0%)	17 (20.5%)
Conversion to open surgery	5 (6.0%)	9 (10.8%)

The recovery in the early laparoscopic cholecystectomy group was better. The mean hospital stay was 3.2 ± 1.1 days in the early group, while it was 5.7 ± 1.6 days in the delayed group. Recurrent pain and repeated acute attacks were the only criteria used to observe readmission before definitive surgery in the delayed group.



The number of postoperative complications was a little higher in the delayed group. In the early group, 3 patients were infected with wounds, whereas 6 patients were infected in the delayed group. Early group: 1 patient reported a leak of bile; delayed group: 2 patients reported a leak of bile. There were no deaths reported in either group.

Postoperative Outcome	Early LC (n=83)	Delayed LC (n=83)
Mean hospital stay (days)	3.2 ± 1.1	5.7 ± 1.6
Wound infection	3 (3.6%)	6 (7.2%)
Bile leak	1 (1.2%)	2 (2.4%)
Postoperative fever	5 (6.0%)	9 (10.8%)
Readmission before surgery	0 (0%)	11 (13.3%)

In general, early LC had shorter operative times, fewer hospital stays, fewer readmissions, and similar safety postoperatively. A larger number of adhesions, difficult dissection, and longer total treatment duration were seen in delayed laparoscopic cholecystectomy.

DISCUSSION

Early vs delayed laparoscopic cholecystectomy was the subject of the present prospective cohort study, and an early cholecystectomy was correlated with improved overall clinical results in patients with acute cholecystitis. The findings of this study were that early laparoscopic cholecystectomy had a shorter operative time, fewer dense adhesions, a lower conversion rate, a shorter hospital stay, and fewer readmissions prior to definitive surgery. The findings endorse the expanding opinion that early laparoscopic cholecystectomy is also a safe and effective surgical procedure for selected patients with acute cholecystitis, particularly when the patients are clinically stable, and the operation is performed by an experienced team of laparoscopic surgeons (1). Inflammation, edema, and friability can make it hard to visualize Calot's triangle and could result in bleeding, bile duct trauma, and open surgery, making acute cholecystitis a challenging surgical scenario. This was the reason that many surgeons used to prefer initial conservative treatment, and then delayed surgery for cholecystectomy after several weeks.

However, waiting for surgery doesn't always ease the pain. Chronic inflammation of the gallbladder during the waiting period can result in fibrosis, thick adhesions, and the alteration of the normal anatomical structure, making delayed laparoscopic cholecystectomy technically more challenging. This is consistent with previous observations by Mudhale et al., who noted a decrease in overall hospital burden with early surgery without significant differences in complications (2). In the current study, dense adhesions and challenging dissection of the Calot's

triangle occurred more frequently in the delayed group. This finding is in accordance with the experience of Budiæcã et al. (3) with a single center, in which repeated inflammatory episodes often caused more difficult operative conditions in delayed cases. The same Gupta et al. also concluded that, in acute calculous cholecystitis, early laparoscopic cholecystectomy is practical and safe, and that the operative outcome is acceptable when performed in the index admission (4).

The results indicate that the acute inflammatory phase does not necessarily have to be more serious than the fibrotic phase, which occurs following conservative treatment. The early group in this study did not have as much operative time. This might be due to the fact that the early cases of acute cholecystitis may be associated with edema, creating a plane of dissection, while the delayed cases may have developed mature adhesions and fibrosis. As reported by Khan et al., Favorable results were also obtained in acute calculus cholecystitis, which included reduced length of treatment and decreased recurrence of symptoms, with early laparoscopic cholecystectomy (5). A systematic review and meta-analysis by Wu et al. has also shown that early laparoscopic cholecystectomy is not correlated with an increased conversion rate or significant major complications, but is correlated with a decreased hospital stay (6).

Surgery that was performed laparoscopically was better for patients who had an early laparoscopic cholecystectomy. The early group had a shorter mean hospital stay than the delayed group. This finding is significant in local health centers where hospital beds are limited and where patient finances and multiple admissions contribute to a strain on the patient and the hospital. Şahin and Alçı emphasized that the timing of surgery could also be a factor affecting the quality of life after surgery and that people could return to their normal physical and social lives more quickly after surgery if surgery was performed early. (7) Early laparoscopic cholecystectomy thus offers both surgical and functional and economic benefits. The overall complication rate in this study was slightly greater in the delayed group; however, both were largely safe procedures. A few cases of wound infection, postoperative fever, and bile leak were seen, and no deaths were reported.

Similar results were reported by Iftikhar et al., who found that there were no significant differences in the postoperative mortality and morbidity rates between early surgery and delayed surgery (8). Lad et al. also found that early laparoscopic cholecystectomy yields favorable results in cases of acute calculous cholecystitis and helps to avoid interval complications (9). The findings confirm that careful patient selection and surgical technique are critical. Both groups underwent open cholecystectomy, but it was more common in the delayed group. The conversion is not a failure, but rather an important decision for safety that is made when it is determined that the anatomy is not known or dissection can become hazardous. The early laparoscopic cholecystectomy has been shown to be safe by Dinesh et al, who suggest that the principles and bail-out techniques are followed by surgeons (10). Likewise, Kilinc Tuncer et al. noted that the severity of the disease has to be taken into consideration when deciding the timing of surgery, particularly when it comes to Grade II cholecystitis (Tokyo 2018) (11).

Delayed management in the present study was a significant disadvantage because of the readmission rate prior to definitive surgery. Patients in the delayed group continued to have the same risk of recurrent biliary colic, recurrent attacks of cholecystitis, and emergency admission during their waiting period for elective surgery. Cheon et al. also found that early laparoscopic cholecystectomy in an appropriate patient population may decrease the incidence of re-admission and postoperative complications (12). Similarly, Jain et al. found early surgery to be advantageous as it would treat the disease at the initial admission and prevent interval morbidity (13). Studies on acute biliary pancreatitis also support the role of cholecystectomy. Prasanth et al. reported that early cholecystectomy after biliary pancreatitis decreases the recurrence of biliary events (14). In a systematic review of UK clinical practice, Munir et al. also concluded that early laparoscopic cholecystectomy was indicated if there was no difficulty in the surgical procedure or patient condition (15).

In addition, local evidence by Ahmad et al. further indicates that early intervention in biliary stone disease is effective in preventing recurrence and complications of the disease (16). Podder et al. also concluded that the early laparoscopic cholecystectomy has good results in acute calculus cholecystitis (17). The results of this study confirm that early laparoscopic cholecystectomy is a good option for clinically stable patients with acute cholecystitis. However, surgery may be delayed in those with severe sepsis, uncontrolled comorbidities, late presentation, and poor anesthetic fitness. In most of the patients who were selected for early surgery, however, surgery during the same stay has been a definitive treatment, leading to a shorter hospital stay, preventing readmission, and having similar safety but superior outcomes.

CONCLUSION

In this study, early laparoscopic cholecystectomy was determined as a safe and effective treatment option for acute cholecystitis. Compared to delayed laparoscopic cholecystectomy, early surgery had significantly fewer dense adhesions, less difficulty with Calot's triangle dissection, a shorter hospital stay, and a lower

readmission rate, along with a shorter operative time. The incidence of postoperative complications was similar in both groups, suggesting that early intervention did not raise the risk of surgery when the patients were well selected for the procedure. Laparoscopic cystectomy may be performed at a later time in cases of severe inflammation, uncontrolled comorbidities, and poor anesthetic fitness. On the other hand, early laparoscopic cholecystectomy is a definitive treatment in the same admission for clinically stable patients, and reduces the burden of recurrent symptoms and repeated hospitalization. Early laparoscopic cholecystectomy should be the preferred treatment for suitable patients with acute cholecystitis.

REFERENCES

1. Kumar A, Nandini N, Shayana A. A comparative study of early and delayed laparoscopic cholecystectomy in the management of acute cholecystitis. Int J Acad Med Pharm. 2024;6(2):990-6.
2. Mudhale V, Phatak P, Dige S, Ghate U, Kadalge B. A comparative study of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Sri Lanka Journal of Surgery. 2023 Jul 31;41(2).
3. Budiæcã OA, Harosa FM, Ahmed S, Strugari V, Szanto LA, Bãlan M, Malache D, Bacârea V, Suciu BA, Nicolescu C, Molnar C. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a single center experience. Chirurgia. 2024;119(1):44-55.
4. Gupta G, Shahbaj A, Pipal DK, Saini P, Verma V, Gupta S, Rani V, Yadav S. Evaluation of early versus delayed laparoscopic cholecystectomy in acute calculous cholecystitis: a prospective, randomized study. Journal of Minimally Invasive Surgery. 2022 Dec 15;25(4):139.
5. Khan S, Kumar B, Kumar A, Gaur M. A comparative study of early versus delayed laparoscopic cholecystectomy in acute calculus cholecystitis. Int J Acad Med Pharm. 2024;6(2):1323-7.
6. Wu H, Liao B, Cao T, Ji T, Huang J, Luo Y, Ma K. Comparison of the safety profile, conversion rate, and hospitalization duration between early and delayed laparoscopic cholecystectomy for acute cholecystitis: a systematic review and meta-analysis. Frontiers in Medicine. 2023 Dec 11;10:1185482.
7. Şahin AG, Alçı E. Impact of surgical timing on postoperative quality of life in acute cholecystitis: a comparative analysis of early, intermediate, and delayed laparoscopic cholecystectomy. Surgical Endoscopy. 2025 Apr;39(4):2489-97.
8. Iftikhar M, Qazi MS, Khan R, Ahmad S, Ullah S, Ullah F, Khattak I, Khan Sr R. Comparative Analysis of Complications in Early Versus Delayed Laparoscopic Cholecystectomy for Acute Cholecystitis. Cureus. 2025 Feb 14;17(2).
9. Lad V, Modi J, Godhani P. Early vs. Delayed Laparoscopic Cholecystectomy in Acute Calculous Cholecystitis: A Comparative Analysis of Outcomes and Complications. National Journal of Medical Research. 2025 Jan 1;15(1).
10. Dinesh S, Kumar A, Pasi DK, Singh J, Dhamija P, Kumar N, Dinesh S, Pasi D, Singh D. Early Versus Delayed Laparoscopic Cholecystectomy in Acute Cholecystitis: A Comparative Study. Cureus. 2026 Mar 30;18(3).
11. Kilinc Tuncer G, Tuncer K, Sert I, Emiroglu M. Effect of early versus delayed laparoscopic cholecystectomy on postoperative morbidity and difficult cholecystectomy in patients with Grade II cholecystitis according to Tokyo 2018 guidelines: a prospective study. The American Surgeon™. 2023 Dec;89(12):5775-81.
12. Yousaf M, Shah MN, Afridi SK. Comparison of postoperative complications early vs delayed laparoscopic cholecystectomy for acute cholecystitis. Journal of Saidu Medical College. 2022 Jun 14;12(2):75-8.
13. Jain S, Singh NK, Varshney S. Comparative Study Between Early Versus Delayed Laparoscopic Cholecystectomy in Acute Cholecystitis. Med Int. 2025;12:104-8.
14. Prasanth J, Prasad M, Mahapatra SJ, Krishna A, Prakash O, Garg PK, Bansal VK. Early versus delayed cholecystectomy for acute biliary pancreatitis: a systematic review and meta-analysis. World journal of surgery. 2022 Jun;46(6):1359-75.
15. Munir A, Osman AM, Galluci A, Ahmed M, Ahmed S, O'Neill S, Magee C. Comparison of Outcomes of Early and Delayed Laparoscopic Cholecystectomies in UK Clinical Practice: A Systematic Review. Cureus. 2025 Aug 25;17(8).
16. Ahmad MS, Mehmood S, Kareemullah M, Rashid M, Hameed B, Imran HM, Ullah RH. Acute biliary stone-induced pancreatitis: the outcomes of early vs. delayed laparoscopic cholecystectomy: early versus delayed cholecystectomy. Pakistan Journal of Health Sciences. 2024 Sep 30:213-8.
17. Podder S, Chowdhury DA, Mowla MG, Islam SI, Nurunnabi M. Comparison of Early Versus Delayed Laparoscopic Cholecystectomy in Patients with Acute Calculus Cholecystitis: A Single-Center Cross-Sectional Study. Journal of Rangpur Medical College. 2025 Nov 24;10(2):135-40.