Original Article

OPEN ACCESS

Early Versus Late Laparoscopic Cholecystectomy for Acute Cholecystitis

Israr Ahmed[1], Muhammad Naeem Taj[2], Aasma Waleed[3], Waleed Munir[4], Zakia Akbar[5], Muhammad Ali Taj[6]

[1]General Surgeon, Department of General Surgery, CDA Hospital Islamabad
[2]Consultant Surgeon and HOD, Department of General Surgery CDA, Islamabad
[3]Postgraduate resident CDA, Islamabad, [4]Registrar, Maroof International Hospital, Islamabad
[5]Taj Surgery Hospital, Rawalpindi, [6]3rd year student Shifa College of Medicine, Islamabad

Author`s Contribution

[1,4]Substantial contributions to the conception or design of the work; or the acquisition, [2]Final approval of the study to be published,[6]Active participation in active methodology, analysis, or interpretation of data for the work, [2,3,5]Drafting the work or revising it critically for important intellectual content

Funding Source: None
Conflict of Interest: None

Received: April 12, 2025
Revised: Oct 24, 2025
Accepted: Nov 12, 2025

Address of Correspondent
Dr Israr Ahmed
General Surgeon, Department of General Surgery, CDA Hospital Islamabad
israr284284@gmail.com

ABSTRACT

Objective: To compare outcomes between early and late laparoscopic cholecystectomy (LC) in patients presenting with acute cholecystitis (AC).

Methodology: This randomized controlled trial was conducted in the Surgical Department of Capital Development Authority Hospital, Islamabad, from 29 October 2019 to 29 April 2020. Patients aged 18–60 years of either gender diagnosed with acute cholecystitis—confirmed on ultrasonography by the presence of gallstones, a positive sonographic Murphy's sign, gallbladder wall thickening >3 mm, or pericholecystic fluid—were included. Participants were randomly allocated into two groups: Group A (early LC) and Group B (late LC). All patients received standard preoperative and anesthetic management. Surgeries were performed by a single experienced laparoscopic surgeon. Outcomes were assessed in terms of conversion to open surgery, bile leak, and mean hospital stay.

Results: The mean age in the early LC group was 44 ± 10.7 years, compared to 40 ± 11.9 years in the late LC group. In Group A, 40% of patients were male and 60% were female, whereas in Group B, 35% were male and 65% were female. None of the patients in the early LC group required conversion to open surgery, while 9% of patients in the late LC group were converted. Bile leak occurred in 2% (1 patient) of the early LC group compared to 12% (5 patients) in the late LC group. The mean hospital stay was shorter in the early LC group (2 ± 1.29 days) compared to the late LC group (3 ± 2.84 days).

Conclusion: Early laparoscopic cholecystectomy was associated with fewer complications and a shorter hospital stay and appears to be a better treatment option compared to late laparoscopic cholecystectomy in patients with acute cholecystitis.

Keywords: Outcome; early laparoscopic cholecystectomy; late laparoscopic cholecystectomy; acute cholecystitis.

Cite this article as: Ahmed I, Taj MN, Waleed A, Akbar Z, Taj MA. Early Versus Late Laparoscopic Cholecystectomy for Acute Cholecystitis. Ann Pak Inst Med Sci. 2025; 21(4):706-710. doi. 10.48036/apims.v21i4.1591.

Introduction

Acute cholecystitis refers to gallbladder swelling caused by blockage of the cystic duct or disrupted gallbladder drainage.[1] This disruption is frequently linked to gallstones or thickened bile.[1] Gallbladder disorders affect both genders, though some groups are more susceptible. The likelihood rises among females, individuals with obesity, pregnant patients, and those in their forties.[1] AC presents with persistent pain in the right upper abdomen, loss of appetite, vomiting, nausea and fever. Around 95% of cases, gallstones are present, while 5% of cases occur without stones.[2] Patients showing symptoms suggestive of acute cholecystitis should have an abdominal ultrasound to confirm the diagnosis. If the initial ultrasound is inconclusive or to exclude complications or alternative diagnoses, additional imaging techniques should be considered.[2]

Early concerns included active inflammation, challenging dissection, and a greater risk of complications. However,

with growing expertise, it is now widely recognized that laparoscopic cholecystectomy is safe and offers more benefits compared to open surgery.[3,4] However the optimal timing for laparoscopic cholecystectomy remains unclear and it is typically managed with two timing strategies for LC.[5] The first is early cholecystectomy, where the procedure is performed within the same hospital stay, typically within 3 days of symptom onset. The second is interval cholecystectomy, which involves initial conservative treatment followed by surgery in a subsequent hospital admission, usually scheduled 3–9 weeks later.[5-7] These approaches are influenced by hospital resources, the surgeon's proficiency, and the patient's general health.

Usually, the timing of the laparoscopic cholecystectomy for acute cholecystitis has been questioned, with numerous studies offering differing observations regarding the optimal timing for the surgeries. Few evidences suggested that the early LC, performed within 24 to 48 hours of symptom onset, is linked to lower rates of the complications, decreased hospital stays, and enhanced overall outcomes.[8,9] On the other hand reported that the both early and delayed laparoscopic cholecystectomy are considered safe for treating acute cholecystitis; however, patients undergoing early surgery experience quicker recovery and lower pain levels.[10,11] Comparatively, other advocate for a delayed approach to PTGBD,[12,13] disagreeing that the initial conservative management followed by the delayed LC after the resolution of acute inflammation reduces the risk of the complications rates like as injury to bile duct and bleeding intra-operatively. Given above differing evidences, this study is significant as it aims to provide clarity on the optimal timing of LC to improve patient safety, enhance recovery, and guide surgical practice.

Methodology

A randomized controlled trial was conducted at the Surgical Department of Capital Development Authority Hospital, Islamabad, over duration of six months from October 2019 to April 2020. The sample size was calculated using the World Health Organization (WHO) formula, based on a 3.3% complication rate in early laparoscopic cholecystectomy (LC) compared to a 25% complication rate in late LC, with a 5% level of significance and 90% power of the test. A consecutive (non-probability) sampling technique was employed. Patients aged between 18 to 60 years of both genders presenting with acute cholecystitis, confirmed by ultrasound findings such as the presence of gallstones, sonographic Murphy's sign, gallbladder wall thickening greater than 3 mm, or pericholecystic fluid, were included in the study. Patients with choledocholithiasis or empyema gallbladder (as assessed by ultrasound) and those with a history of previous upper abdominal surgery (as determined by medical history) were excluded.

A complete medical history, routine physical examinations, ultrasound and relevant anesthesia fitness assessments were performed for all patients. All the patients were randomly assigned into two groups: Group A underwent early laparoscopic cholecystectomy (LC), while Group B underwent late LC. All patients received preoperative sedation with Midazolam 7 mg one hour before surgery. Anesthesia induction was carried out using Propofol at a dose of 2 mg/kg body weight, Atracurium 0.5 mg/kg, and Tramadol 1 mg/kg. All procedures were performed by a single experienced laparoscopic surgeon who is a fellow of the College of Physicians and Surgeons Pakistan (CPSP). The outcomes were assessed in terms of conversion to open cholecystectomy, incidence of bile leak, and mean hospital stay. All the data was entered and analyzed by SPSS version 22. Conversion to open cholecystectomy and bile leak was compared between two groups. Post stratification chi square test was applied ($P \leq 0.05$) was considered significant.

Results

Overall average age of patients in Group A was 44 ±10.7 years, while in Group B it was 40 ±11.9 years, (p= 0.1049). According to the gender distribution, Group A had 17 male patients (40%) and 26 female patients (60%), while Group B had 15 males (35%) and 28 females (65%) (p= 0.655). Table I

In Group A, none of the patients required conversion to open surgery, while in Group B, 4 patients (9%) required conversion, showing a statistically significant difference (p = 0.040). Bile leak was observed in 1 patient (2%) in Group A and in 5 patients (12%) in Group B; however, this difference was not statistically significant (p = 0.090). The average hospital stay was significantly shorter in Group A,

Table I: Descriptive statistics of age and gender. (n=86)

Variables		Early LC group	Delayed LC group	*P Value
Age	Mean ± SD	44 ± 10.7	40 ± 11.9	0.104
Gender	Male	17(40%)	15(35%)	0.655
	Female	26(60%)	28(65%)	

Table II: Outcomes in terms of conversion, bile leak and hospital stays. (n= 86)

Outcomes		Early LC group	Delayed LC group	P value
Conversion	Yes	0(0%)	4(9%)	0.040
	No	43(100%)	39(91%)	
Bile leak	Yes	1(2%)	5(12%)	0.090
	No	42(98%)	38(88%)	
Hospital stay	**Mean ± SD**	2 ± 1.29 days	3 ± 2.84 days	0.038

Table III: Stratification of outcomes with respect to the age, gender and obesity. (n=86)

Variables		CONVERSION	Early LC group	Delayed LC group	P value
Age groups	18-30 years	Yes	0	2	0.136
		No	20	17	
	31-60 years	Yes	0	2	0.157
		No	23	22	
Gender	Male	Yes	0	2	0.119
		No	17	13	
	Female	Yes	0	2	0.164
		No	26	26	
Obesity	Obese	Yes	0	3	0.062
		No	18	14	
	Non Obese	Yes	0	1	0.322
		No	25	25	
Bile leak					
		Bile leak	**Early LC group**	**Delayed LC group**	**P value**
Age groups	18-30 years	Yes	0	2	0.136
		No	20	17	
	31-60 years	Yes	1	3	0.316
		No	22	21	
Gender	Male	Yes	0	2	0.119
		No	17	13	
	Female	Yes	1	3	0.335
		No	25	25	
Obesity	Obese	Yes	1	3	0.261
		No	17	14	
	Non Obese	Yes	0	2	0.157
		No	25	24	
Hospital stay					
		Hospital stay	**GROUP A**	**GROUP B**	**P value**
Age groups	18-30 years	Mean and SD	2 ± 1.54	3 ± 1.97	0.084
	31-60 years	Mean and SD	3 ± 1.88	4 ± 1.91	0.077
Gender	Male	Mean and SD	2 ± 1.77	3 ± 2.81	0.232
	Female	Mean and SD	2 ± 1.69	3 ± 2.75	0.116
Obesity	Obese	Mean and SD	3 ± 2.06	4 ± 3.02	0.258
	Non Obese	Mean and SD	2 ± 1.66	3 ± 1.95	0.054

with a mean of 2 ± 1.29 days, compared to 3 ± 2.84 days in Group B (p = 0.038). Table II

Stratified analysis of outcomes by age, gender, and obesity showed that early LC group consistently resulted in fewer complications and shorter hospital stays compared to late LC group, though most differences were not statistically significant (p=>0.05). Conversion to open surgery occurred only in late LC group, with slightly higher rates in younger, obese, and both male and female patients. Bile leaks were also more frequent in late LC group across all subgroups. Hospital stays were generally shorter in early LC group for all age, gender, and obesity categories, with the difference being nearly significant in non-obese patients (p=>0.05). Table III

Discussion

The AC, a common disorder encountered in emergency settings, typically presents with abrupt abdominal pain. Since LC remains the gold standard for treatment, but the optimal timing of LC continues to be a topic of significant debate and ongoing controversy, this study was conducted to compare the outcomes between early and delayed LC in patients presenting with acute cholecystitis. The overall mean age was 44 ± 10.7 years in the early LC group and

40 ± 11.9 years in the delayed LC group, with a female predominance in both groups, 26 (60%) and 28 (65%) respectively. Consistently, Ahmad MS et al[14] reported that the average age of participants was 43.70 ± 5.91 years, with 18 (36.00%) males and 32 (64.00%) females. Similarly, another study by Iftikhar M et al[15] found that in the early LC group, the average patient age was 42.5 ± 10.3 years, while in the delayed group, it was 44.1 ± 9.8 years. Both groups showed a comparable gender distribution, with a slight predominance of females. The female predominance in gallbladder disease may due to several factors, like female sex hormones such as estrogen and progesterone, which are known to increase cholesterol saturation in bile and decrease gallbladder motility, respectively, thereby promoting cholelithiasis. Furthermore, pregnancy, use of oral contraceptives, and hormonal replacement therapy further contribute to the higher prevalence of gallbladder disease among women.

According to the effectiveness in this study in early LC group showed none of patients had converted to open cholecystectomy and lower rate of bile leak 1(2%) whereas in delayed group 4(9%) patients had converted to open cholecystectomy. And 5(12%) patients had bile leak. In aligns to this study Iftikhar M et al[15] reported that the early LC group had a shorter mean operative time (60.2 ± 12.4 minutes), lower conversion to open surgery (3.3%), and less mean blood loss (45.6 ± 8.2 mL), whereas delayed LC group showed a longer operative time (75.6 ± 15.3 minutes), higher conversion rate (10.3%), and greater blood loss (52.4 ± 10.1 mL) with significance difference (p=0.001). Comparatively Ahmad MS et al[14] reported that the early laparoscopic cholecystectomy showed fewer complications (p<0.04), reduced hospitalization duration (p<0.003), and more rapidly healing. Consistently Nasir M et al[9] reported that the open cholecystectomy was done in 6 patients (7.9%) in early LC group and 16 patients (21.0%) in delayed LC group, showing a significant distinction between the two groups (P=0.021).

Furthermore, the Bundgaard NS et al[17] concluded that the early LC for acute cholecystitis, even after 5 days of symptom onset, remains safe and does not lead to higher complication rates. The length of symptoms in AC is not an independent risk factor and should not affect the surgeon's choice to proceed with ELC.[17] On the other hand Budiæcã OA et al[18] found that early LC is associated with benefits such as shorter hospital stays and reduced conversion rates to open surgery, thereby confirming the effectiveness of early intervention. Additionally, few other recent studies alos reported that the early LC is effective than delayed LC.[19,20] Additionally this study showed the average hospital stay was significantly shorter in early LC group, with a mean of 2 ± 1.29 days, compared to 3 ± 2.84 days in delayed group (p = 0.0385). These findings were similar according to the studies by Ahmad MS et al[14] and Wani H et al[3], while inconsistently Raja S et al[5] reported that there were no significant differences in operative duration or length of postoperative hospitalization between the groups.

In this study based on stratification the early LC group had fewer complications and shorter hospital stays than the late LC group, though differences were mostly not statistically significant. Conversion to open surgery and bile leaks were more common in the late LC group, especially among younger, obese, and both male and female patients. Overall early LC proves to be a safe and effective intervention for AC, offering several advantages like reduced hospital stays and lower rate of the conversion to open surgeries. Though, the limitations of this study include its relatively small sample size and the lack of long-term follow-up data on complications. Hence future large-scale, multi-center studies with extended follow-up are needed to better understand the long-term outcomes and refine patient selection criteria for optimal surgical timing for patients with acute cholecystitis.

Conclusion

Study concludes that the early intervention may be safer and more effective, reducing complications and improving patient recovery times. Based on the observed trends, early laparoscopic cholecystectomy should be considered the preferred approach for acute cholecystitis. Further large-scale studies are required to confirm these findings and to establish standardized guidelines for the timing of LC in clinical practice.

References

1. Jones MW, Genova R, O'Rourke MC. Acute cholecystitis [Internet]. Treasure Island (FL): StatPearls Publishing; last updated 2023 May 22. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459171/
2. Mannam R, Narayanan RS, Bansal A, Yanamaladoddi VR, Sarvepalli SS, Vemula SL, Aramadaka S. Laparoscopic cholecystectomy versus open cholecystectomy in acute cholecystitis: a literature review. *Cureus*. 2023 Sep 21;15(9):e45704. https://doi.org/10.7759/cureus.45704
3. Wani H, Meher S, Srinivasulu U, Mohanty LN, Modi M, Ibrarullah M. Laparoscopic cholecystectomy for acute cholecystitis: any time is a good time. *Ann Hepatobiliary Pancreat Surg*. 2023 Aug;27(3):271–6. https://doi.org/10.14701/ahbps.22-127

4. Catena F, Ansaloni L, Bianchi E, Di Saverio S, Coccolini F, Vallicelli C, et al. The ACTIVE (Acute Cholecystitis Trial Invasive Versus Endoscopic) study: multicenter randomized, double-blind, controlled trial of laparoscopic versus open surgery for acute cholecystitis. *Hepatogastroenterology*. 2013;60:1552–6.
5. Raja S, Ali A, Kumar D, Raja A, Samo KA, Memon AS. Early vs interval approach to laparoscopic cholecystectomy for acute cholecystitis: a retrospective observational study from Pakistan. *Front Surg*. 2024 Sep 6;11:1462885. https://doi.org/10.3389/fsurg.2024.1462885
6. Gupta G, Shahbaj A, Pipal DK, Saini P, Verma V, Gupta S, et al. Evaluation of early versus delayed laparoscopic cholecystectomy in acute calculous cholecystitis: a prospective, randomized study. *J Minim Invasive Surg*. 2022;25(4):139–44. https://doi.org/10.7602/jmis.2022.25.4.139
7. Janjić G, Simatović M, Skrbić V, Karabeg R, Radulj D. Early vs delayed laparoscopic cholecystectomy for acute cholecystitis: single-center experience. *Med Arch*. 2020;74(1):34–8. https://doi.org/10.5455/medarh.2020.74.34-37
8. Murshid MY, Murshid AJ, Ansari FA. Early vs delayed laparoscopic cholecystectomy for acute cholecystitis: a single-center study. *SAS J Surg*. 2023 Feb;9(2):59–64. https://doi.org/10.36347/sasjs.2023.v09i02.002
9. Nasir M, Choudry ZA, Farooq A, Iqbal MS, Abbas A, Ali M. Comparison of early and delayed laparoscopic cholecystectomy in acute cholecystitis. *Ann Punjab Med Coll*. 2021 Mar;15(1):91–4. https://doi.org/10.29054/apmc/2021.1099
10. Mudhale V, Phatak P, Dige S, Ghate U, Kadalge B. A comparative study of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. *Sri Lanka J Surg*. 2023 Jul;41(2). https://doi.org/10.4038/sljs.v41i2.9030
11. Gibson J, Allen N, Viswanath Y. EP-617 early vs delayed laparoscopic cholecystectomy for acute cholecystitis: a systematic review. *Br J Surg*. 2022 Aug;109(Suppl 5):znac245.158. https://doi.org/10.1093/bjs/znac245.158
12. Gao W, Zheng J, Bai JG, Han Z. Effect of surgical timing on postoperative outcomes in patients with acute cholecystitis after delayed percutaneous transhepatic gallbladder drainage. *World J Gastrointest Surg*. 2024 Nov;16(11):3445. https://doi.org/10.4240/wjgs.v16.i11.3445
13. Hassan N, Mehmood S, Bajwa K, Hussain SM, Batool W, Ashraf I. Perioperative complications in patients with acute cholecystitis: early versus interval laparoscopic cholecystectomy. *Pak Armed Forces Med J*. 2024 Dec;74(6):1584. https://doi.org/10.51253/pafmj.v74i6.10064
14. Ahmad MS, Mehmood S, Kareemullah M, Rashid M, Hameed B, Imran HM, Ullah RH. Acute biliary stone-induced pancreatitis: outcomes of early versus delayed laparoscopic cholecystectomy. *Pak J Health Sci*. 2024 Sep;5(9):213–8. https://doi.org/10.54393/pjhs.v5i09.2110
15. Iftikhar M, Qazi MS, Khan R, Ahmad S, Ullah S, Ullah F, Khattak I, Khan SR. Comparative analysis of complications in early versus delayed laparoscopic cholecystectomy for acute cholecystitis. *Cureus*. 2025 Feb 14;17(2):e78985. https://doi.org/10.7759/cureus.78985
16. Wani H, Meher S, Srinivasulu U, Mohanty LN, Modi M, Ibrarullah M. Laparoscopic cholecystectomy for acute cholecystitis: any time is a good time. *Ann Hepatobiliary Pancreat Surg*. 2023 Aug;27(3):271–6. https://doi.org/10.14701/ahbps.22-127
17. Bundgaard NS, Bohm A, Hansted AK, Skovsen AP. Early laparoscopic cholecystectomy for acute cholecystitis is safe regardless of timing. *Langenbecks Arch Surg*. 2021 Nov;406(7):2367–73. https://doi.org/10.1007/s00423-021-02229-2
18. Budiacă OA, Harosa FM, Ahmed S, Strugari V, Szántó LA, Bălan M, et al. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a single-center experience. *Chirurgia (Bucur)*. 2024;119(1):44–55. https://doi.org/10.21614/chirurgia.2024.v.119.i.1.p.44
19. Sukhontamas S. Early versus delayed laparoscopic cholecystectomy for the management of acute cholecystitis: a retrospective review. *J Assoc Gen Surg Thailand*. 2020 Aug;5(1):5–12.
20. Khalid S, Iqbal Z, Bhatti AA. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis. *J Ayub Med Coll Abbottabad*. 2017 Oct;29(4):570–3.
21. Cheng X, Cheng P, Xu P, Hu P, Zhao G, Tao K, Wang G, Shuai X, Zhang J. Safety and feasibility of prolonged versus early laparoscopic cholecystectomy for acute cholecystitis: a single-center retrospective study. *Surg Endosc*. 2021 May;35:2297–305. https://doi.org/10.1007/s00464-020-07643-z