



A COMPARATIVE STUDY OF EARLY VERSUS LATE LAPAROSCOPIC CHOLECYSTECTOMY FOR ACUTE CALCULOUS CHOLECYSTITIS

General Surgery

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ABSTRACT

Introduction: Acute calculous cholecystitis is a common surgical emergency, especially in adults, often necessitating cholecystectomy. Among treatment options, laparoscopic cholecystectomy is the preferred choice due to faster recovery and fewer complications. However, the timing of surgery—early (within 72 hours) versus delayed (after 4–6 weeks)—remains debated. **Aim & Objective:** The aim of this study was to compare early versus delayed laparoscopic cholecystectomy in acute calculous cholecystitis with respect to operative time, frequency of complications, and length of postoperative hospital stay. **Methodology:** This comparative observational study was conducted on 70 patients aged 18–60 years at SGT Medical Hospital. Patients were randomly divided into early (n=35) and delayed (n=35) laparoscopic cholecystectomy groups. Standard investigations and follow-up protocols were followed, and statistical analysis was performed using SPSS 24.0. **Result & Conclusion:** Early surgery showed a significantly shorter operative time (54.97 ± 12.48 min vs 69.85 ± 12.84 min), reduced hospital stay (4.98 ± 1.08 days vs 7.88 ± 1.77 days), and less gallbladder wall thickening compared to delayed surgery. No major difference was noted in conversion or complication rates. Early laparoscopic cholecystectomy is thus a safe, efficient, and cost-effective approach for acute calculous cholecystitis.

KEYWORDS

Acute Calculous Cholecystitis, Early Laparoscopic Cholecystectomy, Delayed Laparoscopic Cholecystectomy, Operative Time, Hospital Stay, Gallbladder Wall Thickness, Surgical Outcomes, Comparative Study, Minimally Invasive Surgery, Postoperative Recovery.

INTRODUCTION

Acute calculous cholecystitis is an increasingly common cause of abdominal pain and discomfort, especially in the adult population of North India, with a reported prevalence of 6.12%¹. It represents a significant form of gallbladder disease associated with gallstones and manifests across a spectrum of symptoms ranging from mild abdominal pain and nausea to severe, life-threatening complications. Major complications include recurrent biliary colic and cholestasis, which may lead to ascending cholangitis, treatable with antibiotics². However, severe complications like gallbladder perforation, gangrene, bile leakage, and acute biliary pancreatitis usually require surgical intervention. Thus, cholecystectomy remains the treatment of choice for acute calculous cholecystitis.

There are currently three treatment approaches: elective surgery following initial medical stabilization, delayed cholecystectomy during the same admission, and early cholecystectomy soon after diagnosis. Among these, laparoscopic cholecystectomy (LC) is preferred for its advantages of quicker recovery, reduced pain, better cosmesis, and lower costs. It is a safe procedure, with major complications occurring in fewer than 5% of cases³. Laparoscopic surgery further offers benefits such as reduced postoperative pain, shorter hospital stays, and decreased inflammatory stress⁴. Nevertheless, it also has limitations, including increased risk of bile duct injuries, longer operative times⁵, and challenges due to limited three-dimensional vision⁶.

Surgical removal of the gallbladder, particularly through laparoscopy, is the preferred treatment for symptomatic gallstones. Approximately 80% of cholecystectomies are performed laparoscopically, and one-third of these follow an episode of acute cholecystitis⁷. It is now the most commonly performed laparoscopic surgery globally⁸. The first laparoscopic cholecystectomy was done by Muhe in 1985 and later performed by Mouret and Dubois in 1987 and 1988, respectively⁹. The modern technique was standardized by Reddick and Olsen in 1988¹⁰.

Initially, laparoscopic cholecystectomy was considered relatively contraindicated in acute cases due to inflammation, poorly defined planes, and tissue friability^{11–12}. However, with increased surgical expertise, laparoscopy has become the gold standard even for acute cases^{13–14}. Early laparoscopic cholecystectomy is now the accepted standard for acute cholecystitis as it reduces morbidity, mortality, and hospitalization duration¹⁵. The 2013 Tokyo Guidelines and SAGES recommend early surgery within 24–72 hours of diagnosis¹⁶.

Delaying surgery increases the risk of further gallstone-related complications and rehospitalization¹⁷. In delayed LC, surgery is typically scheduled 6–8 weeks after symptom onset to allow inflammation to subside¹⁸. However, this strategy remains controversial. While conservative treatment is successful in around 90% of cases, delayed cholecystectomy may face technical challenges due to chronic inflammation. As acute inflammation progresses, edema may extend into the Calot's triangle or remain localized at the gallbladder fundus. Over time, chronic inflammation leads to fibrosis and tissue contraction, making surgery more difficult and hazardous^{19–20}.

Evidence supports performing laparoscopic cholecystectomy within 72 hours of symptom onset to prevent complications and reduce repeated hospitalizations²¹. Early surgery capitalizes on the edematous surgical planes created during acute inflammation, which later become fibrotic and difficult to dissect. Therefore, early intervention offers clinical advantages, although the optimal timing remains debated. This study aims to compare early versus late laparoscopic cholecystectomy in acute calculus cholecystitis by assessing operative difficulty, operative time, conversion rates, postoperative complications, hospital stay, and patient recovery, to guide evidence-based clinical decision-making.

AIM AND OBJECTIVES

Aim

- To do a comparative study of early vs late laparoscopic cholecystectomy in acute calculous cholecystitis.

Objectives

To compare early vs late laparoscopic cholecystectomy in terms of

- Frequency of complications
- Operative time
- Length of postoperative stay

MATERIAL AND METHODS

This comparative observational study was conducted in the Department of General Surgery at SGT Medical Hospital and Research Institute, Budhera, Gurugram, starting from November 2022. The study included patients aged between 18 and 60 years who presented with acute calculous cholecystitis to the emergency or outpatient departments. A total of 70 consecutive patients who fulfilled the inclusion criteria were enrolled. Among them, 35 patients underwent early laparoscopic cholecystectomy, while the other 35 were managed conservatively and later operated on electively after 4–6 weeks. Patients were randomly allocated into early and delayed surgery groups using the envelope (chit-box) method.

Patients were eligible if they had symptomatic gallstone disease with a recent onset of typical pain lasting less than 72 hours. Those excluded from the study included patients with common bile duct stones based on imaging or biochemical findings, those with pancreatitis, prior abdominal surgery, aged below 18 or above 60 years, or unfit for general anesthesia. Informed written consent was obtained from all eligible participants prior to enrollment.

Upon admission, detailed clinical histories and investigations were recorded, including complete blood count, liver and kidney function tests, blood grouping, PT-INR, random blood sugar, HIV, HCV, HBsAg, chest X-ray, ECG, and abdominal ultrasonography. Patients undergoing early surgery received intravenous Cefosulbactam 1.5 g within one hour before the incision, followed postoperatively by the same antibiotic for 48 hours, then oral Cefuroxime 500 mg twice daily for three days. Immediate postoperative complications such as bleeding, bile duct, bowel, or liver injury were closely monitored.

For those managed conservatively, intravenous Cefosulbactam 1.5 g twice daily was administered for three days alongside supportive care for symptoms like pain, nausea, vomiting, and dyspepsia. They were discharged on a two-day course of oral antibiotics and advised to return for elective surgery after 4–6 weeks. All patients were followed up at one week, two weeks, one month, and three months post-intervention. If complications arose, appropriate evaluation and management were conducted.

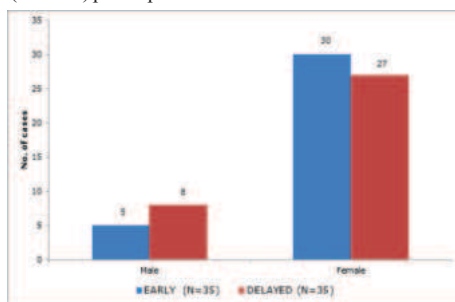
All procedures were conducted after prior ethical approval and in accordance with ICMR and Good Clinical Practice (GCP) guidelines. For statistical analysis, data from the study was verified, cleaned, and entered into a master chart in Microsoft Excel. SPSS version 24.0 was used for analysis. Descriptive statistics summarized categorical variables and central tendencies of continuous variables. Bi-variate analysis was performed using the Chi-square or Fisher's exact test for categorical variables, and unpaired t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant.

RESULT

Table 1 : Gender Distribution

Gender	EARLY (N=35) (%)	DELAYED (N=35) (%)	Grand Total (%)
Male	5 (7.17%)	8 (11.43%)	13 (18.57%)
Female	30 (42.86%)	27 (38.57%)	57 (81.43%)
Grand Total	35 (50.00%)	35 (50.00%)	70 (100%)

The study analyzed the distribution of participants based on gender in both the early and delayed groups. The gender distribution showed that in the early group, 5 males (7.17%) and 30 females (42.86%) participated, while in the delayed group, 8 males (11.43%) and 27 females (38.57%) participated.



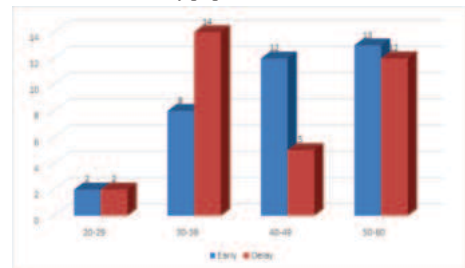
Graph 1 : Gender Distribution

Table 2 : Age Group

Age Group (years)	EARLY (N=35) (%)	DELAYED (N=35) (%)	Grand Total
20-29	2 (2.86%)	2 (2.86%)	4 (5.71%)
30-39	8 (11.43%)	14 (20.0%)	22 (31.43%)
40-49	12 (17.14%)	5 (7.14%)	17 (24.29%)
50-60	13 (18.57%)	12 (20.0%)	27 (38.57%)
Grand Total	35 (50.00%)	35 (50.00%)	70 (100%)
Mean±SD	45.68±10.97	43.28±12.14	44.48±11.55

Out of the total 70 participants, both the early and delayed surgery groups consisted of 35 patients each. In the early group, the age distribution was as follows: 2 patients (2.86%) were aged 20–29 years, 8 patients (11.43%) were between 30–39 years, 12 patients (17.14%)

were between 40–49 years, and 13 patients (18.57%) were in the 50–60 years age range. In the delayed group, 2 patients (2.86%) were aged 20–29 years, 14 patients (20.0%) were between 30–39 years, 5 patients (7.14%) were between 40–49 years, and 12 patients (20.0%) were aged 50–60 years. The most common age group overall was 50–60 years, accounting for 27 participants (38.57%), followed by 30–39 years with 22 participants (31.43%). The mean age was 45.68 ± 10.97 years in the early group, 43.28 ± 12.14 years in the delayed group, and 44.48 ± 11.55 years for the total study population.



Graph 2 : Age Group

Table 3 : Gallbladder Wall Thickness

GB wall thickness (mm)	EARLY (N=35) (%)	DELAYED (N=35) (%)	Grand Total
<5 mm	27 (38.57%)	17 (24.29%)	44 (62.86%)
>5 mm	8 (11.43%)	18 (25.71%)	26 (37.14%)
Grand Total	35 (50.00%)	35 (50.00%)	70 (100%)
Mean±SD	45.68±10.97	43.28±12.14	44.48±11.55
p = 0.0126			

In the Early group, 27 patients had a GB wall thickness of <5 mm (38.57%) and 8 had a thickness of >5 mm (11.43%). In the Delayed group, 17 patients had a GB wall thickness of <5 mm (24.29%), and 18 had a thickness of >5 mm (25.71%). The mean±SD GB wall thickness was 45.68 ± 10.97 mm for the Early group, 43.28 ± 12.14 mm for the Delayed group, and 44.48 ± 11.55 mm for the overall sample. The p-value for the comparison of mean GB wall thickness is 0.0126.

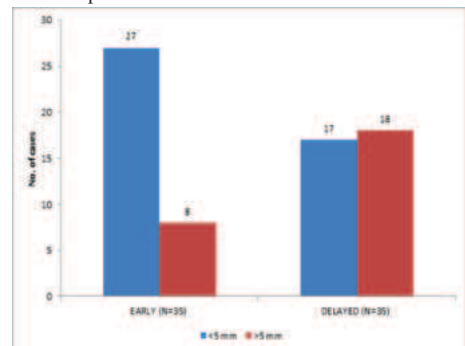
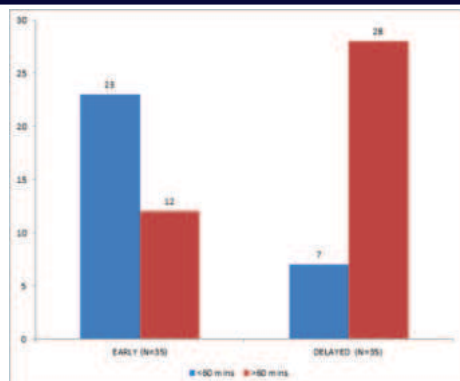


Table 4 : Duration of Surgery

Duration of surgery	EARLY (N=35) (%)	DELAYED (N=35) (%)	Grand Total
<60 mins	23 (32.86%)	7 (10.0%)	30 (42.86%)
>60 mins	12 (17.14%)	28 (40.0%)	40 (57.14%)
Grand Total	35 (50.00%)	35 (50.00%)	70 (100%)
Mean±SD	54.97±12.48	69.85±12.84	62.41±14.64
p<0.001			

The percentages for normal, adherent and anatomical outcomes, as well as the duration of surgery and conversions to open surgery. The mean duration of surgery for early cases was 54.97 ± 12.48 , for delayed cases it was 69.85 ± 12.84 and the overall mean was 62.41 ± 14.64 . The p-value of 0.001 indicates a statistically significant difference in mean duration of surgery between early and delayed cases. However, there was no statistically significant difference ($p=0.452$) in the conversion to open surgery between early and delayed cases. On assessing the duration of surgery, comparing early and delayed surgeries. In the early surgery group, 30 patients had a surgery duration of less than 60 minutes, while 12 had a duration of more than 60 minutes. In the delayed surgery group, 7 patients had a duration of less than 60 minutes, and 28 had a duration of more than 60 minutes. The mean duration of surgery was 54.97 ± 12.48 minutes for early surgery, 69.85 ± 12.84 minutes for delayed surgery and 62.41 ± 14.64 minutes overall, with a statistically significant difference ($p < 0.001$).

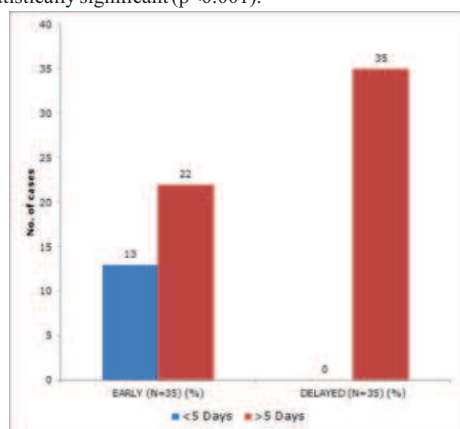


Graph 4 : Duration of Surgery

Table 5 : Length of Hospital Stay

Length of Hospital Stay	EARLY (N=35) (%)	DELAYED (N=35) (%)	Grand Total
<5 Days	13 (18.57%)	0 (0%)	13 (18.57%)
>5 Days	22 (31.43%)	35 (50.0%)	57 (81.43%)
Grand Total	35 (50.00%)	35 (50.00%)	70 (100%)
Mean±SD	4.98±1.08	7.88±1.77	6.43±2.06
p<0.001			

For the Early group (N=35), 13 patients (18.57%) had a stay of less than 5 days, while 22 patients (31.43%) had a stay of more than 5 days. In the Delayed group (N=35), no patient had a stay of less than 5 days, and 35 patients (50.00%) had a stay of more than 5 days. The mean length of hospital stay was 4.98 ± 1.08 days for the Early group, 7.88 ± 1.77 days for the Delayed group, and 6.43 ± 2.06 days overall. The difference in mean length of hospital stay between the two groups was statistically significant ($p < 0.001$).



Graph 5 : Length of Hospital Stay

DISCUSSION

The present study was conducted to compare the outcomes of early versus delayed laparoscopic cholecystectomy (LC) in patients with acute calculous cholecystitis, specifically focusing on frequency of complications, operative time, and length of postoperative hospital stay. In our study, although the gender distribution and mean age were comparable between the groups, the outcome variables revealed significant differences supporting the benefits of early surgical intervention.

In terms of operative time, the mean duration was significantly shorter in the early group (54.97 ± 12.48 minutes) compared to the delayed group (69.85 ± 12.84 minutes), with a p -value < 0.001 , indicating statistical significance. This finding aligns with the results of Gupta et al.,²⁵ who also reported a significantly reduced operative time in the early LC group (56.67 ± 11.70 minutes) versus the delayed group (75.67 ± 20.52 minutes), with $p = 0.001$. Similarly, Sharma G et al.²² reported shorter operative durations in early surgeries (54.30 ± 6.30 minutes), supporting the conclusion that earlier surgery facilitates less complicated procedures. The findings are also consistent with Yadav R et al.,²⁷ who observed that early surgery was associated with reduced operative time while maintaining comparable morbidity rates.

Regarding gallbladder wall thickness, a marker of inflammation severity, our study revealed that a significantly higher number of patients in the delayed group had wall thickness > 5 mm (25.71%) compared to the early group (11.43%), with a p -value of 0.0126. This suggests that delay in surgery may be associated with increased inflammation and tissue edema, which can complicate the dissection and prolong operative time. While most previous comparative studies such as those by Lal R et al.²⁴ and Borzellino G et al.²³ did not directly report on gallbladder wall thickness, their findings indirectly support this observation by demonstrating increased technical difficulty and higher conversion rates in delayed surgery, likely attributed to inflammatory changes.

The length of postoperative hospital stay was significantly lower in the early group (mean 4.98 ± 1.08 days) compared to the delayed group (mean 7.88 ± 1.77 days), with $p < 0.001$. This reduction in hospital stay supports the conclusions of Sharma G et al.,²² who reported significantly shorter stays in early LC cases (5.10 ± 2.15 days) than in delayed cases (9.80 ± 2.20 days). Similarly, Gupta et al.²⁵ found the early group had a significantly shorter hospital stay (3.40 ± 1.99 days) than the delayed group (6.27 ± 2.90 days), $p = 0.006$. Lal et al.²⁴ also emphasized that early cholecystectomy not only reduced the duration of hospitalization but also avoided the risk of failed conservative management and repeated admissions. These findings are consistent with those of Sivakumar A et al.²⁶ and Yadav R et al.,²⁷ both of whom highlighted that early LC significantly reduced hospital burden without increasing complication rates.

CONCLUSION

In this comparative study between early and delayed laparoscopic cholecystectomy for acute calculous cholecystitis, the findings clearly demonstrate the advantages of early surgical intervention. A female predominance was observed across both groups, with 81.43% of participants being women, suggesting that gallstone-related disease is more prevalent in females. The most commonly affected age group was 50–60 years, followed by 30–39 years, with the overall mean age being 44.48 years, indicating that middle-aged individuals are most commonly impacted by this condition. A statistically significant difference was noted in gallbladder wall thickness between the groups, with more patients in the delayed group having a wall thickness greater than 5 mm (25.71%) compared to the early group (11.43%), reflecting the progression of inflammation with delayed management ($p = 0.0126$). The duration of surgery was significantly shorter in the early group, with a mean of 54.97 ± 12.48 minutes, compared to 69.85 ± 12.84 minutes in the delayed group ($p < 0.001$), indicating that early surgery is less technically demanding. Furthermore, the length of postoperative hospital stay was significantly reduced in the early group (mean 4.98 ± 1.08 days) compared to the delayed group (mean 7.88 ± 1.77 days), with a p -value < 0.001 , suggesting that early laparoscopic cholecystectomy facilitates quicker recovery and lowers hospital resource utilization. Overall, these results support early surgical intervention as a safe and efficient approach in the management of acute calculous cholecystitis.

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