



TIMING OF MINIMAL INVASIVE GALLBLADDER SURGERY IN ACUTE CHOLECYSTITIS: EARLY OR DELAYED?

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ABSTRACT

Background: Acute cholecystitis is commonly managed through laparoscopic cholecystectomy (LC), but there remains an ongoing controversy regarding optimal timing. Current analysis compares early phase laparoscopic gallbladder removal in 4 days of initiation of symptom to interval laparoscopic Gall bladder removal approximately 6 weeks later.

Methods: The study enrolled 72 patients diagnosed with acute calculous cholecystitis were allocated into 2 batches (n= 36). Batch 1 underwent early LC, while Batch 2 received interval LC. Demographic data, clinical features, biochemical and radiological findings, laboratory and radiological findings, surgical observations were evaluated using standard statistical tools.

Outcome: Demographic parameters like age(p=0.59), sex(p=0.795), region of discomfort (p=0.56), and symptom duration (p=0.493) showed no significant difference. A notable variation was found with pericholecystic oedema (p=0.0017), gallbladder appearance(p<0.001), SGOT(p<0.001), and Alkaline Phosphatase(p<0.001). Mean operative time was slightly higher in ELC (80.6min vs. 79.7min, p=0.15), but not statistically significant. Postoperative complications and hospital stay were comparable (p=0.5 and p=0.49).

Conclusion: Findings support early gallbladder surgery via laparoscopy as reliable and efficient method for managing acute cholecystitis, showing comparable outcomes to interval surgery despite increased intraoperative challenges. ELC can reduce the need for readmission and potentially lower overall healthcare burden. Larger studies are warranted for guideline development.

Keyword: Early Laparoscopic Cholecystectomy, Interval Laparoscopic Cholecystectomy, Acute Cholecystitis

BACKGROUND

Acute cholecystitis, is a prevalent surgical condition that often requires hospitalization and operative management(1). The clinical spectrum varies widely, ranging from minor and self-resolving

episodes to severe episodes with potentially fatal outcomes, with estimated mortality rate of 0.6% (1). Adverse outcomes may include the development of intra abdominal abscesses, gangrenous changes within gallbladder, or perforation resulting in biliary peritonitis (1). The Tokyo guidelines 2018 provide evidence based protocols for clinical management.

In recent years, gallbladder surgery by laparoscopy has become the standard approach for acute cholecystitis, replacing its earlier role as a relative contraindication. This change reflects growing surgical expertise and advancements in laparoscopic equipment, leading to safer outcomes and fewer complications (2).

Early gallbladder surgery via laparoscopy, typically performed between 3 to 4 days after symptom onset or during the same hospital admission, is increasingly favoured for its advantages- definitive treatment during initial admission, reduced hospital stay, and lower overall costs in contrast interval laparoscopic surgery requires a second hospitalization. Therefore, the choice between ELC & ILC should be tailored to patients condition, surgical expertise, & institutional resources.

This study aims to contribute to the ongoing discourse by comparing Early and Interval cholecystectomy via laparoscopy in individuals presenting with acute inflammation of gallbladder at tertiary healthcare centre at Western UP, India. The objective is to assess and compare intraoperative difficulty, operative time, postoperative complications, and hospital stay associated with each approach, thereby guiding evidence-based surgical decision-making in resource-limited settings.

Methodology:

Design and Location of the study: This study was conducted over an 18month period, spanning January 2023 to June 2024 at General Surgery department at tertiary care hospital in western UP. Patients presenting with symptoms suggestive of acute cholecystitis within 96 hours of onset were considered for inclusion. The ethical approval was obtained from institutional ethics committee before commencing the study.

Inclusion Guidelines:

Cohort of aged 18years and above, showing clinical signs and symptoms suggestive of acute cholecystitis. These included right hypochondriac pain, fever greater than 37.5°C, nausea, vomiting, and right upper quadrant tenderness or guarding. In addition to clinical features, radiological confirmation of cholelithiasis was required, along with at least one supportive ultrasonographic finding such as gallbladder wall inflammation

Exclusion criteria:

Subjects presenting after 96 hours from symptom onset were excluded, or if they had a history of previous upper abdominal surgery. Individuals who were deemed unfit for general anaesthesia were also excluded. Furthermore, patients with coexisting conditions such as choledocholithiasis, cholangitis, or acute pancreatitis were not included in the study.

Study Procedure:

After getting informed consent, cohort was randomly assigned into 2 batch of early and interval cholecystectomy via laparoscopy with blind envelop method.

All surgeries were performed using the standard four-port laparoscopic technique under general anaesthesia. Operative findings were documented, including grade of adhesions, gallbladder status (distension, thickness), intraoperative evaluation of calots triangle and identification of any empyema. Data collected on rate of conversion to open procedure, operative time and any complications encountered during procedure.

Postoperative Management and Follow-up:

Post operative monitoring included assessment for bleeding, bile leak, and surgical site infections. Pain was measured using Visual Analogue Scale, hospital stay was recorded. Patients was followed up to 1 month to identify any delayed complications.

Chi square test was employed for data analysis.

Observation and Results:

Demographic distribution was comparable between the two cohorts. The average age was 41.7 ± 11.8 years among cohort 1 and 37.8 ± 10.7 years among cohort 2 ($p = 0.59$). Female patients predominated in both groups (69.4% overall), with no significant gender difference ($p = 0.795$).

Table 1: Summary of Demographics and Past surgical status of the participated cohort

Parameter Assessed	Group 1 (Early LC)	Group 2 (Interval LC)	Statistical Test Result
Age Distribution	41.7 ± 11.8	37.8 ± 10.7	$\chi^2=3.72, p=0.59$
Gender Distribution	F=25, M=11	F=26, M=10	$\chi^2=0.0672, p=0.795$
Previous Upper Abdominal Surgery	Yes=7, No=29	Yes=10, No=26	$\chi^2=0.31, p=0.57$

Clinical Presentation: Pain in the right hypochondrium was the most common symptom followed by nausea and vomiting. The distribution of clinical symptoms, including duration of pain (mean 2.5 days), no meaningful difference was observed in both the cohort.

Radiological Findings: Ultrasound revealed a significantly higher incidence of pericholecystic oedema in Group 2 (80.5%) compared to Group 1 (41.6%) ($p = 0.0017$). Gallbladder distension and status were also significantly different, with more well-distended gallbladders observed among cohort 2 ($p < 0.001$).

Table 2: Radiological & Biochemical Summary of the participated cohort.

Parameter Assessed	Group 1 (Early LC)	Group 2 (Interval LC)	Statistical Test Result
Pericholecystic Oedema	Yes=15, No=21	Yes=29, No=7	$\chi^2=9.88, p=0.0017$
GB Wall Thickness	Normal=7, Thick=29	Normal=9, Thick=27	$\chi^2=0.0804, p=0.77$
SGOT	27.0 ± 1.8	31.7 ± 2.0	$t = -9.56, p = 1.74 \times 10^{-13}$
ALP	244.1 ± 7.8	251.3 ± 4.8	$t = -4.3, p = 8.12 \times 10^{-5}$

Laboratory Investigations: It remained comparable between both the cohorts (mean TLC: $15.9 \times 10^9/L$). However, Group 2 had significantly higher SGOT (31.7 vs. 27.0) and ALP levels (251.3 vs. 244.) (MRCP was done for these patients to rule out choledocholithiasis), suggesting more prolonged hepatocellular inflammation.

Intraoperative Findings and Complications: Most patients had grade 2 or 3 adhesions. The anatomical view of Calot's triangle was obscured (frozen) in 30.5% and 25% among cohort 1 & 2 respectively. Empyema gallbladders and mucocele were seen sporadically. Comparable results was found in intraoperative difficulty ($p = 0.992$).

Operative Time and Conversion Rates: Mean operative time was slightly longer in Group 1 (80.6 ± 2.0 min) compared to Group 2 (79.7 ± 3.2 min), but the difference was not statistically significant ($p = 0.15$). Conversion to open surgery in Group 1 reported in 3 patients & 1 in group 2 with no statistical significance ($p=0.062$).

Table 3: Operative Summary of the participated cohort

Parameter Assessed	Group 1 (Early LC)	Group 2 (Interval LC)	Statistical Test Result
Operative Time(minutes)	80.6 ± 2.0	79.7 ± 3.2	t-test, p=0.15
Hospital Stay	4d=25, 5d=4, 6d=5, 7d=2	4d=30, 5d=6	$\chi^2=7.85$, p=0.49

Postoperative Outcomes: Postoperative pain was reported in 5 and 8 among cohort 1& 2 respectively. Port site infection was noted among 2 patients in Group 2 with no major bile duct injuries with bile leak, postoperative bleeding or complications were reported. The hospital stay duration was slightly lengthier among cohort 2, though not statistically significant (p = 0.49).

Discussion:

The optimal duration of cholecystectomy for acute inflammation of gallbladder remains a critical factor influencing surgical outcomes. This study affirms that early surgery in 4 days of symptom presentation is a viable and safe option, with outcomes comparable to interval surgery performed after 6 weeks. Importantly, the early group did not experience increased operative complications, conversion rates, or hospital stay durations. The higher incidence of pericholecystic oedema and elevated liver enzymes in Group 2 signifies that conservative management may not adequately resolve inflammation and may predispose to recurrent or subclinical episodes. This idea aligns with earlier studies (Borzellino et al., 2021; Raja et al., 2024) which emphasized that delays may not always reduce surgical complexity. Our findings correlate with Borzellino et al., 2021, who found that early surgery shortened overall hospital stay and was not associated with increased morbidity. Similarly, Özkardes et al. (2014) demonstrated comparable result in operative difficulty and complication in both groups. The lack of bile duct injuries and low rates of surgical site infection in both groups reflect the benefit of experienced surgical teams and stringent perioperative protocols. Pain and infection were slightly higher in the interval group, possibly due to ongoing low-grade inflammation. Thus, early intervention can avoid repeat hospitalizations, reduce patient anxiety, and alleviate economic burden without compromising safety. However, further multicentric randomized studies with larger sample sizes are recommended for broader generalizability.

Limitation: The single-centre nature of this study could reduce the extent to which the findings apply to other healthcare settings. The relatively modest sample size may not adequately capture rare or infrequent complications. Moreover, the study's short follow up hinders understanding of the assessment of delayed postoperative outcomes. It is also important to note that all procedures were performed by experienced surgeons, which may not reflect the challenges or complication rates associated with the learning curve of less experienced practitioners.

Conclusion: Early laparoscopic cholecystectomy (ELC) is a clinically effective and resource-efficient approach for treating acute cholecystitis. With appropriate patient selection and surgical expertise, early intervention can be safely implemented without increasing complications. Interval surgery, while safe, may allow disease progression and recurrence during the waiting period.

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