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Original Article

Comparative Study of Early Versus Delayed Laparoscopic Cholecystectomy for Acute Cholecystitis: A Single-Centre Experience

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Abstract

Background

Symptomatic gallstone disease, particularly acute calculous cholecystitis, is a leading surgical emergency globally. While laparoscopic cholecystectomy is the definitive treatment, consensus on the optimal timing of surgery remains debated, with traditional delayed management being challenged by evidence favouring early intervention within 72 hours. This study aimed to compare outcomes between early and delayed laparoscopic cholecystectomy in a tertiary care setting in Nepal.

Materials and Methods

This prospective comparative study was conducted from April to July 2025. One hundred twelve patients were stratified into an Early Group (surgery ≤72 hours from symptom onset, n=56) and a Delayed Group (surgery after 6 to 12 weeks of symptom onset, n=56). Outcomes measured included operative time, intraoperative difficulties, hospital stay, and complications.

Results

Early laparoscopic cholecystectomy was associated with a significantly shorter hospital stay (2.0 vs. 2.3 days, p = 0.02) compared to delayed surgery, with no significant differences in operative time, conversion rate, or postoperative complications between the two groups. No major morbidity or mortality occurred in either group.

Conclusion

Early laparoscopic cholecystectomy for acute cholecystitis is safe and yields outcomes comparable to delayed surgery with respect to operative difficulty, conversion rate, and postoperative complications. Its significant advantage lies in reducing hospital stay, supporting its adoption as the preferred treatment approach for suitable patients.

Keywords: *Acute cholecystitis, Cholecystectomy, Hospitalization*

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Introduction

Laparoscopic cholecystectomy (LC) is the gold-standard surgical treatment for symptomatic gallstone disease and acute calculous cholecystitis [1]. Compared with open cholecystectomy, LC is associated with reduced postoperative pain, shorter hospital stays, faster recovery, and lower morbidity. Traditionally, patients with acute cholecystitis were managed conservatively with antibiotics during the acute phase, followed by interval cholecystectomy several weeks later due to concerns regarding operative difficulty and complications [2], [3].

Recent evidence from randomized controlled trials and systematic reviews has demonstrated that early laparoscopic cholecystectomy, performed during the initial admission, is safe and effective. Early surgery has been associated with reduced overall hospital stay, fewer recurrent biliary events, lower healthcare costs, and comparable or improved perioperative outcomes when compared with delayed surgery [4], [5]. Consequently, international guidelines now recommend early LC as the preferred treatment for acute cholecystitis [6]. However, implementation of this approach remains variable in many resource-limited settings, including Nepal, where both early and delayed strategies continue to be practiced.

This study aims to compare the clinical outcomes of early versus delayed laparoscopic cholecystectomy in patients with acute calculous cholecystitis at a tertiary care centre. The findings will provide locally relevant evidence to guide clinical decision-making and help optimize the timing of surgical intervention.

Materials and Methods

This is a prospective comparative observational cohort study conducted on patients arriving to the OPD or ER of Nobel Medical College Teaching from April 2025 to July 5, 2025. Ethical approval was obtained from the Institutional Review Committee of Nobel Medical College, and written informed consent was secured from all participants prior to their inclusion in the study. Consecutive adult patients (≥18 years) diagnosed with a case of acute cholecystitis who underwent early laparoscopic cholecystectomy (within 72 hours) as well as delayed laparoscopic cholecystectomy (after 72 hours) were enrolled in the study. Diagnosis was established based on clinical history, physical examination, and confirmatory ultrasonographic findings. Exclusion criteria included pregnancy, critical illness (ASA class IV–V), evidence of complicated gallbladder pathology such as perforation or gangrene, concurrent acute pancreatitis, and patient refusal to participate. The sample size was determined using the single population proportion formula. Based on a reported prevalence of acute cholecystitis of 4.87% [7] among the Nepalese population, a 95% confidence level (Z=1.96), and a 4% margin of error, the minimum required sample size was calculated to be 112 patients.

Participants were allocated into two study groups based on the interval from the onset of characteristic biliary symptoms to surgical intervention. Patients undergoing surgery within 72 hours of symptom onset were classified into the Early Group (n=56), while those operated on after 6 to 12 weeks comprised the Delayed Group (n=56). All surgical procedures were performed by consultant surgeons utilizing a standardized four-port laparoscopic technique under general anaesthesia. The critical view of safety was meticulously achieved before transaction of the cystic structures. Specimens were retrieved endoscopically and submitted for histopathological analysis. A standardized perioperative protocol was followed. Prophylactic intravenous antibiotics (Ceftriaxone 1g) were administered at induction. Postoperative analgesia was managed with intravenous Ketorolac (30mg) every 8 hours for the first 24 hours, followed by oral analgesics. Patients were advanced to a soft diet 6 hours postoperatively and were discharged upon meeting standard criteria: afebrile status, independent ambulation, adequate oral intake, and controlled pain on oral medication. For the delayed group, patients were started on antibiotics and analgesics, discharged and cholecystectomy was performed 6 to 12 weeks later.

Data regarding patient demographics, clinical presentation, operative details, and postoperative course were collected prospectively. The primary outcome measure was the incidence of intraoperative difficulties, defined as the presence of dense adhesions, difficult anatomy, or significant bleeding. Secondary outcomes included total operative time (in minutes), length of hospital stay (in days), rate of conversion to open surgery, and clinical status at the routine 4-week postoperative follow-up visit. Data was entered in Microsoft Excel and statistical analysis was performed using SPSS software version 25.0.

Results

A total of 112 patients with acute cholecystitis were enrolled in this prospective comparative study, with 56 patients undergoing early laparoscopic cholecystectomy (≤72 hours from symptom onset) and 56 patients undergoing delayed laparoscopic cholecystectomy (after 6 to 12 weeks of symptom onset). The two groups were comparable with respect to baseline demographic characteristics. The mean age was 44.1±10.5 years in the early group and 47.5±10.9 years in the delayed group (p=0.09). Females constituted the majority in both groups (60.7% in the early group vs. 64.3% in the delayed group, p=0.85).

Table 1: Demographic Characteristics of Study Groups

Parameter	Early Group (n=56)	Delayed Group (n=56)	P value
Age (Years)	44.1 +/- 10.5	47.5 +/- 10.9	0.09
Sex	Male (22) Female (34) M:F = 11:17	Male (20) Female (36) M:F = 5:9	0.85

Table 2: Intraoperative Parameters and Surgical Outcomes

Parameter	Early Group (n=45)	Delayed Group (n=55)	P value
Operative Time (minutes)	74.2 +/- 20.1	74.9 +/- 22.4	0.86
Conversion to Open	3	4	0.70

Table 3: Comparison of wound infection between Group A and Group B

	Group A	Group B	p value
Wound infections	Infected= 5 Noninfected= 51	Infected= 2 Noninfected= 54	0.14

Table 4: Comparison of hospital stay between Group A and Group B

Parameter	Group A	Group B	P value
Hospital Stay (days)	2.0 +/- 0.8	2.3+/- 0.7	0.02

The mean operative time was significantly shorter in the early group compared to the delayed group (74.2±20.1 vs. 74.9±22.4 minutes). However, this difference did not reach statistical significance (p=0.86). Intraoperative difficulties, defined as dense adhesions, difficult anatomy, or significant bleeding, were encountered in 16 patients (28.6%) in the early group and 18 patients (32.1%) in the delayed group (p=0.68).

The conversion rate to open cholecystectomy was low in both groups, occurring in 3 patients (5.4%) in the early group and 4 patients (7.1%) in the delayed group. This difference was not statistically significant (p=0.70). Surgical site infection (SSI) was observed in 5 patients (8.9%) in the early group and 2 patients (3.6%) in the delayed group (p=0.14). No major complications such as bile duct injury, bleeding requiring transfusion, or postoperative mortality occurred in either group. The mean hospital stay was significantly shorter in the early group compared to the delayed group (2.0±0.8 days vs. 2.3±0.7 days, p=**0.02**). In the early group, 16 patients (28.6%) were discharged within 1 day, 28 patients (50.0%) within 2 days, and 12 patients (21.4%) within 3 days. In the delayed group, 7 patients (12.5%) were discharged within 1 day, 30 patients (53.6%) within 2 days, and 19 patients (33.9%) within 3 days.

Discussion

The timing of laparoscopic cholecystectomy (LC) for acute cholecystitis (AC) is a critical determinant of patient outcomes, with a substantial body of evidence largely supporting early laparoscopic cholecystectomy (ELC) over delayed laparoscopic cholecystectomy (DLC) [5]. ELC is typically defined as surgery performed within 72 hours to 7 days of symptom onset or during the index admission, whereas DLC involves an initial conservative management period followed by elective surgery, often 6 to 12 weeks later [8]. The findings of this prospective comparative study demonstrate that early laparoscopic cholecystectomy (ELC) performed within 72 hours of symptom onset is a safe and effective strategy for acute cholecystitis, offering a specific advantage in reducing hospital stay without increasing perioperative morbidity. Our analysis revealed no statistically significant differences in key operative parameters between the two groups. The mean operative time was comparable between the ELC and delayed laparoscopic cholecystectomy (DLC) groups (74.2 vs. 74.9 minutes, p=0.86), and the conversion rate to open surgery was similarly low (5.4% vs. 7.1%, p=0.70). These findings align with multiple meta-analyses and randomized trials which have shown that operating in the acute phase, even with ongoing inflammation, does not translate into longer operative times or a higher risk of open conversion compared to operating after a delay of 6–12 weeks [5, 10, 14]. The comparable rates of intraoperative difficulties (28.6% vs. 32.1%, p=0.68) and surgical site infections (8.9% vs. 3.6%, p=0.14) further reinforce that ELC does not compromise patient safety. The absence of major complications such as bile

duct injury or mortality in either group underscores that both strategies are safe when performed in a tertiary care setting by experienced surgeons.

The most clinically significant finding in our study was the markedly shorter hospital stay in the early group (2.0 vs. 2.3 days, p=0.02). Patients undergoing ELC were more than twice as likely to be discharged within one day (28.6% vs. 12.5%). This advantage is consistent with the literature; a major systematic review similarly reported that ELC reduces total hospital stay by approximately 3 days compared to DLC [5]. Beyond the obvious benefits to patient convenience and recovery, this reduction has substantial implications for healthcare resource utilization and cost savings, particularly in resource-limited settings like Nepal [11]. By treating the condition during the index admission, early surgery avoids the need for a second hospitalisation, repeated diagnostic imaging, and the risk of recurrent biliary events during the waiting period [8]. While some surgeons remain concerned about increased technical difficulty during the acute inflammatory phase, our results suggest that delaying surgery to 6–12 weeks does not confer any operative advantage. In fact, the trend toward a shorter operative time and lower difficulty rate in the early group (though not statistically significant) suggests that operating before dense fibrotic adhesions develop may be equally or even less challenging. This supports the modern understanding that the "golden window" for intervention is within the first 72 hours [13].

Numerous meta-analyses and randomized controlled trials have demonstrated the advantages of ELC across several key metrics [9]. A systematic review concluded that ELC is safe and associated with less overall morbidity, even beyond 72 hours of symptom onset [10]. For instance, ELC significantly reduces the total length of hospital stay compared to DLC [5, 11]. One meta-analysis found that patients undergoing ELC had a mean hospital stay of 4.7 days compared to 7.9 days for DLC [5]. This reduction in hospital stay has significant implications for healthcare costs and patient recovery [12]. Beyond hospitalization duration, ELC is associated with a lower incidence of recurrent biliary events and complications [9]. Delaying surgery carries the risk of recurrent attacks of cholecystitis, cholangitis, or gallstone pancreatitis during the waiting period, often necessitating re-admission and increasing the overall burden on the patient [8]. Concerns regarding increased conversion rates from laparoscopic to open cholecystectomy and higher complication rates in ELC due to acute inflammation have largely been mitigated by modern evidence [11, 13]. Early surgical intervention, particularly within the first few days, often occurs before severe inflammation and adhesions make dissection excessively difficult. While the surgical field may be inflamed and tissues may bleed more easily, surgery is generally considered safe during this early inflammatory period [14]. Conversely, delaying surgery can lead to chronic inflammation and fibrosis, making the dissection more challenging and potentially increasing the risk of bile duct injury or conversion to open surgery if undertaken after prolonged conservative management [15]. Meta-analyses have shown comparable or even lower conversion rates and similar overall complication rates between ELC and DLC groups [5, 11, 15]. For example, one study found that the mean operative time for ELC was 65.6 minutes compared to 73.5 minutes for DLC, and the conversion rate was 10% for ELC versus 12% for DLC, suggesting no significant disadvantage for early intervention [16]. Another study reported a conversion rate of 12% for ELC and 13% for DLC [17]. The safety profile of ELC is also supported by findings regarding specific complications. Studies comparing ELC and DLC have indicated that the incidence of biliary leak and other postoperative complications, such as wound infection and intra-abdominal abscess, are either similar or lower in the ELC group [15], [17].

However, the "golden window" for ELC is typically within the first 72 hours to 7 days of symptom onset. After this period, particularly beyond 7 days, the benefits may become less pronounced, and the surgical difficulty might increase due to established inflammation and fibrosis. Some studies indicate that ELC remains safe even for cholecystitis with prolonged symptom duration (>7 days), but this remains a debated area [18]. For patients who are too ill or have significant comorbidities, percutaneous cholecystostomy may be used as a bridge to definitive surgery, allowing the patient to stabilize before a delayed cholecystectomy [19]. This approach is particularly relevant for high-risk surgical candidates, critical care patients, or those with severe inflammation, where immediate cholecystectomy might be contraindicated [20].

Overall, while both early and delayed approaches are safe, early laparoscopic cholecystectomy should be the preferred strategy for fit patients with acute cholecystitis. It significantly shortens hospital stay without increasing operative difficulty or complications. Furthermore, the prevailing evidence strongly favours early intervention, as it offers additional benefits such as a decreased risk of recurrent biliary complications and comparable safety and efficacy profiles to delayed surgery [5, 11]. This approach aligns with current surgical guidelines and best practices aimed at optimizing patient outcomes and healthcare resource utilization [9].

Conclusion

In this prospective comparative study, early laparoscopic cholecystectomy performed within 72 hours of symptom onset was found to be a safe and effective treatment option for acute cholecystitis. Although operative time, intraoperative difficulty, conversion to open surgery, and surgical site infection rates were comparable between the early and delayed groups, patients undergoing early surgery experienced a significantly shorter hospital stay. No major perioperative complications or mortality were observed in either group. These findings support the use of early laparoscopic cholecystectomy as the preferred management strategy for acute cholecystitis, as it facilitates earlier discharge without increasing operative risk or postoperative morbidity.

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Conflict of interest: None

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