Journal of Surgery and Surgical Specialities
Volume 1, Issue 1, March 2025; pp: 7-12
eISSN: 2455-2852 DOI: 10.65129/surgical.v1i1.15

RESEARCH ARTICLE

Timing of Laparoscopic Cholecystectomy Post-ERCP: Impact on Surgical and Postoperative Outcome

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Abstract

The standard management of Common Bile Duct (CBD) stones involves Endoscopic Retrograde Cholangiopancreatography (ERCP) for stone clearance, followed by Laparoscopic Cholecystectomy (LC). However, the optimal timing of LC after ERCP remains debated, as inappropriate intervals can increase postoperative complications, such as inflammation, adhesions, and injury to adjacent structures, including the duodenum or biliary tract. This study aims to compare the technical difficulties and outcomes of early versus delayed LC following ERCP to determine the most suitable timing for surgery. This cross-sectional study was conducted at Government Rajaji Hospital, Madurai, from April 2024 to April 2025. A total of 80 patients who underwent LC after ERCP in the Department of General Surgery were included. Among them, 45 patients underwent LC within 3 days of ERCP (early group), and 35 patients underwent LC after 3 days (delayed group). Several intraoperative and postoperative factors were assessed and compared, including gallbladder adhesions, frozen Calot's triangle, drain placement, operative time, conversion to open surgery, and duration of postoperative hospital stay. The majority of patients were aged between 41 and 60 years. The delayed group showed a significantly higher incidence of dense adhesions, frozen Calot's triangle, requirement for drain placement, longer operative time, higher conversion rates to open surgery, and prolonged hospital stay compared to the early group. Based on these findings, performing laparoscopic cholecystectomy within 3 days of ERCP is associated with fewer technical challenges, reduced operative time, lower conversion rates, and shorter hospital stays. Delaying surgery beyond this period increases operative difficulty and postoperative morbidity. Therefore, the ideal timing for LC after ERCP is within 72 h to achieve optimal surgical outcomes and minimise complications.

Keywords: ERCP, Ideal Timing, Laparoscopic Cholecystectomy

1. Introduction

Cholelithiasis is one of the most common conditions requiring hepatobiliary surgery, affecting 5% to 20% of the population[1]. Among these, approximately 15–20% have associated Common Bile Duct Stones (CBDS), and nearly 55% of such cases develop symptoms and complications[2].

The standard treatment approach involves endoscopic retrograde cholangiopancreatography (ERCP) for stone extraction, followed by LC[3]. However, the timing of LC after ERCP varies widely, depending on the surgeon's experience and available resources. Reported intervals range from 1 day to 2 months[4], and inappropriate timing may lead to increased morbidity, including inflammation and injury to adjacent organs such as the duodenum or biliary tract[5]. It is well established that LC after ERCP is technically more demanding than LC performed for uncomplicated gallstone disease[6]. This is mainly due to biliary pancreatitis, a common indication for ERCP, which causes inflammation and adhesions in the pericholedochal region[7]. Furthermore, sphincterotomy during ERCP can lead to bacterial colonisation, resulting in inflammation, fibrosis, and frozen Calot's triangle due to scarring of the hepatoduodenal

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Article Received on: 10 Jan 2025 Revised on: 25 Feb 2025 Accepted on: 15 March 2025

ligament[8]. Despite these challenges, there are relatively few studies evaluating the best time to perform LC after ERCP. This study aims to compare the technical difficulties encountered during early versus delayed LC post-ERCP and to determine the optimal timing for surgical intervention.

2. Aim and Objectives

Aim

This observational study is designed to determine the most appropriate timing for performing laparoscopic cholecystectomy following ERCP.

Objectives

The primary objective is to identify the ideal interval between ERCP and laparoscopic cholecystectomy by comparing the technical challenges encountered during early versus delayed surgery. The parameters evaluated include:

- Presence of adhesions around the gallbladder
- Difficulty due to a frozen Calot's triangle
- Requirement for conversion to open cholecystectomy
- Need for postoperative drain placement
- Mean duration of the surgery
- Length of postoperative hospital stay

3. Review of Literature

Cholecystectomy, particularly laparoscopic cholecystectomy introduced in 1985, is among the most commonly performed surgical procedures and remains the gold standard for treating gallstone disease[9]. Over time, it has become relatively safe, though it can present technical challenges. In 3%–35% of cases, the laparoscopic approach is converted to open surgery due to intraoperative difficulties[10,11]. Identifying such challenges preoperatively through clinical and radiological assessment aids in better patient counselling.

Endoscopic Retrograde Cholangiopancreatography (ERCP) with sphincterotomy is the preferred treatment for choledocholithiasis in many countries. Despite a complication rate of ~5.1% (including ~1.6% pancreatitis) and ~0.4% mortality, ERCP remains widely used[12,13]. For high-risk surgical patients, ERCP with sphincterotomy alone may suffice, but international guidelines recommend laparoscopic cholecystectomy afterwards to prevent recurrence. The British Society of Gastroenterology advises performing either sphincterotomy or cholecystectomy within two weeks of gallstone pancreatitis or during the same hospital stay[14]. However, laparoscopic cholecystectomy after ERCP is linked with higher complication risks — such as increased operating time, bleeding, and conversions to open surgery[15]. These may reflect either the underlying disease severity or ERCP-related changes. Several studies note male gender as a factor predicting difficult surgeries due to more frequent inflammation, dense adhesions, and visceral fat[16]. A palpable gallbladder, often associated with distension, mucocele, or acute cholecystitis, is another predictor of difficult laparoscopic dissection[17].

Thick gallbladder walls complicate grasping and manipulation, especially during dissection at Calot's triangle. Pericholecystic fluid or inflammation further impairs the visualisation of critical anatomical landmarks. Impacted stones at the gallbladder neck also hinder retraction, complicating dissection[18]. These findings are echoed across multiple studies. One randomised trial showed that performing cholecystectomy shortly after ERCP significantly reduced recurrent biliary events, whereas delays of 6–8 weeks led to recurrence in up to 36% of patients[19,20]. The difficulty of cholecystectomy post-ERCP is notable, with conversion rates reported between 8%–55% compared to <5% in uncomplicated cases[11,21]. This may be due to altered bile-duct anatomy, bacterial colonisation after sphincterotomy, and fibrosis, especially around the hepatoduodenal ligament. Studies report that 60% of patients post-sphincterotomy have colonised bile[22]. Such bacterial presence can increase surgical complexity and complications, justifying the need for experienced laparoscopic surgeons. Post-ERCP patients also show increased cystic-duct leakage — possibly due to oedema and wide ducts where clips may fail. In such situations, alternative closure methods like endoloops or sutures may be required[23]. Evidence suggests that earlier laparoscopic cholecystectomy post-ERCP is technically less demanding and prevents further biliary events. A recent meta-analysis reported that even within a 40-day waiting period, up to 18% of patients developed new complications, and no significant difference in

complication rates was observed between early and delayed surgeries, supporting early intervention

4. Materials and Methods

Study Design: This was a cross-sectional observational study.

Study Duration: Conducted over one year, from April 2024 to April 2025.

Inclusion Criteria: All male and female patients aged between 18 and 75 years who underwent laparoscopic cholecystectomy following ERCP in the Department of General Surgery, Government Rajaji Hospital, Madurai, during the specified study period were included.

Study Population: A total of 80 patients were enrolled in the study.

Methodology: The patients were categorised into two groups based on the timing of their laparoscopic cholecystectomy post-ERCP:

Early group – surgery performed within 3 days of ERCP

Delayed group – surgery performed after 3 days of ERCP

A structured proforma was utilised to collect relevant patient data, including age, sex, admission and discharge dates, date of surgery, intraoperative findings, and any technical challenges faced during the procedure. All patients with confirmed gallstones and choledocholithiasis underwent ERCP by a team of three experienced medical gastroenterologists, during which CBD clearance was achieved and a biliary stent was placed.

Subsequently, laparoscopic cholecystectomy was carried out by a team of three skilled surgeons using the standard four-port technique. The duration of surgery was measured from the insertion of the initial trocar to the closure of the final port site. Intraoperative challenges were systematically documented and compared between the early and delayed groups for analysis.

5. Results (Including Observations)

A total of 60 patients were included, 45 underwent laparoscopic cholecystectomy within 3 days of ERCP (early), and 35 patients underwent laparoscopic cholecystectomy beyond 3 days of ERCP (delayed).

Delay in operation is attributed to the referral system.

Figure 1 shows the age distribution in the study population (n=80). The mean age group of 41-60 was observed.

Figure 2 shows adhesions to the gall bladder (n=80), pvalue 0.031. In the early group, 20/45 (44.44%) and in the late group, 24/35 (68.57%) had adhesions with p value of 0.031, which is statistically significant.

Figure 3 shows frozen Calot's triangle (n=80), p value 0.021. A total of 14 patients had frozen calot's. Of these, 3/45(6.66%) were in the early group and 11/35 (31.42%) in the delayed group, with a p value of 0.021, which is statistically significant.

Figure 4 shows the placement of the drain (n=80), pvalue 0.029. A total of 57 patients had drain placement. Of these, 25/45 (55.55%) were in the early group and 32/35 (91.42%) in the delayed group with a pvalue of 0.029, which is statistically significant.

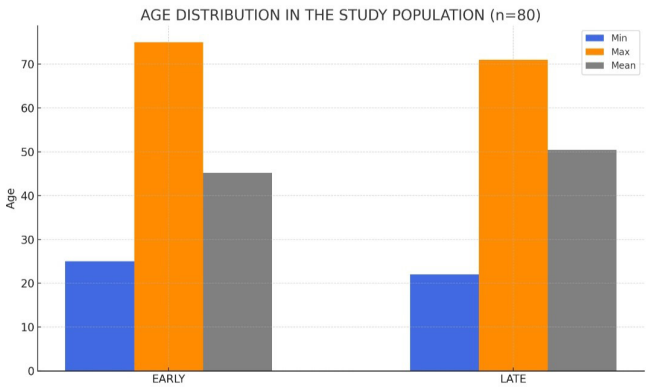

Figure 1. Age distribution in the study population (n=80).

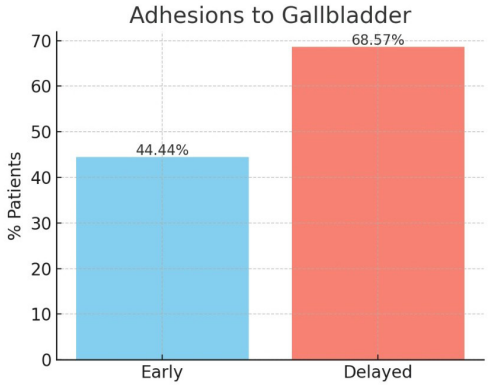

Figure 2. Adhesions to the gall bladder (n=80).

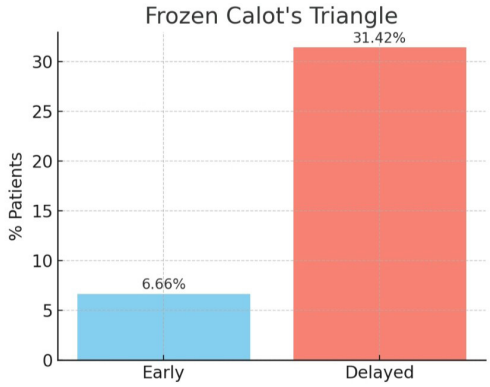

Figure 3. Frozen Calot's triangle (n=80).

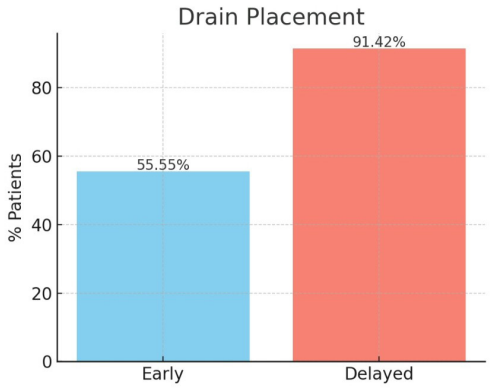

Figure 4. Placement of drain (n=80).

Figure 5 shows conversion to open procedure (n=80). pvalue 0.045. A total of 9 patients had a conversion from lap to open procedure. Of these, 1/45 (2.22%) in the early group and 8/35 (22.85%) in the late group, with p value of 0.045, which is statistically significant.

Figure 6 shows the mean operative time (n=80), pvalue 0.039. The mean operating time in the early group was 82.5 mins and in the delayed group was 120.5 mins with p value of 0.039, which is statistically significant.

Figure 7 shows postoperative hospital stay, pvalue: 0.037 (Statistically significant). Patients who underwent early laparoscopic cholecystectomy (within 3 days of ERCP) had a shorter hospital stay, with a mean duration of 2.75 days.

In contrast, those in the delayed group (after 3 days) stayed significantly longer, with a mean duration of 5 days.

The difference was statistically significant (p=0.037), indicating that early intervention results in faster recovery and discharge.

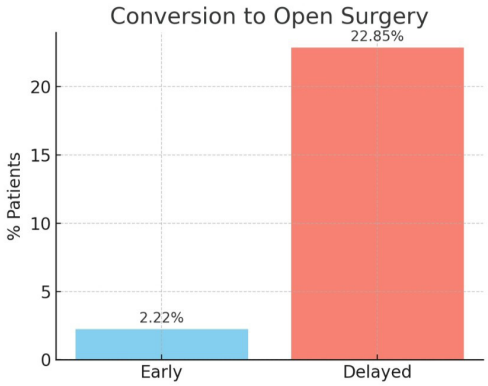

Figure 5. Conversion to open procedure (n=80).

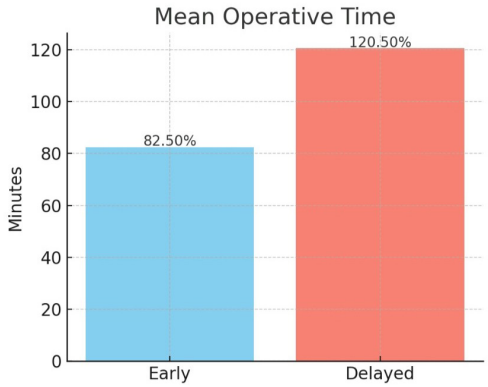

Figure 6. Mean operative time (n=80).

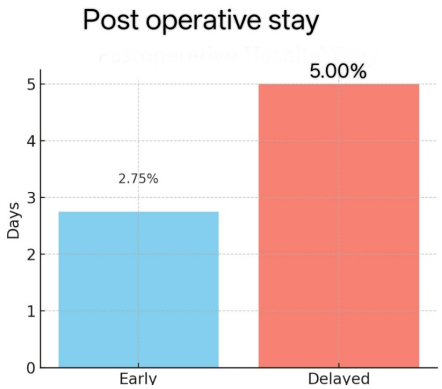

Figure 7. Postoperative hospital stay.

6. Discussion

- In the management of cholelithiasis associated with choledocholithiasis, sequential ERCP with biliary stenting followed by laparoscopic cholecystectomy is a widely accepted treatment protocol.
- Lau *et al.*[8] and Costi *et al.*[24] emphasised the importance of laparoscopic cholecystectomy following ERCP, as patients managed with ERCP

alone demonstrated higher long-term morbidity and mortality.

- The timing of cholecystectomy post-ERCP significantly influences surgical outcomes. Salman *et al.*[25] observed that performing laparoscopic cholecystectomy after 72 h leads to increased difficulty due to inflammation, and they recommended operating within 24-72 h.
- Our study supports this early approach. The incidence of gall bladder adhesions was considerably lower in the early group (44.44%) compared to the delayed group (68.57%), with a statistically significant pvalue of 0.031, indicating that early intervention may reduce inflammatory complications (Figure 1).
- Similarly, frozen Calot's triangle was present in only 6.66% of early cases versus 31.42% in the delayed group (p=0.021), reinforcing that delayed surgery can complicate anatomical dissection (Figure 2).
- Drain placement, often used in challenging or high-risk dissections to monitor for bile leak or bleeding, was also significantly more frequent in the delayed group (91.42%) compared to 55.55% in the early group (p=0.029), indicating greater operative difficulty with delayed timing (Figure 3).
- The mean operative time was 82.5 min in the early group and extended to 120.5 min in the delayed group (p=0.039), reflecting the added complexity due to scarring and fibrosis from the delayed inflammatory response (Figure 4).
- Regarding conversion to open surgery, only 1 out of 45 patients (2.22%) in the early group required conversion, while this rate was significantly higher in the delayed group at 8 out of 35 patients (22.85%) (p=0.045). Adhesions and distorted anatomy likely contributed to the need for open conversion in delayed cases (Figure 5).
- The postoperative hospital stay was also longer for delayed cases. Though exact values were not specified in the last table, the overall trend supports that early intervention leads to shorter hospital stays and potentially quicker recovery (Figure 6).

7. Summary and Conclusion

Laparoscopic cholecystectomy is best performed within the first 3 days following ERCP for optimal outcomes. Delaying the procedure beyond this period is associated with a higher risk of intraoperative complications, increased likelihood of conversion to open surgery, longer operative duration, and extended postoperative hospital stay.

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