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Outcomes of Laparoscopic Cholecystectomy Performed Within the First Week Following ERCP

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Abstract | **Original Research Article**

Background: Laparoscopic cholecystectomy (LC) following endoscopic retrograde cholangiopancreatography (ERCP) is a standard intervention for choledocholithiasis. However, the optimal timing of LC post-ERCP remains debated, with concerns that early surgery may be complicated by inflammation and adhesions. ***Aim of the study:*** To compare the perioperative and postoperative outcomes of LC performed within the first week following ERCP versus LC performed after the first week. ***Methods:*** This prospective observational study included 44 adult patients who underwent ERCP for choledocholithiasis, cholangitis, or biliary sludge and were scheduled for subsequent LC. Patients were divided into two groups: LC within the first week post-ERCP (n = 22) and LC after the first week (n = 22). Baseline demographics, comorbidities, intraoperative parameters (operative time, adhesions, blood loss, conversion rate, bile duct injury), postoperative complications, hospital stay, readmission, and patient-centered outcomes were recorded. Statistical analysis was performed using SPSS v26, with $p < 0.05$ considered significant. ***Result:*** Baseline characteristics, including age, gender, BMI, ASA grade, and comorbidities, were comparable between groups. Operative time (67.18 ± 14.83 vs. 83.55 ± 17.92 min, p = 0.002) and intraoperative blood loss (median 50 vs. 75 mL, p = 0.01) were significantly lower in the early LC group. Rates of conversion to open surgery, adhesions, and bile duct injury were lower in the early group, though not statistically significant. Postoperatively, early LC was associated with shorter hospital stay (2.00 ± 0.70 vs. 3.18 ± 1.03 days, $p < 0.001$) and higher rates of favorable outcomes (90.91% vs. 68.18%, p = 0.04), early return to work (72.73% vs. 45.45%, p = 0.05), and patient satisfaction (9.09 ± 0.63 vs. 8.00 ± 1.00, p = 0.001). Overall complication rates were lower in the early group (9.09% vs. 27.27%), though not statistically significant. ***Conclusion:*** Performing LC within the first week after ERCP is safe and confers significant advantages, including reduced operative time, blood loss, hospital stay, and improved patient-centered outcomes, without increasing the risk of major complications. Early LC should be considered as the preferred approach in patients undergoing ERCP for choledocholithiasis.

Keywords: Laparoscopic cholecystectomy, ERCP, early surgery, choledocholithiasis, postoperative outcomes, adhesions, operative time.

INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) remains the first-line therapeutic approach for most bile duct lesions (BDLs), including choledocholithiasis and post-cholecystectomy bile duct injuries [1–3]. It provides both diagnostic and therapeutic benefits through procedures such as endoscopic sphincterotomy, biliary stenting, or a combination thereof, which facilitate bile drainage into the duodenum, reduce intraductal pressure, and promote spontaneous healing of bile duct defects [4,5]. Cholelithiasis is the leading cause of biliary tract disorders and remains the predominant etiological factor for acute pancreatitis, contributing to approximately 35–60% of global cases [6]. According to the revised Atlanta classification, around 80% of pancreatitis cases are categorized as mild in severity and resolve with conservative management [7]. However, patients recovering from acute biliary pancreatitis (ABP) often experience recurrent biliary complications—such as cholangitis, biliary colic, or recurrent pancreatitis—if the underlying gallstones are not addressed [8,9]. Consequently, definitive management through cholecystectomy is critical to

prevent recurrent attacks and associated morbidity. Although there is broad agreement on delaying cholecystectomy in cases of severe acute biliary pancreatitis until resolution of inflammation and peripancreatic collections [10], the timing of cholecystectomy after ERCP in mild to moderate disease remains controversial. ERCP with endoscopic sphincterotomy (ES) has been established as the standard of care for patients with concomitant gallbladder and common bile duct stones [11]. International guidelines consistently recommend performing a subsequent laparoscopic cholecystectomy (LC) in all surgically fit patients after successful ductal clearance to prevent recurrent biliary events. Recent randomized clinical trials have shown that performing LC soon after ERCP significantly reduces recurrence rates of biliary complications. In contrast, postponing LC for 6–8 weeks, a practice still followed in many centers, resulted in recurrent biliary events in up to 36% of patients during the waiting period [12]. Nevertheless, debate continues regarding whether LC is necessary immediately following endoscopic ductal clearance. Some studies suggest that endoscopic management alone may be sufficient as a definitive treatment in select patients with high surgical risk or limited symptoms [13]. However, numerous retrospective and prospective studies have shown that deferring cholecystectomy substantially increases the likelihood of recurrent biliary symptoms, cholangitis, or pancreatitis—reported in more than 24% of patients when the gallbladder is left in situ [14]. Additionally, LC performed after ERCP and sphincterotomy has been shown to be technically more demanding, with conversion-to-open surgery rates ranging between 8% and 55%, compared to less than 5% in uncomplicated gallstone disease [11]. The increased operative difficulty is primarily attributed to inflammatory changes, adhesions, and fibrosis that develop around the hepatoduodenal ligament and Calot's triangle following ERCP. Given these inconsistencies, determining the optimal interval between ERCP and LC remains a subject of clinical importance. Evidence suggests that performing LC within the first week after ERCP may offer advantages in reducing operative complexity, minimizing hospital stay, and preventing recurrent biliary events. This study aims to evaluate the operative difficulty, conversion rate, perioperative complications, hospital stay, and incidence of recurrent biliary events among patients undergoing LC within one week following ERCP, compared with later intervals.

METHODOLOGY & MATERIALS

This prospective observational study was conducted at Department of Surgery, Community Based Medical College, Mymensingh, Bangladesh January 2021 to December 2022.

Study Population and Patient Selection

Patients aged 18 years or older who underwent ERCP for choledocholithiasis, cholangitis, or biliary sludge and were planned for subsequent LC were screened for inclusion.

Inclusion criteria:

1. Age ≥ 18 years.
2. Underwent ERCP for choledocholithiasis, cholangitis, or biliary sludge.
3. Planned for elective laparoscopic cholecystectomy.
4. Provided written informed consent.

Exclusion criteria:

1. Previous upper abdominal surgery precluding safe laparoscopic access.
2. Known coagulopathy or bleeding disorders.
3. Severe cardiopulmonary comorbidities contraindicating general anesthesia.
4. Pregnancy.
5. Incomplete clinical, operative, or follow-up data.
6. Concurrent hepatobiliary malignancy.

After applying these criteria, a total of 44 patients were included and categorized into two groups according to the timing of LC: LC within the first week post-ERCP (n = 22) and LC after the first week post-ERCP (n = 22).

Data Collection

Baseline demographic data including age, sex, body mass index (BMI), and comorbidities (diabetes mellitus, hypertension) were recorded. The American Society of Anesthesiologists (ASA) physical status classification was assigned for all patients. Indication for ERCP, laboratory findings, and perioperative risk factors were also documented.

Surgical Procedure

All LCs were performed under general anesthesia using a standardized four-port technique by experienced surgeons. Intraoperative data included operative time, conversion to open surgery, presence and severity of adhesions, intraoperative blood loss, and bile duct injuries. Adhesions were graded as mild, moderate, or severe based on intraoperative findings.

Postoperative Care and Outcome Assessment

Postoperative monitoring included assessment for complications such as wound infection, bile leak, and pancreatitis. Length of postoperative hospital stay and readmission within 30 days were recorded. Overall outcome was assessed using a composite measure, with a favorable outcome defined as absence of major complications, hospital stay ≤3 days, and high patient-reported satisfaction.

Statistical Analysis

Data were analyzed using SPSS version 26 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR), and categorical variables

as frequencies and percentages. Between-group comparisons were performed using the independent t-test or Mann–Whitney U test for continuous variables, and the Chi-square test or Fisher's exact test for categorical variables. A p-value <0.05 was considered statistically significant.

RESULT

A total of 44 patients undergoing laparoscopic cholecystectomy (LC) after ERCP were included, with 22 patients in the LC within 1st week group and 22 in the LC after 1st week group. Baseline demographic and clinical characteristics, including age, gender, BMI, ASA grade, and comorbidities, were comparable between the two groups (p > 0.05 for all comparisons) (Table 1). The most common indication for ERCP was choledocholithiasis in both groups. (Table 2) showed that conversion to open surgery occurred in 4.55% of early LC cases versus 13.64% in delayed LC, though this difference was not statistically significant (p = 0.3). Moderate to severe adhesions were observed in 18.18% of early LC patients compared to 40.91% in the delayed group (p = 0.09). Operative time was significantly shorter in the early LC group (67.18 ± 14.83 min) than in the delayed group (83.55 ± 17.92 min, p = 0.002). Similarly, median intraoperative blood loss was lower in early LC (50 mL, IQR 30–70) than in delayed LC (75 mL, IQR 50–110; p = 0.01). (Table 3) indicated that overall complications were fewer in the early LC group (9.09%) than in the delayed group (27.27%), though this difference was not statistically significant (p = 0.12). Wound infection occurred in 4.55% of early LC versus 13.64% of delayed LC (p = 0.3). Postoperative hospital stay was significantly shorter in the early LC group (2.00 ± 0.70 days) compared to the delayed group (3.18 ± 1.03 days, p < 0.001). Readmission within 30 days was rare, with only one case in the delayed group. (Table 4) favored early LC, with 90.91% of patients achieving a favorable outcome compared to 68.18% in the delayed group (p = 0.04). Early return to work (≤7 days) was observed in 72.73% of early LC patients versus 45.45% of delayed LC patients (p = 0.05). Mean patient satisfaction scores were also higher in the early LC group (9.09 ± 0.63) compared to the delayed group (8.00 ± 1.00, p = 0.001).

Table 1: Baseline demographic and clinical characteristics of study population (N = 44).

Variable	LC within 1st week (n = 22)		LC after 1st week (n = 22)		p-value
	n	%	n	%	
Age (years)					
Mean ± SD	44.8 ± 11.9		46.1 ± 12.3		0.67
Gender					
Male	10	45.45	11	50.00	0.76
Female	12	54.55	11	50.00	
BMI (kg/m²)					
Mean ± SD	26.9 ± 3.5		27.5 ± 4.0		0.54
ASA grade					
ASA I	10	45.45	9	40.91	0.82
ASA II	8	36.36	9	40.91	
ASA III	4	18.18	4	18.18	
Comorbidities					
Diabetes mellitus	5	22.73	6	27.27	0.73
Hypertension	6	27.27	7	31.82	0.75
Indication for ERCP					
Choledocholithiasis	18	81.82	17	77.27	0.71
Cholangitis	3	13.64	4	18.18	0.68
Biliary sludge	1	4.55	1	4.55	—

Table 2: Intraoperative Outcomes

Parameter	LC within 1st week (n = 22)		LC after 1st week (n = 22)		p-value
	n	%	n	%	
Conversion to open surgery	1	4.55	3	13.64	0.3
Adhesions (moderate/severe)	4	18.18	9	40.91	0.09
Bile duct injury	0	0.00	1	4.55	0.31
Operative time (min)					
Mean ± SD	67.18 ± 14.83		83.55 ± 17.92		0.002*
Intraoperative blood loss (mL)					
median (IQR)	50.00 (30.00–70.00)		75.00 (50.00–110.00)		0.01*

Table 3: Postoperative outcomes

Outcome	LC within 1st week (n = 22)		LC after 1st week (n = 22)		p-value
	n	%	n	%	
Postoperative complications	2	9.09	6	27.27	0.12
Wound infection	1	4.55	3	13.64	0.3
Bile leak	0	0.00	1	4.55	0.31
Postoperative pancreatitis	1	4.55	2	9.09	0.55
Postoperative hospital stay (days)					
Mean ± SD	2.00 ± 0.70		3.18 ± 1.03		<0.001*
Readmission within 30 days	0	0.00	1	4.55	0.31

Table 4: Comparison of overall outcome scores among the study population

Outcome	LC within 1st week (n = 22)		LC after 1st week (n = 22)		p-value
	n	%	n	%	
Favorable outcome	20	90.91	15	68.18	0.04*
Early return to work (≤7 days)	16	72.73	10	45.45	0.05*
Mean patient satisfaction (0–10)					
Mean ± SD	9.09 ± 0.63		8.00 ± 1.00		0.001*

DISCUSSION

Laparoscopic cholecystectomy (LC) following endoscopic retrograde cholangiopancreatography (ERCP) remains a subject of ongoing debate regarding the optimal timing to achieve the best clinical outcomes [14]. Our finding of significantly lower operative time (Mean ± SD: 67.2 ± 14.8 min vs 83.6 ± 17.9 min, the mean age of patients undergoing laparoscopic cholecystectomy (LC) within the first week following ERCP was 44.8 ± 11.9 years, with a slightly higher proportion of females (54.55%) and a mean BMI of 26.9 kg/m². Comorbidities such as diabetes and hypertension were present in 22.73% and 27.27% of patients, respectively, and the majority were classified as ASA I or II. In comparison, the study by Jaiswal et al. reported a slightly higher mean age for early LC patients (49.94 ± 14.79 years) and a comparable gender distribution (female 63.15%), but a lower BMI (23.03 kg/m²) [15]. The mean operative time was significantly shorter in the early group (67.18 ± 14.83 min) than in the delayed group (83.55 ± 17.92 min, p = 0.002), indicating easier dissection and fewer adhesions. Similarly, Özkardeş et al. (2014) reported a shorter but statistically insignificant operative time for early LC (67.00 ± 28.52 min vs. 71.33 ± 24.07 min, p = 0.202). The conversion rate to open surgery in our study was lower in early LC (4.55%) than in delayed LC (13.64%), whereas Özkardeş et al. found a higher conversion in early cases (13.3%) compared to none in delayed LC (p = 0.112). Moderate to severe adhesions were more frequent in delayed LC (40.91%) than early LC (18.18%), reflecting increased technical difficulty in delayed surgery. Intraoperative blood loss was also significantly greater in delayed LC (75 mL vs. 50 mL, p = 0.01). Although Özkardeş et al. did not assess blood loss, their study showed shorter hospital stay (5.20 ± 1.40 vs. 7.80 ± 1.65 days, p = 0.04) and lower cost (p = 0.03) in early LC [16]. The early LC group had a mean satisfaction score of 9.09 ± 0.63 and 72.73% returned to work within 7 days, compared to a mean satisfaction score of 8.00 ± 1.00 and 45.45% in the delayed LC group. Cao et al. reported that early surgery has a decreased risk of wound infections (RR 0.57, 95 % CI 0.35–0.93, p = 0.01) compared with delayed surgery but no difference in mortality, bile duct injuries, bile duct leaks and the risk of conversion to open surgery. Of patients in the delayed group, 9.7 % failed initial non-operative management and underwent emergency LC [17]. Our study did not observe any bile duct injuries in the early LC group, whereas one case occurred in the delayed LC group (4.55%, p = 0.31). Immediate cholecystectomy performed within 24 h of admission did not prove to reduce post-operative complications with relative risk (RR) of 1.89 and its 95% confidence interval (CI) [0.76; 4.71]. When the timing was based on the onset of symptoms, cholecystectomy performed within 72 h of symptoms was found to significantly reduce post-operative complications compared to delayed cholecystectomy with RR = 0.60 [95% CI 0.39;0.92] [18].

Limitations of the study:

This study is limited by its single-center, prospective observational design and relatively small sample size, which may reduce generalizability. Selection bias cannot be entirely excluded, and the timing of LC was not randomized, potentially influencing outcomes. Long-term follow-up was not assessed, limiting evaluation of late complications or recurrence. Additionally, operative difficulty and adhesions were subjectively graded by surgeons, introducing potential observer bias. Multicenter randomized trials are warranted to validate these findings.

CONCLUSION AND RECOMMENDATIONS

Laparoscopic cholecystectomy performed within the first week following ERCP is safe and

feasible, offering superior perioperative and patient-centered outcomes compared with delayed surgery. Early intervention is associated with reduced operative time, lower intraoperative blood loss, fewer adhesions, shorter hospital stay, and higher rates of favorable outcomes and patient satisfaction, without increasing the risk of major complications. These findings support prioritizing early LC in patients undergoing ERCP for choledocholithiasis, as timely surgery optimizes surgical efficiency, minimizes postoperative morbidity, and enhances recovery and functional outcomes, reinforcing the growing evidence for early post-ERCP cholecystectomy as standard practice.

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