

# Laparoscopic Cholecystectomy within 24 Hours Following Endoscopic Retrograde Cholangiography as a Good Option for the Treatment of Cholecysto-Choledocholithiasis

Ibrahim Sabry Bakr<sup>1\*</sup>, Ahmed Alwaseif<sup>2</sup>, Alshimaa Alaboudy<sup>3</sup>, and Yasser Hussein Metwally<sup>1</sup>

1. Assistant Professor of General Surgery, Faculty of Medicine, Al-Azhar University, Egypt
2. Consultant of Gastroenterology, Sultan Qaboos University Hospital, Muscat, Oman
3. Lecturer of Tropical Medicine and Gastroenterology, Sohag University, Sohag, Egypt

**Corresponding author:** Ibrahim Sabry Bakr, **Mobile:** +966566454748,

**ORCID:** 0000-0001-7226-3684, **Email:** Isb11117777@gmail.com

## ABSTRACT

**Background:** Endoscopic retrograde cholangiopancreatography (ERCP) followed by laparoscopic cholecystectomy (LC) is a preferred treatment option for combined cholelithiasis and choledocholithiasis. Numerous studies have investigated the optimal timing of LC after ERCP, which can be early (within 72 hours) or delayed for 6 to 8 weeks.

**Objective:** The aim of the current study is to evaluate the laparoscopic cholecystectomy within 24 hours following ERCP, as an option for the treatment of cholecysto-choledocholithiasis.

**Patients and methods:** A total of 200 consecutive patients with combined cholelithiasis and choledocholithiasis, diagnosed by abdominal ultrasonography and magnetic resonance cholangiopancreatography, were included in our study. All patients underwent therapeutic ERCP, with sphincterotomy and stone extraction, followed by LC within 24 hours. The post-ERCP complications, the operative time, intraoperative blood loss, intraoperative severity of gall bladder adhesion, postoperative complications, and hospital stay were recorded and studied.

**Results:** Among the 200 patients included, their mean age was 34 years. Of them 120 (60%) were females. Only 60 (30%) patients originally presented with biliary pancreatitis. Post-ERCP pancreatitis was recorded in 20 (10%) patients. The mean duration of laparoscopic cholecystectomy was 40 minutes (range 30-60) with minimal blood loss. Moderate to severe gall bladder adhesion was detected in 60 (30%) patients. In addition, intraoperative moderate to severe cholecystitis was detected in 80 (40%) patients. The post-cholecystectomy complications included ileus (N=10; 5%) and superficial wound sepsis (N=8; 4%). The mean hospital stay was 4 days (range 3-5).

**Conclusion:** ERCP followed within 24 hours by laparoscopic cholecystectomy appears to be an effective choice for treating cholecysto-choledocholithiasis.

**Keywords:** ERCP, CBD stone, Laparoscopic cholecystectomy, Choledocholithiasis, Cholecystolithiasis, Case series, Al-Azhar University.

## INTRODUCTION

Gallbladder stone is one of the most common diseases worldwide. It is commonly seen in middle-aged females. It is the main cause of at least one million hospitalizations [1]. Despite the low mortality rate (0.6%) associated with this disease, there are a variety of complications that may arise from it. Concomitant bile duct stone occurs in 10–18% of patients with gallbladder stones and varies according to age. About 55% of patients are symptomatic, and half of those experience complications [2]. Many treatment options are currently available for combined cholelithiasis and Choledocholithiasis. This included endoscopic retrograde cholangiopancreatography (ERCP) followed by laparoscopic cholecystectomy (LC), LC with intraoperative ERCP, laparoscopic common bile duct exploration, and open common bile duct exploration. Among those treatment options, ERCP followed by LC appears to be the safest and the least invasive [3,4].

*Manes et al.* mentioned that there is a 4% to 24% risk of biliary complications following ERCP if the LC is not performed early after the surgery. Additionally, they noted that LC difficulties and the rate at which laparoscopic cholecystectomies are converted to open procedures both increased after a 6- to 8-week post-ERCP interval [5]. On the other hand, it had been advocated that

early LC after ERCP, can reduce recurrent biliary complications and post-LC complications [6].

The timing between the ERCP and LC, as well as the order in which the two procedures should be performed, is debatable. *Liu et al.* advocated that ERCP should be followed immediately by LC. The majority of biliary occurrences in the interval following ERCP may be avoided by early LC, according to their findings and early LC appears to be generally safe [7]. Yet, other studies favor delayed LC [8].

In the current study, we aimed to evaluate the LC within 24 hours following endoscopic retrograde cholangiopancreatography (ERCP), as a treatment option for cholecysto-choledocholithiasis.

## PATIENTS AND METHODS

A total 250 consecutive patients with combined cholelithiasis and choledocholithiasis were studied. This study was conducted at Al-Dar Private Hospital in Saudi Arabia, from January 2013 to January 2020. All patients underwent full clinical assessment, full laboratory investigations, and abdominal ultrasonography. In patients with doubtful etiology of CBD dilatation CT and/or MRCP were done mainly to roll out malignancy.

Patients with biliary malformation and previous history of esophageal, gastric, or biliary surgery were excluded. In addition, patients with severe post-ERCP pancreatitis, associated end-stage liver disease, or end-stage kidney disease were also excluded.

Eventually, 200 patients who met the inclusion criteria were included. All patients were subjected to ERCP and followed by laparoscopic cholecystectomy within 24 hours. Both procedures were done under general anesthesia by the same team of laparo-endoscopic surgeons and an anesthesia team with more than 10 years of experience. All patients were discharged within 48 hours after laparoscopic cholecystectomy with stable conditions except, patients with ileus 5% as they were discharged after recovery on the third-day post-LC.

#### **Endoscopic procedure:**

After at least 6 hours of fasting, ERCP was done under general anesthesia, while patients were in the left lateral, almost prone position. The duodenal papilla was cannulated by sphincterotome with a subsequent cholangiogram. After the presence of common bile duct stone(s) was confirmed, sphincterotomy was performed, and CBD stone(s) were extracted by either extraction balloon, Dormia basket, or both. Complete stone extraction was confirmed by balloon occluded cholangiography. The duration of ERCP procedures was ranging from 30-50 minutes with a mean time of 40 minutes.

Post-ERCP pancreatitis was assessed three hours following ERCP for all patients. The presence of two of the following was used to make the diagnosis of pancreatitis; characteristic abdominal pain, the two-fold elevation of serum amylase or lipase, and evidence of pancreatitis in abdominal imaging.

#### **Laparoscopic procedure:**

Laparoscopic cholecystectomy was performed using a four-trocar approach. A CO<sub>2</sub> pneumoperitoneum was established and maintained at a pressure of around 12 (10-14) mmHg. A camera was inserted via an infraumbilical port. Other trocars included 10-mm-port 2 cm below the Xiphoid process, 5-mm-trocar to the midclavicular line, and 5-mm-trocar to the anterior axillary line. The fundus of the gallbladder was identified,

grasped, and retracted superiorly and directed to the right axilla. Both cystic duct and vessels were identified, dissected, clipped, and cut after meticulous dissection of Calot's triangle with clear visualization of the critical view of safety. In a few cases, ligation of the cystic duct was done by Vicryl Endoloop or extracorporeal Vicryl knots if indicated as if the cystic duct was dilated and cannot be secured by clips. Meticulous dissection of the gallbladder from its liver bed with good hemostasis followed by removed through the epigastric port. Indwelling abdominal drainage tubes fr.18, were selectively placed in 20 cases (10%), according to the operation conditions, as if there were extensive adhesions with edematous gall bladder wall. The abdomen was deflated from CO<sub>2</sub> before the removal of the trocars followed by the closure of trocar incisions by Vicryl 2/0 with J-needle and the skin by Vicryl 4/0.

#### **Severity of adhesion:**

*Yokoe et al.* scored the degree of adhesion as follows: Grade 1, no adhesions; Grade 2, flimsy adhesions that allow easy dissection; Grade 3, severe adhesions encasing the gallbladder and Grade 4, severe adhesions covering other structures, such as the duodenum or colon, which may lead to conversion to OC [9].

#### **Ethical Approval:**

**This study was ethically approved by the Local Ethics Committee of Al-Azhar University. Written informed consent was obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.**

#### **Statistical analysis:**

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 20 for windows. Qualitative data were defined as numbers and percentages. Quantitative data were described as means and standard (SD).

#### **RESULTS**

Table 1 summarizes the demographic and medical data of the included patients.

**Table 1: Patients' characteristics in this study.**

Criteria	Number	Percent
Age (Mean)	20-40 with a mean age of 34	
Gender		
Male	80	40%
Female	120	60%
BMI (Body Mass Index)	20-34 with a mean of 26	
Biliary pancreatitis presentation	60 patients	30%
Diameter of CBD		
Less than 1 cm	60	30%
More than 1 cm	140	70%
Stone(s) of the CBD		
Less than 1 cm	160	80%
More than 1 cm	40	20%
Number of stones		
Single stone	30	15%
Multiple stones	170	85%

Table 2 summarizes the surgical findings of the included patients.

**Table 2: The operative (laparoscopic cholecystectomy) outcomes.**

Criteria	Number	Percentage
Duration of operation (in min)	Range 30-60 Minutes with mean 40 Minutes	
Blood loss volume (in ml)	Range 5-15 ml with mean 10 ml	
Severity of adhesion		
Mild	140	70%
Moderate	50	25%
Severe	10	5%
Intraoperative grading for cholecystitis		
Mild	120	60%
Moderate	60	30%
Severe	20	10%
Drainage tube placement	20 cases	10%
Hospitalization days	Range 3-5 days with a mean of 4 days	

Table 3 summarizes Post-ERCP, intraoperative and postoperative complications of the included patients.

**Table 3: Post-ERCP, intraoperative and postoperative complications.**

Complications	No. of Patients	Percentage
Post ERCP Pancreatitis		
Mild	15	7.5%
Moderate	5	2.5%
Bleeding or perforation during ERCP	0	0%
Ileus	10	5%
Wound sepsis		
Superficial	8	4%
Deep or organ-related	0	0%
Conversion from lap. to open, subtotal cholecystectomy, Bile leakage, Hospital readmission, or Bleeding requiring transfusion	0	0%

## DISCUSSION

Cholecysto-choledocholithiasis is more frequently seen in middle-aged females. Many treatment

options are currently available for those conditions. These included ERCP followed by laparoscopic cholecystectomy (LC), as well as LC with intraoperative ERCP, laparoscopic common bile duct exploration, and open common bile duct exploration. The least intrusive procedure is ERCP followed by LC [10]. Arguments are ongoing regarding the timing of LC after ERCP as well as the order in which the two procedures should be performed. *Zhang et al.* recommended prompt LC following ERCP for the management of combined choledocholithiasis and cholelithiasis, given the benefits of early intervention that include short hospital stay and cost-effectiveness [11]. In the current study, we found that ERCP followed by LC within 24 h is associated with a short duration of surgery; there was no conversion from laparoscopic to open cholecystectomy.

*Poprom et al.* reported that delayed LC had shown a lot of difficulties due to fibrotic changes, and adhesions around the gallbladder that happen over time. In our study, we showed that early LC is associated with minimal adhesions, fibrotic changes, and scarring of the gallbladder, with overall low complications [12]. *Aziret et al.* documented that early LC reduces recurrent biliary-related events, on the other hand, the longer the time elapsed between ERCP and LC may increase the rate of biliary disease progression and complication [2]. Going with this notion, it was shown that the risk of recurrent bile duct stones was 15% at 15 days and this percentage increased to 20% at 1 month after ERCP [13]. Moreover, an increase in acute cholecystitis sequelae was observed, parallel to the length of LC delay from ERCP [9].

In the same line, *Ekici et al.* supported the opinion of doing early LC after ERCP for cholecysto-choledocholithiasis as it has shown that longer operation time and postoperative hospital length of stay were related to the delay in LC, in addition to a higher incidence of conversion to open surgery, and overall postoperative-complications [14]. *Gao and Jiang* suggested an explanation for those findings that the marked inflammation of the hepatoduodenal ligament caused by ERCP itself, complicates the anatomic recognition and subsequent dissection of Calot's triangle, therefore, making LC technically difficult, thereby increasing the risk of conversion [15]. *Nzenza et al.* suggested another explanation that the long delay between ERCP and LC allows the disease to progress, like acute cholecystitis or recurrent bile duct stones, thereby complicating the subsequent LC. He also reported that the risk of recurrence of bile duct stones was 15% at 15 days and 20% at 1 month [13].

In our study, early LC was associated with a very short duration of surgery ranging from 30 to 60 minutes with an average of 45 minutes also there was no conversion from laparoscopic to open cholecystectomy with very minimal postoperative complications.

*Paik et al.* reported that elevated bilirubin levels did not affect the outcome of early LC after ERCP and

recommended that LC should not be delayed because of elevated bilirubin [16]. In spite of the resolution of jaundice did not affect the surgical outcome of early LC, surgeons tend to prefer operating on patients, with normal bilirubin levels in practice [17]. However, in our study, LC was not delayed because of jaundice and we reported no postoperative liver dysfunction.

*Peponis et al.* reported that subtotal cholecystectomy, biliary tract injury, superficial and deep wounds sepsis, incisional hernias, and requirement of post-laparoscopic cholecystectomy ERCP were more frequently reported in late LC compared with early one [18]. *Senocak et al.* reported that the usage of a contrast agent may have a role in increasing the formation of post-ERCP fibrosis. Indeed, the usage of a contrast agent in ERCP is mandatory to visualize the biliary tree and any filling defect [19]. *Wang et al.* also reported that during performing ERCP, the use of a contrast agent may intensify the inflammatory process brought on by bacterial colonization, which could lead to adhesions at Calot's triangle. [20]. Other studies supported this mechanism of bacterial colonization, as 60% of patients who underwent ERCP with sphincterotomy developed translocation of bacteria into the biliary system [14].

The rapid sequence of LC following ERCP that we applied was effective in avoiding those time-related complications.

Indeed, the ERCP procedures, such as papillary cannulation, sphincterotomy, or balloon dilatation, can lead to post-ERCP pancreatitis, bleeding, and perforation. Post-ERCP pancreatitis has an incidence of 5% to 7% [18].

*Muangkaew et al.* reported that by comparing the guidewire-assisted cannulation procedure to contrast-assisted cannulation, pancreatitis following ERCP was dramatically reduced using the guidewire-assisted cannulation technique. Due to the increased difficulty of subsequent LC, individuals with post-ERCP pancreatitis linked to contrast agents may have poor surgical outcomes [21].

In the present study, we used the guidewire-assisted cannulation technique so the rate of post-ERCP pancreatitis was very low, as well as all cases of post-ERCP pancreatitis were mild to moderate without interrupting the decision of LC within 24 hours. Moreover, post-laparoscopic cholecystectomy laboratory results showed a return of pancreatic enzymes level near to normal before discharge.

*Al-Temimi et al.* recommend early surgery to avoid readmissions, despite the possibility that a very early procedure would miss the presence of persistent choledocholithiasis or necessitate numerous preoperative ERCPs [22].

There were no missed CBD stones in the present study and none of our cohorts required post-cholecystectomy ERCP. *Li et al.* reported that; the combined endoscopy and surgery have the advantage of short hospital stay, compared to delayed LC, which was

supported by our results. This will be reflected directly in the financial expenses, risk of nosocomial infections, and overall complication rate [23].

The limitation of our study may be related to a single-center study and the fact that it is not a randomized trial. Also in our study, a single physician performed both ERCP and LC which is logistically difficult in most hospitals. In addition, the insurance system for different countries may interfere with the decision for the time interval between ERCP and LC [24].

Indeed, in our study, a single physician performed both ERCP and LC which is logistically difficult in most hospitals.

**In conclusion**, ERCP followed within 24 hours by laparoscopic cholecystectomy is a good therapeutic option for cholecysto-choledocholithiasis, as it has the benefit of short hospital stay and duration of surgery, less operative difficulty, and reasonable outcome.

#### DECLARATIONS

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- **Funding:** None.
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