



RESEARCH ARTICLE

EARLY VERSUS DELAYED POST ERCP LAPAROSCOPIC CHOLECYSTECTOMY

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ARTICLE INFO

Article History:

Received 24<sup>th</sup> May, 2017  
Received in revised form  
18<sup>th</sup> June, 2017  
Accepted 25<sup>th</sup> July, 2017  
Published online 31<sup>st</sup> August, 2017

Key words:

Choledocholithiasis,  
Cholelithiasis,  
Endoscopic retrograde  
Cholangiopancreatography,  
Laparoscopic cholecystectomy.

ABSTRACT

**Introduction:** The optimal management of symptomatic or suspected common bile duct (CBD) stone continues to be controversial. Preoperative ERCP followed by LC is currently the most widely used procedure. The optimal interval between ERCP and LC is disputed.

**Aim:** The aim of this study was to compare 2 groups of patients managed with laparoscopic cholecystectomy post ERCP after 72 hours and after 4 weeks ) in terms of outcome of LC, the rate of conversion to an open procedure, operative time and hospital stay.

**Patients and methods:** A total of 60 patients divided into two groups of 30 each were included in the study; group one underwent early laparoscopic cholecystectomy whereas group two had delayed laparoscopic cholecystectomy. The length of hospital stay, overall operative time, complications and the rate of conversion to an open procedure in both groups were calculated and statistically analyzed.

**Results:** There were significant differences between both groups as regards morbidity rates, operative time and the mean hospital stay. Conversion to open cholecystectomy occurred in two case due to severe adhesions at the Calot's triangle in Group II patients.

**Conclusion:** In our study ERCP followed by early laparoscopic cholecystectomy was safe with significant reduction in the average length of stay , operative time , complications and rate of conversion to an open procedure as compared to ERCP followed by delayed laparoscopic cholecystectomy in patients with choledocholithiasis.

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Citation: Hassan A.Abdallah. 2017. "Early versus delayed post ercp laparoscopic cholecystectomy", *International Journal of Current Research*, 9, (08), 55832-55836.

INTRODUCTION

Choledocholithiasis is a common surgical problem affecting about 3.5–10% of all patients with gallstone disease (Collins, 2004 and Petelin, 2003). Preoperative ERCP, intraoperative open or exploration of the CBD, and postoperative ERCP are the recommended options for treatment of simultaneous gallbladder and CBD stones (Reema Mallick, 2016). The most commonly used minimal invasive approach in practice is the two-stage management, which consists of pre-operative (or post-operative) endoscopic retrograde cholangiopancreatography (ERCP), sphincterotomy and common bile duct (CBD) clearance followed by laparoscopic cholecystectomy (LC) (Iodice, 2001). Multiple national and international studies showed that ERCP is safe particularly prior to laparoscopic cholecystectomy (LC) while other studies concluded that that ERCP followed by early laparoscopic cholecystectomy could reduce the risk of cholangitis and recurrent pancreatitis (Al-Hadi, 1998; Meshikhes, 1995; Solana de Lopez, 1998). The rate of conversion of LC after ERCP is higher than elective LC for uncomplicated cholelithiasis. Some studies have revealed that early LC improves the outcome and decreases morbidity (Boerma, 2002 and Salman, 2009).

The possible reason could be that ERCP causes cholangitis, leading to inflammation and scarring around extra hepatic biliary ducts, thus making a laparoscopic procedure more difficult. This inflammatory adhesion will be more evident 2 to 6 weeks after ERCP. Also, during the interval of surgery after ERCP, patients can have recurrent biliary complications, as high as 20% (Ko, 2002). Multiple other studies have demonstrated that the outcome after LC following ERCP is independent of interval between these two steps (Reinders, 2010; Bostanci, 2010; Donkervoort, 2010).

MATERIALS AND METHODS

This prospective randomized study was carried out in the period from January 2015 to May 2017 at department of general surgery, Aswan University Hospital, Egypt. It included 60 patients with cholelithiasis and a possibility of choledocholithiasis who underwent laparoscopic Cholecystectomy (LC) after Endoscopic retrograde cholangiopancreatography (ERCP). Patients who fulfilled any of the following criteria were included in this study: history of obstructive jaundice, high serum bilirubin, elevated liver enzymes, dilated common bile duct (CBD) (diameter  $\geq$  8mm by ultrasonography) and CBD stones diagnosed by ultrasonography. Management of choledocholithiasis in hospital passed through the following steps:

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- All patients were subjected to complete evaluation through detailed history, complete physical examination, laboratory investigations and imaging study (US and/or MRCP).
- Investigations carried out for all patients on admission: complete blood counts (CBC), liver function tests (LFT), urea, electrolytes and blood sugar, ABO grouping, coagulation profile, abdominal ultrasound, urine analysis and chest X-ray & ECG for patients above 35 years
- Confirmed choledocholithiasis cases were managed in our unit by ERCP followed by early(after 72 hours) or delayed(after 4 weeks) LC.
- ERCP was done to all patients under general anesthesia. Endoscopic sphincterotomy (ES) was achieved and the stones were extracted using either Dormia basket or balloon catheter. Mechanical lithotripsy was done in cases of large stones.

After ERCP patients were classified into two groups:

- Early group in whom LC was done 72 hours after ERCP
- Delayed group in whom LC was done after 4 weeks.

The outcome of LC, the rate of conversion to an open procedure, operative time and hospital stay were recorded.

The severity of adhesions was graded by use of 4-point scale: 1, no adhesions; 2, mild adhesions 3, severe adhesions encasing gallbladder; and 4, severe adhesions involving other structures. The operating time was calculated from the start of the incision to placement of the last suture. The operative time, intraoperative findings, postoperative complications and hospital stay were taken into account. All patients were followed up at 3 and 6 months and were instructed to notify the surgeon if there were any biliary symptoms.

## RESULTS

A total of 60 patients were studied. Of them 30 patients had undergone ERCP followed by early LC (after 72 hours) and the remaining 30 had ERCP followed by delayed LC (after 4 weeks). The profile of these cases is shown in Table 1.

### Group 1 (early group) outcome

This group included 30 patients, 6 male and 24 female, with a mean age of 44.2 years (Table 1).

**Table 1. Characteristics of patients according to procedure**

Characteristics	early group "n=30"	Delayed group "n=30"	P.value
Age (Years ±SD)	44.2±11.2	46.2±14.1	P=0.227n.s
Sex:			
Male	6(20.0%)	3(10.0%)	P=0.472n.s
female	24(80.0%)	27(90.0%)	
Proportion of abnormal LFTs (%)	27(90%)	26(86.7%)	P=0.375n.s
US findings:			
1- Dilated CBD (diameter ≥ 8mm)	28(93.33%)	29(96.67%)	P=0.473n.s
2- CBD stone (s)	25(83.33%)	26(86.7%)	
Recurrent biliary symptoms	2(6.67%)	15(50.0%)	p<0.000***

28 patients had CBD dilatation based on US examination, with a mean bilirubin level of 4.2 mg/dl. Three patients had MRCP

as their US examination revealed biliary dilatation with normal laboratory bilirubin level, and in all the three patients MRCP demonstrated floating CBD stones. ERCP was done in the operating theatre with the patient under general anesthesia in prone position, with 100% cannulation success rate and complete stone extraction in 25 ( 83.33%) patients; 5(16.67%) patients showed no stones (Figure 1). Cholecystectomy was completed laparoscopically in all patients with no conversion to open surgery. The postoperative course was smooth in all patients.



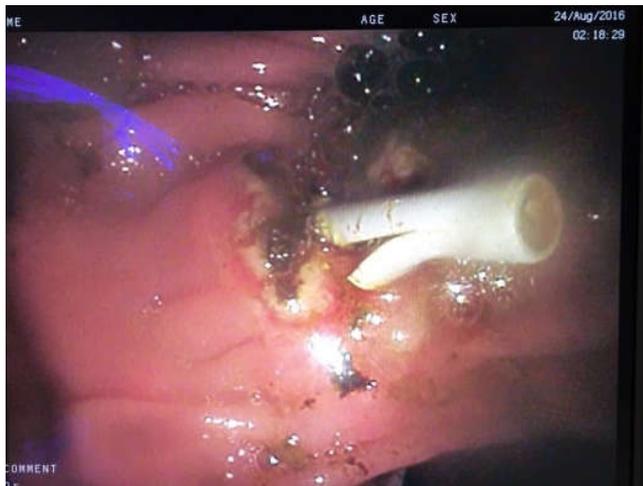
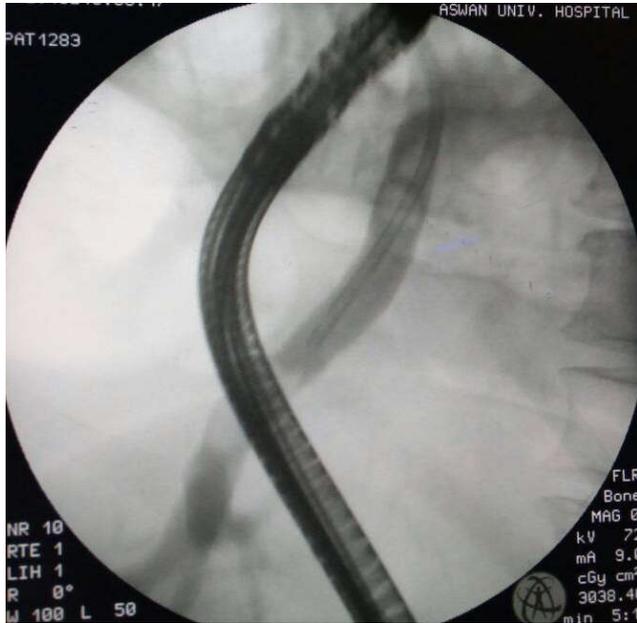
**Figure 1. ERCP shows a stone in the CBD. Stone extracted into the duodenum by the Dormia basket**

No postoperative complications related to the surgery or endoscopic procedure were noted, i.e., pancreatitis, bleeding, or perforation.

### Group 2 (delayed group) outcome

This group included 30 patients, 3 male and 27 female, with a mean age of 46.2 years (table 1). 29 patients had CBD dilatation based on ultrasound (US) examination, with a mean bilirubin level of 3.7 mg/dl. Four patients had MRCP for similar reasons as in group 1. Computed tomography (CT) examination was carried out for two patients to ensure

absence of neoplasia. ERCP was done at the endoscopy unit with the patient under general anesthesia in prone position, with 100% cannulation success rate and complete stone extraction in 27 (90.0%) patients; One patient (3.33%) showed no stones. In two patients with failed stone extraction because of large stone, a plastic stent was placed and patients were scheduled for CBD exploration within the next 4 weeks of the ERCP (Figure 2).



**Figure 2.** ERCP shows large irretrievable stones in the CBD. A plastic stent was placed with the intention of a CBD exploration

Cholecystectomy was completed laparoscopically in 28 patients. Only two cases were converted to open cholecystectomy. In the first patient severe inflammation and adhesions were present at the gallbladder area. Because of the intense adhesions at the Calot's triangle we decided to convert the operation to open cholecystectomy with open CBD exploration (Figure. 3.). In the second patient, laparoscopic cholecystectomy was initiated and during dissection the cystic duct was avulsed from its attachment near the bile duct. We decided to perform an open CBD exploration with successful extraction of the stone. Gallbladder removal was completed with closure of the CBD over a T-tube. Only five patients had complications in the form of biliary leak from cystic duct stump in one case, two postoperative bleeding and two wound infection (Table 3).

Table (2): shows the significant differences between grade 1 and grade 4 adhesion ratings between the early and delayed LC groups. The overall proportion of patients with high adhesion grades (grades 3 and 4) was higher in the delayed LC group than in the early group.

**Table 2. Comparison of adhesion grading**

Grade of adhesion	early group (n=30)	Delayed group (n=30)	P value
•1	15 (50%)	6 (20%)	P<0.001**
•2	9 (30%)	7 (23.3%)	
•3	4 (13.3%)	5 (16.7%)	
•4	2 (6.7%)	12 (40%)	

**Table 3. Outcome of patients**

Item	early group (n=30)	Delayed group (n=30)	p-value
Operative time (min) mean ± SD	45.0 ± 12.4	57.4 ± 18.8	P<0.04*
Conversion to open(rate)	0	2 (6.67%)	P=0.483n.s
Length of post-operative hospital stay (days)	2.1 ± 1.1	5.4 ± 2.2	P<0.000***
Post-operative complications:			
•bleeding	0	2(6.67%)	P=0.365n.s
•bile leak	0	1(3.33%)	
•wound infection	0	2(6.67%)	
No (%)			



**Figure 3.** Delayed laparoscopic cholecystectomy after ERCP shows severe pericholecystic adhesions

## DISCUSSION

The outcome of LC following ERCP remains a controversial subject. According to recent study, if LC is achieved early (< 72 hours) then outcome is good (El Nakeeb, 2016). However, many studies claim that delaying LC after ERCP allows the pericholecystic area to cool off and give time to recover from

the acute inflammations (Mann, 2013; Reinders, 2013). But the major pitfall of delaying LC is the incidence of biliary complication, which is as high as 20% (Ko, 2002). On the other hand, Donkervoort et al. reported in 2010 that the interval between LC and ERCP failed to influence the outcome of surgery (Donkervoort, 2010). In our study we compared the results in two groups who underwent ERCP followed by laparoscopic cholecystectomy early and after 4 weeks regarding the safety, hospital stay, conversion rate and complications. In our study, the mean length of postoperative hospital stay in group I ( $2.1 \pm 1$  days) was significantly lower than that of group II ( $5.4 \pm 2.2$  days) and this also was in agreement with a study by Donkervoort et al. (Donkervoort, 2010), who found significant reduction in the hospital stay. The mean length of postoperative hospital stay in group I was shorter than in other studies (Ko, 2002; Donkervoort, 2010; El Nakeeb, 2016; Mann, 2013; Reinders, 2013). The patients in the delayed group have significantly longer hospital stay than patients in the early group, which may be attributed to more postoperative complications in the delayed group. Our study revealed, a higher conversion rate when LC was done 4 weeks following ERCP. There were no conversions in group I. The conversion rate to open cholecystectomy was 6.67 % (2 patients) in Group II only compared from those reported by Meshikhes (1%) (Meshikhes, 1995) and Romano (7.3%) (Romano, 2002). Studies on LC performed within days after ERCP reveal conversion rates as low as those for patients with uncomplicated cholelithiasis and our study is consistent with the study carried out by Bostanci and colleagues (Bostanci, 2010) who demonstrated significant reduction in the conversion rate that was mostly attributed to inflammatory adhesions. Many studies have concluded that ERCP is a predictor of conversion to open surgery and postoperative complications (Sarli, 2013; Ammori, 2003).

This study showed that operating times and severity of adhesions at the gallbladder area were increased in delayed group in whom LC was performed 4 weeks after ERCP. In the present study, the mean operative time in group I was  $45.0 \pm 12.4$  min and in group II was  $57.4 \pm 18.8$  min, i.e. the mean operative time in the early group is shorter than that of the delayed group and this is in concordance with the results of the study carried out by Csendes et al<sup>25</sup>. The operating time was longer in Group II patients who underwent delayed cholecystectomy, mostly attributed to scarring and fibrosis of the biliary tree and gallbladder area. Significantly higher levels of adhesions encountered during surgery have been reported for patients who underwent ERCP (Chandio, 2009; Schachter, 2000). This finding is corroborated in present study, in which a significantly higher grade of adhesions was encountered in patients undergoing LC 4 weeks after ERCP. A causal relationship between ERCP and operative difficulty remains a controversial subject. ERCP is most commonly done for patients in whom biliary pancreatitis and cholangitis develop, who are likely to have peripancreatic and pericholedochal fibrosis. This would be reflected in the adhesion grading. ERCP itself may injure the structures within the hepatoduodenal ligament either because of instrumentation of the biliary duct or as a direct effect of the contrast, causing increased periportal inflammation and scarring. (Boerma, 2002 and Bostanci, 2010). It has been reported that earlier LC is less challenging and can be achieved without significant adverse events (Reinders, 2010; Bostanci, 2010 and Van Baal, 2012). The difference between the two groups comes from the difficulty in the surgery. There were more pericholecystic

adhesions, which is a sign of inflammation, in group 2. Interestingly, during the surgery it was seen that the duodenum was adherent to the common bile duct with loose adhesions. This is probably attributed to inflammation occurring in contrast material infusion and endoscopic instrumentation of the biliary duct during ERCP (El Nakeeb, 2016).

## Conclusion

The optimal management of CBDS is dependent on the skills and techniques of the surgical team available at the hospital. There is no doubt, however, that the early LC after ERCP has some definite advantages over delayed LC 4weeks after ERCP. The current study suggests that early LC after ERCP for the management of cholecysto-choledocholithiasis is a safe, effective, and time saving technique with a low rate of post-operative complications. In the light of our findings we have felt that if patients could be brought to operation earlier after ERCP the morbidity might be substantially reduced.

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