

Challenges of Post ERCP Laparoscopic Cholecystectomy versus Elective Cholecystectomy

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Background: Laparoscopic cholecystectomy (LC) post Endoscopic retrograde cholangio-pancreatography (ERCP) with endoscopic sphincterotomy (ES) is accepted as treatment of choice for choledocholithiasis. Studies have demonstrated that LC after ES is associated with difficulties, complications and higher conversion rate. Our study was to assess the challenges and complexities of LC after ERCP compared with standard elective LC for symptomatic uncomplicated cholelithiasis and assess the stenting effect when inserted on the following cholecystectomy and detect other factors that may cause post ERCP cholecystectomy challenges and complexities.

Patients and methods: Prospective controlled clinical trial was conducted over 50 patients : (Group A 25 patients) who had undergone a previous ERCP for choledocholithiasis (PES) and (Group B 25 patients) with cholelithiasis with no previous intervention before LC (NPES).

Results: Patients in PES group had higher risks for longer operative time (mean 36 min) which is statistically highly significant, the conversion rate in the PES group and the NPES group (12% versus 0%), were not statistically significant, duration of post-operative hospital stay in the PES group was longer than NPES group (statistically highly significant), there was more difficulty in achieving the critical view of safety in the PES group (easily achieved in 52%) than NPES group (easily achieved in 92%) (Statistically different), the amount of post-operative drain was higher in the PES group (30-300 ml sero-sanguinous fluid) than the NPES group (15-30 ml serosanguinous fluid) (statistically highly significant).

Conclusion: Laparoscopic cholecystectomy post ERCP especially when delayed or stent was inserted is a challenge for any surgeon with higher complexity and longer operative time and more conversions to open cholecystectomies with more difficulty to achieve critical view of safety. So, it has to be done by an experienced surgeon and rendezvous ERCP with laparoscopic cholecystectomy in same setting is advised with further prospective studies is needed with proper timing of interventions.

Key words: ERCP, cholecysto-lithiasis, sphincterotomy, stent, CBD.

Introduction

Endoscopic retrograde cholangio-pancreatography (ERCP) is indicated patients who have clinical features and radiologic evidence of CBD stones.¹

Elective laparoscopic cholecystectomy (ELC) has risk of more complications after ERCP, with longer operative times, increased bleeding insults, and with higher conversion rate to open cholecystectomy, cause for these risks and complications is not fully understood, and these may be attributed to the severity of gallstone disease or because of ERCP.²

Previous studies have shown that LC after ES is more difficult than LC for uncomplicated cholelithiasis.³

ERCP itself may cause harm to structures in the hepato-duodenal ligament either during instrumentation and dissection of the biliary tract

or as a direct contrast effect that causes peri-portal inflammation and fibrosis.³

The conversion rate after a previous ES has been reported to be as high as 8–55% versus 5% in patients with uncomplicated disease.⁴

It may be due to disruption of sphincter of Oddi and bacterial colonization and translocation into biliary tract leading to inflammation and subsequent scarring of the hepatoduodenal ligament hindering dissection of Calot's triangle and promote adhesions which is not easy to dissect, this theory of reflux and bacterial colonization is strengthened by the finding that bile in patients who have undergone a sphincterotomy during ERCP is colonized in about 60% of patients.⁵

LC is more difficult after ES it might be helpful to

these patients to be operated by an experienced laparoscopic surgeon to decrease the risk of conversion and subsequent complications.⁶

The conversion rate is affected by the learning curve of surgeons and their skills. The surgeons performing LC during their learning curve are associated with a high conversion rate.⁷

Aim of the work

The study was to assess the challenges and complexities of LC after ERCP compared with elective LC for symptomatic uncomplicated cholecystolithiasis and assess the stenting effect when inserted on the following cholecystectomy and detect other factors that may cause post ERCP cholecystectomy challenges and complexities.

Patients and methods

This study was a prospective controlled clinical trial conducted at Ain Shams University Hospitals on two groups of patients 50 patients during period from June 2018 to June 2019 with follow up for 3 months. Group A (25 patients) patients who had undergone a previous ERCP for choledocholithiasis and Group B (25 patients) with cholecystolithiasis who had no previous intervention prior to LC.

We included any adult patient with cholecystolithiasis.

We excluded patients with previous abdominal surgery and patients with liver diseases and those with a history of biliary stricture, cholangitis, hepatopancreato-biliary malignancy, prior bile tree surgery, or prior PTC drainage.

Informed consent was taken from all patients accepted to participate in the study. Risks, complications and alternative procedures were explained to the patient. Confidentiality was assured of the personal data and medical information of all patients.

Technique

We standardize procedures in both groups

For Group A: Patients were prepared to LC within one month to 40 days after ERCP this is due to difficulties in admitting patients to operations as soon as possible due to waiting lists. The number of days between ERCP and LC (the interval) was counted from last ERCP (complete duct clearance or stent insertion after clearance) till the day of operation. Stenting is confined to patients either had stricture, stone passer, or delayed cholecystectomy after ERCP is highly suspected.

Procedure

The laparoscopic cholecystectomy in both groups was carried out using a standard four-trocar technique (**Figure 1**). Prophylactic antibiotic was

not routinely administered. After achievement of critical view of safety cystic artery and duct were clipped and transected (**Figures 2,3**), the gallbladder was removed. Drain inserted in all operations of two groups for 24 hours to detect amount and nature of drained fluid. When indicated conversion was done by right subcostal incision.



Fig 1: Standard four trocar technique for laparoscopic cholecystectomy.

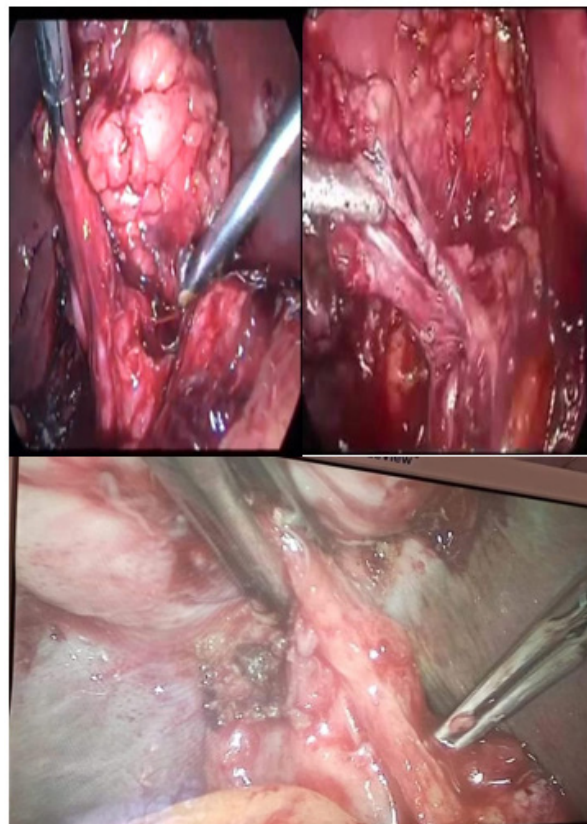


Fig 2: Difficulty in achieving critical view of safety due to severe adhesions in PES group.

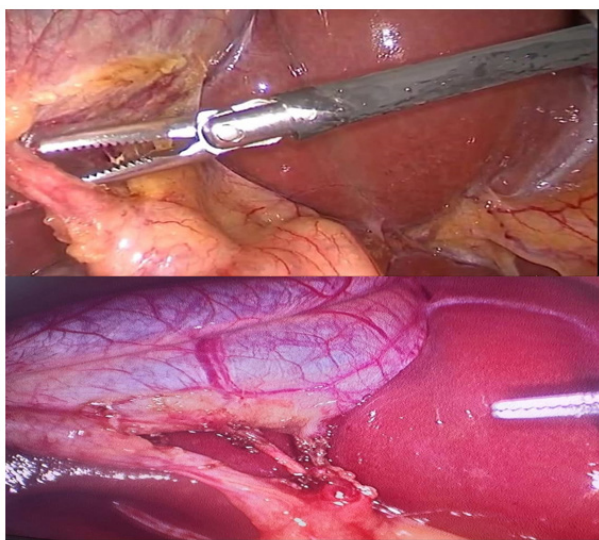


Fig 3: Easy access to critical view of safety in NPES group.

Outcome parameters and intra and postoperative assessment:

Length of the surgical procedure, conversion rate, uncontrollable bleeding, bile leakage during operations, difficulty in achieving critical view of safety, color and amount of drained fluid and post-operative hospital stay were recorded for all patients. All patients were followed for 3 months. Complications were recorded during hospital stay and outpatient clinic visits.

Results

Data management and analysis: Data were

revised, coded, entered on a computer and analyzed using SPSS package version number 20. Quantitative data were tested for normality with Shapiro-Wilk test and described as mean, standard deviation (SD) and range. Student t-test was used for comparing quantitative variables between two study group. Qualitative data were expressed as frequencies (n) and percentage (%). Fisher exact test was used to test the association between qualitative variables. P-value ≤ 0.05 was considered significant.

25 patients actually underwent a cholecystectomy after ERCP, 12 patients were operated within 30 days, and 13 patients were operated from 30-40 days from ERCP. Successful ERCP was 100%, all patients had CBD stones, and successful ductal clearance was done in 15 patients with no stent were inserted (60%), the remaining 10 patients (40%) underwent stenting after ductal clearance due to either stricture, stone passer, or delayed cholecystectomy after ERCP is highly suspected , post procedural pancreatitis developed in 1 patient (4%). These data are shown in **Table 1**.

Table 1: ERCP outcomes

ERCP Parameter	No. (%)
Completion rate	25 (100)
CBD stones	25 (100)
Successful clearance with no stenting	15 (60)
Stented after ductal clearance	10 (40)
Post ES pancreatitis	1 (4)

Table 2: Patient characteristics

Patients	PES (n=25)	NPES (n=25)	P-value	Significance
Age (years)				
Mean (SD)	37.92 ± 8.93	37.48 ± 9.38	0.866	Non-significant
Male to female	(1:1.5)	(1:1.2)	0.0128	Non - significant

SD: Standard deviation.
 PES: Previous ERCP.
 NPES: No previous ERCP.

There was no significant difference in age between the PES and NPES groups. In the PES group. There

was no difference in male to female ratio.

Table 3: Procedural characteristics

		PES (n=25)	NPES (n=25)	P-value	Significance
Length of procedure (min)	Mean (range)	89(60-120)	53(42-70)	0.000	Highly significant

The mean length of LC was 36 min longer for the PES group compared with the NPES group

($P < 0.001$) which is highly significant.

Table 4: Conversion rate comparison in PES group and NPES group

		PES (n=25)	NPES (n=25)	P-value	Significance
conversion		3 (12%)	0 (0.0%)	0.074	Non -significant

There were three conversions in the PES group (12%), in the NPES group there were zero

conversions (0%) (**Figure 4**).

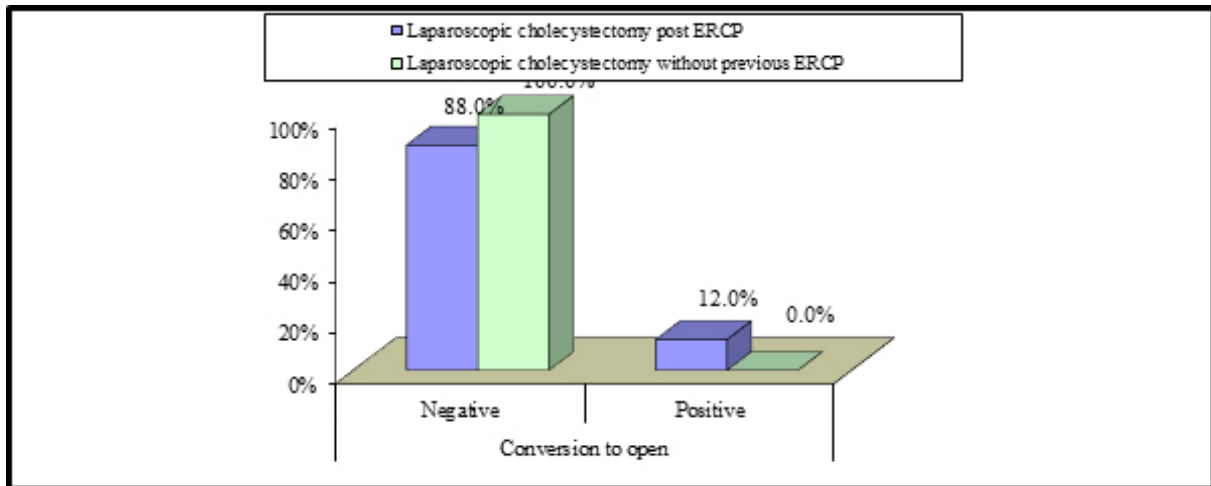


Fig 4: Chart shows conversion rate in the PES group and NPES group.

Table 5: Comparison between PES and NPES according to complications and post-operative hospital stay

		PES (n=25)	NPES (n=25)	P-value	Significance
Complications		3 (12%)	2 (8%)	0.476	Non -significant
Post-operative hospital stay (days)	Mean (range)	2 (1-3)	1 (1-1)	0.000	Highly significant

Table 6: Comparison between PES and NPES according to Uncontrollable bleeding during operation

	PES (n=25)	NPES (n=25)	P-value	Significance
Uncontrollable bleeding during operation	3 (12%)	0 (0.0%)	(0.074)	Non-significant

During the operation, there was uncontrollable bleeding during operation from cystic artery in three patients in the PES group (12%) due to severe

adhesion and unclear anatomy, while there were no cases of uncontrollable bleeding in the NPES group (0.0%).

Table 7: Comparison among both groups as regard amount of post-operative drained fluid

	PES (n=25)	NPES (n=25)	P-value	Significance
Amount of drained fluid				
Mean (Range)	80(30-300)	20(15-30)	<0.001	Highly significant

Amount of post-operative drained fluid is higher in the PES group (30-300 ml sero-sanguinous fluid)

more than in the NPES group (15-30 ml sero-sanguinous fluid) (p-value <0.001).

Table 8: Comparison between two groups as regard difficulty to achieve critical view of safety (CVS)

	PES (n=25)	NPES (n=25)	P-value	Significance
Number of patients with difficult to achieve CVS	12 (48%)	2 (8%)	<0.001	Highly significant

CVS: critical view of safety.

There were difficulty in achieving critical view of safety intraoperative in 12 cases (48%) in the PES group, while there were difficulty in achieving

critical view of safety in only 2 cases (8%) in the NPES group (p-value <0,001).

Table 9: Difficulty to achieve critical view of safety according to stent insertion among PES group

	PES with stent (n=10)	PES without stent (n=15)	P-value	Significance
Number of patient with difficulty to achieve CVS	8 (70%)	4 (26%)	<0.001	Highly significant

There was higher risk of difficulty in achieving critical view of safety in PES group with stent (70%) more than others without stent (26%) with

statistically highly significant. as stent causes periductal fibrosis.

Discussion

Data showed that patients who have undergone an ERCP for choledo-cholelithiasis are more liable to difficult cholecystectomy, compared with patients with LC without ERCP.

Our study was conducted on two groups of patients undergoing LC. Although there were no statistically significant differences in rates of major complications, more challenges and complexity during cholecystectomy after ERCP were demonstrated.

LC after ERCP makes it difficult due to adhesions at the area of Calot's triangle, besides the risk of second-time anesthesia,⁷ more adhesions were found during LC after ERCP.²

Complications occurred in three patients from PES group (12%) and in two patients in NPES group. 25 patients actually underwent a cholecystectomy after ERCP, 12 patients were operated within a month, and 13 patients were operated after 40 days. successful ERCP was 100%, all patients had CBD stones, and successful ductal clearance was done in 15 patients (60%), the remaining 10 patients (40%) underwent stenting, post procedural pancreatitis developed in 1 patient (4%).

No significant difference in age and sex between PES and NPES groups.

Although there was a higher conversion rate of LC after ERCP compared with LC without previous ERCP, but this difference fails to reach statistical significance (P-value = 0.074). There were three conversions in the PES group, two cases because of difficult visualization and difficulty to achieve critical view of safety with bleeding and one due to bleeding from short cystic artery. In the NPES group there were no conversions. Our study is in agreement with studies that showed a 6 fold higher conversion rate of LC after ERCP compared with LC for uncomplicated cholelithiasis.⁶

The conversion rate after a previous ES has been reported to be as high as 8–55% versus 5% in patients with LC without previous ERCP. Conversion to open cholecystectomy is associated with increased post-operative pain, pulmonary complication, longer hospital stay and slow recovery to normal daily activities.⁴

The conversion rate is affected by learning curve and skills of the surgeons. The surgeons performing LC during their learning curve are associated with a higher conversion rate.⁷

Amount of post-operative drain is more in PES group

(mean=80 ml) than in NPES group (Mean =20 ml) (p-value <0.001) which is significantly statistically different. It could be attributed to minor bleeding from dissecting adhesions and use of saline wash to ensure good hemostasis especially in cases that converted to open surgeries and those with stent inserted.

Critical view of safety was hard to be achieved in 12 cases in the PES group, especially when stent was inserted, while it were hard to be achieved in only 2 cases in the NPES group (p-value <0,001) which is of high statistical significance. There was difficulty in achieving it in PES group with stent (70%) more than others without stent (26%) which is of high statistical significance.

The mean length of LC was 36 min longer for the PES group compared with the NPES group (P<0.001) which is highly significant. Long duration of the operation could be attributed to complexity of the procedure and severe adhesions in the PES group.

The median operative time in NPES group was 53min and in PES group was 89min, (P<0.001) and it is statistically significant and reflects the complexity of procedure post ERCP. It is agreed with a study that showed significant longer duration of LC in PES group in comparison with NPES group.⁶

In our study, there was longer hospital stay in PES group as there more patients in PES were converted to open cholecystectomy which is statistically different, longer anesthesia time, and more postoperative complications such as wound infection and post-operative pain and chest infection and this is consistent with the results of other studies,^{4,6} But in contrast other study showed that there was no difference in hospital stay between the two groups.⁸

In our study there were three cases of uncontrollable bleeding while exploring the calot's triangle due to injury of cystic artery and failure to control bleeding with clips in the PES group, in addition to unclear anatomy so the decision for conversion was taken, while no cases were converted in the NPES group although lower cases but failed to reach statistical significance. Various factors such as improper technique and handling instruments and inability to recognize the anatomy contribute to occurrence of bleeding.⁹

Dissection during LC, especially the Calot's triangle, can lead to bleeding if the right hepatic artery or the portal vein is injured. This can also happen when the anatomy is distorted or unrecognized, and when there is persistence in using sharp dissection in a difficult Calot's, leading to bleeding and because of blind attempts to control the bleeder. Not being

able to recognize the extent of injury and delaying conversion in such a situation definitely contributes to increasing the morbidity and mortality of the procedure.¹⁰

In our study patients were admitted within 40 days after ERCP this is due to waiting lists which may delay operative admissions for cholecystectomy after ERCP. We are convinced that early cholecystectomy after ERCP is safer and less liable for fibrosis and complications. It is also supported with another study that shows that early cholecystectomy after ERCP within 72 hours is safer.¹¹ Delay of admissions for operations could be a confounder and affects the outcomes. So, single-stage management might be considered as the preferred approach but due to the existence of heterogeneity as patient's condition and operator's experience these findings should be taken into account in making treatment decisions.

This is supported with a study that demonstrated that after ERCP Culture growth was significantly higher, and fibrosis/collagen deposition in the gallbladder wall with injury to the mucosal epithelium was significantly more frequently detected by histopathological examination in the moderate and late period LC groups (moderate; 72 h–6 weeks, and delayed; 6–8 weeks) than in the early period LC group (within 72 hours) ($p < 0.05$). Collagen deposition and damage to the mucosal epithelium were detected more in the moderate and delayed period LC groups than in the early period LC group. So, over a period of time, inflammation and the use of a contrast agent may increase the formation of fibrosis after ERCP.¹¹

Conclusion

Laparoscopic cholecystectomy post ERCP especially when delayed or stent was inserted is a challenge for any surgeon with higher complexity and longer operative time and more conversions to open cholecystectomies with more difficulty to achieve critical view of safety. So, it has to be done by an experienced surgeon and rendezvous ERCP with laparoscopic cholecystectomy in same setting is advised with further prospective studies is needed with proper timing of interventions.

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