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**Research Article**

# A study to assess the outcome of patients undergoing laparoscopic cholecystectomy post ERCP

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## ABSTRACT

**Background:** Choledocholithiasis is prevalent in 8 to 20 percent of patients with cholelithiasis. Of all the treatment options available, laparoscopic cholecystectomy post ERCP is one of the most commonly used modality. Surgeons have always experienced difficulties while performing a laparoscopic cholecystectomy post ERCP due to adhesions induced by ERCP. This study was to investigate this modality further to assess the difficulty during the procedure and the possible factors influencing this.
**Methods:** Patients post ERCP who underwent interval laparoscopic cholecystectomy was studied in a tertiary care centre in the urban setting.
**Results:** Out of the 40 patients studied over the 18 month period, 14 (35%) underwent conversion to open cholecystectomy. Calot's triangle adhesions were the most common cause of conversion. Multiple ERCP sessions positively influenced the chance of conversion (P-value 0.014). Intraoperative bleeding was directly related to the Calot's triangle adhesions which subsequently increased the chance of post-operative bile leak (P-value 0.022). No mortalities were encountered during the course of the study.
**Conclusions:** Laparoscopic cholecystectomy in post ERCP patients is difficult but safe.

**Keywords:** ERCP, Choledocholithiasis, Sphincterotomy

## INTRODUCTION

Incidence of choledocholithiais is around 8 to 20 percent among patients of cholelithiasis.[1] Multiple different treatment modalities have been in practice. ERCP followed by laparoscopic cholecystectomy has been the most widely used modality. The procedure includes performing ERCP to remove the CBD stones. During the procedure, radio opaque dye is injected into the CBD to visualise the CBD. This dye induces inflammation at the CBD and surrounding structure which can lead to fibrosis. During the procedure of laparoscopic cholecystectomy, dissection of the cystic duct off the CBD marks one of the most important steps of the procedure. Obtaining the critical window between the cystic duct and the CBD helps in safe clipping of the cystic duct and artery. The fibrosis induced during the ERCP procedure can lead to adhesions at the Calot's triangle. This makes the dissection around the Calot's triangle difficult and may lead to inadvertent injury to common bile duct. There have also been reports of increase in the hospital stay and other postoperative complications in these patients. This study aims at observing and analyzing the outcome of post ERCP laparoscopic cholecystectomy. This study was conducted in a tertiary care centre in an urban area.

## METHODS

This is a prospective observational study conducted between January, 2014 and December, 2015. Forty patients were enrolled with imaging (using ultrasonography or CT scan) proven choledocholithiasis. Written informed consent was taken after explaining the nature of the study to the patients. These patients underwent ERCP with sphincterotomy with or without stenting of common bile duct. There was no reported complications post ERCP. Patients with multiple sessions of ERCPs were also included. Patients underwent a detailed pre-operative evaluation for co-morbidities which were controlled before cholecystectomy. The exclusion criteria included uncontrolled co-morbidities, patients in paediatric age group, deranged liver and renal function tests, previous upper abdominal surgery, patients undergoing and additional procedure along with laparoscopic cholecystectomy. These patients underwent a standard four port laparoscopic cholecystectomy after a minimum time period of four weeks after ERCP. The procedures were done under general anaesthesia. Procedures that encountered difficulty were converted to open cholecystectomy using a subcostal incision. The intraoperative findings like intra operative adhesions at Calot's triangle and gall bladder fossa, blood loss (arbitrarily decided as greater than 50 ml.) and operative time were noted. Patients were started on liquid diet in the evening of day of surgery. Post-operative course in ward was noted based on post-operative bile leak, bleeding, wound infection and time to discharge. The data was analysed using chi square and ANOVA tests using SPSS 21 software.

## RESULTS

The mean age of patients included was 41.9 years with standard deviation of 12.95 years. Out of 40 patients enrolled, 67.5% (n=27) were females. Statistical analysis showed that presence of adhesions at Calot's triangle (n=34) increased the chances of intraoperative bleeding (p=0.0019). However there was no statistical difference on comparing incidence of adhesions at Calot's triangle in patients with single session of ERCP (n=37) vs multiple sessions of ERCP (n=3). Also there was no statistically significant difference in the incidence of bleeding while dissection when comparison was made between single session ERCP group (n=20 of 37) and multiple session ERCP group (n=3 of 3).

Fourteen of the forty subjects (35 percent) underwent conversion to open cholecystectomy. Adhesions at Calot's triangle were the major reason for conversion in all the patients (present in all patients). Although these patients also had significant bleeding and gall bladder fossa adhesions intra operatively; they were not the prime reason for conversion. The subjects were categorised on the basis of number weeks between ERCP and surgery (Table1).

**Table 1: Conversion in patients on basis of timing of surgery post ERCP.**

| Timing of surgery | No. of patients | Conversion | Percentage |
|---|---|---|---|
| 4-6 weeks | 1 | 0 | 0 % |
| 6-8 weeks | 17 | 6 | 35% |
| 8-10 weeks | 8 | 1 | 12.5% |
| >10 weeks | 14 | 7 | 50% |

**Table 2: Operative time in minutes (excluding conversion).**

| | N | Mean | Std. deviation | Std. error | 95% confidence interval for mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower bound | Upper bound | | |
| 4-6 weeks | 1 | 90.0000 | - | - | - | - | 90.00 | 90.00 |
| 6-8 weeks | 11 | 90.9091 | 29.39542 | 8.86305 | 71.1610 | 110.6572 | 45.00 | 140.00 |
| 8-10 weeks | 7 | 88.5714 | 13.45185 | 5.08432 | 76.1305 | 101.0123 | 70.00 | 110.00 |
| 4 >10 weeks | 7 | 99.2857 | 44.19922 | 16.70574 | 58.4082 | 140.1632 | 45.00 | 180.00 |
| Total | 26 | 92.5000 | 29.60574 | 5.80616 | 80.5420 | 104.4580 | 45.00 | 180.00 |

Out of the patient who underwent cholecystectomy, the mean time interval between ERCP and cholecystectomy was 4.1023 weeks. The mean time interval in patients who underwent conversion to open technique was 6.859 weeks. The data was analyzed using ANOVA test and there was no significant association between timing of surgery and conversion (p >0.05). Out of the 14 patients needing conversion, 3 patients had history of more than one session of ERCP. On the other hand, 26 patients in whom the procedure could be completed laparoscopically, all the patients had only one session of ERCP. This data was compared using chi square test which showed that the difference was statistically significant (p=0.014). Multiple ERCP sessions increase the chance of conversion. The mean operative time on patients on whom the procedure could be completed

laparoscopically was 92 minutes with a standard deviation of 29.6 minutes. The impact of timing of surgery and its impact on operative time was compared (Table 2). The data was categorised into groups depending on the timing of surgery and operative time. ANOVA test was performed which showed no significant difference in any group.

## DISCUSSION

A study of 40 patients was undertaken to study the outcome of laparoscopic cholecystectomy in patients who have undergone endoscopic retrograde cholangiopancreatography for choledocholithiasis in a tertiary care hospital in urban setting.

### *Demographic profile*

Out of the 40 patients studied, 67.5% were women and rests were males. In a similar study published by Schmitt et al, 63.46% patients were females and the rest were males.[2] The mean age of the patients who underwent a laparoscopic cholecystectomy post ERCP was 41.9 years with a standard error of 2.049. Most of the patients in the study were between the age of 21 and 60 years. These findings were also corroborated in another study by Cakir et al, which included 80 (65%) females and 42 (35%) males.[3] The reason for the increased incidence of choledocholithiasis in the above mentioned age group is the increased prevalence of cholelithiasis in middle aged females. The reason for this is the estrogenic activity in females which leads to increased concentration of cholesterol in bile, leading to the increased propensity for stone formation.[4,5]

### *Conversion rate*

Out of the forty patients who were taken up for laparoscopic cholecystectomy, 14 (35%) of them had to be converted to an open technique. In a study published by Cakir et al, the rates of conversion to open cholecystectomy was 9.8 percent.[3] The causes of conversion in present study were adhesions at Calot's triangle (n=14) and intra operative bleeding. Adhesions being the most common followed by bleeding. Cakir et al, found adhesions to be the main cause of conversion.[3] Ahn et al. also had higher incidence of intraoperative inflammation and adhesions and higher rates of conversion in patients with pre-operative ERCP.[6] In a similar setting, Bostanci et al. had a conversion rate of 14%.[7] Allen et al had higher incidence of conversion in patients with pre-operative ERCP, also concluded that preoperative serum bilirubin levels greater than 5 mg/dl can be an effective predictor of conversion.[8] Patients with raised bilirubin were excluded, this finding could not be corroborated.

### *Timing of surgery and its impact on conversion to open cholecystectomy*

Out of the patient who underwent cholecystectomy, the mean time interval between ERCP and cholecystectomy was 4.1023 weeks. The mean time interval in patients who underwent conversion to open technique was 6.859 weeks. Statistical analysis also proved that there was no significant difference in conversion rate in different groups after four weeks of ERCP.

Bostanci et al included patients of interval cholecystectomy in their study, and found that timing of cholecystectomy after ERCP has no impact on its outcome.[7] Ahn et al found that there is no significant impact of timing of surgery post ERCP on its outcome.[6] This study was also performed in a setting similar to present study.

According to Sahu et al, there is no difference on the outcome of laparoscopic cholecystectomy if performed 4 weeks after the ERCP.[9] This could be because of the fact that the inflammatory process around the Calot's triangle settles by the end of 4th week and the fibrosis mature (remodeling) around the same period.

### *Number of sessions of ERCP and its impact on conversion*

Out of the 14 patients in the study who underwent conversion to open cholecystectomy three had more than one session of ERCP (the cause being stent blockage). The remaining patients who were operated laparoscopically, had only one session of ERCP. These two subgroups were compared and the difference was statistically significant (P-value 0.014119296). Hence number of ERCP sessions, positively affect conversion. The main reason for this could be the increased amount of inflammation caused by the repeated stenting or injection of dye during the injection of radio contrast dye during the procedure. Hence, caution must be exercised while taking up the patient for laparoscopic cholecystectomy with multiple sessions of ERCP. The patient must be explained pre operatively regarding the possibility of conversion to open cholecystectomy. However, there were only three patients of multiple sessions of ERCP in the study. A larger number of patients with multiple ERCP are needed to confirm the finding with greater authority. The above mentioned finding was corroborated by Bostanci et al in his study; who found that there was increased incidence of conversion in patients of multiple sessions of ERCP.[7]

### *Adhesions at the Calot's triangle*

In the study it was found that 85%percent of the patients had adhesions at the Calot's triangle. This was the most common cause for difficulty during laparoscopic cholecystectomy post ERCP. These adhesions led to difficulty in obtaining the critical angle adequately thus

making the delineation of common bile duct more difficult. These adhesions may also cause inadvertent injury to the aforementioned structures leading to dangerous and potentially life threatening complications. These adhesions may also cause accidental transection of the cystic artery leading to intra operative bleeding

***Adhesions at the gall bladder fossa***

These adhesions were found in 50% of patients. Classified as Class III adhesion in classification by Bat et al, these adhesions were responsible for bleeding during dissecting the gall bladder off the gall bladder fossa.[10] This led to bleeding from the liver bed and occasionally accidental intra operative perforation of the gall bladder. The latter led to spillage of bile in the peritoneal cavity along with stones. In this scenario a thorough wash with normal saline is warranted along with removal of the spilled gallstones; thus prolonging the operative time. These adhesions generally don't lead to conversion of the procedure to open technique. The incidence of GB fossa adhesion in patients operated before and after 8 weeks was similar and statistically insignificant.

***Intra operative bleeding***

Excessive intra operative bleeding was taken to be in excess of 50 ml. In the study 57.5% of patients had bleeding in excess of 50 ml. This bleeding was most commonly seen when the patients had excessive adhesions in the Calot's triangle. Adhesions at the gall bladder fossa were not a major contributor to the bleeding. Excessive bleeding was found in almost all patients of conversion (13 out of 14) and was a major cause for conversion along with other factors with a P-value of 0.000902, which is significantly higher. In a study Cakir et al reported higher rates of conversion due to bleeding. Study also reported that bleeding was the reason of conversion in 47% of the cases.[3]

Intra operative bleeding was compared to presence of adhesions at the Calot's triangle and the results were statistically significant (P-value of 0.001999). The increased bleeding is due to the injury to the minor vessels while separation of adhesions and sometime due to the accidental injury to the cystic duct. In such a scenario, careful dissection and cauterisation of the bleeder should be done; with an open mind to conversion as and when the bleeding is uncontrollable laparoscopically.

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