

## MANAGEMENT OF CHOLEDOCHOLITHIASIS IN PAKISTAN: A COMPARISON OF ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY AND LAPAROSCOPIC COMMON BILE DUCT EXPLORATION

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**Abstract:** *The objective of this study was to compare the management outcomes of endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic common bile duct exploration (LCBDE) for choledocholithiasis in Pakistan, based on a sample size of 150 patients. A retrospective analysis was conducted on 150 patients diagnosed with choledocholithiasis who underwent either ERCP (n=75) or LCBDE (n=75) at a tertiary care hospital in Pakistan. Patient demographics, procedure-related variables, postoperative outcomes, and complications were collected and analyzed. Primary outcome measures included stone clearance rates, procedure-related complications, length of hospital stay, and cost-effectiveness. The study included 150 patients, with 75 in each group. The stone clearance rate was significantly higher in the LCBDE group (82.7%) compared to the ERCP group (68.0%). However, the ERCP group had a lower incidence of procedure-related complications (12.0%) than the LCBDE group (24.0%). The mean length of hospital stay was shorter in the ERCP group (4.2 days) compared to the LCBDE group (6.1 days). Cost analysis revealed that ERCP was more cost-effective than LCBDE. In managing choledocholithiasis, ERCP and LCBDE are effective treatment options in Pakistan. LCBDE demonstrated a higher stone clearance rate (82.7%), while ERCP had a lower incidence of procedure-related complications (12.0%) and a shorter length of hospital stay (4.2 days). In terms of cost-effectiveness, ERCP was found to be more favorable.*

**Keywords:** Endoscopic Retrograde Cholangiopancreatography, Choledocholithiasis, Laparoscopic Common Bile Duct Exploration, Complications, Gallstones.

### Introduction

Choledocholithiasis, the presence of gallstones in the common bile duct, is a common biliary disorder that poses a significant healthcare challenge in Pakistan. The management of this condition requires careful consideration of various treatment options, including endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic common bile duct exploration (LCBDE) (Li et al., 2022). These two techniques have emerged as the primary modalities for removing choledocholithiasis and have shown promising outcomes in terms of efficacy and safety. In Pakistan, the burden of choledocholithiasis is substantial, with many patients presenting with symptoms such as jaundice, abdominal pain, and biliary obstruction (Sorensen et al., 1994). These patients' timely and appropriate management is crucial to prevent further complications and improve overall outcomes. Given the availability of both

ERCP and LCBDE as treatment options, evaluating and comparing their effectiveness in the local context is imperative. ERCP, a minimally invasive endoscopic procedure, involves using a specialized scope to access the biliary system and remove gallstones (Bektas et al., 2014). It has gained popularity due to its non-surgical nature and ability to diagnose and treat choledocholithiasis simultaneously. On the other hand, LCBDE is a surgical technique that combines laparoscopy with intraoperative cholangiography to directly explore and clear the common bile duct of stones (Bansal et al., 2016).

The choice between ERCP and LCBDE depends on various factors, including patient characteristics, stone characteristics, technical expertise, and available resources. The optimal management strategy selection is crucial to ensure successful stone

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clearance, minimize complications, and reduce the need for additional interventions. However, limited data compares ERCP and LCBDE outcomes, specifically in the Pakistani population. Furthermore, understanding the local context is crucial when comparing the management of choledocholithiasis in Pakistan (Ding et al., 2014). The healthcare system in Pakistan faces unique challenges, such as limited resources, variations in expertise and infrastructure, and disparities in access to healthcare services across different regions. These factors can significantly impact the choice of treatment modality and the subsequent outcomes for patients. Endoscopic retrograde cholangiopancreatography (ERCP) has gained popularity worldwide due to its non-surgical nature and relatively low invasiveness. It can be performed in specialized endoscopy centers and does not require a hospital stay. ERCP offers the advantage of simultaneous diagnosis and therapeutic intervention, making it an attractive option for managing choledocholithiasis. However, it requires a skilled endoscopist and access to advanced endoscopic equipment, which may be limited in certain regions of Pakistan (Everhart et al., 2002).

On the other hand, laparoscopic common bile duct exploration (LCBDE) is a surgical technique that combines laparoscopy with intraoperative cholangiography. This approach allows for direct visualization and clearance of the common bile duct, ensuring complete stone removal. LCBDE can be particularly beneficial in cases where ERCP is technically challenging, such as when there are large stones or anatomical variations. However, it requires surgical expertise, specialized instrumentation, and an operating theater for laparoscopic procedures. The comparison between ERCP and LCBDE in the Pakistani context must consider factors such as procedural success rates, complications, hospital stay duration, overall costs, and long-term outcomes (De Silva et al., 2022). Patient preferences and acceptance of different treatment modalities also play a significant role in decision-making. Cultural and societal factors may influence patients' perceptions of surgery and endoscopy, impacting their treatment choices. This study aims to provide comprehensive data on managing choledocholithiasis in Pakistan, comparing the effectiveness and feasibility of ERCP and LCBDE. By evaluating these techniques' clinical outcomes and cost-effectiveness in the local healthcare system, we can guide healthcare providers in selecting the most appropriate intervention for their patients (Ghazanfor et al., 2017).

The study's main objective is to compare the management outcomes of endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic common bile duct exploration (LCBDE) for choledocholithiasis in Pakistan.

## Methodology

This retrospective analysis involved a review of medical records of patients diagnosed with choledocholithiasis who underwent either endoscopic retrograde cholangiopancreatography (ERCP) or laparoscopic common bile duct exploration (LCBDE) at a tertiary care hospital in Pakistan. The study included 150 patients, with 75 patients in each group (ERCP and LCBDE). Patients were selected based on the availability of complete medical records and a confirmed diagnosis of choledocholithiasis. Patients diagnosed with choledocholithiasis based on clinical evaluation, imaging studies (such as ultrasound or magnetic resonance cholangiopancreatography), or endoscopic findings who underwent either ERCP or LCBDE as the primary treatment modality for choledocholithiasis, aged 18 years or older and patients with complete medical records available for review were included in the analysis. Whereas the patients who underwent alternative treatment modalities for choledocholithiasis, such as open common bile duct exploration or percutaneous transhepatic cholangiography, with a history of previous biliary surgery or interventions that could significantly impact the technical feasibility or outcomes of ERCP or LCBDE and patients with contraindications to ERCP or LCBDE, such as severe coagulopathy, uncontrolled bleeding disorders, or hemodynamic instability or who underwent a combined approach, involving both ERCP and LCBDE, for stone clearance were excluded from the study.

Data for this retrospective analysis were collected from the medical records of 150 patients diagnosed with choledocholithiasis who underwent either ERCP or LCBDE at a tertiary care hospital in Pakistan. A standardized data collection form was used to ensure consistent and comprehensive recording of relevant information. This form captured patient demographics, including age and gender, as well as comorbidities. Stone characteristics, such as size and number, were documented along with associated biliary complications. Procedure-related variables, including technical success, procedural time, and adjunctive procedures, were also recorded. Postoperative outcomes such as stone clearance rates, procedure-related complications (bleeding, perforation, and pancreatitis), length of hospital stay, and readmission rates were assessed. Additionally, cost-related data, including procedure and hospitalization expenses, were collected. A rigorous quality control process was implemented to maintain data integrity, including data validation and cross-checking.

In addition to the clinical data collected from the medical records, biochemical analysis results were

included in this retrospective analysis. These results provided valuable information regarding the preoperative and postoperative biochemical profiles of the patients with choledocholithiasis. The preoperative biochemical analysis involved the assessment of liver function tests, including serum levels of total bilirubin, direct bilirubin, alkaline phosphatase (ALP), alanine aminotransferase (ALT), and aspartate aminotransferase (AST). These parameters were used to evaluate the degree of biliary obstruction and liver injury caused by choledocholithiasis. The postoperative biochemical analysis focused on monitoring these liver function parameter changes following the ERCP or LCBDE procedure. It aimed to assess the effectiveness of stone clearance and the restoration of normal biliary flow. Decreased total bilirubin levels, direct bilirubin, ALP, ALT, and AST indicated successful stone removal and improved biliary drainage.

The primary outcome measures of this study included stone clearance rates, procedure-related complications, length of hospital stay, and cost-

effectiveness. Stone clearance rates were determined based on post-procedure imaging or documentation of stone retrieval. Procedure-related complications, such as bleeding, perforation, and post-procedure pancreatitis, were documented according to established criteria. The length of hospital stay was calculated from the day of the procedure to the day of discharge. Cost-effectiveness was assessed by considering the procedural costs and hospitalization expenses.

Statistical analysis was performed using appropriate statistical software. Descriptive statistics were calculated for patient demographics and procedure-related variables, including means, standard deviations, frequencies, and percentages.

**Results**

The retrospective analysis included 150 patients, with 75 patients in each group (ERCP and LCBDE) who underwent treatment for choledocholithiasis.

**Table 01: Demographic data of selected participants**

Patient Characteristics	ERCP Group (n=75)	LCBDE Group (n=75)
Total Number of Patients	75	75
Age (mean ± SD)	57.2 ± 10.4	55.8 ± 11.2
<b>Gender</b>		
- Male	40 (53.3%)	38 (50.7%)
- Female	35 (46.7%)	37 (49.3%)
<b>Comorbidities</b>		
- Hypertension	18 (24.0%)	20 (26.7%)
- Diabetes Mellitus	12 (16.0%)	15 (20.0%)
- Cardiovascular Disease	9 (12.0%)	7 (9.3%)
- Others	10 (13.3%)	12 (16.0%)
<b>Radiological Investigation</b>		
Ultrasound		
- Common Bile Duct (CBD)	-	-
- Stone Presence	45 (60.0%)	48 (64.0%)
- CBD Dilation	32 (42.7%)	28 (37.3%)

Stone Clearance Rate: The stone clearance rate was significantly higher in the LCBDE group, with 82.7% of patients achieving successful stone removal. In contrast, the ERCP group had a slightly lower stone

clearance rate of 68.0%. This difference in stone clearance rates between the two groups was statistically significant.

**Table 02: Comparison of Stone Clearance Rates and Procedure-Related Complications**

	ERCP Group	LCBDE Group
Stone Clearance Rate (%)	68.0	82.7
Procedure-Related Complications (%)	12.0	24.0

Procedure-related Complications: The incidence of procedure-related complications was lower in the ERCP group, with 12.0% of patients experiencing complications. In contrast, the LCBDE group had a

higher incidence of complications, with 24.0% of patients encountering procedure-related adverse events. This difference in complication rates between the two groups was statistically significant.

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**Table 03: Comparison of length of hospital stay and cost-effectiveness**

	ERCP Group	LCBDE Group
Mean Length of Hospital Stay (days)	4.2	6.1
Cost-effectiveness	Lower	Higher

Length of Hospital Stay: The mean hospital stay was shorter in the ERCP group, with an average duration of 4.2 days. In comparison, the LCBDE group had a

longer mean hospital stay of 6.1 days. This difference in hospital stay duration between the two groups was statistically significant.

**Table 04: Postoperative complications**

Complications	ERCP Group (n=75)	LCBDE Group (n=75)
Bile Leakage	5 (6.7%)	8 (10.7%)
Postoperative Infection	7 (9.3%)	9 (12.0%)
Hemorrhage	2 (2.7%)	4 (5.3%)
Pancreatitis	4 (5.3%)	3 (4.0%)
Other Complications	3 (4.0%)	5 (6.7%)
No Complications	54 (72.0%)	46 (61.3%)
Total	75	75

**Discussion**

Our study comparing endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic common bile duct exploration (LCBDE) for managing choledocholithiasis in Pakistan revealed several important findings. Firstly, we found that the stone clearance rate was significantly higher in the LCBDE group (82.7%) compared to the ERCP group (68.0%) (Lyu et al., 2019). This suggests that LCBDE may be more effective in completely removing stones from the common bile duct. However, it is worth noting that the ERCP group still had a relatively high stone clearance rate, indicating that ERCP remains a viable option for stone removal (Abdelmajid et al., 2013).

On the other hand, the ERCP group demonstrated a lower incidence of procedure-related complications (12.0%) compared to the LCBDE group (24.0%). This finding suggests that ERCP may be associated with a lower risk of complications during the procedure. These complications could include bile leakage, postoperative infection, hemorrhage, pancreatitis, and others (Yang et al., 2012). Furthermore, the mean length of hospital stay was shorter in the ERCP group (4.2 days) compared to the LCBDE group (6.1 days). This shorter hospital stay in the ERCP group could lead to cost savings and improved patient satisfaction. In terms of cost-effectiveness, our cost analysis revealed that ERCP was more cost-effective compared to LCBDE. This finding highlights the potential economic benefits of choosing ERCP as the primary treatment modality for choledocholithiasis in the Pakistani healthcare setting (Elmunzer, 2017).

Overall, our study provides valuable insights into managing choledocholithiasis in Pakistan, specifically comparing the outcomes of ERCP and

LCBDE. The results suggest LCBDE may have higher stone clearance rates, while ERCP may have lower procedure-related complications, shorter hospital stays, and better cost-effectiveness (Costi et al., 2014). These findings can assist clinicians in making informed decisions regarding the optimal treatment approach for patients with choledocholithiasis, considering factors such as stone characteristics, patient comorbidities, and available resources. Further research and prospective studies are warranted to validate and expand our findings (Halawani et al., 2017; Zhu et al., 2021).

**Conclusion**

In conclusion, our study comparing the management of choledocholithiasis in Pakistan between endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic common bile duct exploration (LCBDE) provides important insights into the efficacy, safety, and cost-effectiveness of these procedures. Our findings indicate that LCBDE achieved a higher stone clearance rate than ERCP, suggesting its effectiveness in complete stone removal from the common bile duct. However, ERCP demonstrated a lower incidence of procedure-related complications, indicating its safety and potential for minimizing postoperative risks.

**Conflict of interest**

The authors declared absence of conflict of interest.

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