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## Research Article

# Primary Laparoscopic Common Bile Duct Exploration in Management of Choledocholithiasis in a Resource Constraint Setting: Our Experience

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## Abstract:

**Introduction:** Today's options for biliary bypass procedures, in symptomatic choledocholithiasis, range from open surgery to laparo-endoscopic hybrid procedures. The aim of this study was to analyse the outcomes of patients with choledocholithiasis primarily treated with laparoscopic common bile duct exploration and Laparoscopic cholecystectomy (LCBDE + LC) in a remote setting with no facility of endoscopic retrograde cholangio-pancreatography and endoscopic sphincterotomy (ERCP + ES).

**Methods:** We performed a retrospective cross sectional study from March 2011 to June 2021. We included all symptomatic patients with common bile duct stones who underwent surgery by a single surgeon. A primary laparoscopic bile duct exploration with intraoperative cholangioscopy with T-tube placement with cholecystectomy was offered to all patients. Data was maintained in excel sheets and analysed with respect to their demographics, case records, operation notes and follow-up data. All significant intra operative and postoperative complications were recorded and our results were analysed.

**Results:** A total of 5793 patients underwent laparoscopic cholecystectomy from march 2011 to June 2021 by a single surgeon. 58 patients were diagnosed to have choledocholithiasis and underwent LCBDE + LC for the same. We found a female predominance (62.1%), advanced mean age (48.3 years) and multiple comorbidities. Most patients had previous episodes of cholangitis. Mean operative time 218.74 min. Only one patient required conversion into an open procedure. CBD clearance rate was 96.5%. We had a median of 18 (12–60) months of follow-up. All patients except 2 had normalisation of liver enzymes during follow-up. Four patients required a second surgery. Port site infection, retained stones, retained T tube end and leak were encountered.

**Conclusions:** Laparoscopic CBD exploration with intraoperative cholangioscopy with cholecystectomy seems to be safe and effective treatment for patients with difficult common bile duct stones. This procedure can be a good first line option for patients with advanced age and multiple comorbidities, avoiding the cost and morbidities of ERCP + ES.

**Key words** Laparoscopic common bile duct exploration, choledocholithiasis, cholangitis, ERCP, T-tube.

## INTRODUCTION

**C**holelithiasis is a very common gastrointestinal disorder with a prevalence of 10%–20% in developed countries<sup>1,2</sup>. Common bile duct (CBD) stones (Choledocholithiasis) are encountered in about 3–16% of patients with gallstones<sup>1,3</sup>. These can occur by passage of a calculi through a large cystic duct (secondary stones) or rarely originate in the bile duct (primary stones). In contrast to gallstones, CBD stones are symptomatic in about 88% of patients<sup>4</sup>. CBD Stones could present as biliary colic, obstructive jaundice, cholangitis, or pancreatitis<sup>1,2</sup>.

Cholechocholothisais can be diagnosed based on basic radiological investigations like ultrasound abdomen, MRCP has been recommended as the gold standard in cases of where further confirmations are required<sup>5</sup>.

Laparoscopic cholecystectomy (LC) is the gold standard for the treatment of gallstones<sup>1</sup>. However, the best approach for CBD stones is still a matter of debate. Choledocholithiasis could be managed by ERCP + ES, especially in cases where relief of biliary obstruction is needed. Then LC may be performed simultaneously or later on. Alternatively, LC may be combined with laparoscopic common bile duct exploration (LCBDE) in the same operation setting<sup>3,6</sup>.

The unavailability of the ERCP in the region that we practise has compelled us to offer primary LCBDE plus LC to all patients with choldechollithiasis.

Therefore, this study aims to retrospectively analyse and compare the impact of primary LCBDE + LC among patients with choledocholithiasis based on early and late postoperative complications and long term follow up.

## METHODS

We retrospectively collected our data on all cases of imaging proven choledocholithiasis, data was maintained in excel sheet and analysed with respect to their demographics, case records, operation notes and follow-up data. A standard LCBDE + T-Tube placement + LC was offered to all the patients. Patients were followed up closely with liver enzymes and ultrasound abdomen. All significant complications were recorded which included bile leak, pancreatitis, cholangitis, T-tube problems, retained stones, urinary retention and wound infection.

## OPERATIVE TECHNIQUE

The LC was performed using the regular 4-port technique. To introduce the choledochoscope another fifth port site was created, in between the right midclavicular and epigastric port just below the subcostal margin. In addition to the above a 6th port was occasionally placed in the left hypochondrium for retracting the duodenum whenever required and also in cases where choledochocuoodenostomy was necessitated.

After the standard LC was performed, the anterior surface of the CBD was defined carefully and choledochotomy was done using an endoscopic knife just below the insertion of the cystic duct into the bile duct by a longitudinal incision depending on the size of the calculi. The calculi were expelled out spontaneously or would require some manoeuvres like irrigation and suction. To look for any residual calculi a check choledochoscopy (Fr 3.8, Karl storz) was always performed. A T-tube was introduced into the CBD and defect closed using continuous 3-0 vicryl suture. A peritoneal drain was placed in the morrison's pouch which was brought out through the right hypochondrial working port in the right anterior axillary line.

## RESULTS

During our study period in all 5793 patients underwent LC out of which 58 patients i.e. (1%) underwent LCBDE + LC. We found a female predominance (62.1%), a mean age of 48.3 years and multiple comorbidities (like diabetes mellitus type 2, Hypertension and cardiac issues) **Chart 1 and 2.** 86.2% (50/58) of the patients had previous episodes of cholangitis. 7% (4/58) initially presented to us with gallstone pancreatitis. All of them had image proven choledocholithiasis on evaluation. A mean common bile duct diameter was 24.97 mm ranging from (22.1mm to 54.3mm). One patient underwent a further choledochoduodenostomy during the primary surgery as the CBD was dilated more than 3 cm with a distal CBD stricture with CBD calculus on MRCP. Only one patient required conversion into an open procedure (1%). Mean operative time 218.74 min which ranged from (198 minute to 364 minute) estimated blood loss 150mL (30– 600) mL. Postoperatively oral intake was resumed in an average of 3.21 days, mean length of hospital stay was 7.5 days. We had a median of 18 (12–36) months of follow-up. CBD stone clearance rate of 96.5% was achieved. Complications encountered were port site infection (2/58), biliary leak due to immature fibrosis of the tract in (3/58) out of which two of them resolved on conservative management but one required a laparoscopic peritoneal lavage and drain placement. Other issues like retained stones with persistent high bilirubin were seen in (2/58), and retained horizontal limb of T Tube was seen in (1/58) for which re laparoscopy and CBD exploration and removal of the retained stone / T tube with choledochoduodenostomy was done. CBD stone recurrence was seen in one patient after 2 years of primary LCBDE +LC who presented to us with a choledochal cyst and was offered a laparoscopic excision of the choledochal cyst with hepaticojejunostomy. Postoperative biliary stricture was not encountered on long term follow up of 60 months in any of the 36/58 patients.

Chart: 1

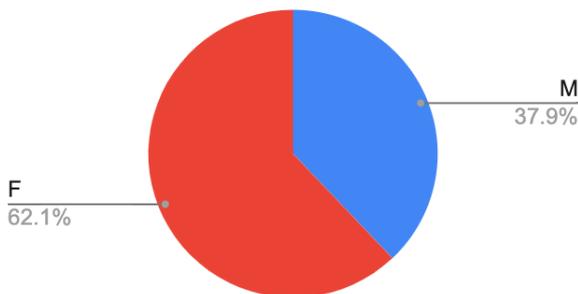


Chart 1 Male to female distribution

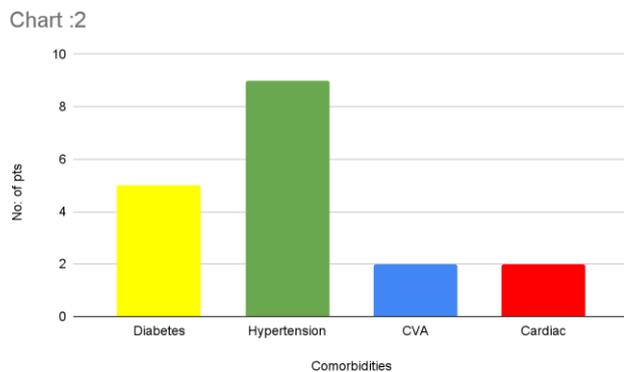


Chart 2 Associated comorbidities

## DISCUSSION

There is no doubt that LC is currently the gold standard for surgical treatment of symptomatic gallbladder calculi<sup>1</sup>. This question is still in debate when it comes to bile duct stones. Initially open CBD exploration used to be the favoured line of management. After its introduction ERCP

established itself as a preferred method of treatment for CBD stones<sup>7</sup>. With the advancing technology and improving laparoscopic skills LCBDE + LC is now being opted as a preferred treatment option for patients with cholecysto- choledocholithiasis, when adequate expertise is available<sup>5</sup>.

Various other non-operative options have been also explored but none of them have yet been efficacious enough to be compared with the above line of management<sup>8</sup>.

In comparison the success rate for stone clearance with ERCP + ES ranges from 87% to 94% and more than 25% of patients require two or more ERCP sittings (1). ERCP + ES can also be performed in combination with laparoscopic cholecystectomy intraoperatively, especially with stones in the common hepatic duct or intrahepatic system<sup>7</sup>. ERCP is also useful post operatively in patients with incomplete stone clearance or retained stones.

The associated morbidity and mortality rates are 5% to 11% and 0.7% to 1.2% respectively<sup>3,6</sup>. Complications of ERCP include bleeding, duodenal perforation, cholangitis, pancreatitis and bile duct injury.

The option of LCBDE in management of CBD stones is dependent on several factors including surgical expertise, adequate equipment, the biliary anatomy and the number and size of CBD stones. Successful stone clearance rates for LCBDE range from 89% to 95% with a morbidity rate of 4% to 16% and mortality of 0% to 2%. It tends to be a single stage procedure with less financial burden. Complications include bile leak, retained T tube and CBD stricture have been reported<sup>1,3,6</sup>.

The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) also concludes that LCBDE plus LC is the preferred approach for managing CBD and gallbladder stones<sup>5</sup>.

A recent meta-analysis of 1757 patients from 13 studies worldwide where in LCBDE + LC was compared with preoperative ERCP + ES and LC. It revealed a mean duct clearance of 94.1% with average morbidity of <10% (4–16%) and mortality of <1% (0–2.7%) and concluded that LCBDE + LC is superior to preoperative ERCP + ES and LC both in perioperative safety and short- and long-term postoperative efficacy<sup>3</sup>. Our duct clearance rate is 96.5% with average morbidity of 5.1% is in accordance with the results in the literature review.

Various techniques of choledochotomy have also been studied and no significant difference was seen between use of energy source and cold knife as to cause long term stricture formation<sup>2</sup>. We used a cold knife and no cases of postoperative bile duct stricture was seen.

A study done in 2007 did not show any statistical significance between the outcomes of T-tube and primary closure of choledochotomy, except a slightly prolonged hospital stay which was lower in the group without T-tube<sup>9</sup>. Instead of T-tube placement an antegrade stent placement and primary closure can be done<sup>10</sup>. But due to the unavailability of ERCP we could not offer that option either. So we had a slightly prolonged average hospital stay of 7.5 days. The only complication that was in regards with T-tube was a retained arm of the T-tube which required re laparoscopic exploration, extraction of the T-tube limb and a choledochoduodenostomy in one patient.

Another common complication is bile leak which has been proposed to be about 3.5% in LCBDE + LC. In our series we had about 5% of bile leak.

## CONCLUSION

The limited access to ERCP from our remote region inadvertently made us offer LCBDE + LC as a primary option to patients and our results speaks for itself, hereby reinforcing the fact that LCBDE + LC should be the first treatment offered to a patient with choledocholithiasis.

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**Abbreviations:** LCBDE: Laparoscopic common bile duct exploration; LC: Laparoscopic cholecystectomy; ERCP: Endoscopic retrograde cholangio-pancreatography; ES: Endoscopic sphincterotomy; CBD: Common bile duct; MRCP: Magnetic resonance cholangio pancreatography.

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