Laparoscopic common bile duct exploration for choledocholithiasis: Theodor Bilharz Research Institute preliminary experience

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Background
Laparoscopic common bile duct stones exploration (LCBDE) is a potential option for the management of stones within the biliary tree at the same time as laparoscopic cholecystectomy.
Materials and methods
All data on LCBDE were prospectively collected from April 2014 to June 2015; 36 consecutive patients diagnosed with cholelithiasis and common bile duct stones were enrolled in this study. There were 10 men and 26 women, median age 57 years (range 43–71 years). Our inclusion criteria were as follows: patients with obstructive jaundice because of stones, patients who had not undergone upper abdominal surgery, surgically fit patients with concomitant gallstones and common bile duct (CBD) stones (de-novo cases), patients in whom endoscopic retrograde cholangiopancreatectomy retrieval had failed previously mainly because of instrumentation failure; large or multiple CBD stones requiring extraction and drainage with remaining stent; LCBDE that could be approached either through the cystic duct or directly through a choledochotomy incision.
Results
All patients survived the operation. Successful LCBDE and stone clearance were achieved in 34 of 36 patients, whereas treatment failure occurred in the other two patients. The reasons for failure were due to instruments issues e.g. balloon rupture and broken basket. No incidences of bile leakage, hemobilia, abdominal bleeding, or pancreatitis occurred in the patients in our series. Transient colic pain occurred in two patients and was treated conservatively. A transient increase in the liver function tests (aspartate aminotransferase and alanine aminotransferase) was observed in three patients and returned to normal on postoperative day 3 without any treatment. The external drainage tube was removed 48 h postoperatively.
Conclusion
LCBDE can be performed after proper training and with the availability of adequate equipment and laparoscopic facilities. LCBDE is a safe and cost-effective treatment option for gall bladder and CBD stones in the short term.

Keywords:
choledochotomy, common bile duct, exploration, laparoscopic, transcystic

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Introduction

CBD stones are encountered in about 9–16% of cases during laparoscopic cholecystectomy. It has been reported that endoscopic sphincterotomy may cause recurrent ductal stones, stenosis of the papilla with cholangitis, and late development of bile duct cancer, which is a cause of concern especially in younger patients. Laparoscopic common bile duct stones exploration (LCBDE) is a potential option for the management of stones within the biliary tree at the same time as laparoscopic cholecystectomy [1–4].

Materials and methods

(1) All data on LCBDE were collected prospectively from April 2014 to June 2015; 36 consecutive patients diagnosed with cholelithiasis and CBD stones were enrolled in this study.
(2) There were 10 men and 26 women, median age 57 years (range 43–71 years).
(3) The diagnosis of CBD stones was made by ultrasonography and/or magnetic resonance cholangiopancreatectomy.
(4) The inclusion criteria were as follows:
    (a) stones gall bladder (multiple or single), CBD measuring greater than 6 mm, no intrahepatic duct stones, number of stones (single up to three), with or without jaundice, and

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those who had failed endoscopic retrograde cholangiopancreatectomy (ERCP) stone extraction with or without stent.

(5) All the patients had been fully informed about the study, the characteristics of the procedure, and its advantages over conventional choledochotomy exploration and their consent was obtained.
   (a) This study was approved by the local IRP.
   (b) Before induction of general anesthesia, the patient received prophylactic antibiotics and low molecular weight heparin (LMWH).
   (c) The procedure was performed with the patient in the supine position and the operating bed was positioned such that a fluoroscopic C-arm could be positioned for imaging in the patient's right upper quadrant.
   (d) The procedure was carried out using a four-trocar laparoscopic cholecystectomy technique. After dissection of the Calot's triangle, the cystic artery and cystic duct came into view. Once the cystic artery was transected, the cystic duct was left intact, connecting to the CBD.

Cholangiogram and common bile duct exploration

We used two different approaches to perform LCBDE: the transcystic duct or a choledochotomy approach (Fig. 1).

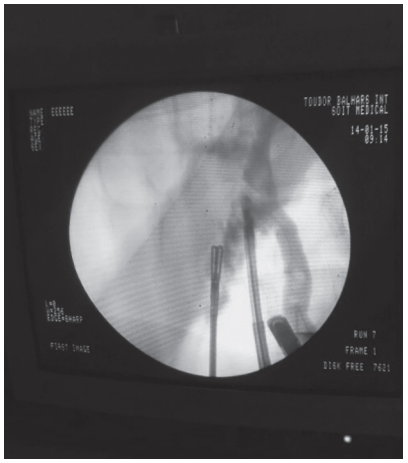
Transcystic approach (seven patients)

(1) A clear cystic duct identification with its junction to the CBD was the main and first objective.
(2) Then, the CBD was flushed with 30 ml of saline through the catheter. Small stones may be flushed and fluoroscopic-guided basket retrieval can be performed or a 4-Fr Fogarty balloon can be inserted through the cystic duct in an attempt to first dilate it after inflation and then withdraw to pull stones into the intra-abdominal cavity for retrieval.
(3) Clear Cystic duct identification with its junction to the CBD was the main and first objective.
Then common bile duct was flushed with 30 cc of saline via the catheter. Small stones may be flushed and fluoroscopic-guided basket retrieval can be performed, or a 4 French Fogarty balloon can be inserted through the cystic duct trying first to dilate it after inflation, and then withdrawn to pull stones into the intra-abdominal cavity to be retrieved (Fig. 2).

Choledochotomy approach (29 patients)

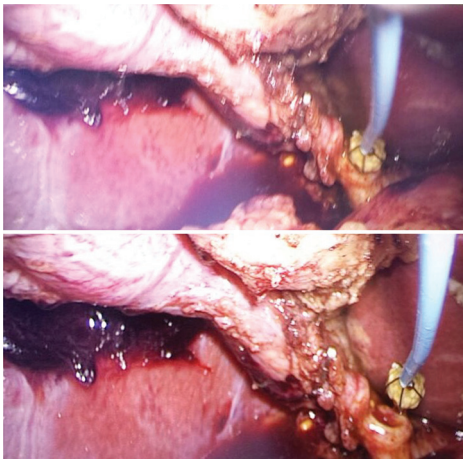
(1) Alternatively, this method was performed through a choledochotomy.
(2) The CBD was exposed and a vertical ductotomy was performed on the anterior surface of the duct distal to the cystic–CBD junction.
(3) The techniques for stone clearance are identical to the transcystic approach, that is, Fogarty balloon dilatation and then withdrawal of stones into the intra-abdominal cavity for retrieval.
(4) Through the choledochoscope, pressurized saline through a side working port of the scope facilitates clearance of small stones and particulate matter and to ensure that all stones were removed.
(5) The choledochotomy was managed with a T-tube in 20 of 29 cases and primary closure in other cases, where it was sutured in place with absorbable suture, primary closure over a stent (for later removal by ERCP) in five of 29 cases, and primary closure alone in the remaining four of 29 cases.
(6) External tube drains were used only when we used the choledochotomy technique and not in the transcystic technique (Figs. 3 and 4).

Figure 1



Intraoperative cholangiogram.

Figure 2



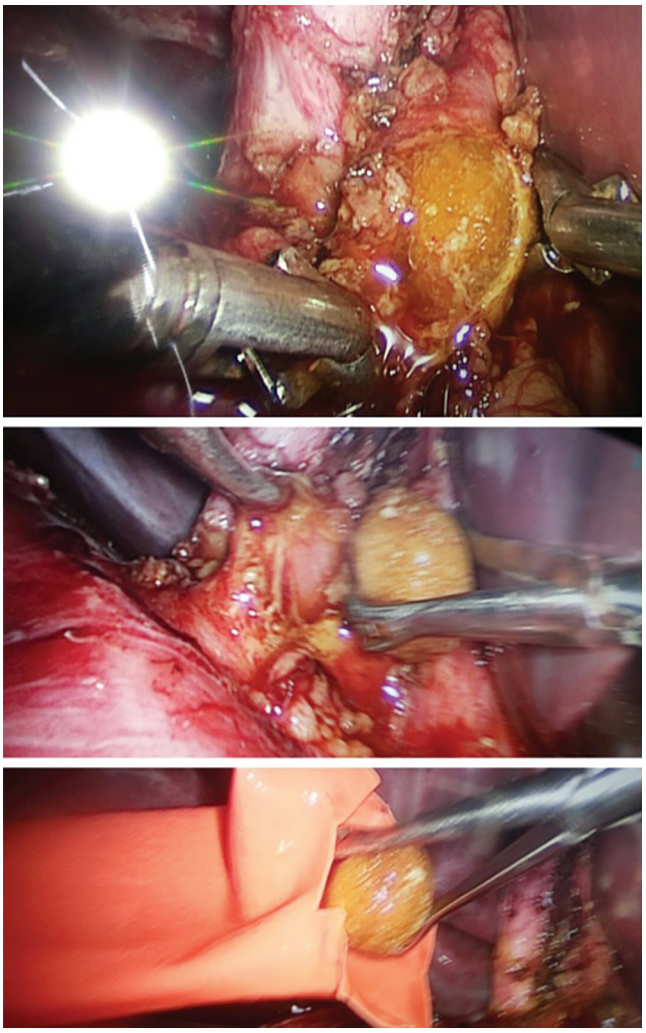
Transcystic stone extraction by the Dormia basket.

Results

(1) All patients survived the operation. Successful LCBDE and stone clearance was achieved in 34 of 36 patients, whereas treatment failure occurred in the other two patients because of instrument failure – balloon ruptured and basket broken.
(2) The duration of the operation in the 34 of 36 patients with successful laparoscopic CBD stone clearance was 126 min (range 102–140 min), and was similar in both transcystic and choledochotomy techniques.
(3) Open CBD exploration was performed successfully in the two of 36 patients in whom failure occurred in the same session.
(4) No bile leakage, hemobilia, abdominal bleeding, or pancreatitis occurred in our series. Transient colic pain occurred in two patients and was treated conservatively. A transient increase in the liver function tests (aspartate aminotransferase and alanine aminotransferase) was observed in three patients and returned to normal on postoperative day 3 without any treatment. The external drainage tube was removed 48 h postoperatively.
(5) Finally, when the transcystic approach was used, the patients were discharged home on day 3–4 postoperatively once we completely ensured that the operation was successful and no complications had occurred.
(6) In the choledochotomy approach, the T-tube was left in place for 7–10 days; a cholangiogram was performed through the T-tube first to ensure adequate clearance of the ductal system.

Short-term follow-up (median 5 months; range 1–11 months) showed no recurrence of CBD stones by clinical, laboratory, and imaging studies.

Figure 3



Choledochotomy technique and extraction of a large common bile duct (CBD) stone.

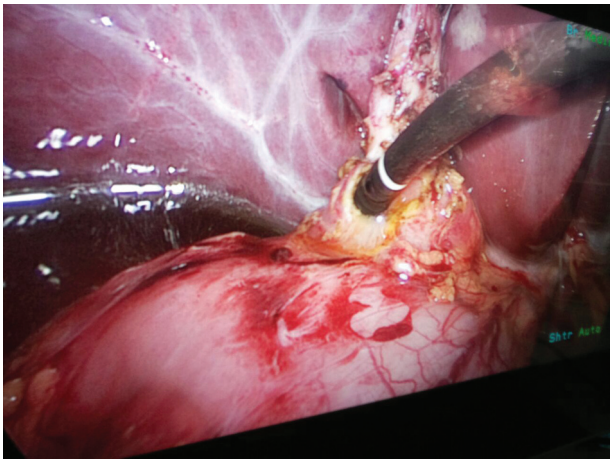
Discussion

The introduction of LCBDE has made it possible to avoid the drawbacks of both a two-stage procedure (preoperative ERCP+laparoscopic cholecystectomy) and the open CBD exploration [5–8].

In this study, we present our preliminary experiences at the Theodore Bilharz Research Institute (TBRI), with a success rate of 92.5% (34/36), which are comparable with the results of ERCP and open CBD exploration with less morbidity and mortality; it is hoped that the success rate will increase with increasing experience.

The transcystic approach is technically easer, but it has its limitations and indications, for example, dilated cystic duct, small stones (preferably single stone), and there should be no stent in the CBD [9–12]. In TBRI, as a tertiary center, we rarely encounter such cases.

Figure 4



Intraoperative transcystic choledocoscope.

The choledochotomy approach is technically demanding and needs advanced laparoscopic and biliary experience [4,13,14]. In our series, most of the cases were referred to us after the ERCP has failed to retrieve the stone from the CBD due to impacted big stone, that's why we decided to use the choledochotomy technique in these cases from the begining without trying to retrieve the stone by the transcystic technique.

In our study, we routinely used an intraoperative cholangiogram before and after stone extraction to confirm the presence of stones and later to confirm complete clearance of the CBD.

A choledochoscope is a very useful tool in CBD exploration both for direct visualization of the intraluminal stones and for their removal using the Dormia basket or Fogarty's vascular catheter [7,15–17]. In our study, we used the choledochoscope in most of our cases to confirm the complete clearance of the CBD and to inject saline and wash out stone fragments and debris.

In our study, we closed the choledochotomy over the T-tube in 20 of 36 cases (55%); when there was concern in terms of retained fragments or tiny stones, we used primary closure over a stent in five of 36 cases (15%) and primary closure without a stent in four of 36 cases (12.5%). There was no bile leakage in our cases and also no intra-abdominal collections.

Whereas the length of stay for the laparoscopic cholecystectomy is generally short (from 1–3 days), it is longer for LCBDE, 1–7 days, in most of studies [11,17–19]. In our study, the length of stay depended on the technique used. In the transcystic technique, it was 1–3 days and in the choledochotomy technique, it was longer, 2–7 days, especially when we used the T-tube to close the choledochotomy.

In most studies, the mortality of LCBDE is 0–1% in the hands of experienced biliary surgeons. This rate is similar to the incidence found in open CBD exploration [5,20–23]. In our study, there was no mortality, which may be attributed to improved preoperative preparation, and improved anesthesia and selection of patients.

Conclusion

LCBDE is an effective single-stage procedure for the treatment of gall bladder and CBD stone in one session, with the benefits of a minimally invasive approach and avoiding the drawbacks of both the ERCP and the open CBD approach.

LCBDE can be performed after proper training, and with the availability of adequate equipment and laparoscopic facilities.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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