

Research Article

Early Experience in Laparoscopic Common Bile Duct Evaluation

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Abstract

Aim: To evaluate the role of Laparoscopic exploration of common bile duct in the management of common bile duct stones and its effectiveness to clear the CBD stones. **Patients and methods:** This prospective study included 11 consecutive patients with calcular obstructive jaundice that were admitted to department of surgery Minia University Hospital between Jan 2022 and Jan 2023, all procedures were done with laparoscopic CBD exploration (LCBDE). **Results:** There was bile leak in 1 case, residual stone in 2 cases, 1 case with wound infection, 1 case postoperative ileus, 1 case with bile duct injury and no mortality. **Conclusion:** Laparoscopic choledocholithotomy has been shown to be feasible, safe, and highly effective in the management of choledocholithiasis. The main advantage of this management strategy is a single hospital admission for the majority of patients with CBD stones and low morbidity and mortality rates, which both compare favorably with those of either open surgery" or management of CBD stones with ERCP.

Key words: Laparoscopic, CBD and Evaluation

Introduction

The incidence of common bile duct stones among patients undergoing cholecystectomy is 10% and the incidence of common bile duct stones unsuspected on preoperative investigations but discovered at the time of routine intra-operative cholangiography is from 3% to 5%⁽¹⁾.

Primary calculi originating inside the duct are uncommon. The majority of these stones is secondary calculi, having been produced in the gall bladder and migrates to the common bile duct⁽²⁾. Many common bile duct stones are small and therefore can pass spontaneously into duodenum; the larger ones can be impacted in common bile duct due to narrowing in the ampulla of Vater and cause jaundice, cholangitis or biliary pancreatitis. 20 to 50% of asymptomatic cases may eventually develop symptoms and so this group will require treatment⁽³⁾.

The modern era of common bile duct surgery started with Mirizzi, who introduced the intra-operative cholangiography in 1932. Intra-operative choledochoscopy had been developed as an adjunctive to intra-operative cholangio-

graphy, which helped to detect the common bile duct stones. Efforts have been exerted to treat patients with common bile duct stones in one session and avoid potential complications of endoscopic sphincterotomy⁽⁴⁾.

Laparoscopic bile duct clearance, which was first carried out in April 1990, has since then been shown to be potentially preferable option when compared with endoscopic retrograde cholangio-pancreatography (ERCP), allowing the surgeon to reclaim the treatment of common bile duct stones detected at routine intra-operative cholangiography⁽⁵⁾.

Martine et al reported on 300 consecutive patients undergoing laparoscopic exploration of common bile duct suggesting that the procedure was an equally effective alternative to ERCP with the benefit of cost reduction by means of a single stage and avoidance of known morbidities associated with ERCP, the findings of decreased hospital stay associated with laparoscopic common bile duct exploration and correspondingly lower cost of treatment has

raised suggestions of superiority of single stage treatment⁽⁵⁾.

Recently, single stage laparoscopic cholecystectomy and laparoscopic exploration of common bile duct is the primary approach for patients with common bile duct stones, except in the presence of severe biliary sepsis⁽⁶⁾.

Any contemporary approach to the management of common bile duct stones must take into consideration the availability of local expertise and technology. An integrated health care team including surgeons, gastroenterologists and radiologists will help to decrease patient morbidity, enhance cost-effectiveness and optimize patients' quality of life⁽⁷⁾.

Patients and methods

This study, was carried out in the department of General surgery, Minia university hospital during the period from Jan 2012 to Jan 2013. Eleven patients were subjected to laparoscopic exploration of CBD. Each patient was thoroughly evaluated by our surgery team.

Inclusion criteria were large or multiple CBD stones, concomitant gallstones and CBD stones in a young patient. Previously failed endoscopic removal of stones due to difficult cannulation or due to failed extraction of stones, recurrent pyogenic cholangitis combined with multiple extrahepatic stones which may require stone extraction with drainage.

Exclusion Criteria include Severe cardiac disease which carries anesthetic risks, severe coagulopathy, patients had small stone that can be removed using ERCP and presence of severe inflammation (as gangrenous cholecystitis or acute necrotizing pancreatitis, etc.) at the region of portahepatis making unsafe identification of CBD.

A written informed consent form patients was taken. The details of the study and the operation was explained for the patients. The patients were informed about the procedure and the possible risks and complications which may require reoperation as biliary leakage and also complications of the T- tube as biliary infection or migration of the tube causing biliary tract

obstruction and also the possible bile duct leaks and peritonitis which may follow removal of the T-tube.

Data was collected by designed wall structured sheet. The aim of our study was explained to all patients. Full history, examination, laboratory and radiological investigations were done for patients. Diagnosis of CBD stones was based on clinical presentation, liver function tests, abdominal ultrasound, abdominal CT and cholangiography. The latter may include ERCP, percutaneous transhepatic cholangiography or magnetic resonance cholangiopancreatography (MRCP).

In general, ERCP was preferred in patients who had biliary sepsis (acute cholangitis or biliary pancreatitis), with exception of the patients with previous gastrectomy. Percutaneous transhepatic biliary drainage (PTD) was preferred for biliary decompression when ERCP had failed. MRCP was performed to assess biliary tree in stable, non-septic patients. If endoscopic extraction was unsuccessful or was considered inappropriate, biliary stenting could be inserted and LECBD was performed 2 to 3 weeks later. Endoscopic extraction could be difficult in patients who had multiple and large CBD stones.

Patients with a history of previous upper abdominal surgery were excluded during the early period of the study. Correction of Prothrombin deficiency by Vitamin K administration. Antibiotic prophylaxis to guard against infection (third generation cephalosporin was the drug of choice). Adequate hydration by IV fluids to prevent possibility of renal failure and IV mannitol was prescribed if urine output is not satisfactory. Prevention of thromboembolism by the use of below knee elastic stocking or crepe bandage and early ambulation in the first postoperative day were the best prophylaxis for postoperative thromboembolism. Preoperative pulmonary functions studies were obtained for patients with respiratory illness. Patients with impaired lung functions were at risk for pulmonary complications especially during the first 24 hours postoperatively. Treatment of airway diseases were necessary. Obtaining arterial

blood gases was important procedure. Pre-operative anesthetic consultation was indicated for all patients to evaluate patient's condition and evaluate the hepatic and renal functions

Surgery was performed under general anesthesia with the patient on supine position on X-ray table. All patients received routine prophylactic antibiotics. The patient lies in American position. Five trocars were used: Optical trocar was positioned in the umbilical area, with 30 degree scop. (VIsera Pro OTV-SV), Operating trocars which were two trocars were used and were positioned in the epigastrium 10 mm and the right subcostal area 10 mm in the MCL, Retracting trocar 10 mm was positioned in the right subcostal area on the AXL and a fifth trocar 10 mm was positioned over the area of GB to introduce the instrument or the choledocoscope into the common bile duct.

After routine abdominal exploration, we focused attention at the biliary tree and GB. A very important step in the surgery was adequate exposure of sub hepatic area. The patient was placed in steep-reverse trendelenburg position with slight tilt to the left, to facilitate the descend of organs toward the pelvis and to left. The duodenum was retracted caudally with the retractor, The GB was retracted upward laterally to ensure safe dissection and good exposure of anterior surface of Calot's triangle. After adhesions to the GB were freed, Calot's triangle was stretched open making retraction on the fundus of the GB superior and stretching on CBD Laterally to the right side by making retraction laterally on the Hartman's pouch. The aim of this step was to isolate the biliary and vascular elements at the Calot's triangle. The dissection was in close relation to the GB at the junction of the Hartman's pouch and the CBD. The peritoneum over the neck of the GB was incised both posteriorly and anteriorly. Then skeletonization of the cystic pedicle was performed, the artery

was clipped proximally and distally. The cystic duct was clipped close to junction with the GB. Then we open the anterior peritoneal layer which is along the free border of the Lesser omentum, hemostasis was done and the anterior surface of the CBD was exposed over length of about 10 mm to 20 mm. The anterior surface of the common bile duct may be cleared of the overlying fatty tissue near cystic duct-common duct junction. The choledochotomy was made vertically and long enough to allow insertion of the choledochoscope and extraction of stones, with cautious not to tear the common bile duct. Longitudinal incision about 1 cm length or as long as the largest stone diameter.

Care was taken to avoid injury of posterior wall of CBD. This diminishes the time that may be spent in closing the choledochotomy. The choledochotomy was made longitudinally in the supraduodenal portion of CBD with retractile blades or scissors. It could be enlarged if necessary. It could be used for CBD measuring more than 5 mm in diameter. Access to the common bile duct was facilitated by retracting on the clipped cystic duct stump. Risks were posterior injury of the common duct and too short incision which lead to tear of the CBD during stone extraction and manipulation.

Results

Our study performed on 11 patients in general surgery department, Minia university Hospital. All of these patients had gallbladder stones with CBD stones as shown by abdominal ultrasound and CT. The study included 6 females (54%) and 5 males (46%). The age of the subjects ranged between 40-68 years (mean age 50.1±7.2)

At initial presentation, the patients presented with biliary pancreatitis (n=1,9%), obstructive jaundice with deranged liver function tests (n=3, 27%), acute cholecystitis (n=3, 27%) and biliary colic (n=4, 36%) as shown in table (1).

Table (1) : Initial presentation of patient

Initial presentation of patients	No. (%)
Biliary colic	0 (40%)
Acute cholecystitis	3 (27%)
Obstructive jaundice	2 (18%)
Biliary pancreatitis	1 (9%)

Endoscopic retrograde cholangiopancreatography was attempted in six patients, but failed due to either difficult cannulation due to anatomical difficulties or due to failed extraction due to large size of stones.

Mean operation time was 110.0 ± 11.1 (range 90-130) min with a mean postoperative hospital stay of 16.6 ± 1.0 (range 10-19) days. There were no postoperative deaths. The mean intraoperative blood loss was 78.6 ± 20.0 (mL) and no patient required postoperative transfusion as shown in table (2).

Table (2): Operative time, intraoperative blood loss and postoperative hospital stay.

Variables	Range	Mean±SD
Operative time (min)	90-130	110.0 ± 11.1
Intraoperative blood loss (ml)	0-120	78.6 ± 20.0
Postoperative hospital stay (days)	10-19	16.6 ± 1.0

Table 3 is a summary of the mortality and morbidity in our patients undergoing LECBD. The patient with postoperative ileus recovered uneventfully with conservative treatment. The patient with wound infection was managed conservatively. There were no major complications related to T-tube insertion. The patient with a bile leak was successfully managed by Endoscopic stenting.

Complete ductal clearance was achieved in 9 patients (82%). Duct clearance was incomplete in two patients. The two patients underwent ERCP for extraction of impacted stone. It was thought the duct had been cleared laparoscopically, was found to have retained stones on T tube cholangiography at 14 day postoperative.

Table (3): Postoperative morbidity and mortality of laparoscopic exploration of common bile duct.

Morbidity/mortality	No. (%)
Bile leak	1 (9%)
Residual stones	2 (18%)
Wound infection/bleeding	1 (9%)
Bile duct injury	1 (9%)
Paralytic ileus	1 (9%)
Mortality	0 (0%)

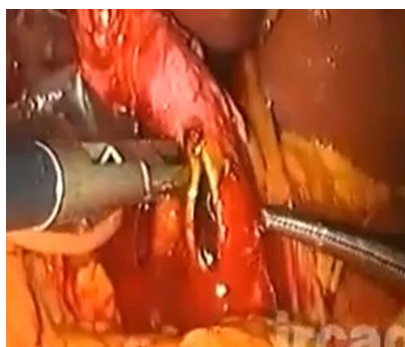
In two patients the stones were extracted spontaneously when CBD is opened. The stones size is about 1.0 cm. In three patients stones were extracted by graspers. Stones that are easily accessible or visible through choledochotomy are extracted with non-traumatic graspers. Stones can be pushed out by exerting pressure with graspers on the surrounding CBD wall. Stones size are about 2.0 cm. In three patients stones were extracted by using Fogarty catheter. The catheter was guided into the common duct forceps. The balloon was inflated and the catheter was withdrawn. Stones retrieved can be removed with forceps

introduced through the medial epigastric port. Care should be taken and gentle manipulations with the catheter in order to avoid perforation of the ductal system during these maneuvers. the stones size are about 3 cm.

In three patients stones are extracted by using Dormia basket. The basket was introduced into the choledochotomy. It was then opened and the basket was moved around slowly until the stone can be felt and pushed into the basket prior to closure and extraction. The stone size are about 3 cm.

Table 4: Show size of stones and method of stones extraction.

Stones size	Method of extraction of stones	No. (%)
1.0 cm	Spontaneous extraction	2 (18.1)
2.0 cm	Grasper	3 (27.3)
3 cm	Fogarty catheter	3 (27.3)
3 cm	Dormia basket	3 (27.3)



Discussion

Choledocholithiasis refers to the presence of one or more gallstones in the common bile duct. Usually, this occurs when a gallstone passes from the gallbladder into the common bile duct (6).

laparoscopic CBD exploration appears to be the most cost-effective method, it should be emphasized that this method is very challenging

and it should be performed by a well-trained laparoscopic surgeon. CBD stones are suspected if there is a history of pancreatitis or cholangitis, or there is increased serum levels of conjugated bilirubin, SGPT, SGOT and alkaline phosphatase, or if there is dilatation of CBD more than 4mm or stone in the CBD at abdominal ultrasonography or the presence of stone in the CBD at MRCP. Various short- and long-term complications of ERCP and ES have been

reported in young patients can be avoided by LECBD. The short-term complications include bleeding, pancreatitis, and perforation. In 0 to 24% of patients there are long term complications (recurrent stone formation, duodenal reflux, ascending cholangitis, and papillary stenosis)⁽⁴⁾.

Thus a cautious approach is required when electing a two-stage approach. In our unit, single-stage LC and LECBD is the primary approach for patients younger than 60 years. ERCP was performed in six patients but failed. The presence of several stones or big stones is usually the cause of ERCP failure. The multiple attempts and maneuvers performed increase the complication rate, such as pancreatitis, bleeding, or perforation. The primary closure might be as effective as T-tube drainage after choledochotomy in the prevention of the development of post-operative complications.⁽³⁾

T-tubes were used in patients in whom there was concern for possible retained debris or stones, distal spasm, pancreatitis, or general poor tissue quality secondary to malnutrition or infection. In cases where choledochotomy was used, a T-tube was placed in 67% of patients and primary closure without a T-tube was done in 33% of patients. There were no complications in the group of patients who underwent choledochotomy and primary ductal closure without T-tube placement or in the group in whom T-tubes were placed.⁽¹¹⁾ T-tubes are used in all patients in our study.

In Topal et al., No mortality occurred, Laparoscopic stone clearance of the bile duct was successful in 91.8% of the patients, Median length of hospital stay (LOS) was six days (range, 2 to 22 days) after stone clearance via choledochotomy. Choledochotomy was performed for CBDS measuring an average of 11.0 mm (range, 0 to 30 mm) in diameter. Mean duration of surgery was 90 minutes (range, 30 to 180 minutes) when flexible choledochoscopy was used.⁽¹¹⁾

Laparoscopic exploration can effectively clear CBD stones, but is not without complications. In our series, laparoscopic stone clearance of the bile duct was successful in 82% of the patients,

median length of hospital stay was 10 to 17 days, stone size measuring 10 to 30 mm in diameter, mean duration of surgery was 90 to 130 minutes, and no mortality. Most complications resolved with conservative treatment. Postoperative bile leak are most alarming, though most patients can be successfully managed by endoscopic stenting.

Moreover, adhesion formation may not be as good as after open surgery; the T-tube tract probably needs longer to mature before its removal. T-tube placement has also intrinsic problems (dislodgement, kinking, longer hospital stay to undergo a postoperative cholangiogram)⁽⁴⁾. All complications related to T-tube placement were managed by conservative treatment in our study.

In our study complete ductal clearance was achieved in 9 patients. The stone clearance rate is 82%. Duct clearance was incomplete in two patients. In the study done by Tang, in Hong Kong 2006⁽⁶⁾, the stone clearance rate was 92%. Duct clearance was incomplete in ten patients.

In Tinoco et al, successful laparoscopic stone clearance was achieved in 86.8(97.3%). An elective postsurgical endoscopic sphincterotomy were done on the 13(2.7%) patients not cleared laparoscopically. Seven patients had unexpected retained stones.⁽¹¹⁾

In our study there was no death. In the study done by Tang, in Hong kong 2006⁽⁶⁾, one patient died due to multi organ failure following major bile leakage. In our study the mean postoperative hospital stay was 11 days, but in the study done by Tang 2006⁽⁶⁾, the mean postoperative hospital stay was 10 days. The mean intraoperative time in our study was 110 min. In the study done by Margert and John 2000⁽¹⁷⁾, the mean intraoperative time was 90 min due to facilities and advanced medical equipment.

Exploration of the CBD is not an obsolete approach in the management of CBD stones. Laparoscopic exploration of the CBD is highly successful and can achieve satisfactory ductal clearance for 'endoscopically irretrievable' stones⁽⁴⁾.

Laparoscopic common bile duct exploration has a high success rate, with rates reported from 83% to 96% in recent years. The morbidity rate has been reported to be approximately 10%. Mortality rates are very low, at less than 1%.⁽¹⁴⁾ Future increase in the number of patients and comparison between different modalities of CBD exploration is planned to be done.

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