ORIGINAL ARTICLE

LAPAROSCOPIC CHOLEDOCHOTOMY

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Aim: *The latest advance in management of common bile duct (CBD) stones is laparoscopic common bile duct exploration (LCBDE). We present our experience in management of patients with CBD stones by the LCBDE.*
Methods: *Between February 2006 and May 2008, 58 patients with CBD stones had been operated by LCBDE in Mansoura Gastroenterology Surgical Center. Patients considered for LCBDE were those who were found to have CBD stones with a dilated CBD 10 mm or more, in the absence of cholangitis, pancreatitis or contraindication to laparoscopy. All patients had been treated by laparoscopic choledochotomy.*
Results: *The operation was completed laparoscopically in 52 (89.7%) and only 5 (8.6%) patients were converted to an open procedure. One patient had intraoperative endoscopic retrograde cholangiopancreatography (ERCP). The CBD was closed around T-tube in 35 patients, 13 had primary closure and 4 had choledochoduodenostomy. No mortality or intraoperative complications were reported but 2 patients had postoperative complications. Retained CBD stones were detected in 2 patients.*
Conclusion: *LCBDE is both feasible and safe. Biliary surgeons should aim to master LCBDE as an essential surgical option in CBD stone management.*

Keywords: *Common bile duct, Exploration, Stones.*

INTRODUCTION

Approximately 5 to 15 percent of patients having symptomatic gallbladder stones have common bile duct (CBD) stones as well.[1,2] The management of such patients had passed through various revolutionary steps, but the optimal therapy is still controversial. Options include selective pre-operative ERCP, post-operative ERCP, or open choledochotomy.[3] The latest advance was the introduction of advanced laparoscopic techniques in biliary surgery, adding the option of laparoscopic common bile duct exploration (LCBDE) which was first described by Jacob et al.[4] According to the results of several groups experienced in laparoscopic and biliary surgery, LCBDE was found to be feasible, safe and cost effective.[5-22]

In this paper we present our experience in management of patients with CBD stones by the laparoscopic approach.

PATIENTS AND METHODS

Between February 2006 and May 2008, 58 patients with CBD stones had been operated by LCBDE in Mansoura Gastroenterology Surgical Center. Data were collected retrospectively from patients' records. All procedures, including obtaining written informed consent from the patient, were conducted in accordance with the recommendations of the Ethics Committee of the Faculty of Medicine, Mansoura University. All patients were subjected to clinical examination, routine laboratory workup (complete blood count, liver function tests and serum amylase) abdominal ultrasound examination and medical fitness for anesthesia. Late in this work, magnetic resonance cholangiopancreatography (MRCP) was considered when the diagnosis of CBD stone was doubtful.

Patient selection: Patients considered for LCBDE were those with biliary colic who were found to have bile duct stones with a dilated CBD 10 mm or more on abdominal ultrasonography or MRCP. Late in our study,

laparoscopic CBDE was considered in patients who had undergone unsuccessful removal of CBD stones by ERCP.

Patients were excluded when the CBD diameter (by US or MRCP) was less than 10 mm, evidence of pancreatitis (abdominal pain, nausea/vomiting, serum amylase more than triple the normal value), or evidence of cholangitis (upper abdominal pain, fever/rigors and high leucocytic count). Additionally, patients with a contraindication to laparoscopy (associated medical comorbidities, upper abdominal surgery, morbid obesity, or marked liver cirrhosis) were also excluded. All these excluded patients were given the option of endoscopic sphincterotomy (ES).

Surgical technique: Patients included in the study had been surgically treated by laparoscopic choledochotomy. Patients treated by laparoscopic transcystic approach were not included in this study.

The patient was positioned in the American position with head up and table tilt to the left. The surgeon stood to the left of the patient with the camera holder by his side. The first assistant and the nurse stood to the right side of the patient. We used four port sites; 10-12 mm at the umbilicus for the camera, 10-12 mm at the epigastrium, 5 mm at the midclavicular line close to the right costal margin and 5 mm at the right anterior axillary line. A fifth port was used optionally to facilitate the introduction of basket, balloon and guidewire.

The operation started by dissection at Calot's triangle exposing the cystic duct and artery. The cystic artery was divided between clips and the cystic duct was dissected for a sufficient length. The cystic duct was opened using scissors for intraoperative cholangiography. For all cases, operative cholangiography was performed using the Olsen/Reddich cholangiography forceps with a 4 or 5 French ureteric catheter. Dynamic fluoroscopic images were obtained with a mobile C-arm.

Choledochotomy was performed by first dissecting the peritoneal coverage of the anterior wall of the CBD. The actual wall of the CBD was opened longitudinally by scissors and the hole was extended by hook diathermy. The choledocotomy was located below the level of the cystic duct and close to the duodenum. The hole in the CBD was made to equal the size of the largest stone.

Stones were removed by suction irrigation, forceps milking of the CBD or by basket and/or biliary balloon either blindly or under fluoroscopic guidance. Choledochoscope was not available at the time of our study so we did not use choledochoscopy in any case. Duct clearance was confirmed by routine completion cholangiography proximally and distally, using Fogarty balloon catheter.

After radiological verification of clearance of the CBD, the choledocotomy was closed by one of the following methods; (1) T tube insertion (the method of choice early in our work), (2) choledocoduodenostomy (in cases of ampullary stenosis with ducts dilated to >15 mm in diameter), (3) primary closure (when there was minimal manipulations at the region of the sphincter of Oddi), (4) primary closure leaving the stent placed in the CBD at previous failed ERCP attempts (retrograde stenting), or (5) primary closure with antegrade stent (by simply pushing the stent down the choledochotomy and confirming its entry into the duodenum with fluoroscopy). The choice of the method of choledochotomy closure was dependant on the operative circumstances and the surgeon's judgment.

A drain was placed routinely in the subhepatic space. Postoperative T-tube cholangiograms were obtained at 7-10 days and the tube was removed once clearance was verified. Stents were removed at 4 to 6 weeks endoscopically, after reimaging the biliary tree.

RESULTS

Of the 58 patients included in our study, 45 (77.6%) were female and 13 (22.4%) male, with an average age of 41 (17-76) years. Jaundice was present in 52 (90%) of the patients, with a mean serum bilirubin level 3.4 mg/dL. LCBDE was indicated because of failure of endoscopic treatment of bile duct stones in 6 (10%) patients. The overall duct clearance rate was 89.7%, with a median surgical duration, including cholecystectomy, of 100 (90 - 150) minutes and postsurgical stay of 3 days (range 2 to 14 days).

Laparoscopic Failures: Of the 58 patients, the operation was completed laparoscopically in 52 (89.7%) and only 5 (8.6%) patients were converted to an open procedure due to access difficulties and unclear anatomy from adhesions and inflammation (n=2), technical difficulties (n=2) and bile leakage from unsatisfactory choledochoduodenostomy (n=1). The remaining patient had a failed laparoscopic clearance, and a decision was made to perform intraoperative ERCP rather than convert to open surgery. It is to be noted that five out of the 6 cases that had failed LCBDE were among the first 25 cases performed in this series.

Two (3.4%) patients had a negative bile duct exploration. Two (3.4%) patients had retained stones after LCBDE; one of them was detected during removal of retrograde stent and imaging of the biliary system at ERCP, and the second one was detected on postoperative T tube cholangiogram. Residual stones were successfully removed endoscopically.

Closure of choledochotomy:

Laparoscopic choledochotomy was successfully completed in 52 out of the 58 patients (as mentioned previously). The most common method of drainage of CBD after successful clearance was T tube drainage, which was used in 35/52 patients (67.3%) patients. Four (6.9%) patients underwent laparoscopic

choledochoduodenostomy. Late in our series, we tried primary closure of the CBD in 5 patients (9.6%). Primary closure with an antegrade stent was performed in 6 (11.5%) patients and primary closure with a retrograde stent in 2 (3.8%) patients.

Intra- and postoperative Complications:

No complication was detected during surgery and there was no mortality. Clinical pancreatitis was not observed in any patient. Postoperative complications were reported in only 2/52 (3.8%) patients.
T-tube-related complication was reported in only one of 35 patients (2.9% of those with T-tubes). In this patient the T-tube was dislodged with resultant bile peritonitis. Percutaneous drain insertion for intra-abdominal collections was required but this was not sufficient therefore, open drainage and closure of choledochotomy was necessary on the 4th postoperative day.

Early in our work, bile leak from laparoscopic choledochoduodenostomy was detected in one of the four patients (25% of those underwent laparoscopic choledochoduodenostomy) which was corrected by open resuturing of the defect.

DISCUSSION

According to our work, about 90% of common bile duct stones can be dealt with laparoscopic choledochotomy. The last 33 patients were successfully treated laparoscopically with no residual stones or conversion to open, mostly a result of the learning curve required for successful LCBDE.

The complications rate in our series (3.8%) and the mortality rate (0%) compare favorably with that of open CBDE and ERCP.[23-26] These results support the findings of both Liberman et al,[22] Rhodes and Sussman[27] and Tinoco R et al.[28] that laparoscopic CBDE has reduced morbidity rates, length of hospital stay, and costs when compared with laparoscopic cholecystectomy plus ERCP. Our results are similar to those of other authors who have reported on laparoscopic CBDE.(16, 18, 29, 30) Khoo et al.[18] attempted 59 laparoscopic CBDEs with an overall clearance rate of 75%. Stones were not confirmed in 8 of 59 patients, reflecting the difficulties with still-plate exposures rather than dynamic fluoroscopy, an essential component of image-guided basket retrieval. Berthou et al.[29] reported on 200 laparoscopic CBDEs from two institutions in France with an overall success rate of 95%. Lezoche et al.[7] reported on 100 laparoscopic CBDEs with five retained calculi and a procedure-related morbidity rate of 8%. Similarly, Millat et al.[16] reported on 115 laparoscopic CBDEs with an 87% clearance rate.

In our experience, external biliary drainage increased the morbidity rate and operative time, and we have shifted to primary closure of the CBD with or without stenting that significantly shortened the operative time and in addition it is simpler and less hazardous alternative to T-tube insertion. We see that primary closure should be the method of choice of the CBD after laparoscopic choledochotomy. Laparoscopic choledochoduodenostomy was performed in elderly patients with ampullary stenosis and ducts dilated beyond 15 mm in diameter. This may be technically challenging; however, our early results support continuation of this practice .

Although management of bile duct stones may vary around the world, depending on local expertise, our figures suggest that with practice, surgeons can tackle more than 90% of stones successfully with laparoscopic cholecystectomy, avoiding ERCP with its disadvantages. ERCP and endoscopic sphincterotomy carry substantial morbidity and mortality rates and these risks now equal or exceed those of patients undergoing laparoscopic CBDE. Even in selected patients with biochemical or ultrasound indicators, preoperative ERCP results in many unnecessary procedures, because >50% of patients will have no evidence of bile duct stones at surgery.[30-33] Postoperative ERCP is effective for common duct clearance, but places the patient at risk for complications of sphincterotomy, including pancreatitis, perforation, and bleeding.[34,35] Late sequelae of endoscopic sphincterotomy include recurrent ampullary stenosis, chronic bacterial colonization of the biliary tree, recurrent cholangitis, primary common bile duct stones, and theoretical concerns of increased risk for future pancreaticobiliary malignancy.[35-36] As well, an experienced endoscopist may not always be available. Moreover, reported rates of failure to clear the common duct by ERCP range from 4.4% to 10%, depending on the endoscopist's experience[24] and this compares favorable with reported rates of failure by LCBDE .

Laparoscopic common bile duct exploration (LCBDE) at the same setting as cholecystectomy has the advantage of addressing cholelithiasis and choledocholithiasis with a single procedure while leaving the sphincter of Oddi anatomically intact, and without the added morbidity of laparotomy. Additionally, LCBDE aims to spare the patients multiple hospital admissions/trips, to shorten the hospital stay, and lastly, to decrease the cost. Nevertheless, ERCP still has its place in managing CBD stones. We think it is suitable when laparoscopy is either contraindicated (e.g. previous upper abdominal surgery, associated comorbidities…etc) or not possible (e.g. lack of experience, equipments, …etc). additionally, ERCP should be the first option for treatment of postcholecystectomy CBD stones, although LCBDE is possible.

It should be mentioned that many recent studies showed the safety, feasibility and efficacy of laparoscopic transcystic approach for retrieval of CBD stones, particularly when the CBD diameter is small and the stones are small and few in number. Experience with LTCBDE shows that the approach is applicable in more than 85% of cases, with a success rate of 85% to 95%.[13,21,22,37-41]

As mentioned above, we did not perform transcystic approach in our study, because our hospital policy is to do ERCP when CBD diameter is smaller than 10 mm and only laparoscopy is offered by choledochotomy approach when CBD diameter is larger than 10 mm. Although we have a limited experience in laparoscopic transcystic approach, transcystic approach may be less invasive than choledochotomy and it may be the first choice for removal of CBD stones when feasible.

In conclusion, we have demonstrated that laparoscopic CBDE is both feasible and safe. The vast majority of patients fit for surgery with gallbladder and bile duct stones can expect to be managed with a single laparoscopic procedure without biliary drains or ERCP. However, it is not devoid of complications and the procedure is more time consuming; it also needs experience particularly in laparoscopic suturing techniques. Surgeons who operate regularly on the gallbladder should aim to master laparoscopic CBDE as an essential surgical option in the management of bile duct calculi. In this study we tried to show that laparoscopic choledochotomy is feasible, safe and advantageous but our work had been conducted in a retrospective manner and , as we know, the only possible way to prove the superiority of this technique for dealing with CBD stones is via randomized controlled trials.

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