ORIGINAL ARTICLE

LAPAROSCOPIC COMMON BILE DUCT EXPLORATION: PATIENT SELECTION FOR NON- EXPERIENCED SURGEONS

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Abstract

Background and study aims: Gall stones (Cholelithiasis) are a common health problem worldwide. Common bile duct (CBD) stones are the second most frequent complication of cholelithiasis and occur in 10% to 15% of patients. Most laparoscopic surgeons prefer the "single-stage" laparoscopic approach to cholelithiasis and choledocholithiasis in an attempt to decrease the need for multiple procedures and their associated morbidity and mortality. This is a preliminary experience aiming at evaluation of laparoscopic common bile duct exploration in a selected group of patients with choledocholithiasis to choose good selection criteria.

Patients / Material and Methods: From March 2011 to May 2013, fifty patients with common bile duct stones underwent laparoscopic CBD exploration in Gastro-enterology surgical center, Mansoura, Egypt.

Results: Fifty patients with CBD stones underwent laparoscopic CBD exploration, with successful procedure in 47 cases and the remaining 3 cases required conversion to open surgery; Two patients underwent laparoscopic trans-cystic approach with successful CBD clearance in both patients as they have small stones below 0.5 cm. Forty-five patients required laparoscopic choledochotomy. Hospital morbidity occurred in 2 (4%) patients; one with minor bile leak which managed conservatively and one with missed CBD stone that required endoscopic stone removal 5 days postoperatively. There was no operative mortality.

Conclusions: Laparoscopic CBD exploration is a feasible, safe and effective procedure that has a low morbidity and mortality rate. Patient selection is mandatory especially in the first few cases (during the learning curve) until experience is approached.

Keywords: Common bile duct stones, Laproscopic exploration, Non-experienced surgeons.

INTRODUCTION

Gall stones (Cholelithiasis) are a common health problem worldwide. Gall stones can occur anywhere within the biliary tree, including the gallbladder and the CBD. CBD stones are the second most frequent complication of Cholelithiasis and occur in 10% to 15% of patients.[1,2]

The management of CBD stones remains controversial. There is no standard algorithm and the disparity in laparoscopic skills among surgeons has perpetuated this lack of a standard.[3]

The big revolution in biliary surgery was the introduction of laparoscopic cholecystectomy (LC) in

1989.[4] The logical extension of this procedure was the introduction of laparoscopic CBD exploration (LCBDE) for suspected or proved ductal stones. Two approaches have been popularized for LCBDE: trans-cystic common bile duct exploration (TC-CBDE).[5,6] and laparoscopic choledochotomy (LCD).[7,8]

During the early development of LC, patients with the slightest suspicion of CBD stones underwent preoperative endoscopic retrograde cholangio pancreatography (ERCP) with a view that if stones were discovered they could be removed either using endoscopic sphincterotomy or operative CBD exploration. However, the use of preoperative ERCP is increasingly being challenged because it is a costy procedure; in the majority of cases;[9-11] there is a risk of life-threatening complications such as bleeding (3%), pancreatitis (2%), duodenal perforation (1%), and late papillary stenosis (10% to 33%);[12] and it has a failure rate that may require patients to return to the operating room to clear their CBD stones. Most laparoscopic surgeons therefore prefer the "single-stage" laparoscopic approach for cholelithiasis and choledocholithiasis in an attempt to decrease the need for the excessive number of negative ERCPs and their associated morbidity and mortality; to avoid damaging the ampulla of Vater, the physiological consequences of which are of legitimate concern; and to spare the patients multiple hospital admissions, to shorten the hospital stay, and lastly, to decrease the cost.[13-15]

Aim of the study: This is a preliminary experience aiming at evaluation of LCBDE in a selected group of patients with cholelithiasis and choledocholithiasis trying to establish good selection criteria.

MATERIAL AND METHODS

From Mars 2011 to May 2013, fifty patients with CBD stones diagnosed by history, physical examination, biochemical data, ultrasonography, or magnetic resonance cholangio-pancreatography (MRCP) underwent LCBDE in Gastro-enterology surgical center, Mansoura University, Egypt, with successful completion in 47 cases. Failure of completing the procedure laparoscopically in 3 cases that required conversion to open surgery with completion of the operation. Of the 47 successfully treated patients, 2 patients underwent laparoscopic trans-cystic stone extraction and 45 underwent laparoscopic choledochotomy. Our primary technique was laparoscopic trans-cystic CBD exploration (LTC-CBDE), and the indications for LTC-CBDE were stones smaller than 8 mm, fewer stones, and cystic duct lateral entrance to the CBD. The LCD technique is an alternative approach in patients with dilated common duct (diameter >10 mm), failure of trans-cystic duct exploration, or proximal ductal calculi.

Informed consent was obtained from all patients to be included in the study, after explaining the nature of the disease and operative steps and possible complications. This study was approved by the local ethical committee.

The exclusion criteria were:

1. Age below 20 or above 70 years.
2. Serum bilirubin level above 10mg/dl "neglected Obstruction".
3. Patients with liver cirrhosis.
4. History of previous upper abdominal surgery.
5. Severe acute cholecystitis (pyogenic or gangrenous).
6. Severe gallstone pancreatitis.
7. Acute pyogenic cholangitis.
8. Ampullary stenosis with multiple intra-hepatic stones, and
9. Suspected biliary tumor.

Surgical Procedure:

LC was performed by a standardized technique using a 45° video laparoscope placed through a 10-mm umbilical port and three additional laparoscopic sheaths: one 10-mm at the epigastrium, one 5- mm right flank, and one 5-mm inserted into the right upper quadrant. Intra-operative cholangiography (IOC) was a mandatory step. All IOC were typically performed by introducing a 14-gauge cholangio-catheter through a small puncture site in the right upper quadrant. The catheter was then inserted into a small incision in the cystic duct and secured in place with a clip. A half-strength contrast solution was injected under fluoroscopy for visualization of the biliary anatomy. Gentle instrumental compression was exercised on the CBD to ensure adequate filling of the sub-hepatic ducts and visualization of small calculi, and to eliminate false positive images due to air bubbles. Biliary anatomy as well as the number, size, and location of bile duct stones were considered in choosing a trans-cystic approach or a choledochotomy. After the decision was made, the bile duct was dissected and exposed, a longitudinal incision no longer than the largest stone was made in the anterior surface of the CBD and below the cystic duct, through which a 3 Fr-flat-wire basket was inserted through epigastrium sheath into the CBD and maneuvered both proximally and distally in the biliary tree. Also, a balloon catheter was used to retrieve the stones.

After complete clearance of the CBD, a latex rubber T-tube of appropriate size (14–16 Fr) was inserted into the CBD incision. After the tube had been positioned in place, the CBD incision was closed using interrupted sutures (4/0 Vicryl or Ethicon). Complementary T-tube cholangiogram was done to detect any residual stones. At the end of the procedure, a single infra-hepatic suction drain was placed, and this was removed after 48–72 h if there was no bile leak. Patients were discharged with their T-tubes opened in situ.

Discharge and Follow-Up: A T-tube cholangiogram was performed within about 10 days postoperatively, and if this was free the T-tube was clamped for one day then removed safely in the outpatient setting. If there were retained stones, the T-tube was left in place. ERCP was done for removal of missed stone/s once the diagnosis is made.

RESULTS

Fifty patients with CBD stones underwent LCBDE attempt, with successful completion in 47 cases and the remaining 3 cases required conversion to open surgery; thus the conversion rate in our study was 6%. The reasons for conversion were dense adhesions with unclear anatomy and impacted stone at the lower end of the CBD. (Table 1) shows the demographic characteristic and clinical presentations of all patients.

Table 1. Demographic characteristic and clinical presentation.

Age (years)	46 .6±15.4
Sex (male/female)	(14/36)
Biliay colic	30 (60%)
Jaundice	36 (72%)
Acute cholecystitis	5 (10%)
Dyspepsia	40 (80%)
Total number	50 cases

Two patients underwent LTC-CBDE with successful CBD clearance in both patients as they had small stones below 0.5 cm. Forty-five patients had LCD. T-tube confirmation cholangiogram at the end of the operation was done. The diameter of the CBD was 13.4± 2.3 mm, diameter of CBD stones was 13.5±2.1mm. Number of CBD stones was 3.1±2.4. Stone clearance obtained in 44 patients. The operative time was 115±29 minutes while the postoperative hospital stays was 5.3± 2.5 days. The median time to remove the drain was 2.4± 1.5 days.

Hospital morbidity occurred in 2 (4%) patients; one with minor bile leak (leakage <100 mL/ 24 h) that was managed conservatively and one with missed stone that required ERCP and stone removal 5 days post-operatively. There was no operative mortality.

DISCUSSION

Several different ways have been described for treating CBD stones, which are diagnosed during or before LC. It is logic that the best treatment should be a one stage technique, with the least discomfort for the patient and with lowest morbidity and the shortest hospital stay period.

Biliary endoscopic sphincterotomy "BES", since its introduction in 1974, has supplanted surgery as the standard therapy for bile duct stones. About 85% to 90% of bile duct stones can be removed by balloon/basket extraction following BES.[16]

Laparoscopic CBDE is more desirable due to several important reasons. Firstly, it removes the need and hence the risks of ERCP. Secondly, it reduces the inconvenience by offering a one-stage procedure in laparoscopic CBDE compared to a two-stage approach in ERCP followed by LC.[17] Laparoscopic CBD exploration is cost effective and permits early recovery with a reduced period of short-term disability.[18]

The results of a multi-center study reported by Cuschieri et al suggest that a single stage laparoscopic treatment is a better option.[19]

Laparoscopic exploration of the common bile duct could be done either by a trans-cystic approach or by a choledochotomy. In the trans-cystic technique, good results have been published with a clearance of 85% or more but the technique has limitations. The laparoscopic choledochotomy has no limitations in size of stones but carries a higher morbidity that could be due to the use of a T-tube when closing the incision in the common bile duct.[20]

In reported series there is a great difference between the results of feasibility of trans-cystic stone removal. In large reported series by Moore et al (21) trans-cystic CBD clearance was succeeded in 65% of cases while Lyass et al,[22] reported 85% success rate. The overall complication rate of trans-cystic exploration is reported as 5% to 10%, with a mortality rate of <1%.[23] In our study trans-cystic stone retrieval was achieved in 2 of 47 patients. (4%). Those patients fulfilled the criteria of such procedure which are small sized stone with the appropriate dilated and short cystic duct. Those 2 patients had smooth post-operative course without complications. However a larger number of patients are needed to judge the efficacy of that approach in comparison to the choledochotomy in terms of reducing complications or improving the outcome.

Comparing the various techniques in performing laparoscopic CBDE, trans-cystic CBDE has been associated with fewer complications compared to choledochotomy.[24]

The risk of retained stones following laparoscopic CBDE had been reported from 0 to 19% of cases. Retained stones continued to be a significant complication in CBDE, whether performed opened or laparoscopically.[25-27]

In our study Hospital morbidity occurred in 2 (4%) patients; one with minor bile leak (leakage <100 mL/24 h) who managed conservatively. And one case

with missed stone CBD (2%) who requires ERCP 5 days later with stone removal.

There always have been debates regarding primary closure of the choledochotomy and T-tube insertion. However, many recent studies have shown that primary closure may be better.[28]

In our study, the choledochotomy was closed over T-tube in all patients; one patient develop minor bile leak who managed conservatively. Our patients are allowed to go home with a functioning T-tube; this would shorten the hospital stay and decrease the total hospital expense. At outpatient clinic the T- tube was removed when T- tube cholangiogram was free.

The conversion to open surgery seems also to be variable between studies. Some authors reported a conversion rate up to (9.5%); on the other hand some reported a rate of conversion less than (1.5%),[29] in our study the conversion rate was 6% (3/50) due to marked adhesion and impacted stone at lower end CBD.

In conclusions clearly there is no single best approach for the management of choledocholithiasis. The optimal treatment is one that can be performed in the same setting. LCBDE is a feasible, safe and effective procedure that carries a low morbidity and mortality. The applicability of LCBDE will be dictated by the suitability of the patient to undergo a more prolonged procedure, the skill and training of the surgeon, the availability of more sophisticated equipment, and the availability of local expertise in ERCP if this failed. Patient selection is mandatory especially in the first few cases till the learning curve approached.

REFERENCES

1. Ponsky JL, Heniford BT, Gersin K. Choledocholithiasis: Evolving intraoperative strategies. Am Surg. 2000;66:262-8.

2. Hungness ES, Soper NJ. Management of common bile duct stones. J Gastrointest Surg. 2005;10:612-19.

3. Rai SS, Grubnik VV, Kovalchuk OL, Grubnik OV. Comparison of long-term results of laparoscopic and endoscopic exploration of common bile duct. Journal of Minimal Access Surgery. 2006;16-22.

4. Dubois F, Berthelot G, Levard H. Cholecystectomy by coelioscopy. Presse Medicale. 1989;18:980–2.

5. Jacobs M, Verdeja JC, Goldstein HS. Laparoscopic choledocholithotomy. J Laparoendosc Surg. 1991;1:79–82.

6. Petelin JB. Laparoscopic common bile duct exploration: transcystic duct approach. In: Scott-Conner CEH, ed. The SAGES Manual: Fundamentals of Laparoscopy and GI Endoscopy. New York: Springer-Verlag. 1998:167–77.

7. Dion YM, Ratelle R, Morin J, Gravel D.: Common bile duct exploration: the place of laparoscopic choledochotomy. Surg Laparosc Endosc. 1994;4:419–24.

8. Cuschieri A, Kimber C. Common bile duct exploration via laparoscopic choledochotomy. In: Scott-Conner CEH, Ed. The SAGES Manual: Fundamentals of Laparoscopy and GI Endoscopy. New York: Springer-Verlag. 1998:178–87.

9. Rijna H, Borgstein PJ, Meuwissen SG, et al.: Selective preoperative endoscopic retrograde cholangiopancreatography in laparoscopic biliary surgery. Br J Surg. 1995;82:1130–3.

10. Vitale GC, Larson GM, Wieman TJ, et al. The use of ERCP in the management of common bile duct stones in patients undergoing laparoscopic cholecystectomy. Surg Endosc. 1993;7:9–11.

11. Schmitt CM, Baillie J, Cotton PB. ERCP following laparoscopic cholecystectomy: a safe and effective way to manage CBD stones and complications. Hepatobiliary Surg. 1995;8:187–92.

12. Cotton PB, Chung SC, Davis WZ, et al. Issues in cholecystectomy and management of duct stones. Am J Gastroenterol. 1994;89:S169–76.

13. Phillips EH, Liberman M, Carroll BJ, et al.: Bile duct stones in the laparoscopic era. Is preoperative sphincterotomy necessary? Arch Surg. 1995;130:880–5.

14. Dion YM, Morin J, Dionne G, Dejoie C.: Laparoscopic cholecystectomy and choledocholithiasis. Can J Surg. 1992;35:67–74.

15. Hawes RH, Cotton PB, Vallon AG.: Follow-up 6 to 11 years after duodenoscopic sphincterotomy for stones in patients with prior cholecystectomy. Gastroenterology. 1990;98:1008–12.

16. Siriboon Attasaranya, EvanL. Fogel, Glen A. Lehman. Choledocholithiasis, Ascending Cholangitis and Gallstone Pancreatitis. Med Clin N Am. 2008;92:925–60.

17. Tan K K, Shelat V G, Liau K H, Chan C Y, Ho C K. Laparoscopic Common Bile Duct Exploration: Our First 50 Cases. Ann Acad Med Singapore. 2010;39:136-42.

18. Aroori S, Bell J C. Laparoscopic management of common bile duct stones: our initial experience. The Ulster Medical Journal. 2002;71:22-5.

19. Cuschieri A, Lezoche E, Morino M et al. E.A.E.S. multicenter prospective randomized trial comparing two-stage vs single-stage management of patients with gallstone disease and ductal calculi. Surg Endosc. 1999;13:952-7.

20. Petelin, J.B. Laparoscopic common bile duct exploration. Surg Endosc. 2003;17:1705-15.

21. Moore KB, Adrales GL, Mastrangelo MJ Jr: Laparoscopic common bile duct exploration. Curr Surg. 2004;61:294-96.

22. Lyass, S, E.H. Phillips. Laparoscopic transcystic duct common bile duct exploration. Surg Endosc. 2006;20:S441-5.

23. Crawford DL, Phillips EH. Laparoscopic common bile duct exploration. World J Surg. 1999;23:343-9.

24. Wills VL, Gibson K, Karihaloot C, Jorgensen JO. Complications of biliary T-tubes after choledochotomy. ANZ J Surg. 2002;72:177-80.

25. Taylor CJ, Kong J, Ghusn M, White S, Crampton N, Layani L. Laparoscopic bile duct exploration: results of 160 consecutive cases with 2-year follow up. ANZ J Surg. 2007;77:440-5.

26. Waage A, Stromberg C, Leijonmarck C, Arvidsson D. Long-term results from laparoscopic common bile duct exploration. Surg. Endosc. 2003;17:1181-5.

27. Ido K, Isoda N, Taniguchi Y, et al. Laparoscopic transcystic cholangioscopic lithotripsy for common bile duct stones during laparoscopic cholecystectomy. Endoscopy. 1996;28:431–5.

28. Ha JP, Tang CN, Siu WT, Chau CH, Li MK. Primary closure versus T-tube drainage after laparoscopic choledochotomy for common bile duct stones. Hepatogastroenterology. 2004; 51:1605-8.

29. Berthou JC, Drouard F, Charbonneau P, Moussalier K. Evaluation of laparoscopic management of common bile duct stones in 220 patients. Surg Endosc. 1998;12:16–22.