



Original research

Laparoscopic management after failed endoscopic stone removal in nondilated common bile duct



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HIGHLIGHTS

- Endoscopic CBD stone removal is still occasionally unsuccessful.
- Nondilated CBD is a contraindication to choledochotomy.
- Studies of LCBDE after failed endoscopic procedures in nondilated CBD are rare.
- LCBDE as a salvage procedure is safe and feasible for failed endoscopic stone removal in nondilated CBD.

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ABSTRACT

Introduction: When common bile duct (CBD) stone removal by endoscopic procedure fails, CBD exploration is an alternative procedure. However, nondilated CBD is a contraindication to choledochotomy. The purpose of this study was to investigate the results of laparoscopic CBD exploration (LCBDE) following unsuccessful endoscopic stone removal in nondilated CBD.

Methods: From January 2011 to June 2015, we retrospectively analyzed 165 LCBDEs. Group 1 was defined as patients with nondilated CBD who underwent LCBDE after failed endoscopic stone removal. Group 2 included patients with dilated CBD who received LCBDE. Outcomes of LCBDE were compared between the two groups.

Results: There were 23 patients in Group 1 and 142 in Group 2. No significant differences were observed in demographics other than CBD diameter. There was no significant difference in operating time, post-operative hospital stay, open conversion rate, overall postoperative complication rate, retained stone rate, and recurrence rate between the two groups.

Conclusion: LCBDE in experienced hands is a safe and feasible option after failure of endoscopic stone removal in nondilated CBD. However, larger numbers of cases and longer follow-up are required to validate LCBDE in nondilated CBD.

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1. Introduction

Five to 15% of patients with gallstones have concomitant common bile duct (CBD) stones [1]. Endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic sphincterotomy have dramatically changed the management of CBD stones. Endoscopic stone removal is quick, often painless, and is usually

successful. However, there are reports of adverse effects of endoscopic sphincterotomy. These include pancreatitis, duodenal perforation and bleeding [2–4]. Laparoscopic CBD exploration (LCBDE) was another revolution in the minimally invasive era that came with the development of laparoscopic cholecystectomy (LC). LCBDE can manage gallstones and CBD stones during the same session safely and effectively with the advantage of minimal access. However, LCBDE is difficult, risky, and time consuming, especially in patients with nondilated CBD. Both LCBDE and endoscopic stone removal have been used to treat CBD stones for many years. Some randomized clinical studies have shown that they have similar rates of stone clearance, morbidity, and mortality, while LCBDE is associated with a shorter hospital stay and is more cost-effective

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compared with ERCP [5–7]. In fact, LCBDE and endoscopic procedure should be considered complementary and their roles defined appropriately according to different indications.

Despite technical innovations, structured training programs and improved endoscopic imaging, failed biliary cannulation during ERCP occurs in 5–20% of all cases [4]. When endoscopic stone removal fails, LCBDE is an acceptable choice [8,9]. However, it remains unclear whether laparoscopic management is an optimal alternative to patients with nondilated CBD after an unsuccessful endoscopic procedure. The purpose of this study was to present our experience of LCBDE as a salvage procedure for failed endoscopic stone removal in nondilated CBD.

2. Materials and methods

2.1. Patients

From January 2011 to June 2015, 165 patients with gallstones and concomitant CBD stones who underwent LC and LCBDE during the same session at Taizhou People's Hospital (Taizhou, Jiangsu Province, China) were included in this retrospective study. Medical records, endoscopic and operative reports were retrieved from a review of inpatient files. Patients were further classified into two groups. In Group 1, 23 patients with nondilated CBD underwent LC and LCBDE after failed endoscopic stone removal. In Group 2, 142 patients with dilated CBD underwent LC and LCBDE. Nondilated CBD was defined as diameter < 8 mm. The study was approved by the ethics committee of our hospital, and informed written consent was obtained from each patient.

2.2. Operative procedure

All patients underwent preoperative blood examination, electrocardiography, chest X-ray, and abdominal ultrasonography. Magnetic resonance cholangiopancreatography was performed routinely to detect CBD stones in our center. Consultant surgeons performed LCBDE. Our standard operative technique included abdominal access for laparoscopic exploration using two 5-mm and two 10-mm trocars. All patients underwent supraduodenal longitudinal choledochotomy and extraction of CBD stones by intraoperative choledochoscopy. We routinely performed T-tube (12–20 Fr depending on the diameter of the bile duct) drainage and cholecystectomy after CBD clearance. Choledochorrhaphy was carried out using interrupted sutures. A subhepatic drain was inserted at the end of the procedure, and removed within three postoperative days, as long as the drainage fluid was <20 ml/day and free of bile. T-tube drainage was removed after cholangiography to exclude retained CBD stones at 6 weeks after surgery. In the case of retained CBD stones indicated by cholangiography, we performed choledochoscopic extraction of stones via the sinus tract of the T-tube. After discharge, patients were followed up every 3 months during the first year and annually thereafter (with clinical evaluation, liver function tests and ultrasonography). According to the findings, we used additional imaging studies to rule out biliary stricture and recurrent CBD stones.

2.3. Statistical analysis

The statistical data were analyzed using the *t*-test, Pearson's χ^2 test or Fisher's exact test. Data were analyzed using SPSS for Windows version 17.0 (SPSS Inc., Chicago, IL, USA). $p < 0.05$ was considered statistically significant.

3. Results

3.1. Patient characteristics

In Group 1, 19 patients failed ERCP because of unsuccessful biliary cannulation. Four patients underwent LCBDE because of retained CBD stones after ERCP. We performed emergency LCBDE in three patients with acute cholangitis. In Group 2, 21 patients required emergency LCBDE. No significant differences were identified with respect to age, gender and other medical conditions, except for CBD diameter. The characteristics of the two treatment groups, including main preoperative biochemical data, are shown in Table 1.

3.2. Outcome of laparoscopic procedure

There was no mortality in the treatment groups. One patient (4.35%) in Group 1 was converted to open surgery and three (2.11%) in Group 2 because of marked adhesions, leading to difficult anatomy and dissection. Duration of surgery was 122.6 min in Group 1 and 117.5 min in Group 2 ($p = 0.11$). There was no significant difference in postoperative hospital stay between the groups ($p = 0.48$).

There was no difference in the overall postoperative complication rate between the groups (8.70% for Group 1 vs 2.82% for Group 2). One patient in Group 1 and three in Group 2 presented with bile leakage in the postoperative 3 days. All were treated conservatively. The subhepatic drain was sufficient, and no extra drainage procedures were required, and the drain was removed within 5 days after surgery. Intra-abdominal bleeding after surgery occurred in one patient in Group 1, which was treated conservatively. One patient in Group 2 was complicated with postoperative intra-abdominal infection, which was managed with intravenous antibiotics and percutaneous drainage. No patients developed biliary stricture in either group.

No patients in Group 1 and two in Group 2 had retained CBD stones (diagnosed within 6 months after operation). One case of retained stones was detected by cholangiography and successfully treated by postoperative choledochoscopy. One patient with retained stones after T-tube removal underwent ERCP, with successful stone extraction. We found recurrent CBD stones in one patient in Group 1 and two patients in Group 2. All of these recurrent CBD stones were successfully removed by ERCP. The outcomes of LCBDE are shown in Table 2.

4. Discussion

Treatment options for concomitant gallstones and CBD stones include single-stage cholecystectomy and CBDE or a two-stage procedure via ERCP before or after cholecystectomy. The best approach remains controversial. As no consensus has been

Table 1
Patient characteristics.

	Group 1 (n = 23)	Group 2 (n = 142)	p value
Age (yr)	51.7 ± 9.2	54.6 ± 8.8	0.15
Sex (M/F)	9/14	48/94	0.62
ASA (I/II/III)	18/3/2	109/18/15	0.96
Diameter of CBD (mm)	6.6 ± 2.74	11.3 ± 4.59	<0.001
Obstructive jaundice (n, %)	5 (21.7%)	33 (23.2%)	0.87
Abnormal LFTs (n, %)	11 (47.8%)	64 (47.8%)	0.81
History of pancreatitis (n, %)	3 (13.0%)	20 (14.1%)	1.000
Cholangitis (n, %)	3 (13.0%)	21 (14.8%)	1.000

ASA: American Society of Anesthesiologists; LFTs: liver function tests.

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