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## Comparing a single-staged laparoscopic cholecystectomy with common bile duct exploration versus a two-staged endoscopic sphincterotomy followed by laparoscopic cholecystectomy

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## ABSTRACT

**Background:** With the advent of minimally invasive surgery, the limits of surgery have been stretched by questioning the more usual, established 2-stage approach for choledocholithiasis with an initial endoscopic retrograde cholangiography and endoscopic biliary sphincterotomy followed by laparoscopic cholecystectomy in favor of the single-stage laparoscopic common bile duct exploration with laparoscopic cholecystectomy. The aim of this study was to compare the related benefits, difficulties, and outcomes of these 2 methods at a single institution.

**Methods:** A retrospective analysis of 128 patients satisfying the inclusion criteria was divided into 2 groups ( $n=68$  for the group with laparoscopic common bile duct exploration with laparoscopic cholecystectomy and  $n=60$  for the group with endoscopic retrograde cholangiography/laparoscopic cholecystectomy) between 2014 and 2017. Patient data including age, sex, duration of the operation, intraoperative and postoperative complications, and duration of hospital stay were reviewed.

**Results:** The group with laparoscopic common bile duct exploration with laparoscopic cholecystectomy had 24 men and 44 women (mean age 52 years), and the group with endoscopic retrograde cholangiography/laparoscopic cholecystectomy had 16 men and 44 women (mean age 47 years). Statistically significant results were found in the clearance rate (100% in the group with laparoscopic common bile duct exploration with laparoscopic cholecystectomy versus 75% in the group with endoscopic retrograde cholangiography/laparoscopic cholecystectomy), a shorter total duration of hospitalization for the group with laparoscopic common bile duct exploration with laparoscopic cholecystectomy (4.1 days vs 8.4 days) ( $P < .05$ ), but a great incidence of biliary leakage in the group with laparoscopic common bile duct exploration with laparoscopic cholecystectomy. Duration of surgery was not different between the 2 groups.

**Conclusion:** Laparoscopic common bile duct exploration with laparoscopic cholecystectomy is a single-stage procedure that has many advantages over endoscopic retrograde cholangiography/laparoscopic cholecystectomy if appropriate experience and when expertise is available.

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## Introduction

The prevalence of asymptomatic choledocholithiasis ranges between 5.2% and 12%.<sup>1</sup> These common bile duct (CBD) stones can be either by primary CBD stones that originate within the CBD or secondary CBD stones originating in the gallbladder.<sup>2</sup> Primary CBD stones are composed primarily of bilirubin and associated

with infection and biliary stasis; in secondary CBD, cholesterol is the predominant component. Whereas secondary bile duct stones can be managed by cholecystectomy and choledocholithotomy, primary CBD stones often require a more complex approach to prevent recurrence.<sup>3,4</sup> Currently, therapeutic decision-making is based on local expertise with either pre- or postoperative endoscopic retrograde cholangiography (ERC) with endoscopic biliary sphincterotomy (ES) in a 2-stage procedure or as a single-stage operative CBD exploration and cholecystectomy.

With less morbidity and mortality associated with the 1-stage management<sup>5</sup> and with increasing experience with the advanced minimally invasive operative technique, a minimally invasive approach to many problems of the biliary tree has become safe,

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efficient, and cost-effective,<sup>6–8</sup> but its success depends on subtle factors, such as biliary anatomy; size, type, and number of CBD stones; surgical expertise; and adequate equipment.<sup>9</sup>

Laparoscopic CBD exploration with laparoscopic cholecystectomy (LCBDE) has been shown to be successful in 85% of patients with results comparable to those of endoscopic removal of CBD stones.<sup>10</sup> The purpose of this study was to compare the efficacy and safety of LCBDE with laparoscopic cholecystectomy (LC) plus ES followed by LC (ERC/LC) in the treatment of patients with CBD stones in our institution.

## Methodology

We performed a retrospective review of all patients who underwent LCBDE and ERC/LC in the Second Affiliated Hospital of Dalian Medical University between September 2014 and September 2017 for gallstones and concomitant CBD stones. All patients were diagnosed preoperatively with radiographic evidence of stones <2 cm in size. The operation on both in Group ERC/LC and LCBDE was performed by 4 different teams of senior attending surgeons, consisting each of an experienced surgeon, 2 junior surgeons, and 3 trainee surgeons. The ERCs and ES were done by 4 teams that included 2 senior physicians, 1 junior physician, and 2 trainee surgeons. Patients with radiologic evidence of large stones (>2 cm); history of bleeding disorders; evidence on ultrasonography (US) or computed tomography of an intrahepatic gallbladder, liver mass, abscess, or periampullary neoplasm; clinical or US evidence of suppurative or necrotizing cholecystitis, gallbladder empyema, or perforation; multiple prior laparotomies; morbid obesity; pregnancy; or severe systemic organ dysfunction (chronic liver, renal or heart diseases); and patients who were HIV positive or immunosuppressed were excluded from the study.

Furthermore, patients who underwent ERC/ES alone without subsequent LC were not included in the study. All patients were followed up as outpatients; if further interventional treatment was required, they were still included in the study, provided the LC was performed within the time frame of the data collection.

All the patients underwent transabdominal US, computed tomography, or magnetic resonance cholangiopancreatography for the confirmation of CBD stones. The patients presenting with cholelithiasis and confirmed choledocholithiasis underwent clinical and laboratory workup, which comprised a complete hemogram and liver, pancreatic, and renal function tests.

After approval from the Ethical Board Committee of the Second Affiliated Hospital of Dalian Medical University, we reviewed retrospectively the patient data, including age, sex, duration of the operation, need for conversion to an open procedure and its reasons, intraoperative and postoperative complications, duration of hospital stay, and condition on follow-up visits. The duration of laparoscopic surgery was calculated from the time of insertion of first port to the time of cutting of last stitch after port site closure.

Postoperative complications analyzed included bile leak/fistula, perforation, bleeding, wound infection, acute cholangitis, and acute pancreatitis after the ERC in Group ERC/LC and cholecystectomy in both groups. The duration of hospital stay was calculated in number of days the patient had to spend in the hospital after the first intervention until discharge. Follow-up was done at postoperative weeks 1 and 2 and the first, third, and sixth months.

Group LCBDE underwent operation via standard 4-port method. After dissection around Calot's triangle and clipping of the cystic artery and duct, choledochotomy was made in the supraduodenal portion of the CBD using a harmonic scalpel and choledochoscopy was performed (Fig. 1). Stones were expressed out by gentle milking of the common duct and/or using a Dormia basket (Fig. 2) followed by flushing of the entire ductal system with copious amounts of 0.9% NaCl. Ductal clearance was confirmed using a

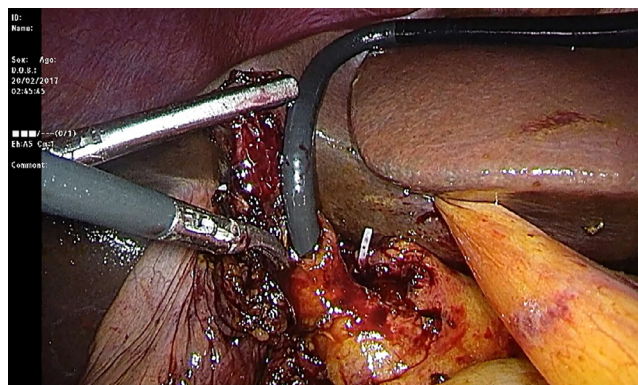


Fig. 1. Intraoperative choledochoscopy.



Fig. 2. Retrieval of common bile duct stones using a Dormia basket.



Fig. 3. Gentle manipulation of the common hepatic duct with a suture line to ease the access of the choledochoscope.

flexible choledochoscope inserted through the epigastric port. Ease of penetration was helped with the gentle manipulation of the common hepatic duct with a suture passed around the duct proximally for traction (Fig. 3). After ensuring CBD clearance, the T-tube was then inserted via midclavicular port into the CBD through the choledochotomy site. The choledochotomy was closed using absorbable suture (3-0 polyglactin) followed by completion of the cholecystectomy and drain placement. In cases of retained stones, an ES was done to evacuate the stones at a later date.

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