

Transcystic Approach to Laparoscopic Common Bile Duct Exploration

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ABSTRACT

Background and Objectives: One-stage laparoscopic management for common bile duct stones in patients with gallbladder stones has gained wide acceptance. We developed a novel technique using a transcystic approach for common bile duct exploration as an alternative to the existing procedures.

Methods: From April 2010 to June 2012, 9 consecutive patients diagnosed with cholelithiasis and common bile duct stones were enrolled in this study. The main inclusion criteria included no upper abdominal surgical history and the presence of a stone measuring <5 mm. After the gallbladder was dissected free from the liver connections in a retrograde fashion, the fundus of the gallbladder was extracted via the port incision in the right epigastrium. The choledochoscope was inserted into the gallbladder through the small opening in the fundus of the gallbladder extracorporeally and was advanced toward the common bile duct via the cystic duct under the guidance of both laparoscopic imaging and endoscopic imaging. After stones were retrieved under direct choledochoscopic vision, a drainage tube was placed in the subhepatic space.

Results: Of 9 patients, 7 had successful transcystic common bile duct stone clearance. A narrow cystic duct and the unfavorable anatomy of the junction of the cystic duct and common bile duct resulted in losing access to the common bile duct. No bile leakage, hemobilia, or pancreatitis occurred. Wound infection occurred in 2 patients. Transient epigastric colic pain occurred in 2 patients and was relieved by use of anisodamine. A transient increase in the amylase level was observed in 3 patients. Short-term follow-up did not show any recurrence of common bile duct stones.

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Conclusion: Our novel transcystic approach to laparoscopic common bile duct exploration is feasible and efficient.

Key Words: CBD stones, One-stage laparoscopic management, Transcystic approach.

INTRODUCTION

With the advancement of laparoscopic equipment and surgical skill, a single-stage laparoscopic procedure for common bile duct (CBD) stones in patients with gallbladder stones has become feasible and practicable.¹⁻⁵ Studies have shown that laparoscopic CBD stone retrieval is as efficient and effective as endoscopic retrograde cholangiopancreatography (ERCP).^{2,4-6}

Laparoscopic CBD exploration involves a transcystic approach or choledochotomy approach. Usually, the transcystic approach is considered the first treatment of choice for laparoscopic CBD exploration because transcystic CBD exploration has more benefits than the choledochotomy approach.³⁻⁸ In the laparoscopic setting, it would be difficult for surgeons to manipulate the choledochoscope into the CBD from a small opening in the cystic duct. To overcome this shortcoming, we developed a novel transcystic approach to laparoscopic CBD exploration.

MATERIALS AND METHODS

From April 2010 to June 2012, 9 consecutive patients diagnosed with cholelithiasis and CBD stones were enrolled in this study. There were 2 men and 7 women, with a median age of 57 years (range, 43-71 years).

The diagnosis of CBD stones was made by magnetic resonance cholangiography. The inclusion criteria were as follows: no upper abdominal surgical history, stones measuring <5 mm, no intrahepatic duct stones, number of stones <3 , normal liver function test results, no jaundice, and normal leukocyte count.

All the patients were fully informed about the characteristics of the procedure and its advantages over conventional choledochotomy exploration and 2-stage minimally



Figure 1. Size and position of trocars.

invasive procedures. Written consent forms were obtained from all the participants or their family members. This study was approved by the ethics committee of our institution.

The patient was transferred to the operating room for laparoscopic management of gallbladder stones and CBD stones and placed in the supine position. At the time of general anesthesia, prophylactic antibiotic was administered to prevent infection. The surgeon stood to the left of the patient. The first assistant, who was in charge of handing the laparoscope, stood at the surgeon's left. The second assistant stood on the right side of the patient.

The procedure was carried out using a 4-trocar cholecystectomy technique. Instead of a 5-mm trocar, a 12-mm trocar was inserted about 3 cm from the right costal arch, at the midclavicular line (**Figure 1**). After dissection of the Calot triangle, the cystic artery and cystic duct came into view. Once the cystic artery was transected, dissection of the gallbladder from its bed was begun at the fundus and continued to the body and infundibulum. While the gallbladder was dissected free from the liver connections, the fundus of the gallbladder was extracted via the 12-mm port incision carefully under laparoscopic vision (**Figure 2**). The cystic duct was left intact, connecting to the CBD.

After a small incision was made in the fundus of the gallbladder extracorporeally, a suction device was inserted into the gallbladder cavity, aspirating the bile juice. A flexible choledochoscope was introduced into the gallbladder through the opening in the fundus of the gallbladder and gently advanced toward the cystic duct under the guidance of both laparoscopic imaging and endoscopic



Figure 2. The freed gallbladder was extracted from the 12-mm port.

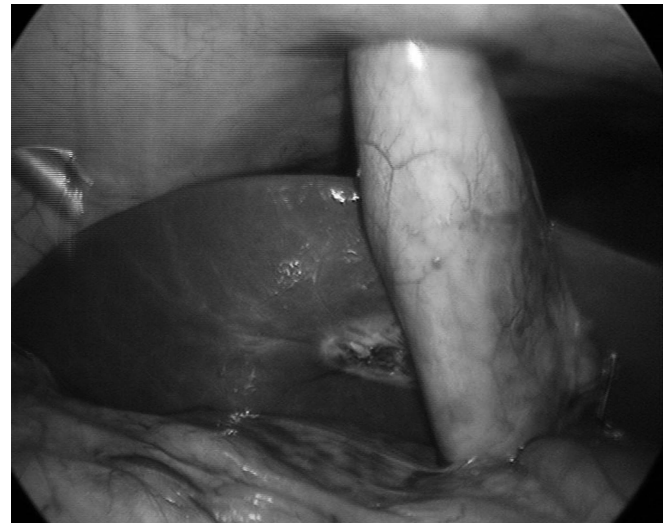


Figure 3. The choledochoscope was inserted through the extracorporeal opening in the fundus of the gallbladder.

imaging (**Figure 3**). Before introduction of the choledochoscope into the CBD, intraoperative cholangiography was performed to confirm the diagnosis of CBD stones and provide information about the number, size, and location of stones, as well as the anatomy of the cystic duct and CBD. In most situations, the cystic duct needs to be dilated by the choledochoscope itself or by a dilator for passage of the choledochoscope. By use of both endoscopic and laparoscopic imaging, the choledochoscope was guided into the CBD via the cystic duct. The CBD was thoroughly examined, and the stones were retrieved under direct choledochoscopic vision (**Figure 4**). Finally, the cystic duct was closed with clips or Surgitie (Covidien,

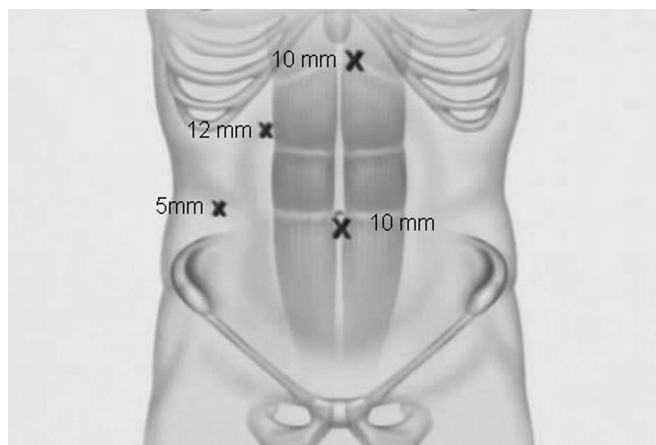


Figure 4. The CBD stone was removed from the abdomen using the choledochoscope.

Mansfield, Massachusetts), and the gallbladder, within a retrieval bag, was removed from the abdomen through the 12-mm port.

Liver function tests and assessments of the amylase level and leukocyte count were performed in patients postoperatively. A drainage tube was placed in the subhepatic space through the 12-mm port.

RESULTS

All patients survived the operation. Successful transcystic CBD stone clearance was achieved in 7 of 9 patients, whereas treatment failure occurred in the other 2 patients. The reasons for failure were a narrow cystic duct in 1 patient and the cystic duct joining the CBD on the left side in the other patient. The duration of the operation in the 7 patients with successful transcystic CBD stone clearance was 126 minutes (range, 96–141 minutes). Postoperative ERCP was successfully performed in the 2 patients in whom failure occurred.

No bile leakage, hemobilia, abdominal bleeding, or pancreatitis occurred in our series. Wound infection in the 12-mm port occurred in 2 patients. Transient epigastric colic pain occurred in 2 patients and was relieved by use of anisodamine. A transient increase in the amylase level was observed in 3 patients, and the amylase level returned to normal on postoperative day 3 without any treatment. The external drainage tube was removed 48 hours postoperatively in the absence of surgical complications.

Finally, the patients were discharged home on day 4 postoperatively once we were completely assured that the operation was successful and no complications had oc-

curred. Short-term follow-up (median, 23 months; range, 16–40 months) showed no recurrence of CBD stones by use of magnetic resonance cholangiography.

DISCUSSION

In the era of minimally invasive surgery, various options for the treatment of CBD stones in patients with gallbladder stones are available, including ERCP plus laparoscopic cholecystectomy, open surgery, and 1-stage laparoscopic cholecystectomy and CBD exploration. Recent reports have shown that laparoscopic clearance of CBD stones is as efficient and effective as that with ERCP⁵ and can avoid the potential complications of ERCP, such as cholangitis, pancreatitis, duodenal perforation, and bile duct injury.⁹ So, laparoscopic cholecystectomy with simultaneous transcystic CBD exploration has gained wide acceptance for 1-stage laparoscopic management of Cholecystochodolithiasis.

There are 2 types of laparoscopic CBD exploration: the transcystic approach and the choledochotomy approach. More and more surgeons prefer the transcystic approach to choledochotomy for CBD stone clearance because the transcystic approach can avoid an incision in the CBD wall. To carry out laparoscopic transcystic CBD exploration, a small incision has to be made in the cystic duct.^{1–3,7,10,11} The key step for successful transcystic CBD exploration is introduction of the choledochoscope into the cystic duct. In the laparoscopic setting, surgeons often confront difficulties in manipulating the choledochoscope into the small cystic duct through its partial opening. To overcome these shortcomings, we developed a novel transcystic approach that would facilitate introduction of the choledochoscope into the cystic duct and then its advancement into the CBD.

CBD exploration and stone extraction were successful in 7 of 9 patients. A narrow cystic duct and the unfavorable anatomy of the junction of the cystic duct and CBD resulted in losing access to the CBD and were responsible for the failure of the novel transcystic approach. No difficulties were met in the process of retracting stones in the selected patients. Except for 2 wound infections in the 12-mm port, no other complications were observed. A drainage tube was placed in case of bleeding and bile leakage. We attributed the results to our inclusion criterion requiring stones to measure <5 mm.^{7,10}

In the future, we would expand this technique to acute inflammatory settings, impacted stones, or stones measuring >5 mm. In a recent study, Chiarugi et al¹¹ showed that

laparoscopic transcystic exploration for single-stage management of common duct stones and acute cholecystitis was a simple technique with a high yield of CBD clearance in the acute setting because the dissection of the Calot triangle is facilitated by the edema. Laparoscopic CBD exploration via a transcystic approach together with holmium laser lithotripsy can solve impacted or large solitary stones. Laser lithotripsy can serve as an additional tool for the laparoscopic surgeon when confronted with impacted or large stones.¹

CONCLUSION

Laparoscopic cholecystectomy with simultaneous laparoscopic CBD exploration offers the advantage of avoiding an extra procedure and the potential complications of ERCP. Our results, along with other reports, have shown that single-stage laparoscopic CBD stone retrieval was feasible and efficient. Our novel technique provides an alternative transcystic approach for single-stage laparoscopic CBD exploration. We believe that more and more CBD stones can be treated by the transcystic approach with advancements in equipment and surgical skill.

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