



Case report

Laparoscopic lithotripsy and lithotomy of impacted stone at the terminal end of the common bile duct using a laparotomy biliary lithotomy spoon: A case report

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ABSTRACT

Introduction and importance: Endoscopic intervention is considered first-line therapy for common bile duct (CBD) stones, in recent times. However, surgically altered anatomy and consequent inaccessibility of the duodenal papilla necessitate surgery in some patients.

Case presentation: A 61-year-old woman presented with fever and right subcostal pain. She underwent total gastrectomy and Roux-en-Y reconstruction for gastric ulcer, 4 years prior to presentation. Based on the clinical findings, she was diagnosed with acute obstructive cholangitis secondary to a CBD stone. Endoscopic retrograde biliary drainage was attempted; however, the duodenal papilla was endoscopically inaccessible owing to the previous Roux-en-Y reconstruction, and we performed percutaneous transhepatic gallbladder drainage (PTGBD). She underwent laparoscopic cholecystectomy and choledocholithotomy, 6 days after the PTGBD. Choledocholithotomy was attempted using basket forceps under choledochoscopic guidance; however, this procedure was unsuccessful, and we performed laparoscopic choledocholithotomy using a laparotomy biliary lithotomy spoon.

Clinical discussion: Usually, laparoscopic cholecystectomy concomitant with CBD exploration is performed in patients with an endoscopically inaccessible duodenal papilla. However, an inadequately opened basket may not capture large impacted stones at the duodenal end of the CBD. Intraductal shock wave lithotripsy (electrohydraulic or laser lithotripsy) is considered in such cases; however, the specialized instruments required for this procedure are unavailable at all centers. Laparoscopic choledocholithotomy using a laparotomy biliary lithotomy spoon may be useful to overcome this surgically challenging situation.

Conclusion: A laparotomy biliary lithotomy spoon is a simple, user-friendly, and economical device that may be useful for laparoscopic lithotripsy and lithotomy of impacted stones.

1. Introduction

Currently, endoscopic intervention is considered first-line treatment for common bile duct (CBD) stones [1]. However, surgically altered anatomy and consequent inaccessibility of the duodenal papilla necessitate surgery in some patients. Laparoscopic CBD exploration (LCBDE) is preferred over open surgery in the era of laparoscopic procedures; however, conversion to open surgery becomes necessary in some patients with dense adhesions and unclear or complex anatomy or

impacted CBD stones [2]. We present a case of successful laparoscopic removal of a stone impacted at the terminal segment of the CBD using a laparotomy biliary lithotomy spoon.

This work has been reported in line with the SCARE criteria [3].

2. Presentation of case

A 61-year-old woman presented to our hospital with fever and right subcostal pain. She underwent total gastrectomy and Roux-en-Y

Abbreviations: CBD, common bile duct; LCBDE, laparoscopic common bile duct exploration; PTGBD, percutaneous transhepatic gallbladder drainage; EHL, electrohydraulic lithotripsy; ERCP, endoscopic retrograde cholangiopancreatography.

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reconstruction for a gastric ulcer, 4 years prior to presentation. Physical examination showed her body temperature was 37 °C, blood pressure was 86/52 mmHg, and heart rate was 62 beats/min. Abdominal examination revealed a scar representing an upper midline skin incision in the abdominal wall. Her abdomen was flat and soft with tenderness elicited in the right hypochondrium. Laboratory findings on admission showed the following results: white blood cell count 34,560/ μ L, serum C-reactive protein 8.9 mg/dL, total bilirubin 2.9 mg/dL, aspartate aminotransferase 94 U/L (normal range 8–38 U/L), alanine aminotransferase 86 U/L (4–44 U/L), alkaline phosphatase 682 U/L (104–338 U/L) and gamma-glutamyl transpeptidase level 241 U/L (16–73 U/L). Abdominal computed tomography and magnetic resonance imaging revealed a CBD stone (15 mm in diameter) at the duodenal end with bile duct dilatation at the hepatic end and an enlarged gallbladder with small stones (Fig. 1). Based on these clinical findings, we diagnosed the patient with acute obstructive cholangitis secondary to a CBD stone. Endoscopic retrograde biliary drainage was attempted; however, the duodenal papilla was inaccessible owing to the Roux-en-Y reconstruction after total gastrectomy performed previously. Therefore, percutaneous transhepatic gallbladder drainage (PTGBD) was performed for biliary drainage because the intrahepatic bile ducts were not adequately dilated to enable puncture. Laparoscopic cholecystectomy and choledocholithotomy were performed as follows, 6 days after the PTGBD:

The patient was placed in the supine position, and a 12-mm trocar was placed in the right mid abdomen using an open method, followed by creation of pneumoperitoneum. Observation using a 5-mm flexible laparoscope showed no visceral adhesions to the abdominal wall. Four 5-mm trocars (placed at the epigastrium, right hypochondrium, right upper flank, and the umbilicus) were inserted under laparoscopic guidance (Fig. 2). The epigastric and right mid abdominal trocars were inserted for the operator and the umbilical trocar for insertion of the laparoscope. Following dissection of the postoperative intra-abdominal adhesions and mobilization of the gallbladder from the liver, the cystic and CBD were exposed. The choledochoscope could not be introduced into the narrow cystic duct; therefore, choledochotomy and choledochoscopy were performed through the CBD orifice, and the stone was identified at the duodenal end of the CBD. Choledocholithotomy was attempted using basket forceps under choledochoscopic guidance. However, the stone was incarcerated in the bile duct, and the forceps did not open satisfactorily to capture the stone; therefore this procedure was unsuccessful. Application of traction to the stone using a balloon

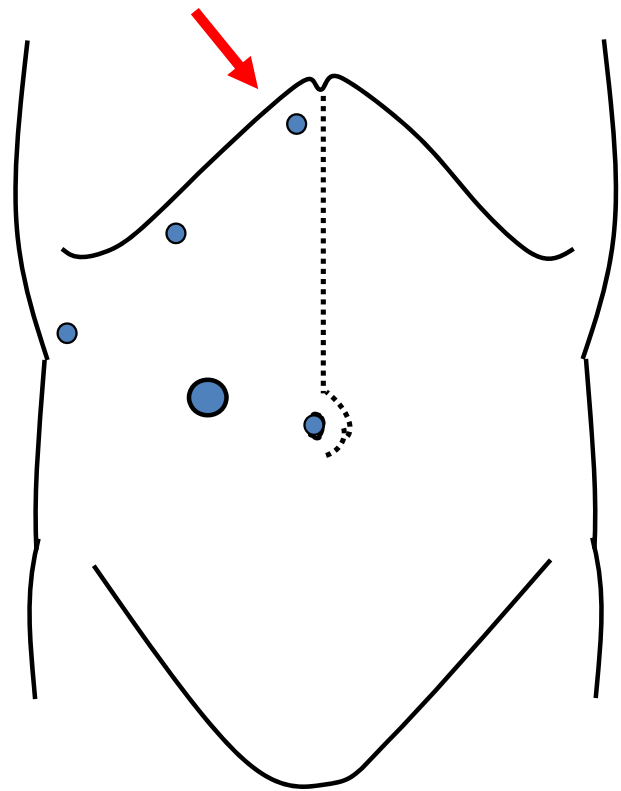


Fig. 2. Dotted line in the mid abdominal wall showing the surgical scar of the total gastrectomy. The large closed circle shows a 12-mm trocar and smaller closed circles showing 5-mm trocars inserted in the abdominal wall. A laparotomy biliary lithotomy spoon is introduced through the epigastric trocar site (arrow).

catheter or saline injection into the distal aspect of the stone failed to remove it. Electrohydraulic lithotripsy (EHL) or laser lithotripsy are unavailable at our hospital; therefore, we used a laparotomy biliary lithotomy spoon (Fig. 3), which was introduced into the abdominal cavity through the orifice of the epigastric trocar removed (Fig. 4a) and introduced into the CBD through the orifice through which we

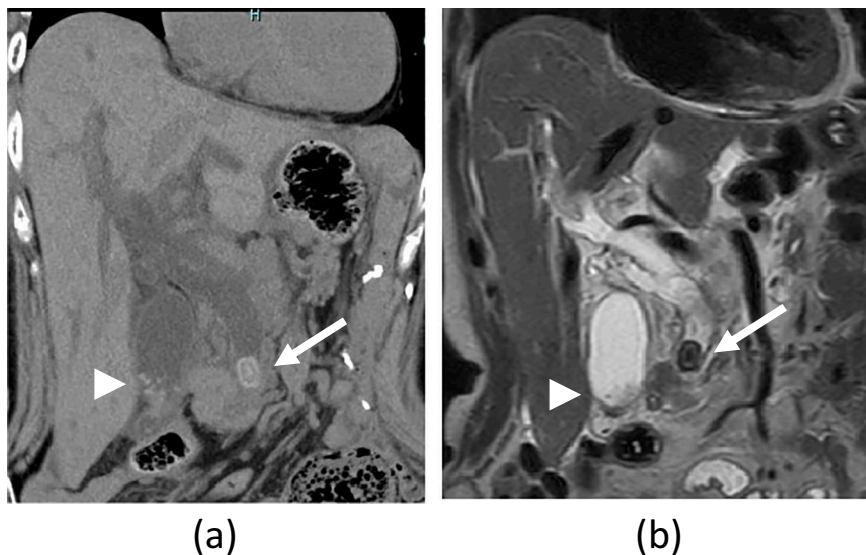


Fig. 1. Computed tomography scan (a) and magnetic resonance imaging scan (b) showing a stone at the duodenal end of the CBD (arrow) with bile duct dilatation at the hepatic end and an enlarged gallbladder with small stones (arrowhead). CBD: common bile duct

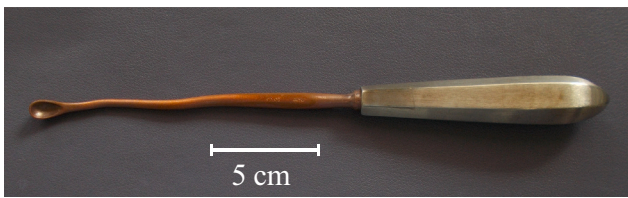


Fig. 3. Image showing the laparotomy biliary lithotomy spoon used in this case.

performed laparoscopic choledochotomy (Fig. 4b). The stone was fragmented by curettage and extracted from the CBD using the spoon and removed using the suction tube (Fig. 4c). The spoon was removed after it was thoroughly washed in the abdominal cavity. After choledocholithotripsy and CBD irrigation, we performed choledochoscopy to confirm there were no residual stones in the bile duct, and the CBD orifice was closed using a primary suture (Fig. 4d). Following cholecystectomy, we placed a biliary drainage catheter into the CBD via the cystic duct and this catheter led through the abdominal wall (Fig. 4d). Intraoperative cholangiography revealed no residual stones in the biliary tract.

The patient's postoperative course was uneventful, and the biliary drainage catheter was removed 21 days postoperatively. The patient has been well over 3-year follow-up without recurrent choledocholithiasis.

3. Discussion

Preoperative endoscopic retrograde cholangiopancreatography (ERCP) with stone removal concomitant with laparoscopic cholecystectomy, laparoscopic cholecystectomy concomitant with LCBDE, laparoscopic cholecystectomy concomitant with intraoperative ERCP, and laparoscopic cholecystectomy together with postoperative ERCP are the various therapeutic approaches available for choledocholithiasis, in the era of laparoscopic surgery. Most surgeons prefer ERCP in patients with preoperatively confirmed CBD stones [4]. Laparoscopic cholecystectomy with LCBDE is selected in patients in whom the duodenal papilla is endoscopically inaccessible, as observed in our patient. Preoperative endoscopic or percutaneous biliary drainage or emergency

operative biliary drainage should be performed in patients with moderate or severe acute cholangitis [5]. Endoscopic biliary drainage could not be performed in our patient; therefore, we performed preoperative percutaneous biliary drainage.

LCBDE is performed via the transcystic (via the cystic duct) or the transductal (via choledochotomy) approach [6,7]. The transcystic approach involves saline irrigation of the CBD to flush out small stones through the sphincter of Oddi or through the opening in the cystic duct. Alternatively, a helical basket is advanced through the cystic duct to extract stones under fluoroscopic guidance or cholangioscopy. In this case, the transcystic approach failed owing to narrowness of the cystic duct, which prevented choledochoscope insertion, and a transductal approach was selected. The stone extraction procedure via the transductal approach is the same as that using the transcystic approach. However, the basket may not open adequately and may not capture the stone in patients with large impacted stones at the duodenal end of the CBD; intraductal shock wave lithotripsy under cholangioscopic guidance (EHL or laser lithotripsy) is used in such cases [1]; however, the sophisticated instruments for these procedures are available only at some specialized centers, and these are unavailable at our hospital. Several other maneuvers, including stone extraction using a balloon catheter or via saline flushed into the distal aspect of the stone, traction on the stone to push it into the duodenum following dilation of the sphincter of Oddi, or intraoperative ERCP may be performed to overcome this technical difficulty. Conversion to conventional open surgery becomes necessary if all other approaches fail to remove the stone. Simple T-tube placement for biliary decompression for postoperative extracorporeal shock-wave lithotripsy [8] and/or choledochoscopy are options that may be useful at centers that lack sophisticated equipment or personnel with experience and expertise to perform technically challenging biliary surgery.

In this case, a laparotomy biliary lithotomy spoon was a simple and convenient device that was useful for removal of the impacted stone. To our knowledge, no report has described this maneuver using a laparotomy biliary lithotomy spoon. The small head of the spoon facilitates easy insertion into the abdominal cavity directly through the trocar wound orifice. The handle of the spoon is malleable, which facilitates introduction into the CBD through the choledochotomy orifice and improves maneuverability. The handle may be relatively short for use in patients

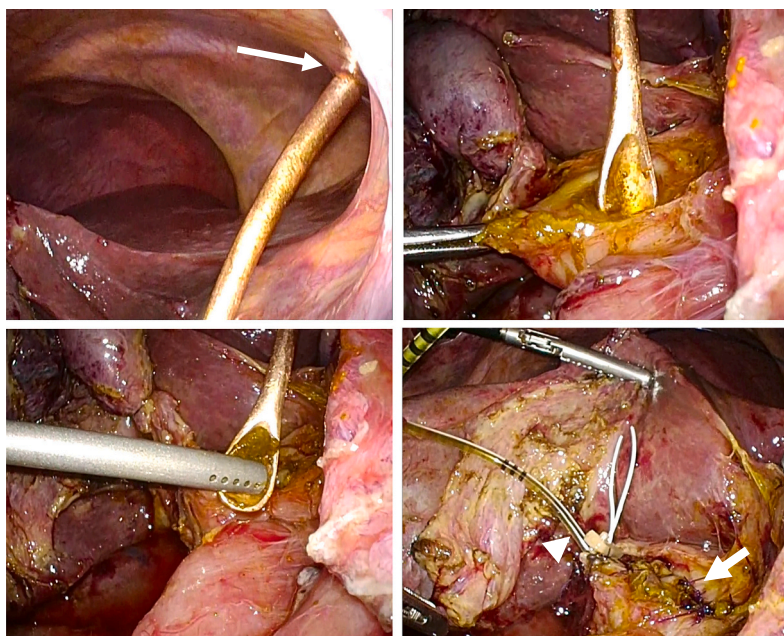


Fig. 4. Laparoscopic images.

(a) The handle of the laparotomy biliary lithotomy spoon is introduced through the trocar site (arrow).

(b) The laparotomy biliary lithotomy spoon is inserted through the CBD orifice.

(c) The stone is fragmented and scooped out by the spoon and removed using a suction tube.

(d) The CBD orifice is closed using a primary suture (arrow). A biliary drainage catheter is inserted through the cystic duct (arrowhead).

CBD: common bile duct

a)	b)
c)	d)

with a thick abdominal wall; in such cases, reduced pneumoperitoneum pressure shortens the distance between the abdominal wall and the CBD, which ensures that the spoon reaches the end of the CBD. The spoon is inserted directly through the abdominal wall; therefore, it is necessary to wash it in the abdominal cavity before removal to avoid abdominal wall infection. The laparotomy biliary lithotomy spoon is available even at basic-level hospitals and is an economical instrument. Laparotomy lithotomy forceps can be used in the same manner [9]; however, owing to the rigid handle, it is difficult to introduce this instrument into the CBD and to open the forceps satisfactorily within the CBD to capture the stone.

4. Conclusion

A laparotomy biliary lithotomy spoon is a simple, user-friendly, and economical device to perform laparoscopic lithotripsy and lithotomy of impacted stones. We recommend the use of a biliary lithotomy spoon with a longer handle and a short flexible port for laparoscopic surgery.

Provenance and peer review

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Ethical approval

The institutional review board accepted this case report for publication.

Consent

Informed consent was obtained from the patient for the operation, therapeutic procedures and publication of this case report and any accompanying images before treatment.

Research registration

Not applicable.

Guarantor

Tadashi Tsukamoto, MD, PhD.

CRediT authorship contribution statement

The study concept and design were conceived by T. Tsukamoto, C. Nobori, T. Kunimoto, R. Kaizaki, T. Inoue, and Y. Nishiguchi. T. Tsukamoto and C. Nobori were responsible for the interpretation of the study. Drafting of the manuscript was completed by T. Tsukamoto.

Declaration of competing interest

There are no conflicts of interest.

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